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JOURNAL  
OF THE  
ASIATIC SOCIETY OF BENGAL.



VOL. XLIX.

PART I. (HISTORY, ANTIQUITIES, &c.)

(Nos. I to IV.—1880: with 22 Plates and 2 Maps.)

EDITED BY

THE PHILOLOGICAL SECRETARY.

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"It will flourish, if naturalists, chemists, antiquaries, philologers, and men of science in different parts of *Asia*, will commit their observations to writing, and send them to the Asiatic Society at Calcutta. It will languish, if such communications shall be long intermitted; and it will die away, if they shall entirely cease." SIR WM. JONES.



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# JOURNAL

OF THE

## ASIATIC SOCIETY OF BENGAL.



Part I.—HISTORY, LITERATURE, &c.

~~~~~  
No. I.—1880.  
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*Description of the Great Śiva Temple of Gangai Kondapuram and of some other places in the Trichinopoly District.—*

By LIEUT.-COL. B. R. BRANFILL. (With a Plate.)

During the past season I visited and examined the great Śiva temple of Gangaikonda (-Shola-)puram (Gangaeondapuram of A. S. 79), situate in the extreme E. N. E. part of the Trichinopoly District, 20 miles S. W. from Chidambaram.

As this is the largest\* and best specimen of a South Indian temple proper I have ever met with, I venture to offer a short description of it. Roughly speaking it is a faesimile of the great Tanjore Temple, possibly its prototype, or perhaps more probably a copy; but never having been “restored,” as the Tanjore example has, and being built throughout in a very hard kind of stone, it retains much of its pristine appearanee and purity of design, which has been lost there.

I made notes of my observations on the spot and took measurements, sketehes and some impressions of the inscriptions with which its base is covered, as speeimens of the eharacter, which is mostly old Tamil, very similar to that at Tanjore.

Gangaikondapuram is the site of a deserted town supposed to have been the eity or ehief town of Gangaikonda Chóla.

\* The largest Indian sanctuary towers mentioned by Fergusson (Hist. of Arch. Vol. III.) are those of Jaganáth at Puri and the great Tanjore Pagoda, which are 80 and 82 feet square at base respectively.

Most of the inscriptions appeared to be mere statements of gifts made to the temple by private persons. The western and southern (side) inscriptions appeared to be mostly in the Tamil character and language with occasional Sanskrit formulæ to begin and end with. Those on the northern side were said to be chiefly in Grantha and Telugu or other (than Tamil) characters.

The temple consists of a grand stone "stubi" (as they called it), a sanctuary *steeple* or *Vimānam* on a raised basement or terrace, decorated by a rail ornament below, having the upright posts engraved with griffins (or *Vāli*), and an elaborate scroll-enveloped animal or figure on every third or fourth post, but no cross-bars or horizontal rails between.

The *Atōdai* or terrace-path is  $3\frac{1}{2}$  feet wide, surrounding the entire temple, including the great *Veli-mandapam* or Outer court, at a height of about 5 feet above the (original) ground level.

The great pyramidal *Vimāna* is 100 feet square\* at base and about 165 feet high. The double story below the pyramid and immediately above the terrace basement is vertical, with five compartments or towers on each face (north, west and south) of the temple, separated by four deep recesses, with a handsome sculptured ornament (*purāna kumbam*) in each recess. Each projecting compartment has a fine sculptured figure, chiefly Śaiva but not without important Vaishnava figures, and the plain intervals of flat wall are covered with (?) historical scenes of rishis, kings, worshippers and attendants, celestial as well as terrestrial, in low relief.

Above the double vertical story rises the pyramidal *stubi* in seven stories to the neck which is spacious and supports four bulls (as at Tanjore) below the dome or semi-dome.

The whole temple is of stone throughout, and the domed top is apparently carved to represent a copper tile or leaf-pattern covering, like that of the five halls (*sabha*) at Chidambaram.

The only or chief ornament of the pyramidal portion of the tower is the square and oblong eells of "Rath" (= ear) or *Gópuram* (= spire-roofed) pattern, with their elaborate fan-shaped windows, like spread peacocks' tails.

There is little if any stucco to be seen, the whole being of pure stone.

On the east side and attached to the great *stubi* is the *Méle-Mandapam* (= a high court or west court), a three-storied portico or transept covering the cross aisle between the north and south entrances to the Temple; this is built to match the *Vimāna*, as at Tanjore.

To its east again and attached to it, is the west wall and end of the great Outer court (*Veli-mandapam*), begun in the same magnificent scale

\* See note above.

and style, but never completed : for it is broken down or left off rather abruptly, and finished by a plain large hall, completely enclosed by its four walls and flat roof, only half the height originally designed.

It measures 80 feet wide, North and South, and 163 feet long, West to East, with a plain doorway in the middle of the east end, having huge stone warders (*dwárapál*), but otherwise devoid of any fine ornamentation. It is 18 or 20 feet in height, and the roof is supported by four rows of plain stone pillars.

There is a large uncovered and incomplete portico in front (East) of the Veli-mandapam, approached by a double flight of steps from North and South and 10 or 12 feet above ground level, which is the level of the interior of the mandap and temple.

The court-yard of the temple is about 610 feet East and West, by 350 feet North and South, with a fine gópuram or entrance tower built entirely of stone (fast falling down) on the East, of grand but suitable proportions, not half the height of the temple itself. Usually the gópuram is 8 or 10 times as high as the temple sanctuary.

The court-yard or quadrangle was once surrounded by a double-storied open cloister of plain but solid stone work, said to have contained 365 cells (in the two stories), but only a few of these remain in the centre of the north wall there is a small plain doorway.

The surrounding wall was of stone and must have been about 25 feet high.

The sculptures round the base of the temple are very good in design and execution.

The architecture struck me as grand, simple and pure, with many traces of the wooden construction of which it is, in many respects, a copy ; especially in the projecting beam-heads at the angles, each of which is surmounted by a rude lump roughly resembling a flattened spiral (conch-) shell, perhaps intended for the *sálagrám* (black ammonite or serpent-stone) ; only this is a Śaiva temple.

I did not notice the *Nága*, but saw traces of trees with umbrellas over them.

The (proper) right hand *Dwárapál* has the right foot raised and resting on a stump (of a tree), encircled by a serpent with a half-swallowed elephant in its mouth, at all three doorways alike.

The projecting stone cornice of single convex flexure is massive, but does not stand out so far as in many more modern cases I have noticed elsewhere, but is, I should say, more free and prominent than some to be seen at Chidambaran.

I did not see the imitation of wooden rafters and laths, with nail heads &c., to be seen at Tinnevely.

The usual Bull (*Nandi*) in front of the temple is a poor one, compared with that at Tanjore.

The minor temples and shrines in the court-yard are inferior and mostly in ruins.

One of the more conspicuous of the sculptures represents Śiva coming out of an opening (*yōni* or split) in a cylindrical stone column (or *lingam*).

This figure is represented at Tanjore and elsewhere, and is to be seen repeated here several times in various parts of the Gangaikonda Sholapuram temples.

A figure of a rishi (*Mārkaṇḍa*) on his knees, with forehead on the ground, is below.

The pillars and pilasters are very plain, square in the four towers (or *rath*-like portions), forming the four corners of the *stūbi*, ornamented by pointed leaves below the capitals, which are very fine large tabular slabs.

The square pillars or pilasters are not cut away to the octagon form leaving square blocks, as is common. The pillars and pilasters of the next, intermediate, partitions or towers are octagon throughout, with similar lanceolate ornamentation and (octagonal) capitals.

The central partitions or towers have 16-gonal pillars and pilasters with similar ornaments and capitals.

The plinth moulding is very grand, bold and chaste. It recalled to my mind the pattern of the plinth moulding of an unfinished temple at Kuttalam (*Courtallam*) in Tinnevely.

The flat portions of the walls are covered with (?) historical scenes in which rishis and country folk, herdsmen &c., figure largely.

There are three or four wells in the Temple court, one of which (the *Sin(g)ha Tīrtham*) is connected with the legend of the founding of the temple and possesses a never-failing supply of very good water.

I noticed that the name on the Tamil inscriptions was Gangaikonda Sholapuram and Gangaikondapuram. The inhabitants now call it Gangaikandapuram. They told me that the *Stalapurāna* or local historical record of Gangaikondapuram had been taken to Tanjore and a copy placed in the Rajah's library there, whilst a copy (or the original) was taken and kept by the copyist who now resides at Nachaiyarkóvil (or at Tirichirai) near Kumbakónam.

Another place of interest I visited may be worth mentioning though quite modern, and that is Rámalinga-pillai-sálai, a remarkable church or college building, called variously *Pardésimaḍam*, and *Sanmárga-Sabai*, situate on the high road from "Cuddalore" to Vriddháchalam, a mile or

so west of the point where the high road from Madras (viâ Panrutti) to Kumbakónam crosses it.

A few years since, one Rámalingapillai collected followers and money and attempted to establish a new religion. He appears to have taught the ethics of Christianity without its theology. But I could not get at any precise particulars. Having collected some hundreds of followers (2000 was stated) and built his college, Rámalingapillai retired with some ceremony into concealment in a house, now styled "*Tirumáligai*," in the village of Moṭṭukuppam, a few miles distant from the College.

He is said, by his followers who now await his re-appearance at "the last day," to have never come forth from the room in which he disappeared, or to have been seen again.

I think the true facts of the case are worth eliciting and putting on record. The building is a remarkable one of brick and *chunam* in the modern Eurasian composite style, and the domed part of the roof or cupola appears to be covered with sheet metal.

I also visited Chenji or Sanji-Kóṭṭai (Anglice *Gingee*), a remarkable precipitous bluff rock, covered with and surrounded by fortifications of no very ancient date apparently. It is just the kind of stronghold that was likely to be seized on and held as a citadel by the successive conquering armies that have overrun the Carnátik for some centuries past.

The most interesting thing I observed here, beside the natural fastness (a notice of which is to be found in the *South Arcot Gazetteer*), was a very rudely carved stone lying in front of a small shrine halfway up the rock on the south side, dedicated to a local goddess called Kamala-kanni-y-amman to whom human sacrifices were formerly offered. Plate I shows copy of a rough pencil sketch taken hurriedly on the spot. Four human heads occupy a square raised shield, with two parallel bars in the centre like a pair of dumbbells with small knobs, which might stand for footprints. Each pair of heads is separated by a *triṣul*-like mark immediately above and below the pair of bars in the centre. Above these in the centre at top is a pair of ram's (?) horns, surmounted by a short transverse bar and appendage which I could not make out, and in the centre below, a corresponding pair of buffalo (?) *kulgá*, horns and head. A bow to the right and five arrows to the left on the lower part of the stone, at each side of the raised part, complete the carving. The arrows are club-headed and feathered, and one of them is furnished with a hole at one end, as if to hold a line. The entire stone is an oblate circle about  $3\frac{1}{2}$  feet high and  $4\frac{1}{2}$  feet wide, and not very thick, lying flat on the ground. Close to it is an upright figure of "*Minudaiyan Vírappan*," with hands together in the attitude of respect or supplication, and a sacrificial post stood near.

The *grām-munsif* said that this “kóvil” or chapel was held in great respect by the country-folk and was originally there before the present fortifications were built. Sacrifices are still made in times of drought and dearth and are supposed to be very efficacious.

The temples at the base of Chenji and some of the sculptures and remains are very interesting, extensive and well wrought, but apparently modern, though quite deserted and going to ruin. The monkey god Hanumán is to be seen in several places sculptured on the rocks.

Since the road was made which passes through part of the Chenji fortress, it has been frequently visited and despoiled of its sculptured treasures. I was informed that the fine columns which adorn the “Place” at Pondicherry were removed hence by stealth, by an enterprising Frenchman. But we need not grudge them, for they are appreciated highly where they are, instead of being neglected and lost sight of in the spot where they formerly lay.

Some very handsome sculptures have been removed and set up at Chittámúr, a few miles distant to the eastward, near a new temple built by a neighbouring chief.

The traditional founder of the fortress is said to be one Supálaka (or perhaps rather *Tupákala*) Náyak.

I may here mention that the Stalapurána of Senji-Kóṭṭai was stated to have been taken away by the Collector of the District (S. Arcot), a few years ago, and never returned.

At Mailam (= *Mayúrastalam*) near Tindivanam, the Tamburán (or abbot) informed me that his temple was founded by King Jayamba or Jayambaga Mahárája, from the north, who also founded or built Senji-Kóṭṭai. This old fellow is a very fine specimen of a man who never touches flesh or any cooked food, but lives on fruit and milk only. He has repaired and restored his temple and is now building a fine stone gópuram on which I was shown a sculpture of himself in the style of an old bearded Rishi. He reminded me of the Tamburán (or abbot) of Tiru(p)panandál near Kumbakónam.

Another very interesting place I visited near Tindivanam is Perumukkal (“*Permaeoil*” of Orme and of the Indian Atlas, sheet No. 78). Perumukkal is the common pronunciation in the district. At the place itself it is called, and written also, Perumukkúl.

Like Senji-Kóṭṭai it has been a fortified stronghold for some centuries. It has a fine large stone mandap on the summit and some small temples or shrines, but the ruins of some larger ones strew the summit, sides and base.

The rock is an isolated one of dark granitic boulders, very precipitous in most places. It is the last to the S. S. Eastward of the rocky masses that stud the plain of the Karnatik to the south-west of Madras.

I noticed stone circles at its eastern base, as well as at other stony places to the west and south-west, on both banks of the Ponníyár (S. Pennár or Pinákini.)

Mr. Garstin in the S. Arcot District Manual gives Peru-múkal (=great travail), from a legend of Sítadévi having here given birth to twins. There are two villages near, called Nalmukkúl (or Nanmukkúl) and Palamukkúl, names having reference to the same legend. Mr. Garstin also mentions Jánikipéttai, and I may add Rámanáthapuram, all in the immediate vicinity. But the old Sanniyási or hermit sent for the stalapurána (kept by an artizan in the neighbourhood) and wished to show me from it that the proper name of the hill is Mukkiyáehalam, and that it is therein styled Madhyakási (Middle Kasi) and is the scene of Rishi Válmiiki's penance, death and burial. A ruined shrine attached to the mandap is pointed out as the spot where he was interred.

There are the remains of many fine sculptures here, destroyed by the Muslím, and many inscriptions on the base of the temples.

The fort was held and besieged repeatedly in the wars of the Karnátik in which much damage was done by the roundshot.

The following observation may be worthy of record.

At Gangaikondapuram the wells are said to have a perennial supply of good water near the surface, that fails not in the driest seasons; and at Chidambaram the same is said of the great tank in the temple enclosure. At Tiruvaḍi (A. S. 79), close to Panrutti, I noticed in the bed of the Geḍilam or Garuḍanadi (the "*Cuddalore*" river) a natural spring or fountain of clear water, welling up with some violence in the midst of the muddy river-water. It is said to be perennial and to be as good as Kávéri water, whence it is locally called *Kollaḍattumólai* = *Kolladam* or "water-spring".

In connection with these I may mention the artesian wells that have recently been opened at Pondicherry and suggest that the perennial supply at Gangaikondapuram, Chidambaram and Tiruvaḍi may be explained by there being at those places a connection with the water-bearing stratum which is the source of the artesian wells, underlying the extensive laterite beds of the *Cuddalore* or S. Arcot district. I have heard of other places, particularly near Villapuram on the South Indian Railway, where the subjacent springs have been tapped by the natives and the outflowing water long since utilized for irrigating their fields.

*Rude Megalithic Monuments in North Arcot.*—  
By LIEUT.-COLONEL R. B. BRANFILL. (With a Plate.)

I have just had an opportunity of visiting the disused *tomb-field* at Iralabanda Bápanattam, in the Palmanér taluk of North Arcot.

The tombs here are of unusual interest from the size, shape and arrangement of the slabs of which they are composed, and the rarity of their chief characteristic.

The usual kistvaen or megalithic sepulchral cell is enclosed by three concentric rings of upright stone slabs, each slab having its top rudely worked (chipped or hammer-dressed) into a semicircular or a rectangular shape, and set closely side by side alternately, the round-heads standing higher than the intermediate flat-heads by the amount of their semi-diameter, *i. e.*, the height of the rounded portion, so as to form a parapeted wall of rounded *merlons* with flat silled *embrasures*.

These walls or parapets rise in three concentric tiers on a slight mound or cairn, a foot or so above the general ground level.

The outer circle or tier consists of some 24 slabs, nearly 3 feet wide, half of them being semicircular at top and standing about 3 feet high, the whole forming a ring fence or enclosing wall about 30 feet in diameter.

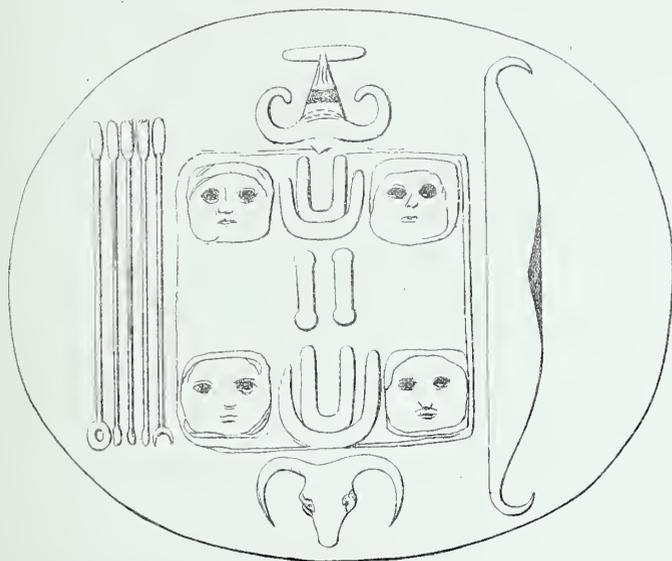
The second tier has 16 slabs, 8 of them round-headed, rising to a height of 5 or 6 feet above the cairn or mound; the whole forming an intermediate ring-wall about 22 feet in diameter.

The third or inner wall is composed of four prominent round-topped slabs, 8 to 10 feet wide, and 12 or 15 feet high above the cairn, and 4 or 5 feet higher than the other four flat-headed slabs that stand between them and complete the inner ring, an octagon of some 16 feet in diameter, or rather a square of 12 to 15 feet, with the corners cut off.

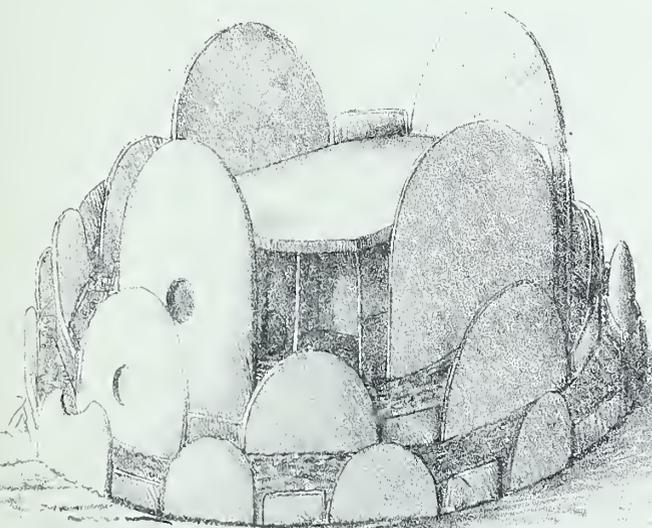
The kistvaen or sepulchral chamber nearly fills up the internal space, the capstone or covering slab of which sometimes projects horizontally beyond the chamber below it, so as to fit closely to the four great round-headed slabs that enclose it, the 4 flat-headed corner stones being only about the same height as the capstone, and narrower than the others.

The only entrance to the interior was apparently intended to be solely by small holes broken in the two or three central slabs on the east front, and nearly opposite to the similar hole in the eastern wall-slab of the kist. There is a kind of antechamber or closed portico between the inner chamber and the inner enclosing wall, provided with a moveable shutter stone or slab.

The stone slabs used throughout are comparatively very thin, being usually about 3 inches thick, and even the great capstones seldom exceed 6 inches.



*Rudely sculptured (sacrificial) stone, lying before Temple of Kamala-kanni-yamma at Chengi or Sanjikhollat ("Gingee") S. Arcot.*



*Rude sepulchral monument of stone slabs at Irabalanda—Bipanattam, in North Arcot District of Madras. Restored slightly.*



The whole forms an imposing structure, and recalls the idea of a small citadel or fortification.

There are many examples, perhaps a score or more of this pattern, still partly standing, and about as many more of a very similar kind, only without the round-headed projections, all the slabs in each ring or tier being of the same height, about 7 feet above ground level, and completely hiding the enclosed kistvaen.

Dividing the tombs into three classes according to size, and counting the fallen and half buried, as well as those standing, there are 170 of the 1st or biggest, 210 of the 2nd, and 200 of the 3rd or smallest sort, a simple kist composed of slabs from 2 feet square and upwards, more or less buried in the earth, and without any enclosing walls or circle of stones remaining.

Most of the tombs in this *nekropolis* are much ruined and overgrown by jungle so that I suppose there may well have been many more than 600 tombs here, within a space 500 yards long and 300 wide. The interments have but a shallow covering of soil, sometimes less than one foot.

On excavating they were found to yield the usual sepulchral relics, except that iron weapons were very scarce or entirely absent, whilst the terracotta coffers were more abundant than in the similar tombs of Mysore. In one, a few ornamental beads, similar to some taken out of the Coorg tombs, were found lying near the remains of a human skull.

Some of the coffers, sepulchral troughs or trays, were ornamented with a chain ornament in festoons and furnished with projecting rings or loops and prominent hooks, as if to hang garlands on. Some were mere small flat oval troughs, whilst others ranged up to 4 feet long, 2 feet wide and high, and were furnished with four or five pairs of legs

Perhaps however I need only further mention the chief novelty that struck me, and this may be no novelty to others.

Two or three Tamil letters were found scratched on a fragment of a little bowl. They seem to spell the words *saduma* or *chathum* or *chadud*; the final letter (? *m*) is very doubtful and may be intended for a terminal *d* or *t*, if that were admissible.

I have some rough notes and sketches of a few of the monuments, but had no leisure to explore further. A careful collection and close scrutiny of every fragment of the pottery (which is abundant and of the rude but antique and polished kind) would probably yield some valuable and curious information as to the habits, &c. of the tomb builders.

The locality has a bad character for being feverish and is in a very retired part of the country just above the Eastern Ghats.

The way to it lies through Chittúr and Palmanéri whence there is a good road for 15 miles to the S. W. to Baireddipalle, and thence a bridle path for 6 miles *viâ* Neilipatla to Bápanattam. The nearest name marked

on the old Indian Atlas, Sheet No. 78, is “Yerlabundah” (? Irala-rock). The Irala are the wild folk who roam the jungle in search of forest products and a free silvan life. During the rainy season some of them are said to dwell in these tombs, many of which would afford them perfect dwelling-houses, and the marks and relics of their recent occupation are to be seen frequently and unmistakeably.

I know of but three or four other places where these peculiar rounded slabs are to be seen, but they will probably be found to be more common when looked for.

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*The Coins of the Mahārājahs of Kángra.*—By C. J. RODGERS.

(With a plate.)

Kángra is the name of a fort and town situated at the junction of two mountain streams which form a tributary of the Bías on its right bank ere it leaves the hills. The coins in the accompanying Plate II go by the name of Kángra coins now-a-days. But the rájahs whose coins they are were known in history by the name of the Rájahs of Trigartta, the country of the three rivers, the Ráví, Bías and Sutlej. The family of these Rájahs claims its descent from Susarma Chandra, governor of Multán at the time of the Mahábhá-rata. After the war was over they went to the hills for refuge and erected the fort of Kángra for their protection. The district under the Rájahs of Kángra seems to have been like all districts governed by such Rájahs in old unsettled times. Kángra was their mountain stronghold. The neighbouring district of Jalandhar was subject to them, and must have furnished a considerable portion of their revenue. So the Rájahs of Kángra would be known at that time as Rájahs of Jalandhar. Being of the lunar race they kept the title *Chandra* after their names.

The Indo-Seythians conquered the fort of Kángra. When Mahmúd conquered it “the genealogical roll of the Indo-Seythian princes of Kabul for sixty generations was found in the fortress of Nagarkot by Mahmúd’s soldiers”\* (Kángra is known in the history of India by the name of *Nagarkot*). From this fact, and from the immense amount of wealth taken from Kángra by Mahmúd, General Cunningham infers that “Kángra must have belonged to the Rájahs of Kabul for several generations, and

\* General Cunningham’s Archaeological Report, Vol. V, for 1872-3, p. 155. The General quotes Abu Rihán’s statement as contained in Al Biruni. I may here state that I am indebted to this report for nearly all my facts concerning the Mahārājahs of Kángra and to General Cunningham for much valuable aid generously given when I began to collect the coins drawn in the plate.

that it was their chief stronghold in which they deposited their treasures.”\* Not only this, but General Cunningham thinks that the wealth accumulated in Kángra at that time consisted of the silver pieces of the Hindu Rájahs of Kabul which are even now found so plentifully throughout the Panjáb—the coins of Samanta Deva, Syalapati Deva, Bhím Deva and Khadavaya Deva.†

One fact bearing strongly on this view the General seems to have overlooked. All the coins of the Kángra Rájahs with some few rare exceptions are of the horseman type. Some are of the bull and horseman type with the names of the Rájahs over the bulls. Nay more than this, the earliest Kángra coins bear the name of Samanta Deva over the bull. That they were coined in Kángra no one will doubt who will cast his eye over the coins of the Rájahs in the plate. I once attributed the first two coins to Susarma Chandra. But a careful examination of the letters together with the results of a comparison of the letters of other coins with these, has convinced me that they are the coins of Samanta Deva.

The list of names of the Rájahs of Kángra from Susarma Chandra down to the last Rájahs is of course obtainable. There is no reason for doubting its correctness. But as yet no coins have been found going further back than Prithví or Píthama to whom General Cunningham assigns the year 1330 A. D. This is an approximation only, but based on fair reasoning. Judging by the number of coins obtainable of any prince we may I think fairly infer the length of his reign. The fewness of the coins argues that the reign was short. Before Píthama I believe the coins of Samanta Deva were coined and used at Kángra. There are immense numbers of these coins found yearly in the Panjáb. Some of them have the horseman after the usual type, horse well shown and the whole body of the rider with letters on either side his head. The bull is well developed too and the name above it is generally legible. But the Kángra type of Samanta Deva, which the die-cutters of the mints of the Rájahs of Kángra seem to have slavishly adhered to, is unmistakeable, after it is once studied and known. The other well drawn coins are probably those of the Kabul or some other mint.

We must not be surprised if the coins of all the Rájahs are not obtainable. The coins of Kashmír, though very abundant, have many kings unrepresented. The coins of Chumba a neighbouring state to Kángra bear only the names of a few Rájahs, although the list of kings numbers no less than 170 sovereigns. Coining seems to have always been considered the peculiar privilege of paramount sovereigns or of independent rulers. Bearing this in mind, we need not wonder if any hiatus occurs in the lists of

\* *Ibid.*, p. 156.

† I have seen several hundreds of these coins this year.—C. J. R.

coins as compared with that of the Rājahs. Nor must we wonder if a small number of coins turns up bearing names of rulers to whom we cannot attribute any country. Jalandhar and Kāngra must have been subject at different periods to Kashmir as well as Kabul and perhaps to Kanauj. General Cunningham gives the following list:—\*

| Aecessions. | Name in list. | Name on Coins. | REMARKS.                                                                                                                                               |
|-------------|---------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1330.       | Prithvi.      | Pithama.       | } Contemporary of Fīroz.<br>} Brothers.<br>} Contemporary of Muhammad Sayid of Delhi, A. D. 1433—1446.<br>} There is <i>one</i> coin known of Devanga. |
| 1345.       | Purva.        | Apurvva.       |                                                                                                                                                        |
| 1360.       | Rupa.         | Rūpa.          |                                                                                                                                                        |
| 1375.       | Sringara.     | Singāra.       |                                                                                                                                                        |
| 1390.       | Megha.        | Megha.         |                                                                                                                                                        |
| 1405.       | Hari.         | Hari.          |                                                                                                                                                        |
| 1420.       | Karmma.       | Karmma.        |                                                                                                                                                        |
| 1435.       | Sansāra.      | Sansāra.       |                                                                                                                                                        |
| 1450.       | Devanga.      | Avatāra.       |                                                                                                                                                        |
| 1465.       | Narendra.     | Narendra.      |                                                                                                                                                        |
| 1480.       | Suvira.       | .....          |                                                                                                                                                        |
| 1495.       | Prayaga.      | .....          |                                                                                                                                                        |
| 1510.       | Rāma.         | Rāma.          |                                                                                                                                                        |
| 1528.       | Dharmma.      | Dharmma.       |                                                                                                                                                        |
| 1563.       | Manikya.      | .....          |                                                                                                                                                        |
| 1570.       | Jaya.         | .....          |                                                                                                                                                        |
| 1585.       | Vridhhi.      | .....          |                                                                                                                                                        |
| 1610.       | Triloka.      | Triloka.       |                                                                                                                                                        |

A little study of Plate II will show that the coins are of several kinds. The commonest is that which has a bull on the obverse, with the name of Rājah above the bull. The reverse in every case except one has on it what is intended for an image of the horseman and horse. But as a rule there are only the legless hind-quarters together with the thigh and boot of the rider visible. The one mark on nearly all of them is the *spear* the horseman carries. First of all fixing this and remembering that the spear is carried close behind the man's thigh, to the right should come the horse's head and to the left the hind-quarters. But in reality only portions come on the coin. The die must have been as large as the silver coins of Samanta Deva which are a little broader than a four-anna piece. The boot is in some cases fully visible. But the head of the horseman is nowhere to be found. The spear has a notch on it near the bottom and a flag at the top. So it was a regular lance. Whether the man wore armour or not we can't say.

These coins are found in considerable numbers not in Kāngra itself, but in Ludhiāna, Jalandhar and Umritsur. Vast quantities of them are how-

\* Vol. V, Archaeological Report, p. 152.

ever annually melted down and very soon there will be no more obtainable. Some of them may contain a very small amount of silver. It is very seldom I now meet with any in Umritsur. It is so with everything. I do not know what provision Government may be making to secure a cabinet of coins for the museums of the country. I believe no provision whatever is being made. A few private collectors are at work for their own cabinets which in the course of a few years will find their way to Europe. The coming generation will have to receive history on mere hearsay. The numismatic monuments are fast disappearing. The old Rājahs in many cases are known already only by name. No records are obtainable of them. One would think that before it is too late Government should interest itself in the matter. The British Museum is far richer in the coins of India than any Museum in India. This is a mistake. If India is to be for the Indians, it is a pity to export from the country all those mementoes of former things and dynasties. Patriotism and loyalty go hand in hand with us. It would surely be wise in our Government to create a love of country in the hearts of the people of India. We want something to displace the grasping and selfishness which everywhere show themselves. The historic remains which lie round about us are not understood, or are rather misunderstood and not valued. History is taught as a matter of dates and names and is useless. Museums are collections of odd things which are to the educated and uneducated alike voiceless. The teachers of history cannot read the coins which would add interest to their lessons.

Of all the provinces of India, the Panjáb has more historic associations than any other. From the time of Darius to that of the Empress of India, the Panjáb has been an arena on which great struggles have taken place. Yet the coin cabinet of the Lahore Museum is wretchedly poor. A few Græco-Bactrian coins, a few Indo-Scythian coins and a few odds and ends with the names attached to them of the persons who presented them (!) are all that are visible to the ordinary visitor. The curator, in whose charge are the valuable coins which are always kept under lock and key, is generally engaged during the day. So visitors passing through Lahore see next to nothing of what ought to be visible at all times. There is no catalogue of the coins, and many valuable ones have been already lost. This is again a mistake. It is exactly the same at Delhi, where the coins are all in a box !!

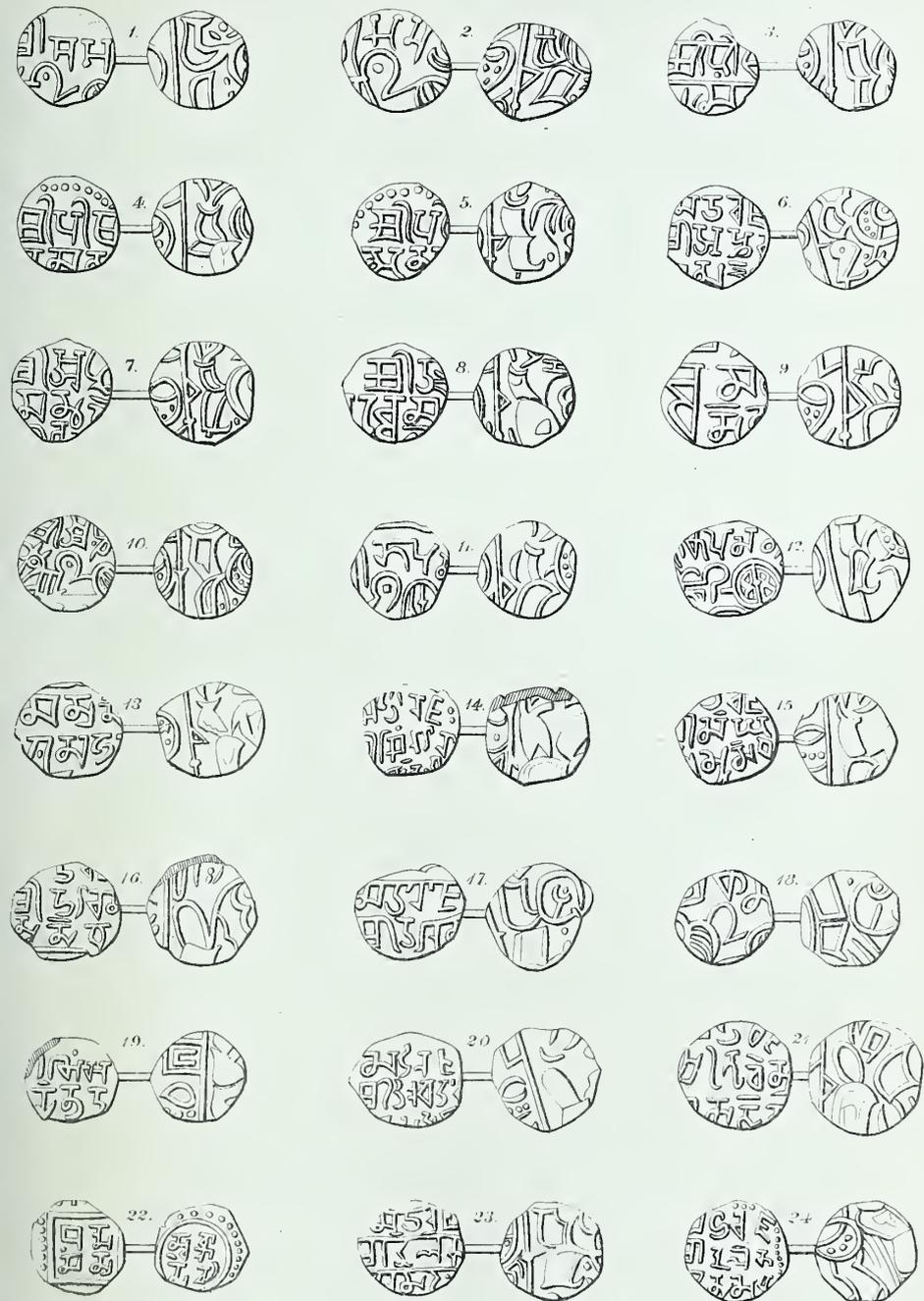
These remarks are made not in a captious spirit, but with a real desire to direct attention to the proper use of museums and provincial coin cabinets, and also with the hope that both be made more use of in the education of the people for whom the museums were built and with whose money they are supported.

I will now proceed to make a few notes on the coins represented in Plate II.

- 14 C. J. Rodgers—*The Coins of the Mahārājahs of Kāngra*. [No. 1,
- No. 1. is a coin of Samanta Deva. Obverse above bull *Srī Sam*: reverse horseman.
- No. 2. is a coin of the same prince, with *Srī Samanta* above bull, reverse horseman.
- No. 3. *Pīthama*. Obverse *Srī Pīthama Chandra (Deva)*, reverse horseman.
- No. 4. Ditto Obv. ditto., rev. do.
- No. 5. Ditto. Obv. ditto., rev. do. Horse's neck ornaments shown and whole leg with pointed boot.
- No. 6. *Apurvva*. Obv. Maharajah *Srī Apurvva Chandra (Deva)*, rev. horseman plain and horse's eye visible.
- No. 7. Ditto. Obv. *Srī Apu(rvva) Chandra Deva Maharajah*, reverse horseman.
- No. 8. Ditto. Obv. *Srī Apurvva Chandra*, rev. horseman.
- No. 9. Ditto. Obv. (*Srī Apu*)rvva Cha(ndra) Deva, rev. horseman.
- No. 10. Ditto. Obv. bull, above which *Srī Apu(rvva)*, rev. horseman.
- No. 11. *Rupa*. Obv. bull, above which *Srī Rupa Cha(ndra)*, rev. horseman.
- No. 12. Obv. bull, above which *Srī Rupa Chandra*, rev. horseman. The horses of Nos. 10, 11 and 12, have beads round their necks.
- No. 13. *Apurvva*. Obv. (*Apurvva*) Chandra Deva Maha(rajah), rev. horseman.
- No. 14. *Singāra*. Obv. Mahārājah *Srī Singāra Chandra Deva*, rev, horseman. Very poor.
- No. 15. *Megha*. Obv. Maharajah *Srī Megha Chandra Deva*, rev. horseman.
- No. 16. *Hari*. Obv. Maharajah *Srī Hari Chandra Deva*, rev. horseman. Neck ornaments and eye of horse visible.\*
- No. 17. Ditto. Obv. Mahārājah *Srī Hari Cha(ndra Deva)*. The letters of the first line are all suspended from one line drawn across the coin as in Hindu letters. Rev. horseman. Head of horse, very much deteriorated.

(This king Hari soon after his accession tumbled into a well while out hunting. He was rescued after an interval of several days had elapsed. In that

\* Since I wrote this article I have come across a coin of Hari हरि. The coin in the paper is of Hari हरि. Now in conversing a few days ago with General Cunningham on this matter I said that I was inclined to ascribe this rare coin to the king who was the brother of Karma and who was hidden in a well for some days. He quite agreed with me. The coins of the paper which as I say are found in great numbers, would then resolve themselves into the coins of the king Hari who lived after Triloka, A. D. 1630-50, whose coins those of Hari resemble in make and letters.



Drawn by J. Rodgers del.

Lith. & Printed by W. Newman & Co. Calcutta.

COINS OF THE MAHARAJAHS OF KANGRA



interval however he was accounted dead : his brother ascended the throne, and his wives mounted the funeral pile. When he came back he found Karmma reigning, and he went and took up his abode in the outskirts of his brother's dominions. I cannot account for Hari's coins being so plentiful. Out of several thousands I have seen, I have seen only one of Karmma, while at least one-fourth of the whole must have been Hari's. A Hari succeeded Triloka : perhaps these or at least some of them may be his coins although General Cunningham's list closes with Triloka.)

No. 18. *Karmma*. Obv. bull, above which Śrī Karmma, rev. horseman.

No. 19. *Sinsára*. Obv. Śrī Sansára Chandra Deva, rev. horseman with a large flag on which is a peculiar mark.

No. 20. *Avatára*. Obv. Maharajah Śrī Avatára Chandra Deva, rev. horseman.

(There is one coin of Devanga, the *god-bodied*, known ; I gave one to General Cunningham.)

No. 21. *Narendra*. Obv. Maharajah Śrī Narendra Chandra Deva, rev. horseman.

No. 22. *Dharmma*. Obv., in a square area which is surrounded by a circle of dots, Dharmma Chandra ; rev., in a circle surrounded with a circle of dots, Durga Deví.

No. 23. *Triloka*. Obv. Maharajah Śrī Triloka Chandra Deva. All the lines have the letters suspended from one line going across the coin. This coin and No. 3. are alike in this matter. Rev. horseman.

No. 24. Ditto. Obv. ditto without lines, each letter separate, rev. horseman. Hinder part of leg and thigh visible and hind-quarters and legs of the horse.\*

The coins of Megha, Avatára Karmma and Dharmma are very rare. "The coins of Rupa, Singára, Sansára and Narendra are rare. Those of Pithama, Apurvva, Triloka and Hari are common. The Kāngra types of Samanta Deva are very common."

\* Where the whole name is not on the coins, the part omitted is in brackets.

*Note on an Inscription found upon a stone lying near the ruins of a Masjid on Lanka Island, Wular Lake, Kashmir.*—By MAJOR H. S. JARRETT, B. S. C.\*

The inscription which is in Persian, is as follows:—

این بقعه چو بنیان فلک محکم باد مشهورترین زیب در عالم باد  
 شه زین عباد تادر و جشن کند پیدوسته چو تاریخ خودش خرم باد

May this edifice be as firm as the foundations of the heavens,  
 May it be the most renowned ornament of the universe,  
 As long as the monarch Zayn Ibád holds festival therein  
 May it be like the date of his own reign,—“happy.”

As is well-known the letters of the Arabic alphabet, like those of the Hebrew or Phœnician and consequently of the Greek, are used as numerals, and the grouping of certain letters into a suitable word is frequently made to serve as a *memoria technica* among the Easterns to recall a date. In the above inscription, the numerical value of the letters in khurram (خرم happy) is 847 which is the year of the Hijra it is intended to record. This date is equivalent to A. D. 1443-4 during which Zayn-úl-Aábídín (the Zayn Ibád of the inscription—for both have the same meaning, *viz.*, ornament of the Adorers) ruled in Kashmir.

It may be interesting to glance cursorily over the events which preceded the accession of this prince from the period of the close of the last Hindu dynasty in the eleventh century of our era.

The Hindu history of that country has been discussed in a short Essay by Horace Hayman Wilson which will be found in the XVth Vol. of the Transactions of the Asiatic Society. He takes as his guide the first of the series of the Raja Tarangini, by Kalhan Pandit who commences his history with the fabulous ages and carries it down to the reign of Sangrama Deva the nephew of Didda Ráni in Sáka 949 or A. D. 1027 approaching to what Wilson considers to be the Pandit's own time Saka 1070 or A. D. 1148. The next two works of the series, *viz.*, the Rajavali of Jonah Raja and the Sri Jaina Rája Tarangini of his pupil Sri Vara Pandit, continue the record to the accession of Fath Sháh, which Wilson places in A. H. 882, but is given by Muhammad Ázám author of the Persian history of Kashmir, as in A. H. 897 (A. D. 1491-2).

\* [A rubbing of this inscription was sent to the Society by Mr. Arch. Constable. The stone bearing the inscription is apparently a slab of black slate, well polished and finished, and measures  $21\frac{1}{2}$  by 12 inches and  $2\frac{1}{2}$  inches thick. The rubbing was taken on the 22nd September, 1874. The inscription, as shown in the rubbing, contains several inaccuracies; thus in the 2nd line زیب is wrongly spelled ذیب; the 1st and 4th lines have جو instead of چو, two dots being omitted apparently for want of space. Ed.]

In the following survey I have followed the narrative of this last mentioned historian who calls himself the son of Khayr úz-Zamán and who commenced writing his history in the year 1147 A. H. (A. D. 1734-5) during the reign of Muhammad Sháh of Hindustán. His work follows the order of the Sanskrit and is divided into three periods, the first treating purely of the Hindu dynasties, the second of the Muhammadan, and the third of the subjugation of the country by the House of Timúr, with some concluding remarks on the features and curiosities of the country.

With the second period alone is this Note concerned, and the narrative is taken up at the accession of the last Hindu Rajah Sahdeo in A. H. 705 (A. D. 1305-6). During his reign occurred an irruption of the Turks under Zulju whose ravages left for generations the traces of his incursion. Forced to leave the country in the winter after a stay of eight months, the army, betrayed by guides, perished in the mountain snows. Many of the inhabitants of the country had fled in fear of their lives, some to Tibet, others, including Rajah Sahdeo, to Kishtwára where he remained in hopes of some day recovering his crown. His General Rám Chand who had been among the fugitives returned to Kashmir with a refugee from Tibet named Rihjú to whom in former times he had accorded his protection. The country was now in a state of anarchy, each petty chief asserting his own independence. Rám Chand and his people occupied the fortress of Lár. Rihjú\* or Rinjú (for the name is indistinctly written) seeing his opportunity gathered a few followers round him, made himself master by stratagem, of Lár, put Rám Chand to death and took his family prisoners. He now (A. H. 725 A. D. 1324) openly assumed the sovereignty, married the daughter of Rám Chand and won to his side the son of that Chief by granting him the government of Lár and Tibet and appointing him to a high command in the army. Though Buddhism was nominally the prevailing religion at this time, the country was distracted by the dissensions of sectaries, whose hostile and contending claims to religious truth perplexed the inquirer dissatisfied with the national religion. Such an inquirer was Rájá Rinjú, who after much perturbation of spirits and constant prayer, was led by divine inspiration—so runs the simple narrative—to watch a Moslem at his devotions. He saw, admired and believed, and soon led his court and people to embrace the Muhammadan faith. This monarch died in A. H. 727, after a reign of a little more than two years and a half, and the ruins of a once noble alms-house and a splendid mosque attest his reverence for the faith of his adoption. His widow Kotabrini† married Udayn Deo, brother of the last Rájá, who continued with his consort to carry on the government till the year A. H. 742, when he died. One of the Generals of the army coming

\* The Rájataranginí has the name Rinchan.

† In the Rájataranginí Kotah Rani.

of a royal stock, named Shahmír who, settling in Kashmír in the reign of Sahdeo as a merchant, had fast risen to place and power, now thought himself strong enough to marry the twice-widowed queen and to usurp the crown. She refused his overtures, but he made himself master of her person, and she was forced to yield a reluctant consent to the espousals. She, however, slew herself during the marriage festival and Shahmír now became undisputed master of the crown (A. H. 743 A. D. 1342-3) and assumed the title of Sultán Shams-u'd-dín. He died in 747 A. H. (A. D. 1346-7) leaving two sons, Jamshíd and Ali Sher.

The reign of Jamshíd was short. He was defeated and slain in battle by his brother who succeeded him in 748 under the title of Alá-u'd-dín.

Alá-ud-dín's rule of ten years is marked by no important event. He died in A. H. 748 (A. D. 1356-8) and was buried at Alá-u'd-dín-púra.

His son Shaháb-u'd-dín succeeded to the crown on the death of his father. He employed his energies in clearing the country of rebels and marauders, and annexed Pakli, Dantaur and the tract, called the Sawád Kabír, to the crown. He wrested Tibet from the ruler of Káshghar and ventured to march towards India, then ruled by Firúz Sháh. After a campaign in which the victory was with neither party, peace was concluded on these conditions that the country from Sirhind to Kashmír should appertain to Shaháb-'ud-dín, while all to the eastward should acknowledge the sovereignty of Firúz Sháh. Muhammad Aázam\* notes with surprise that this fact, which he says is mentioned by many historians, is left unnoticed by the author of the *Tárikh-i-Firuz Sháhi*. I may add that it is equally omitted by Elphinstone. (A. H. 758, A. D. 1356-7.)

On his return to Kashmír, he built the capital of Shaháb-u'd-dín-púra of which now not a trace but the ruins of a mosque remain, and he destroyed the large idol temple at Bijárah.† In the year A. H. 778 (A. D. 1376-7) he died.

Ḳuṭb-úd-dín his brother succeeded him in A. H. 780 (A. D. 1378-9). He ruled with justice and moderation and was celebrated as a scholar and a poet. Ḳuṭb-úd-dín-púra commemorated his name and the metropolis of his kingdom. He died in A. H. 796 after a reign of sixteen years. During his time occurred the advent to the court of Sayyid Ali Hamadání, the sixteenth in direct descent from Ali-b-Abi-Tálib, the son-in-law of Muhammad. He was revered for his sanctity and eminent virtues, and his influence guided the counsels of the monarch. The Sayyid bestowed on him his own cap which Ḳuṭb-úd-dín wore in the royal crown. It is feigned that

\* His son Muhammad Aslam, who is the author of the History of Kashmír entitled the *Gohar-i Aalam* and has made considerable additions to his father's work, goes so far as to say that the conquests of Shahab-úd-dín were carried northwards beyond the Oxus and southwards beyond Lahore.

† Called also Bihárah or Bij Bihárah.

its efficacy secured the throne to the monarch's successors until the reign of Fath Sháh who directed it to be buried with him, from which period dates the decline of the dynasty.

His son Sultán Sikandar, better known by the title of the Iconoclast from the number of idols he destroyed, assumed the sovereignty in A. H. 796 (A. D. 1393-4). During his reign, the rapid advance of Timúr on his march to India, induced Sikandar to conciliate the Tartar conqueror by despatching his son Sháhi Khán known afterwards as Zayn-u'l Aábidín to his court with presents and friendly letters. Timúr gratified by this conduct, left him in possession of his territory but detained Sháhi Khán in Samarkand which he never left until Timúr's death. Sikandar after a reign of twenty-five years and nine months, died in A. H. 822. A superb mosque which contained 372 columns, each 40 cubits in height and 6 in circumference, was begun and completed by him in the space of three years under the direction of two famous architects Khwajah Sudr-úd-dín Khorasáni, and Sayyid Muḥammad Nuristáni. To his piety was also owing the erection of the great mosque of Bijárah, and with the exception of the rattle of the royal kettle-drums, no profane music was permitted to disturb the austere tranquillity of his capital. Through his munificence the walls of the romantic gardens of Shalimar were extended as far as the Parganah of Phág and their stability was assured or blessed by the burial beneath their foundations of all the Hindu works that could be collected. As these treated either of idolatrous rites, astrology or history that was fabulous, they were considered by the monarch as condign objects for destruction.

He was succeeded by his son Ali who reigned but six years and nine months. This prince bent upon performing the pilgrimage to Mecca resigned his kingdom in A. H. 828 into the hands of his famous brother Zayn úl Aábidín and set out on his journey. A. H. 822. (A. D. 1419).

A. H. 828. (A. D. 1424-5.) Zayn úl Aábidín was noted early in life for his abilities. He employed the time he had spent in Samarkand in adding to his store of knowledge, and on his return to his country he brought with him a number of artificers, such as paper-makers, book-binders, carpet-weavers, saddlers and others to improve the industries of his own land. His brother Ali having reached the territory of his father-in-law the Jammu Chief, was persuaded by him to abandon his pilgrimage and resume his sovereignty. Returning therefore with an army, he was met by his brother Zayn úl Aábidín, who gave him battle, defeated him and placed him in confinement wherein he shortly after died. The powerful faction of the Gurjis who in the time of his father possessed great influence in state affairs, and who favoured the cause of his brother, was exterminated by him at Naushahr, at which palace he erected a place for his own residence.

His time was now spent in promoting the prosperity of his country

and in repairing the ravages of the irruption of the Turks under Zulju which the lapse of more than a century had not yet been able to efface. He was a liberal patron of men of letters and encouraged the progress of the arts, especially favouring the artificers whom he had introduced from Samarkand. He travelled much over his dominions and his Hindu and Muhammadan subjects lived at peace with each other undisturbed by religious dissensions, which if they arose were amicably settled by punchayets at which the monarch himself would preside. This conduct gained for him the title of the Great King.

According to tradition in the vicinity of the Wular lake once stood a city of which the Rájá was Sudrasen. By reason of the enormity of his crimes, the waters of the lake rose and drowned him and his subjects. It was said that during the winter months, at low water, the ruins of a submerged idol temple might be seen rising from the lake. Zayn úl Aábidín constructed a spacious barge which he sank in the lake and upon which he laid a foundation of bricks and stones till it rose high enough to be level with the water. Upon this he erected a mosque and other buildings and gave the islet the name of Lanka. The expense of the work was defrayed by the fortunate discovery of two idols of solid gold which had been brought up from the lake by divers. On the completion of Lanka the king ordered a great festival to be held wherein great sums were distributed amongst the poor. Verses were written by the poets to commemorate this event, and among these the inscription under notice by Ahmad Allámah Kashmíri was engraved upon a stone and placed above the Mihráb or sanctuary of the mosque. This Ahmad Kashmíri was the author of the *Núr-náma*, a Persian translation made in the time of Zayn úl Aábidín of an ancient History of Kashmír in the Kashmirian language by Shaikh Nur-úd-dín Wali. His translation was made use of by Muhammad Aslam the son of Muhammad Áqazam, in amending the omissions of his father's History. Mention of the slab with its inscription is made by Muhammad Áqazam who gives a faithful transcript of the verses Muhammad Aslam states that he visited Lanka in 1167 A. H. (A. D. 1753) and observing the inscription carried it in his memory and records it in his work. His second line runs thus—

مشهور به زیب و زین در عالم باد

which shows that either his memory failed him or he was unable to decipher the line more correctly given by his father.

The further history of Zayn úl Aábidín it is perhaps unnecessary to record. He died in A. H. 880 (A. D. 1475) and was succeeded by his son Hydar Sháh. His tomb may still be seen below the Zayna Kadal, the fourth of the thirteen bridges that span the river Jhelam in its course through the valley of Kashmír.



*Coins of the Sunga or Mitra Dynasty, found near Rámanagar or Ahichhatra, the ancient Capital of North Panchála, in Rohilkhand:—the property of H. RIVETT-CARNAC, ESQ., C. I. E., F. S. A., &c. Described by A. C. CARLLEYLE, of the Archaeological Survey of India.*

(With a Plate.)

The great ruined site of *Ahichhatra*, the ancient capital of North Panchála and now known as *Rámanagar*, has of late been yielding a plentiful supply of the coins of the Sunga or Mitra dynasty. Mr. H. Rivett-Carnac has been so fortunate as to procure a considerable number and variety of these coins from that find-spot, and he kindly placed them in my hands for examination and identification.

The fact of so many coins of this dynasty having been found so far to the north-west from their proper capital city, Pushpapura (or Pataliputra), may perhaps be held to be a proof of the wide extent of their sway. While making some excavations at Bhuila, the site of the ancient city of Kapilavastu, in the Basti district, I obtained a considerable number (probably about a hundred) of the coins of the Mitras, dug newly from the soil, in deep excavations, while I was present on the spot; they were mostly of Agni Mitra and Indra Mitra, with a few of other later kings of this dynasty. These coins were mostly of small size; but the coins obtained by Mr. Rivett-Carnac, from Rámanagar, are mostly of the largest size, with three or four only of the smallest size.

About one hundred and ten of these coins, belonging to Mr. Rivett-Carnac, have passed through my hands; and of these, several bear names of kings which are either new, or of rare occurrence, such, for instance, as *Bhadraghosa*, *Phagúni-mitra*, *Surya-mitra*,\* and *Anu-mitra*,—besides several coins of *Bhánú-mitra*, which were already known. The most numerous coins were those of Bhúmi-mitra, and the next numerous were those of Phaguini-mitra,—after whom, in the descending scale of number, followed Agni-mitra, Bhánu-mitra, Surya-mitra, Bhadra-ghosa and Indra-mitra; with also a very few, from other localities, of the later kings, whose coins are of quite a different type, such as Vijaya-mitra, Jaya-mitra, Satya-mitra and Saya-mitra.

From the numerical proportion in which the coins of various kings are found in a hoard, we can generally make a pretty good guess as to who were the earliest, and who the latest, of the series. Thus, the king of

\* [This name was at first read *Srayan-mitra* by the author. General A. Cunningham first suggested the true reading *Suya* or *Surya-mitra*; see Proceedings As. Soc. Beng., January 1880; see also below p. 28, Ed.]

whom the greatest number of coins are found in a hoard, may be accepted as being either the latest, or the contemporary king, of the dynasty, at the time when the hoard was buried or lost; while the king of whom the fewest and most worn coins are found may be accepted as the earliest, in point of time, of the series. But a similar numerical proportion of coins of different kings may, sometimes, also have been brought about by accidental circumstances; and therefore we must, in all cases, be guided by the older or later forms of the alphabetic characters, which appear in the legends on the coins.

But if we follow the rule enunciated above, in a general sense, with sufficient judgment and discrimination, we may apply it in the present case. Thus, as the coins of Bhúmi-mitra are the most numerous, in proportion, in the hoard found at Rámanagar, we may suppose that he was the latest king of the dynasty, at the time when the hoard was buried, and that the hoard was buried during his reign.

In like manner, as the coins of Phaguni-mitra are the next in point of number, to those of Bhúmi-mitra,—or in fact nearly equalling them,—and were, at the same time, far in excess of the coins of any of the other kings, we may conclude that Phalguni-mitra, was the immediate predecessor of Bhúmi-mitra.

The coins of Agni-mitra and Bhánu-mitra follow next behind, in numerical proportion. But as the coins of these two kings are nearly equal in number, it becomes difficult to decide which of them was prior to the other. There is, however, one marked distinction about the coins of Bhánu-mitra and that is, that the central symbol, of the three symbols above the name, is always punched into the coin, with a square punch; and the symbol in this square punch-mark depression is generally a repetition of the raised symbol to the right of it; while on the coins of other kings, the central symbol is generally different from either of the other two. Now this central square punch-mark depression I have also found on a few coins of *Surya-mitra*, who, from the greater rareness of his coins and the rather more antique form of the alphabetic characters of the legend, I consider to have been a predecessor of Bhánu-mitra,—and from these two kings' coins having the square punch-marked depression in common, I should say that Bhánu-mitra must have been the immediate successor of *Súrya-mitra*. Agni-mitra must therefore be of later date, and should probably follow immediately after Bhánu-mitra.

The coins of Bhadra-ghosa are the fewest and the most scarce of all. And the alphabetic characters of the legend, are of an older type than on any of the other coins, and more nearly approach the forms of the old *Laṭ* character of *Aṣoka*. Moreover the large coins of Bhadra-ghosa are very much worn, so much so that the legend is blurred and indistinct.

But Mr. Rivett-Carnac has one most beautiful little coin of Bhadrachosa, of very small size, on which the legend is as clear and distinct as possible,—really wonderfully clear for such a small coin.

The occurrence of only one undoubted coin,—besides one doubtful one,—of Indra-mitra, in this collection, is somewhat puzzling to me,—because, from the style of the alphabetic characters on his coins, I do not think they are so ancient as those of some of the other kings; and I would be inclined to place him certainly after Agni-mitra. The only reason that I can offer for this comparative (and perhaps only apparent or local) scarceness of the coins of Indra-mitra, is that his reign may have been a short one, and either that his residence was in some different part of the country, or that the distribution of his coinage was partial. I did not find that the coins of Indra-mitra were any more scarce than those of other kings, among the coins of this dynasty which I obtained at Bhula (Kapilavastu).

But, in the present case of the Rámanagar coins, I think there may be another way of accounting for this, probably merely temporary or local, scarceness of Indra-mitra's coins. I would suggest that Indra-mitra was the son and immediate successor of Bhúmi-mitra, and that the Rámanagar hoard was buried immediately after the death of Bhúmi-mitra, and in the early part of the first year of the reign of Indra-mitra. This would account for the plentifulness of Bhúmi-mitra's coins, and the scarceness of Indra-mitra's, in the Rámanagar find.

I will now give a list of those Mitra kings whose names have been in any way authenticated; and I will place them in the chronological order in which I think they should be placed; and opposite to the names of those of whom coins were found in the Rámanagar hoard, I will place the number of each found, respectively.

| Initial Date. | Names of Kings.      | Number of <i>Coins</i> found at Rámanagar. |
|---------------|----------------------|--------------------------------------------|
| B. C.<br>178. | Pushpamitra, .....   | (None.)                                    |
|               | Bhadrachosa, .....   | 5                                          |
|               | Surya-mitra, .....   | 7                                          |
|               | Bhánu-mitra, .....   | 10                                         |
|               | Agni-mitra, .....    | 11                                         |
|               | Anu-mitra, .....     | 1                                          |
|               | Phaguni-mitra, ..... | 28                                         |
|               | Bhúmi-mitra, .....   | 34                                         |
|               | Indra-mitra, .....   | 1, <i>certain.</i><br>1, <i>doubtful.</i>  |

I will now proceed to give a detailed description of the coins themselves, see Plate III.

#### I.—BHADRAGHOSA.

1. Coin, very small.

*Obverse.*

A square depression, caused by a die, containing the legend, with three symbols above it,—Bodhi Tree, Linga, and Serpents.

*Legend*—Bhadraghosasa.

*Reverse.*

A curious dumpy figure, as broad as long, of Buddha standing teaching.

2. Coin, large.

*Obverse.* A square depression, containing the Legend, with three symbols above it.

*Legend*—Bhadraghosasa.

(Note.—The three symbols above the legend are, to the left a Bodhi Tree standing on a square base or in a square railing;—in the centre, a linga guarded by two serpents (Nágs) which rise up on each side of it—; to the right, two serpents intertwined, forming a circular knot in the centre, with their two heads extending out, right and left, above, and their two tails extending out, right and left, below. This same description will apply to all other coins bearing these symbols.)

*Reverse.*

Two objects, not distinct.

#### II.—SURYA-MITRA.

3. Coin, middle-sized, pretty large.

*Obverse.*

In a square depression, the legend, with three symbols above it.

*Legend*—Surya-mitrassa.

*Symbols* above legend :—To left, Bodhi Tree, as before. To right, two serpents intertwined, as before. In centre, a square punch-marked depression, containing a symbol, which appears to be composed of several snakes intertwined.

*Reverse.*

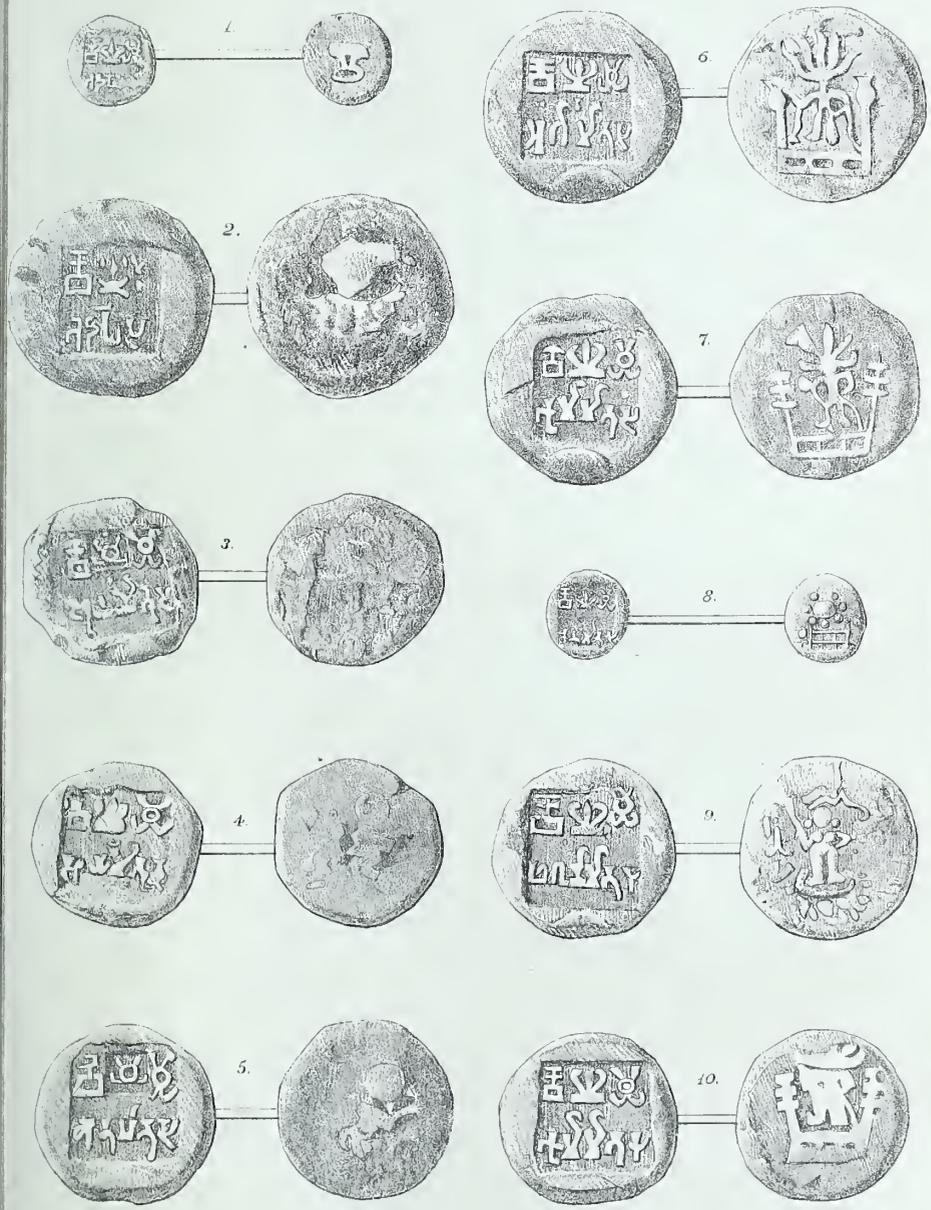
Device indistinct. (But, on another coin, it appears to be the symbol of Sangha with the Buddhist Wheel of the Law, below it.)

4. Coin same size as the former.

*Obverse.*

In a square depression, the legend below, with three symbols above it.

*Legend*—Surya-mitrassa.



COINS OF THE MITRA OR SUNGA DYNASTY.



*Symbols* above the legend:—To left, Bodhi Tree, as before. To right, two serpents intertwined, as before. In centre, linga guarded by two serpents (Nágs) whose heads rise above it on each side.

*Reverse.*

Apparently the symbol of Sangha, with the Wheel of the Law of Buddha. (This was referred to, in describing the previous coin, the reverse of which is defaced.)

### III.—BHÁNU-MITRA.

5. Coin pretty large.

*Obverse.*

In a square depression, the legend below, with three symbols above it.

*Legend*—Bhánu-mitrása.

(Sometimes the last part of the name appears to be *mitrasa*.)

*Symbols*, above the legend. To the left, the Bodhi Tree, as before. To the right, two serpents intertwined, as before. In the centre, a square punch-mark depression, containing a symbol composed of four snakes intertwined, and forming a squarish shaped figure.

*Reverse.*

The symbol of Sangha surmounted by the Wheel of the Law of Buddha. But it is possible that it may be intended for a figure of the Sun (*Bhánu*) placed above a pedestal.

### IV.—AGNI-MITRA.

6. Coin, large.

*Obverse.*

In a square depression, the legend below, with three symbols above it.

*Legend*.—Agimitasa.

*Symbols* above legend. To left, Bodhi Tree, as before. To right, two serpents intertwined, as before. In centre, Linga, guarded by two serpents (Nágs), one on each side.

*Reverse.*

Figure of Buddha standing, with right hand raised, and rays radiating from his head. He stands on a Buddhist Railing, between two trees.

7. Coin, middle-sized, rather small.\*

*Obverse.*

*Legend* and *symbols* the same as in the preceding.

*Reverse.*

Buddha standing, with right hand raised, and flames ascending from

\* [This is a mistake; coin No. 7 in the Plate is not one of Agni-mitra, but of Bhúmi-mitra, like No. 10. By a mischance the wrong coin seems to have been sent to be figured; Ed.]

his head and shoulders. He stands on a sort of ornamental pedestal, probably representing the Lotus.

## V.—ANU-MITRA.

8. Coin, very small.

*Obverse.*

Surface of obverse of coin, concavely depressed. Legend in a line below. Three symbols in a line above.

*Legend*—Anu-mitasa.

*Symbols*, the same as on the coins of Agni-mitra.

*Reverse.*

A Buddhist Railing. Above it, a large round ball, surrounded by a circle of dots. On each side below, a small round ball, with a curved semi-circular figure below it, the concavity of the curve being turned downwards; these two latter symbols resemble in shape the later modified old Indian form of the letter "T", just preceding the Gupta period. I think the central symbol above (namely the round ball surrounded by a circle of dots) may be intended to represent the Sun.

## VI.—PHAGUNI-MITRA.

9. Coin large.

In a square depression, the legend below, with three symbols above it.

*Legend*—Phagúni-mitrasa.

*Symbols*, above the legend. To left, Bodhi Tree standing on a square pedestal. To right, two serpents intertwined. In centre, a Linga, with two serpents (Nágs) twined round it, their hoods raised up on each side of it.

*Reverse.*

Buddha standing on a lotus, with a canopy over his head.

## VII.—BHÚMI-MITRA.

10. Coin, large.

*Obverse.*

In a square depression, legend in one line below, with three symbols in a line above.

*Legend*—Bhúmi-mitasa.

*Symbols*, Bodhi Tree, Linga with serpents (Nágs), and two serpents intertwined in a knot,—as on the coins of Phaguni-mitra and Agni-mitra.

*Reverse.*

Buddha standing between two trees, on a Buddhist Railing. Rays or flames ascend from the head of Buddha.

## VIII.—INDRA-MITRA.

11. Coin, rather small.

*Obverse.*

Legend and three symbols in a square depression, as on the other coins.

*Legend.*—Indra-mitasa.

*Symbols,* the same as on the two preceding coins.

*Reverse.*

A squat figure of Buddha, above a Buddhist Railing.

(*Note* :—The legend on some other coins of Indra-mitra, which I have seen, appeared to read simply as “Inda-mitasa,” while on a few it seemed to have the still more mutilated form of “Ida-mitasa.”)

## SUPPLEMENTARY NOTE.

Since my Paper on the coins of the Sunga or Mitra Dynasty was forwarded to the Asiatic Society of Bengal, I have seen in the collection of Mr. Rivett-Carnac, another apparently unique coin of a king of this dynasty called *Ayu-mitra*, which I believe to be a new name. This king must have been one of the latest of the dynasty, as the letters of the legend belong to the later Gupta period.

*Description.*

Coin, round, middle sized, copper.

*Obverse.* Bull.

*Inscription,* underneath, A-yu mi-ta-sa.

*Reverse.* Apparently a Peacock and Palm-tree ?

The legend on this coin is clearly and distinctly just as I have given it above, and there can not be any doubt whatever about it. This coin therefore must not be confounded with the common, though similar, coins of *Saya-mitra*, with which I am well acquainted.

In order to complete the list, I may mention that I have heard from General Cunningham that he has a coin of a king of this Dynasty named *Dhruva-mitra*. But as I have not seen General Cunningham's coin and therefore I do not know its age, I can not tell where to place *Dhruva-mitra* in the line of succession. But no doubt General Cunningham will describe the coin himself.

With the sole exception of the last named king, I think I feel pretty certain of the place which the rest of the Mitra kings respectively should

occupy in the order of succession. We now know of fourteen kings of this dynasty, and I would place them as follows :—

- |                   |                   |
|-------------------|-------------------|
| 1. Pushpa-mitra.  | 8. Bhûmi-mitra.   |
| 2. Bhadrachosa.   | 9. Indra-mitra.   |
| 3. Surya-mitra.   | 10. Vijaya-mitra. |
| 4. Anu-mitra.     | 11. Satya-mitra.  |
| 5. Bhânu-mitra.   | 12. Saya-mitra.   |
| 6. Agni-mitra.    | 13. Ayu-mitra.    |
| 7. Phâguni-mitra. |                   |

The fourteenth king would be General Cunningham's Dhruva-mitra ; but not having seen the coin, I can not tell in what position to place him.

Of course I have never seen any coin of Pushpa-mitra ; but he is nevertheless sufficiently authenticated otherwise ; but I have seen and examined coins of all the remaining twelve kings.

With regard to the name *Surya-mitra*, I may now state that I have since seen several other coins of this king, and that the result of my examination of these other and more perfect specimens is that the name must be read *Suya* or *Surya Mitra* ; and in this I agree with General Cunningham. On most of these coins the name appears to read as *Suya*, with a dot (anusvara?) above the *y* ; but on at least one coin, the name reads clearly as *Surya*, the *repha* appearing quite plainly on the top of the *y*.

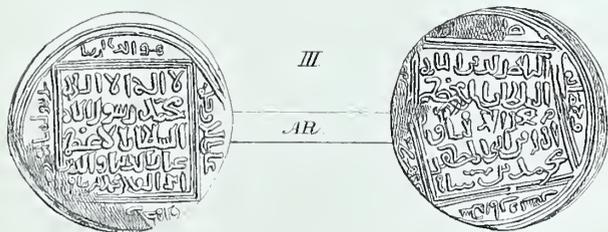
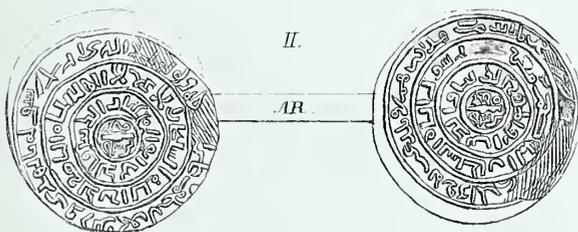
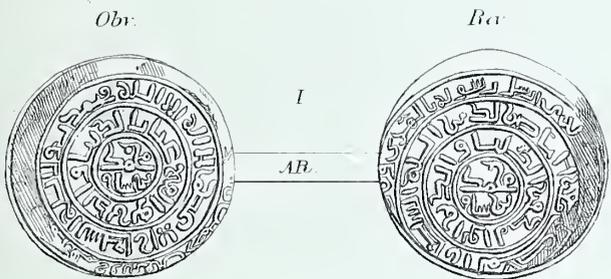
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*Coins of Ghiás-ud-din and Mu'az-ud-din bin Sâm.*—By C. R. STÜLPNAGEL,

M. R. A. S.

(With a Plate.)

The extracts from the *Tabakát-i-Násirí* made by Sir Henry Elliot in his *History of India* contain but little information concerning Ghiás-ud-dín of Ghór, nor is this want of details much to be regretted except for the fact that the coins obtained hitherto generally join the name of this ruler with that of his younger brother Mu'az-ud-dín who is looked upon as the first Pathán king of Delhi. It is stated that when 'Alá-ud-dín Husain, surnamed Jehánsoz, ascended the throne of Fíróz-kóh, he imprisoned his two nephews Ghiás-ud-dín Muhammad Sâm and Mu'az-ud-dín Muhammad Sâm in a fort of Wahíristán, and settled an allowance for their maintenance. He took Ghazní, but did not make it his permanent residence. After his death he was succeeded by his son Sultán Saif-ud-dín. This king released the two





princes, his cousins, of whom Ghiás-ud-dín dwelt peacefully at Firoz-koh, taking service with the Sultán Saif-ud-dín, whereas the more adventurous Prince Mu'az-ud-dín proceeded to Bámián and there found employment under his uncle Fakhr-ud-dín Mas'úd. But when Ghiás-ud-dín succeeded to the throne of Ghór after Saif-ud-dín's tragical death, Fakhr-ud-dín instigated his nephew Mu'az-ud-dín to bestir himself and likewise acquire a regal position. The latter accordingly started in all haste to his brother's court where he was received in a friendly spirit. He served Ghiás-ud-dín one year, after which the countries of Kasr-kajúrán and Istiya, between Herat and Ghazní, were assigned to him; and at a subsequent period he obtained possession of the city Takínábád, specially noted as the largest town in the Garmsír. In 569 A. H. (1173 A. D.) Sultán Ghiás-ud-dín conquered the town of Ghazní, but returned to Ghór after placing his brother Mu'az-ud-dín upon the throne, who secured in addition the territories of Ghazní and the country round about in 570 A. H. In the third year after this time, Mu'az-ud-dín led his forces to Multán, and henceforth his history becomes merged in that of India. Of Sultán Ghiás-ud-dín scarcely anything more is known, but it should be remembered in his favour that, instead of getting his brother murdered, he treated him with the greatest kindness, and always associated his name with his own on the coins of the realm. Ghiás-ud-dín died at Herát in 599, and Mu'az-ud-dín was murdered by the Gakkars at Rohtak in 602 A. H.

Coins in the joint names of Ghiás-ud-dín and Mu'az-ud-dín have already been published by Mr. Edward Thomas in his "Chronicles of the Pathán Kings of Delhi," two of which are of gold and two of silver, the latter being engraved in the first plate and numbered one and two, the latter being identical with the one described by Wilson in the *Ariana Antiqua*, pl. XX, 29. I have lately acquired eight specimens of dirhems of these Ghori brothers, all of them different from those already described. Of these, three are similar to No. 1, pl. I of Mr. Thomas's book; see Plate IV. They are of silver weighing, on an average, 74 grains and have their legends arranged in three concentric circles, the patronymic occupying the centre. The first, however, differs in this that the outer circle containing the date (597) is found in the *obverse* with the name and title of Ghiás-ud-dín, and not on the reverse as on Mr. Thomas's coin. I thought it at first just possible that the engraver might have committed a mistake, and changed the outer circles of the obverse and reverse, but such a supposition is unlikely from the transcript of the coin in the body of the book, which clearly shows that the date belongs to the reverse. Moreover it is totally immaterial on which side the date is actually placed, and it is actually found on the reverse together with Mu'az-ud-dín's name, on two of the coins described in the

sequel of this paper. Although the margins are both a little abraded, they can with ease be supplied from the next coin. I may, however, remark that this coin could not have contained the name of the month of the year, as there is not sufficient space for its insertion.

The following is the transcript :

Date 597.

*Obverse.*

|                                                 |                |
|-------------------------------------------------|----------------|
| * * * الدرهم في * * * سنة سبع وتسعين وخمسة مائة | First circle.  |
| لا اله الا اله محمد رسول الله السلطان الاعظم    | Second circle. |
| غياث الدنيا والدين ابو الفتح                    | Third circle.  |
| محمد بن سام                                     | Centre.        |

*Reverse.*

|                                                         |                |
|---------------------------------------------------------|----------------|
| * * * هو الزئى رسل رسوله بالهدى و دين الحق ليظهره * * * | First circle.  |
| الناصر لدين الله السلطان المعظم                         | Second circle. |
| الدنيا والدين ابو المظفر                                | Third circle.  |
| محمد بن سام                                             | Centre.        |

The last two of the three coins with concentric inscriptions referred to above, differ from the first in this that they have the arrangement of date just as in the Thomas's pl. I, No. 1; *viz.*, the date (596) is placed on the reverse containing the name of Mu'az-ud-dín. The size, however, is smaller, and the letters less bold. The *Ariana Antiqua*, pl. XX, 35 is probably a similar coin to my two; but as Wilson, owing to the worn condition of the coin in his possession, was unable to describe it, I include it in this paper. The outer circle of the obverse contains the Súrah common to all Ghori coins; the second has half the Kalima, which is afterwards continued in the second circle of the reverse; and the third circle and centre show the names and titles of Ghiás-ud-dín. The reverse has in the first or marginal circle the place of mintage and the month and year in which the dirhem was struck. Part of the second and the third circles and the centre, like those of the obverse, contain the titles and names, but of Mu'az-ud-dín.

Ghazni, month Zi-ul-hajja, A. H. 596.

*Obverse.*

|                                                                            |               |
|----------------------------------------------------------------------------|---------------|
| هو الزئى رسل رسوله بالهدى و دين الحق ليظهره على الدين كله ولو كره المشركون | First circle. |
|----------------------------------------------------------------------------|---------------|

|                                                 |                |
|-------------------------------------------------|----------------|
| لا اله الا الله الناصر لدين الله السلطان الاعظم | Second circle. |
| غياث الدنيا و الدين ابو الفتح                   | Third circle.  |
| محمد بن سام                                     | Centre.        |

*Reverse*

|                                                     |                |
|-----------------------------------------------------|----------------|
| ضرب هذا درهم في بلدة غزنة في ذى الحجة سنة ست وتسعين | First circle.  |
| خمس مائة                                            |                |
| محمد رسول الله السلطان المعظم معز                   | Second circle. |
| ادنيا و الدين ابو المظفر                            | Third circle.  |
| محمد بن سام                                         | Centre.        |

The other five coins have never been described before, as far as I know, and are quite of a new type. They were obtained from an itinerant Kabuli who was very shy in speaking of the place where they had been originally procured; but as in his conversation he said that he had been in Ghazni and Kabul, and had lately come to Lahore by way of Jellalabad, it may be reasonably presumed that they were not found in the Panjáb, but in the Kabul valley, or perhaps in or near Ghazni. All of these coins are likewise binominal. The weight is between 56 and 79 grains. The area on either side is a square composed of double lines, with the inscription arranged in five lines. The enclosing margin is of course in four sections. It is bounded by double circles. The margins are partially abraded, but fortunately one coin is sufficiently well preserved and the following inscription can be therefore made out with accuracy:

Dates 597 and 598.

*Obverse.*

Area:—

لا اله الا الله  
 محمد رسول الله  
 السلطان الاعظم  
 غياث الدنيا و الدين  
 ابو الفتح محمد بن سام

Margin:— هو الزئى رسل رسوله بالهدى و دين الحق ليظهره على الدين كله

*Reverse*

Area:—

الناصر لدين الله  
 السلطان المعظم  
 معز الدنيا و  
 الدين ابو المظفر  
 محمد بن سام

Margin:— ضرب هذا الدرهم في شهر سنة ثمان وتسعين و خمس مائة

Of these five dirhems, four have the date on the reverse together with the name of Mu'az-ud-dín, and one on the obverse. None contains the place of mintage.

All these coins, bearing evidence to the joint rule of the two brothers, are dated 596, 597 and 598 A. H., and must have been issued towards the end of their reigns, for Ghiás-ud-dín died in 599 and his brother three years afterwards. Comparing the titles of the two sons of Bahá-ud-dín Sám, the elder, Ghiás-ud-dín, is always called "ul'azam" the greatest, Sultán, ul nasr-l-dín illah and abúl fath, whereas to his younger brother are applied mu'azm, "great," Sultán, nasr-l-dín and abúl muzafr. It was only after the death of Ghiás-ud-dín that Mu'az-ud-dín called himself by the higher sounding title of 'azam.

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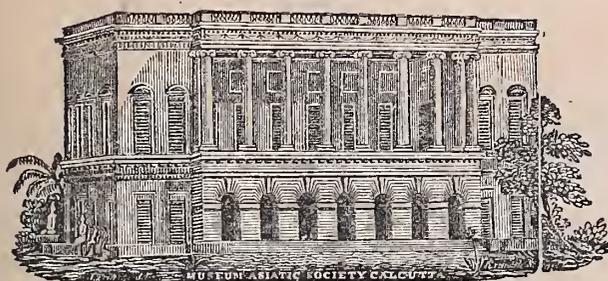
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“The bounds of its investigation will be the geographical limits of Asia: and within these limits its inquiries will be extended to whatever is performed by man or produced by nature.”—SIR WILLIAM JONES.

\* \* \* *Communications should be sent under cover to the Secretaries, Asiat. Soc., to whom all orders for the work are to be addressed in India; or, in London, care of Messrs. Trübner and Co., 57 & 59, Ludgate Hill.*

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# JOURNAL

OF THE

## ASIATIC SOCIETY OF BENGAL.



Part I.—HISTORY, LITERATURE, &c.

No. II.—1880.

*A Collection of Hindí Roots, with Remarks on their Derivation and Classification.*—By DR. A. F. RUDOLF HOERNLE.

This Collection was prepared by me some years ago and was originally intended to form part of my Comparative Grammar of the Gaudian Languages, and to illustrate the Chapter on Roots. The present introductory remarks give the substance of that chapter.

The Hindí, like any other language, possesses roots. By this term I here mean the constant element in any series of sense-related words. Thus in the Hindí words *bol-í* "speech," *bol-áhat* "calling," *bol-aní* "speaking," *bol-á* "spoken," *bol-ai* "he speaks," &c. the constant element *bol* is the root; the remainder are suffixes and vary according to the meaning which is to be expressed by means of the root.

A root may be determined in Hindí, or for that matter in any Gaudian language, by detaching the suffix of the 3rd person singular present *ai* (or *e*) from the word, when the remainder will be the root. Thus in *bol-ai* "he speaks," *kar-ai* "he does," *bújh-ai* "he understands," *bol*, *kar* and *bújh* are the roots respectively.

For comparing Hindí roots with Sanskrit, this is the most convenient rule. For a large number of Hindí roots are not derived from the pure Sanskrit root, but from that modified form of it, which is confined to the present tense (or the so-called special tenses generally). Thus the Sanskrit root *budh* "understands," takes the form *budhga* in the present tense, whence arises the Hindí form *bújh*. From the Sanskrit *budh* comes the 3rd person sing. present *budhyate*, in Hindí *bújhai*; but from it comes also the participle future passive *bodhavya* "to be understood"; in Eastern Hindí this form is *bújhab* or *bujhib*, Western Hindí

*bújhibau*, which transliterated into Sanskrit would be *budhyitavya*. This shows that in Hindí the form *bújh* acts as a root, precisely as *budh* does in Sanskrit.

Putting aside mere phonetic differences, as in the Hindí *sikh* or *sikkh*, Maráthí *śik* "learn," Eastern Hindí *char*, Western Hindí *chal* "walk," the Gauḍian languages differ very little with regard to their roots. There are, however, a few exceptional cases of roots which are confined to some particular Gauḍian language. Thus "see" is in Sindhí *pas*, Maráthí *páh*, but in Hindí *dis* or *dekh*, the Sanskrit *paś*, *preksh* and *ḍrīṣ*; again "come" is in Sindhí *ach*, Bangálí *áis* or *ás*, but in Hindí *áv* or *á*, the Sanskrit *ágaçh* and *áya*.

Roots, as a rule, do not undergo any change, when entering into conjunction with suffixes; except in the formation of the Causal Verb, in which case a long vowel is always shortened; thus *bol-áná* "to speak," but *bul-ánu* "to call"; *chkoṛ-áná* "to loose," but *chkuṛ-ánu* "to cause to loose"; *ghúm-áná* "to turn," but *ghũm-ánu* "to cause to turn"; *pí-ná* "to drink," but *pí-lánu* "to cause to drink", &c. There are, however, a few exceptional cases of echangeable roots. These are *kar* "do," *dhar* "place," *já* "go," *le* "take," *de* "give," *mar* "die." These roots assume a considerably different form in the formation of the past participle and past tense; viz., the first five become *ka* or *ki*, *dha* or *dhi*, *ga* or *gi*, *la* or *li*, *da* or *di* respectively, and *mar* becomes *mu*. The regular, unchanged forms, however, also occur, and generally these three forms are peculiar to some one or other of the Hindí dialects. Thus the High Hindí has the past participle *ki-yá* "done," Eastern Hindí *ka-il* or *ka-yal*, but Western Hindí *kar-au*; Eastern Hindí also has the radical form *ki* in *ki-his* "he did," *ki-hin* "they did."\* So also High Hindí *mu-á* or *mar-á* "dead," Eastern Hindí *mu-il* or *mu-al*.

Roots, when determined as above explained, may be divided into two classes, primary and secondary. To the former class belong all those roots, the originals of which, though sometimes more or less disguised by subsequent phonetic modifications, exist in Sanskrit. Secondary roots are those, which have no Sanskrit original, though their origin can be traced to Sanskrit elements. Thus the Hindí root *khá* "eat" is a primary one; for its original is the Sanskrit root *khád*; but the Hindí root *pañh* "enter" is secondary; for there is no Sanskrit root *pravisht*, though there is a Sanskrit participle *praviṣṭa* "entered" (of the root *pra-vis*), from which it is derived.

Among the primary roots there are a few which have suffered no phonetic modification. Thus, the common root *chal* "walk"; W. H. *çhalai*, H. H. *chale*, Skr. *çhalati*, "he walks." (The E. H., however, has *charai*). But most of them have passed through some sort of phonetic

\* *h* is a euphonic insertion, for the sake of assimilation to *lih-is* "he took", *lih-in* "they took".

change. These changes are of seven kinds, of which sometimes one, sometimes several have affected the same root. They are—

1. Simple *phonetic permutation*, consisting in the elision or softening of a consonant, the contraction of adjacent vowels, and the like. *E. g.*, *khá* “eat,” Skr. *khád*; *chá* “leak,” Skr. *chyut*;—*tor* “break,” Skr. *trot* (causal of *truṭ*); *paṛ* “fall,” Skr. *pat*;—*paros* “distribute,” Skr. *parivesh*; *ho* “be,” Skr. *bhú* (*bhava*), &c.

2. *Incorporation of the “class-suffix,”* that is, the suffix, which in Sanskrit is inserted between the root and the personal endings, and according to which Sanskrit roots are divided into ten classes. In Hindí these suffixes are incorporated with the roots. Thus, *bújh* “understand,” Skr. *budh* + *ya* (*budh* IVth class); *kop* “be angry,” Skr. *kup* + *ya* (*kup* IVth); *nách* “dance,” Skr. *nrít* + *ya* (*nrít* IVth); *sun* “hear,” Skr. *ṣṛi* + *nu* (*ṣru* Vth); *bhanj* “break,” Skr. *bhanaj* (*bhanj* VIIth); *ján* “know,” Skr. *já* + *ná* (*jñá* IXth), &c.

3. *Incorporation of the passive suffix ya.* Thus, *lag* “belong,” Skr. *lag* + *ya*; *sích* “irrigate,” Skr. *sich-ya*; *de* “give,” Skr. *dí* + *ya* (*dá*), &c.

4. *Change of “class.”* In Sanskrit all roots are divided into ten classes, partly according to the various suffixes which some take before the personal endings in conjugation, partly according to internal phonetic changes which some undergo. The simplest roots are those of the VIth class; they are not subject to any internal change, but merely add the suffix *a*. In Hindí all roots alike are reduced to the simple form of the VIth class. This is done (*a*) by sometimes substituting the suffix *á* of the VIth class, for another suffix; or (*b*) by changing the final vowels of other class-suffixes (*u* in the Vth and VIIIth classes, *á* in the IXth class) to *a*. Thus (*a*) *páva* “obtain” (VIth), Skr. *práp* + *nu* (Vth; as if it were *práp* + *a* VIth); *mánga* “ask” (VIth), Skr. *márg* + *aya* (Xth); again (*b*) *kara* “do” (VIth), Skr. *kar-u* (VIIIth, *kri*); *jána* “know” (VIth), Skr. *já* + *ná* (IXth, *jñá*). That is, the Hindí roots *páv*, *máng* (मँग), *kar*, *ján*, all of the VIth class, correspond to the Sanskrit roots *práp*, *márg*, *kri*, *jñá*, of the Vth, Xth, VIIIth and IXth classes respectively, &c.

5. *Change of “voice.”* Some Hindí roots are derived from the passive base of a Sanskrit root. Thus, *bhaj* “break” (active), Skr. *bhaj* + *ya* “be broken” (passive of *bhanj*); *de* “give,” Skr. *dí-ya* “be given” (*dá*); *sak* “can,” Skr. *sak* + *ya* (*sak*); *bik* “sell” (act. intrans.), Skr. *vikri-ya* (*vikrí*), &c.

6. *Change of tense.* Some Hindí roots are derived from the future base of a Sanskrit root. Thus *dekh* “see,” Skr. *drakshya* (future of *dríṣ*); (old H.) *nakh* or *nañkh* “destroy” or “throw away,” Skr. *nañkshya* (future of *naṣ*); (old H.) *krakh* “draw,” Skr. *krakshya* (future of *kriṣh*); *khech* or *khaich* “draw,” Skr. *krakshya* (future of *kriṣh*).

7. *Addition of the pleonastic suffix api.* Thus *sukáv* "please," Skr. *sukh* (as if it were *sukhápi*). In causal roots this is the universal rule; e. g., *karáv* (or shortened *kará*) "cause to do," as if it were derived from a Sanskrit root *karápi* (instead of *kári*).

It will be observed that the laws 2 and 4, and again 3 and 5 are closely connected.

The preservation of a final single consonant (especially a hard consonant) in a Hindí root is a sure sign of its having been affected by the 3rd or 5th law. The final *g* of such a very common root as *lag* would not have been able to escape elision during its passage through Prákrit, unless it had been protected by another consonant following it; Skr. *lagati* "he belongs" would become Pr. *laäi*, H. *lai*; but Skr. *laggate* is Pr. *laggäi*, H. *lagai* or *lage*.\*

The termination *aya* of Sanskrit roots (or rather bases) of the Xth class and of causals is contracted in Prákrit to *e*. This *e* is changed to *a* in Hindí, by the 4th law. Thus Skr. *márgaya* "ask" is Pr. *magge*, H. *mán̄ga* (मँग); Skr. *trotaya* "break" is Pr. *toḍe*, H. *toṛa*. On the same principle the Skr. *vikriya* "sell" (pass.), which in Pr. becomes *vikke*, is H. *bika*; thus Skr. *vikriyate* "it sells," Pr. *vikkei*, H. *bikai* or (contracted) *bike*.

Secondary roots may be divided into three sorts, according to the manner of their derivation; whence they may be called derivative, denominative and compound roots.

1. *Derivative roots* are those which are obtained by the *shortening of a radical vowel*. E. g., *nah* "flow" from *nahá* "bathe", Skr. *sná*. It will be observed that this process is the exact reverse of the well-known method by which Causals are formed in Sanskrit. These are made by *lengthening a radical vowel*; e. g., from the simple root *kar* "do" Sanskrit forms the causal root *kári* "cause to do," for which, by the 7th law, Hindí places *karáv* or *kará*. Now, mistaking *nahá*, which really is a simple root, to be a causal root (as if it meant "cause to flow"), Hindí re-derives from it a simple root *nah*; the pair of roots *nahá* and *nah* being, in outward appearance, exactly like the pair *kará* and *kar*.

2. *Denominative roots* are made by treating nouns, as if they were roots. The nouns which may be treated in this way are either substantives or participles. To the former class belong such roots as *jam* "germinate," derived from the Sanskrit substantive *janma* "birth" (of the Skr. root *jan* "be born"). Of the other kind are *pañh* "enter," derived from the

\* This process is expressly mentioned by Prákrit Grammarians, in the case of a few roots; as Pr. *rujjhāi* (or *rubbhāi*) aet. "he hinders" as well as pass. "he is hindered," from Skr. pass. *rudhyate* "he is hindered," while the Skr. aet. is *runaddhi* (VIIth cl.); see H. C. 4, 218, 245, 248. But it clearly occurred in more cases, than they recognized; thus, in all those cases enumerated in H. C. 4, 230. The case of the Hindí root *bhaj* "break" is exactly similar. See also S. Goldschmidt in J. G. O. Soc., Vol. XXIX, p. 492. and Weber *Saptaśataka*, p. 64.

Sanskrit participle *pravishṭa* “entered” (of the Skr. root *pra-viṣ* “enter”); *baiṭh* “sit” and *píṭh* “beat”, derived respectively from the Sanskrit participles *upavishṭa* “sitting” and *piṣṭa* “beaten” (of the Skr. roots *upaviṣ* and *piṣh*).\*

3. *Compound roots* consist of the Sanskrit root *kṛi* “do” or “make,” and some noun governed by it in the accusative case; in fact, they represent *phrases* in a contracted and much corrupted state. They can easily be recognized by their terminal consonant *k*, which alone remains of their original radical element *kṛi*. Thus *chuk* “cease” is derived from *chyt* + *kṛi*, which is a compound of the Sanskrit noun *chyt* “flowing away” and *kṛi* “make;” *e. g.*, the Skr. 3rd pers. sing. pres. *chyt-kṛiyate*, lit., “he is made a flowing away,” is Pr. *chukkei*, H. *chukai* (or *chuke*) “he ceases.” Similarly *ruk* “stop” or “be hindered” comes from *rut* + *kṛi*, *i. e.*, from the Sanskrit noun *rudh* “hindrance” and root *kṛi* “make;” again *kasak* “be pained” or “suffer pain” from *kasham* + *kṛi*, *i. e.*, from the Skr. noun *kasha* “pain” + *kṛi* “make.” It is probable, I think, that the Prákrit termination (3rd sing. pres.) *kei*, Hindí *kai* or *ke*, is phonetically derived from the Sanskrit passive *kṛiyate* “he is made,” Skr. *rut karoti* would mean “he makes a hindrance”; this phrase, being treated as a compound word, would form the passive *rutkṛiyate*,† “he is made a hindrance” or “he is hindered,” whence would regularly arise the Prákrit *rukkēi*, and the Hindí *rukkai* or *rukke* “he is hindered.” Many of these compound roots are intransitive, which would naturally agree with their derivation from a Sanskrit passive root or base. Others which are transitive could, however, be no less easily derived in the same way, by the aid of the fifth of the above-mentioned laws, the “change of voice.”

By far the largest number of Hindí roots can be brought under one or the other of the above-mentioned classes. Still there remains a small number of roots, the derivation of which, as yet, cannot be satisfactorily explained; *e. g.*, *dhó* “carry,” *lauṭ* “return.” Even these, further research will probably show to belong to one of the two great classes.

The root *dekh* claims some special consideration on account of the controversy regarding its origin to which it has given rise. Various

\* Beames in his *Comp. Grammar*, Vol. III, p. 37 (footnote) says about me that “he discussed this as if it was his own discovery in *Indian Antiquary*, Vol. I, p. 357.” The word “if” is superfluous. The fact is, my article appeared in the December number of that *Journal* in 1872, and was written some months previously. Beames’ 1st Vol. appeared towards the end of that year, and I did not receive it till after some time in 1873; so that when I wrote the article, it was impossible for me to know, that my views had been anticipated by Beames; though, indeed, it may be questioned, whose the merit of the first discovery is, if such a matter can be dignified by that name. Moreover my theory has a much wider application than Beames’, as it includes nouns as well as participles.

† A mongrel form, no doubt, but nothing unusual in colloquial speech.

theories have been put forward,\* among which that of Childers is now probably more generally accepted than any other. Stated briefly, his theory, as first applied to the Pali root-form *dakkh*, is that this root is derived from the Sanskrit future base *drakshya* (Skr. *drakshyati* = Pali *dakkhati*), its original future meaning having been forgotten in later times†. The theory, if true, must, of course, equally apply to the root in its Prākṛit and Gauḍian form *dekh*. In this form, however, it can hardly be directly connected with the future base. But there is, both in Prākṛit and Gauḍian, another very common root *pekh*, also meaning “see”. It appears to me most probable that the original form *dakkh* was in course of time changed to *dekh*, in order to assimilate it to *pekh*.‡ The formation of such, more or less unintentional, assimilations is quite in keeping with the genius of vernacular languages. There are some very striking instances in Hindî. For example there is in E. Hindî the pair of roots *de* “give”, and *le* “take”, representing the Sanskrit roots *dā* and *labh*. The 3rd singular present are *dey*, *ley*, Pr. *deï*, *lei*; here *ley* and *lei* “he takes” are formed in assimilation to, or after the analogy of *dey* and *deï* “he gives”. Prākṛit has also the regular form *lahāï* “he takes”, from Skr. *labhate*. Again the E. Hindî has the past participles *dihal* “given”, *lihal* “taken”; here *dihal* is formed after the analogy of *lihal*, from Prākṛit *lahida*. From the transitive pair of roots *pekh* and *dekh*, another, similarly assimilated, pair *pikh* and *dikh* is derived with, generally,§ an intransitive meaning “be seen”, “appear”. A more serious objection to Childers’ theory, in my mind, was the fact, that the origin assigned to

\* The whole subject of this controversy will be found briefly, but lucidly reviewed in Beames’ *Comp. Grammar*, Vol. III, pp. 45, 46. He does not mention, however, the ingenious theory of the two Goldschmidts (Paul and Siegfried), who explain *dakkh* as a denominative root derived from the past participle *drishṭa*, by assuming the well-known modern pronunciation of *ष् sh* as *क् kh* to have already existed in Prākṛit; (see S. Goldschmidt’s *Prācṛtica*, pp. 6—8, and P. Goldschmidt’s *Essay in Göttinger Nachrichten*, 1874, pp. 518—520). But there is no evidence, really, of the existence of that usage in Prākṛit; moreover in the modern vernaculars, *ष्* would not be pronounced *क्*, when it stood first in a conjunct, but only when it stood singly or second in a conjunct: thus one might hear *purukh* (पुरुष) or *barkhā* (बर्षा), but not *jekkh* (जिष्, always *jeshṭh*).

† In Kuhn’s *Beiträge zur vergleichenden Sprachforschung*, Vol. VII, p. 450; also in a private letter to myself.

‡ Beames also was of this opinion in his *Comp. Gr.* Vol. I, p. 162, where he remarks: “it is perhaps worth notice that in scenic Prākṛit a very frequent word for ‘seeing’ is *pekh*, and that possibly the existence of this verb may have had some influence on the creation of the somewhat anomalous form *dekh*. The idea is based on the well-known fondness of the Indians for jingling words of similar sound.” He now appears to have abandoned it, in Vol. III, p. 46. But it cannot be dispensed with; so far at least, as the relation of the later *dakkh* to the earlier *dakkh* is concerned.

§ In the old Hindî of Chand’s *Prithirāja Rasau*, *dikh* and *pikh* are commonly used in a transitive sense (see, *e. g.*, the verse on p. 39); also in modern Hindî occasionally.

*dekh* seemed to be an unique one. So far as I know, no parallel case of such a process of creation of a new root from the future base has hitherto been shown to exist. Quite lately, however, in my reading of Chand's Prithirája Rasau, preparatory to my edition of it in the Bibliotheca Indica,\* I have come across two other striking instances of that process, so that I now incline to consider Childers' theory to be fully proved. For this reason, I have now† inserted it in the list of laws of formation of roots, above enumerated. Those two instances are the roots *nakkh* or *nañkh* "destroy" or "throw away" and *krakkh* "draw" or "pull." The former occurs, *e. g.*, in the following verses :

दृष्टकि तसबौ कर बणै ॥ (or बणै) 27, 88.

*i. e.* "impatiently he throws away his rosary with his hand"; again

दृष्ट सार सुषं निस्कंत नषं ॥ 27, 84.

*i. e.* "the chiefs of the cavalry he fearlessly destroyed."

The root *krakkh* occurs in the following lines :

बिना लज्ज पणै सची दुँडि पिष्यौ ।

मनौं डिंभरु जांनिकै सीब क्रष्यौ ॥

*i. e.* "unblushingly searching for a partner, Saehí (wife of Indra) espied him, and, like as the fish her young, so she drew him to herself."

Now the origin of these two curious roots finds a very easy explanation, by applying to them Childers' theory. The future of the root *naṣ* "perish" is in Sanskrit *nañkshyati*, which would be Pr. *nañkhaï* or *nakkhaï*, whence in Hindí *nañkhai* or *nakkhai* with meaning of the present. It is to be noted, that in Hindí the meaning of the root has become transitive (by the 5th law). Similarly the Sanskrit future of the root *krish* "draw" is *krakshyati*, Apábhraṃṣa Pr. *krakhaï*, whence in Hindí, with meaning of present tense, *krakkhai*. It should be observed, that the rhyme in the above lines would require *krikhyau* or a root *krikh*. This may serve to illustrate the process by which assimilations of radical forms are brought about in the vernaculars.

But further there is a another well-known Hindí root, the origin of which, hitherto very puzzling, now finds an easy solution and thus serves as an additional confirmation of Childers' theory. This is the root *khech* or *khaich* or *kheñch* (खेँच) or *khaiñch* (खैँच) "draw." The Sanskrit conjunct *ksh* may change in Prákrit to *kkh* or *chchh*; thus the Skr. root *preksh* "see" becomes *pekkh* or *pechchh* in Prákrit; the Sanskrit future base *drakshya*

\* Three fasciculi of this Epic have been published, one of the 1st Vol. by Mr. Beames, and two of the 2nd Vol. by myself; a fourth fasciculus (3rd of Vol. II) as well as an annotated English translation of the 1st fasc. of Vol. II will appear in the course of this year.

† It is not in the list given in my Comparative Grammar, pp. 161—171.

“ will see” becomes *dakkha* or *dachchha* in Prākṛit (see H. C. 3, 171).<sup>\*</sup> Similarly the Sanskrit future base *kṛakshya* or *karkshya* would, in Prākṛit, become *kakcha* or *kachchha*; and the Sanskrit compound future base *ākarkshya* (of root *á* + *kṛish* “draw”) would become *ākkcha* or *āchchha*. With the insertion of the usual euphonic *y*, the latter would become *āyachchha*. The Prākṛit 3rd singular future accordingly might be *āyachchhāi* or (with the not unusual nasalization instead of the reduplication of a consonant) *āyañchhāi*; and, assuming Childers’ theory to be true, this form might occur as a present, equivalent to the Sanskrit *karshati*. Now what I have thus constructed theoretically, is an actual fact, as testified by Hema Chandra in his Grammar (4, 187). He gives the following forms *āyañchhāi*, *ayañchhāi*, *āñchhāi*† as Prākṛit equivalents of the Skr. *karshati*. The last form *āñchhāi* (आइँच्च्) has arisen by contracting *ya* into *i*, and is that form which has immediately passed into Hindî, with this difference only, that *chh* has been disaspirated (a process not uncommon in the modern vernaculars). Hindî has *ainchai* or *enchai* (ऐँचै or ऐँचै). Now to return to *khech* and its compeers; the un-compounded root *kṛish* would yield a Prākṛit form *kachchhai* or *kañchhāi*, which in Hindî, by transferring the lost aspiration of *chh* to *k* and by assimilation to *ainchai* and *enchai*, would result in the modern forms *khaiñchhai* or *kheñchhai* (खैँचै or खेँचै), or without nasalization, *khaichai* and *khechhai*. It will be observed that the later forms *kheñchhai* or *khaiñchhai* are related to what would be the earlier forms *khañchhāi* or *kañchhāi*, just as the modern *dekhai* and Prākṛit *dekhhāi* are to the Pāli *dakkhati*.

There are two other roots which also deserve a special word. One is the root *hokh* “be” or “become.” It is an equivalent of the commoner root *ho* by the side of which it is very commonly used in Eastern Hindî. In Western Hindî, I believe, it is unknown. It is regularly conjugated, through all tenses. Its origin is obscure. I am inclined to look upon it as formed by the same (practically pleonastic) suffix *sk* which also occurs in such roots as *achchh* “be”, *gachchh* “go”, *yachchh* “hold”, the element *sk* would change in Prākṛit either to *kchh* or to *chchh*; so that *bhúsk* (or *bhavask*) would become Pr. *hokkh*, H. *hokh*, just as *úsk* (of *ús*) becomes Pr. *achchh*, H. *achh*, or *gask* (of *gam*) becomes Pr. *gachchh*. Possibly—though I do not think it, probable—the origin of *dekh* might be accounted for in a similar way.

\* See also footnote on page 49. The Prākṛit word *sarichchha* “similar” exhibits the root-form *dichcha*, which is to *dekkh* (or *dikkh*), as *pechchh* is to *pekkh*. On the other hand its Sanskrit equivalent *sadrīksha* exhibits the Prākṛit root *dekh* or *dichh* in its Sanskrit dress *dṛiksh*, and is, I believe, the only instance of the admission of that mongrel Prākṛit root into Sanskrit.

† The MS. readings vary. H. C. also gives the forms *anachchhāi* and *ñachhāi*; in the former the nasal has been transferred to fill up the hiatus, in the latter *ái* is contracted into *a*.

The other is the still more common root *áv* (or H. H. *á*) "come." Its origin has, I think, not yet been satisfactorily explained. One would naturally connect it with the Skr. root *á-yá*, from which, clearly the Maráthi root *yc* "come" is derived. But this does not explain the terminal consonant *v* in the Hindí *áv*. Now it is a curious fact, that the root *áv* imitates, in every respect, the conjugational forms of the root *páv* (Skr. *práp* = *pra-áp*), instead of those of the root *já* "go" (Skr. *yá*) which one would expect it to follow. Thus, present participle E. H. *ávát* or W. H. *ávatu* "coming," E. H. *pávát* or W. H. *pávatu*\* "obtaining," but E. H. *ját* or W. H. *játu* "going;" past participle E. H. *áil* or *áyal* or *ává*, W. H. *áyau* "come," E. H. *páil* or *páyal* or *pává*, W. H. *páyau* "obtained," but E. H. *gáil* or *gayal* or *gayá*, W. H. *gayau* "gone;" 3rd sing. present H. *ávai*, H. H. *áve* "he comes," H. *pávai*, H. H. *páve* "he obtains," but H. *jáy*, H. H. *júe* "he goes." I incline, therefore, to think that there is here another instance of the, already noticed, tendency of the Indian Vernaculars to assimilate verbal forms, so that the *v* in *áv* is due to the influence of *páv*; an influence, natural enough, when it is remembered that *v*, equally with *y*, is often inserted between two adjacent vowels for the sake of euphony.† This assimilation is a very old one. There are traces of it in Prákrít as well as in the Gipsy dialects. In Prákrít there is the 3rd sing. pres. *ávēi*,‡ and shortened *ávāi* (H. C. 4, 367) "he comes." The regular Prákrít form would be *ááai* or shortened *áái* (see H. C. 4, 240); but just as there is *utthēi* or shortened *utthāi* (H. C. 4, 17) for *utthāai* or *utthāi* (see Vr. 8, 25) "he stands up" (of root *ut-sthá*), so there might be *áēi* or *áái* (of root *á-yá*), from which, by the insertion of the connecting consonant *v*, there would arise *ávēi* and *ávāi*.§

The following List of Hindí Roots is arranged alphabetically, in two parts. Part I contains primary roots, while Part II consists of secondary roots.

\* *Páyatu* in Kellogg's Hindi Grammar, p. 202, § 377, is a misprint.

† This influence of *páv* even intrudes occasionally into the conjugation of *já* "go"; thus the E. H. has sometimes *jává* "gone," like *ává*, *pává*; and the 3rd sing. pres. *jáve* is rather common in H. H. beside *jáe* or *jáyē*.

‡ This form is quoted by Dr. R. Mitra from the Pingala in the Vocabulary appended to his edition of the Sankshipta-sára. I have not been able to verify it; but the form is not intrinsically improbable.

§ It is just possible to connect *áv* with the Skr. root *api-i*; thus 3rd sing. *apyēti* Pr. *appēi* or *ápēi* or *ávēi* (cf. *kādum* "to do" for *kattum*). H. C. 4, 400 seems to refer it to Skr. *á-pad* (or better *á-pat*?). The Bangáli uses an altogether different root, *áis* or *ás*. Beames, in his Comparative Grammar (III, pp. 44, 45) rightly refers this root, as well as the Sindhí *ach*, to the Skr. root *á-gachh* (of *á-gam*). Disaspiration of an aspirate and pronunciation of *chh* as *s* are not uncommon in the Indian vernaculars (see my Comparative Grammar, §§ 11, 145, exe. 2). The root *ágachh* would become in Pr. *áchh* (see Delius, *Radices Præriticæ*, pp. 69, 70) or *áyachh*; by contraction in Bangáli, the former would become *ás* (for *áchh*), the latter *áis* (for *áchh*). The root *áis* might, however, be also referred to the Sanskrit root *á-vis*.

PART I.—*Primary Roots.\**

- 1 अट् *roam* = Skr. अट्, Passive अट्ते (with active sense), Pr. अट्टइ (H. C. 4, 230), H. अटै.
- 2 अनुहर् *resemble* = Skr. अनु + ह्, I. cl. अनुहरति, Pr. अणुहरइ (H. C. 4, 259 = Skr. सदृशीभवति), E. H. अनुहरै.
- 3 आव् *come*, see introductory remarks, p. 41.
- 4 आहर् *feed* = Skr. आ-ह्, I. cl. आहरति, Pr. आहरइ (H. C. 4, 259 = Skr. खादति), E. H. आहरै.
- 5 उखाड् *pluck up* = Skr. उत्-क्षप्, I. cl. उत्कर्षति, Pr. उक्खड्डइ (H. C. 4, 187), H. उखाडै (with transfer of aspiration, as in खेचै, see p. 40 and my Comp. Gramm. § 132); see No. 28.
- 6 उघाड् *recall* = Skr. उद्-घट्, X. cl. उद्घाटयति, Pr. उघाडेइ or VI. cl. उघाडइ (H. C. 4, 33), H. उघाडै.
- 7 उठ् *rise* = Skr. उत्-स्था, Passive उत्थीयते (with active sense), Pr. उठ्ठेइ (cf. E. M. p. 27 and Ls. p. 345, also उत्थेइ) or VI. cl. उठ्ठइ (H. C. 4, 17), H. उठै. In Pr. also VI. cl. उठ्ठाअइ or contr. उठ्ठाइ (Vr. 8, 26), in H. *deest*.
- 8 उड् *fly* = Skr. उद्-डी, IV. cl. उड्डीयते, Pr. उड्ठेइ (Cw. p. 99, Spt. v. 223) or VI. cl. उड्ठइ, H. उडै.
- 9 उतर् *descend* = Skr. उत्-तृ, I. cl. उत्तरति, Pr. उत्तरइ (H. C. 4, 339), H. उतरै.
- 10 उथल् intr. *upset, come off from, come down* = Skr. उत्-शल्, I. cl. उत्-शलति (उच्छलति), Pr. उथल्लइ (H. C. 4, 174), H. उथलै.
- 11 उथार or उथाल् tr. *upset, take down* = Skr. उत्-शल्, Causal उत्-शलयति, Pr. उथाल्लेइ or VI. cl. उथालइ, H. उथालै or उथारै.
- 12 उपज् *grow up* = Skr. उत्-पद्, IV. cl. उत्पद्यते, Pr. उपज्जइ (cf. H. C. 3, 142), H. उपजै.
- 13 उबल् *boil* = Skr. उद्-ब्जल्, I. cl. उज्जलति, Pr. उब्लइ, H. उबलै; cf. root बल्.
- 14 उबार् *keep in reserve* = Skr. उद्-भृ, Causal उद्धारयति, Pr. उब्बारेइ or VI. cl. उब्बारइ, H. उबारै.
- 15 उभार् *raise up, excite* = Skr. उद्-भृ, Causal उद्धारयति, Pr. उब्भारेइ or VI. cl. उब्भारइ, H. उभारै.
- 16 उरह् or उलह् *grow up, also reprove* = Skr. उद्-लभ्, I. cl. उल्लभते, Pr. उल्लहइ (T. V. 3, l. 133 = निस्सरति, H. C. 4, 259 has उल्लुहइ), E. H. उरहै, W. H. उलहै. In the sense "reprove" perhaps connected with उलय् ?
- 17 उहर् *subside* = Skr. अ-व-ह्, I. cl. अवतरति, Pr. ओहरइ (H. C. 4, 85 ओअरइ, v. l. अहरइ (with euphonic ह्), H. उहरै.
- 18 ऊँच् *be drowsy* = Skr. ? , Pr. उँघइ (H. C. 4, 12 = निद्रायति), H. ऊँघै.

\* See List of Abbreviations at the end of this article.

- 19 जम् *be excited, raised up* = Skr. उद्-भू, I. cl. उद्भवति, Pr. उबभवद् (Vr. 8, 3) or उबभद् (cf. भन्ति for भवन्ति H. C. 4, 365), H. ऊभै; or denom. from ऊर्ध्व, Pr. उबभ, cf. H. C. 2, 59.
- 20 औद् see secondary roots.
- 21 औट *burn* = Skr. अव-कुट्, IV. cl. अवकुट्यति, Pr. औउट्टद्, H. औटै.
- 22 औस *rot* = Skr. अप-वम्, I. cl. अपवसति, Pr. अववसद् or औवसद्, H. औसै (for औउसै).
- 23 कर् *do* = Skr. कृ, VIII. cl. करोति, vedic also I. cl. करति, Pr. करद् (Vr. 8, 13), H. करै. In Pr. also X. cl. करेद् (H. C. 4, 337); Vedic also V. cl. कृणाति, Pr. कृणद् (Vr. 8, 13), *deest* in H.
- 24 कम् *test* = Skr. कप्, I. cl. कपति, Pr. कसद्, H. कसै.
- 25 कम् *tighten* = Skr. कृप्, I. cl. कर्षति, but also VI. cl. कृपति, whence Pr. कसद्, H. कसै.
- 26 कह् *say* = Skr. कथ्, X. cl. कथयति, Pr. कहेद् (Spt. v. 35) or VI. cl. कहद् (H. C. 4, 2. Cw. p. 99), H. कसै.
- 27 काट् *cut* = Skr. कृत्, Causal कर्तयति, Pr. कहेद् or VI. cl. कडद्, (cf. 1. sg. कटुं H. C. 4, 385), H. काटै.
- 28 काट् *draw* see secondary roots.
- 29 काँप् or कप् *tremble* = Skr. कम्, I. cl. कम्पति, Pr. कंपद् (H. C. 1, 30), H. काँपै or कपै.
- 30 किन् or कौन् *buy* = Skr. क्री, IX. cl. क्रीणाति, Pr. कृणद् (Vr. 8, 30) or कृणद् (Dl. p. 22), H. किनै or कौनै.
- 31 कूट् *pound* = Skr. कुट्, X. cl. कुटयति, Pr. कुटेद् or VI. cl. कुडद्, H. कूटै.
- 32 कूद् or कूद् *jump* = Skr. क्खुद् (or खद्), I. cl. क्खुदते, Pr. कुंदद्, H. कूंदै or कूदै.
- 33 कोड् or कोर् *scrape, dig* = Skr. कुट्, X. cl. कोटयते, Pr. कोडेद् or कोडद्, W. H. कोडै or E. H. कोरै.
- 34 कोप् *be angry* = Skr. कुप्, IV. cl. कृष्यति, Pr. कुष्यद् (H. C. 4, 230), H. कोपै.
- 35 खप् *be expended, sold* = Skr. क्षप् (X. cl. or Causal of क्षि), Passive चयते, Pr. खप्यद्, H. खपै.
- 36 खा *eat* = Skr. खाद्, I. cl. खादति, Pr. खाचद् or (contracted) खाद् (H. C. 4, 228), H. खाम्.\*
- 37 खाँस् *cough* = Skr. कास्, I. cl. कासते, Pr. कासद् or खासद्, (cf. H. C. 1, 181, खासिचं = कासितं), H. खाँसै.
- 38 खिल *be delighted, flower* = Skr. क्रीड्, Pass. क्रीयते, Pr. खिडुद् or खिलद् (cf. H. C. 4, 168 खेडु and 4, 382 खेड), H. खिलै.

\* In Prākṛit also the Passive खाद्यते is used, apparently in an active sense; e. g. खज्जति "they eat" (Dl. p. 54, quoted from the Mṛcchhakaṭika; R. M. p. 87, seemingly quoting the same, gives खज्जदि).

- 39 खीज् or खीभ् *be vexed* = Skr. खिद्, VI. cl. खिन्दति; but also VII. cl. खिन्ते or IV. cl. खिद्यते, Pr. खिज्जद् (H. C. 4, 224), H. खीजै or (corrupted) खीभै.
- 40 खुल् *be opened or open* = Skr. खुड्, Passive खुद्यते, Pr. खुडुद् or खुज्जद्, H. खुलै. See Nos. 41, 44.\*
- 41 खूट् *pluck* = Skr. चोट्, Passive चोट्यते (actively), Pr. खुट्टद् (H. C. 4, 116, said to be a substitute for Skr. तोडते of root तुड्), H. खूट्.
- 42 खेल् *play* = Skr. क्रीड् (cp. कौल् and खेल्), I. cl. क्रीडति, Pr. खेडुद् (H. C. 4, 188) or खेज्जद् (H. C. 4, 382), H. खेलै. (Pr. also कौलद् Dl. p. 47).
- 43 खो *throw away, lose* = Skr. क्षिप्, VI. cl. क्षिपति, Pr. खिवद्, H. खोय् (with खो for इव, see my Comp. Grammar, § 122).
- 44 खोल् *open* = Skr. खुड् *divide*, X. cl. खाडयति, Pr. खोडेद् or VI. cl. खोडद् or खोलद्, H. खोलै. See Nos. 40, 41.
- 45 गठ् *tie* = Skr. ग्रथ्, IX. cl. ग्रथति, also I. cl. ग्रथति, Pr. गठद् (H. C. 4, 120), H. गठै.
- 46 गढ् or गड् *form, grave* = Skr. घट्, I. cl. घटते, Pr. गढद् (H. C. 4, 112), H. गढै or गडै. See Nos. 54, 59.
- 47 गढाव् *form* = Skr. घट्, Caus. घटयति, Pr. गढावेद् or गढावद् (H. C. 4, 340), H. गढावै.
- 48 गन् or गिन् *count* = Skr. गण्, X. cl. गणयति, Pr. गणेद् (S. B. 11, 27) or VI. cl. गणद् (H. C. 4, 358), H. गनै or (corr.) गिनै (see my Comp. Grammar § 35, note).
- 49 गस् *be spent* = Skr. गम्, Pass. गम्यते, Pr. गमद् (Vr. 7, 9, 8, 58) H. गमै.
- 50 गरिधाव् or गलिधाव् *to abuse* = Skr. गर्ह् or गल्ह्, X. cl. गर्हयति, Pr. गरिधावद् (cf. H. C. 2, 104) or गलिधावद्, E. H. गरिधावै for गरिधावै.
- 51 गल् *melt* = Skr. गल्, I. cl. गलति, Pr. गलद् (H. C. 4, 418), H. गलै.
- 52 गच् *seize* = Skr. ग्रह्, IX. cl. गृह्णाति, Pr. VI. cl. गेहद् (Vr. 8, 15) or गहद् (T. V. 2, 4, 157), H. गहै.
- 53 गा *sing* = Skr. गै, I. cl. गायति, Pr. गाअद् or (contr.) गाद् (Vr. 8, 26), H. गाय्.
- 54 गाढ् or गाड् or E. H. गार्ह *form*; see secondary roots.
- 55 गिर् *fall* = Skr. गृ, VI. cl. गिरति, Pr. गिरद्, H. गिरै.
- 56 गुद् *thread* = Sk. गुफ्, VI. cl. गुफति, Pr. गुज्जद् (H. C. 1, 236), H. गुहै.
- 57 गोच् *catch* = Skr. युञ्च (or युच), I. cl. युञ्चति, Pr. गुञ्चद्, H. गोचै.
- 58 घट् *decline* = Skr. घट् *depress*, Passive घट्यते, Pr. घट्टद्, H. घट्टै.
- 59 घड् *form, happen* = Skr. घट्, I. cl. घटते, Pr. घडद् (H. C. 4, 112) H. घड्. See Nos. 46, 54.

\* The roots खुल्, खोल्, खूट् are all connected with one another and with the Sanskrit roots चोट्, खोट्, खोड्, खोर्, खोल्, खुण्ड्, खुड्, खुर्, चुर्, which all mean 1, "limp," 2, "divide" or "break." The original form, apparently, is चोट् or चर, or rather चूट्.

- 60 वस् or विस् *rub, be worn away* = Skr. वृष्, I. cl. वर्षति, Pr. VI. cl. घसद् (= वृषति) or घसद् (H. C. 4, 204, where it is said to be a substitute of वसति), H. घसे or विसै.
- 61 घाल् *throw, destroy, mix* = Skr. घट्, I. cl. घटते, Pr. घडुद् or घलद् (H. C. 4, 334, T. V. 3, 4, 6 where it is said to be a substitute of क्षपति), H. घालै.
- 62 घुल् or घोल् *mix with a liquid, dissolve* = Skr. घूर्ण् (also घुण् and घोल्), I. and VI. cl. घूर्णति (also घोणते, घुणति, घोलयति), Pr. घुलद् or घोलद् (Vr. 8, 6. H. C. 4, 117), H. घुलै or घोलै (see also Bs. III, p. 56).
- 63 घूम् *revolve* = Skr. घूर्ण्, VI. cl. घूर्णति, Pr. घुमद् (H. C. 4, 117), H. घूमै (also Bs. I, 344).
- 64 घेर् *gather, surround* = Skr. ग्रह्?; compare H. घर *house* with Skr. गृह्.
- 65 चढ् *mount, increase* = Skr. उत्-शद्, VI. cl. उच्छ्रति, Pr. (dropping उ) चडुद् or चडुद् (T. V. 3, 1. 128), H. चढै.\*
- 66 चप् *be abashed* = Skr. चप् *press*, Passive चष्यते, Pr. चप्पद् (see H. C. 4, 395. चपिज्जद्, T. V. 3, 4, 65. चपिज्जद्), H. चपै. The transitive form is चाप् or चाँप्.
- 67 चर् *graze* = Skr. चर्, I. cl. चरति, Pr. चरद्, H. चरै.
- 68 चल् or चाल् *walk* = Skr. चल्, I. cl. चलति, Pr. चलद् or चलद् (H. C. 4, 231), H. चलै or चालै.
- 69 च्व् *drip* = Skr. च्यु, I. cl. चवते, Pr. चवद् (H. C. 4, 233), H. चवै. See No. 74.
- 70 चाव् *masticate* = Skr. चव्, I. cl. चर्वति, Pr. चवद्, H. चावै (see also Bs. III, 40.)
- 71 चिन्त् *think* = Skr. चिन्त्, X. cl. चिन्मयति, Pr. चिन्तेद् (Spt. 156, H. C. 4, 265) or चिन्तद् (H. C. 4, 422), H. चिन्तै.
- 72 चिन् *gather* = Skr. चि, V. cl. चिनोति, Pr. VI. cl. चिणद् (Vr. 8, 29. H. C. 4, 241), H. चिनै.
- 73 चुन् *gather, choose* = Skr. चि, V. cl. चिनोति, Pr. VI. cl. चुणद् (H. C. 4, 238), H. चुन.
- 74 चू *leak* = Skr. चुत् (or श्युत्), I. cl. चोतति, Pr. चोचद् or चुचद् (H. C. 2, 77), H. चूर

\* उत् + शद् lit. *fall upwards*, an unusual word in Skr., but formed exactly like the common compound उत् + पत्.—The final द् of शद् becomes ड् in Pr., see H. C. 4, 130 भडद् and Vr. 8, 51. H. C. 4, 219 रुडद्. The initial उ is dropped, and the aspiration of ह् transferred to ड् or lost altogether, just as in the root चाह् *desire*, from उच्छाह् = उत्-साह् or from इच्छा (see my Comp. Grammar § 132). In old H. the root is चडु; M. has both चढ् and चड्; but G., S. and B. have चड्, which is the form given by H. C. 4, 206 (चडद्). T. V. 3, 128 gives both चडुद् and चडद्.

- 75 चूम *kiss* = Skr. चुम्ब, I. cl. चूमति, Pr. चुंबद् (Vr. 8, 71), H. चूमै.  
 76 का *thatch* = Skr. कद्, X. cl. कादयति, Pr. काणद् (cf. Dl. 54) or VI. cl. काञ्चद् (T. V. 2, 4. 110 or कायद् in H. C. 4, 21) or काद् (by contraction; cf. Vr. 8, 26), H. काय्.  
 77 द्विप् or चिप् or कुप् *be hidden* = Skr. क्षि *dwelt secretly*, Causal Passive च्यते, Pr. द्वेप्द् or क्षिप्द्, H. क्षिपै or (corr.) चिपै or कुपै.  
 78 क्ली or क्लीद् *touch* = Skr. स्पृग्, VI. cl. स्पृगति, Pr. क्षिद्द् or क्षिप्द् (H. C. 4, 182), H. क्लीहै or क्लीधै. See No. 80.\*  
 79 क्लीज् *waste away* = Skr. क्षिद्, Passive क्षियते, Pr. क्षिञ्जद् (H. C. 4, 434), H. क्लीजै.  
 80 कू or कुह् *touch* = Skr. कुप्, VI. cl. कुपति, Pr. कुवद्, H. कूरे or कूहै. See No. 78.  
 81 कूट or कुट् *be released* = Skr. कुट् *cut*, Pass. कुट्यते, Pr. कुट्टद्, H. कूटै or कुटै.  
 82 कौड् *release* = Skr. कुट् Causal कुटयति, Pr. कौडेद् or VI. cl. कौडद्, H. कौडै (see also Bs. III, 52).  
 83 जन् *give birth* = Skr. जन्, Causal जनयति, Pr. जणेद् (Spt. 75) or VI. cl. जणद्, H. जनै. Skr. also IV. cl. जायते, Pr. जाञ्चद् (H. C. 4, 136), H. *deest*.  
 84 जप् *recite* = Skr. जल्प, I. cl. जल्पति, Pr. जंपद् (Vr. 8, 24), H. जपद्.  
 85 जर *be feverish* = Skr. ज्वर्, I. cl. ज्वरति, Pr. जरद्, H. जरै.  
 86 जल् *burn* = Skr. ज्वल्, I. cl. ज्वलति, Pr. जलद् (H. C. 4, 365), H. जलै.  
 87 जा *go* = Skr. या, II. cl. याति, Pr. VI. cl. जाञ्चद् or (contr.) जाद् (H. C. 4, 240), H. जाय्.  
 88 जाग् or जाग्र *watch* = Skr. जागृ, II. cl. जागर्ति, Pr. I. cl. जागरद् and VI. cl. जग्द् (H. C. 4, 80), H. जागरै or जागै.  
 89 जान् *know* = Skr. ज्ञा, IX. cl. जानाति, Pr. VI. cl. जाणद् (H. C. 4, 7), H. जानै, (also Bs. III, 41).  
 90 जी *live* = Skr. जीव्, I. cl. जीवति, Pr. जीचद् (H. C. 1, 101), H. जीरे.  
 91 जुम् *fight* = Skr. युष्, IV. cl. युध्यते, Pr. जुड्भद् (Vr. 8, 48), जुम्भै (also Bs. I, 328). In old H. also भुम्.

\* H. C. 4, 182 identifies the roots क्षिद् and क्षिप् with Skr. स्पृग्, for which he gives the Pr. Pass. क्षिप्द् (H. C. 4, 257). The latter is merely a hardened form of क्षिप्द्, which would be the regular Pass. of क्षिप्द् or rather of क्षिद्द्. Now Skr. स्पृग् = Pr. क्षिद् or, on account of labial प्, = कुह् (see No. 80); again in Pr., ह् = भ् = य् = व्. Hence Skr. स्पृग्यते = Pr. \*क्षिद्द् = \*क्षिप्द् = क्षिप्द्. It follows that the radical forms क्षिप् and कुप् (H. क्ली and कू) are derivative roots, made from the Passives क्षिप् and कुप्, and that the Skr. root कुप् is merely the Pr. root कुप् in a Skr. dress (cf. Pr. पञ्चद् &c., and see S. Goldschmidt in J. G. O. S. 29, 493).

- 92 जुट् *be joined* = Skr. जुट्, Passive जुटन्ते, Pr. जुट्इद्, H. जुटै; a very old secondary denominative root of युक्त p. p. of Skr. root युज्.
- 93 जोड़् *join* = Skr. जुट्, X. cl. जोटयति, Pr. जोडेद् or VI. cl. जोडद्, H. जोड़ै,
- 94 भाट् *argue, dispute* = Skr. भाट्, I. cl. भाटति, Pr. भाटद्, H. भाटै. See No. 96.
- 95 भाड् or भर् *fall off* = Skr. शट्, VI. cl. (शटति), Pr. भाडद् (H. C. 4, 130 for डडद्), H. भाड़ै or भरै. See No. 97.
- 96 भाँट् *rush about* = Skr. भाट्, Passive भाटन्ते (used in active sense), Pr. भाँटद् (H. C. 4, 161. for भाट्इद्), H. भाँटै.\*
- 97 भाँड् *sweep off* = Skr. शट्, Causal शटयति, Pr. भाडेद् or VI. cl. भाडद्, H. भाँड़ै. See No. 95.
- 98 भाल् *polish* = Skr. ज्वल् *shine* (?), Causal ज्वालयति, Pr. \*भालेद् or VI. cl. \*भालद्, H. भालै; cf. Skr. भ्रज्जा *brilliancy*, भ्रज्जका *flume*.
- 99 टक् or टंक् *stitch* = Skr. टंक्, I. cl. टङ्कति, Pr. टंक्इद्, H. टंक्कै or टक्कै. Probably a compound root of छ.
- 100 टूट् or तूट् *break* = Skr. चुट्, VI. cl. चुटति, but also IV. cl. चुटयति, Pr. तुट्इद् (H. C. 4, 230) or टुट्इद् (Pingal, as quoted by R. M. p. 99), H. तूटै or टूट.
- 101 टग् *cheat* = Skr. श्यग्, I. cl. श्यगति, Pr. टग्इद्, H. टगै.
- 102 डार् or डाल् *throw away* = Skr. द् *be scattered*, Causal दारयति, Pr. \*डारेद् or VI. cl. \*डारद्, H. डारै or डालै (cf. H. C. I, 217 डरे).  
\*डारेद् or VI. cl. \*डारद्, H. डारै or डालै (cf. H. C. I, 217 डरे).
- 103 डाँस् or डास् or डस् *bite* = Skr. दंश् or दस्, I. cl. दंशति or दसति, Pr. डसद् (H. C. I, 218) or डंसद्, H. डाँसे or डासै or डसै.
- 104 डोल् *swing* = Skr. डुल्, X. cl. दोलयति, Pr. दोलेद् (H. C. 4, 48) or डोलेद् (see H. C. I, 217 डोला) or VI. cl. डोलद्, H. डोल.
- 105 ढक् *cover* = Skr. श्यग्, Pass. श्यग्यते (used actively), Pr. ढक्इद्, (Spt. A. 54 for ढग्इद्) or VI. cl. ढक्इद् (H. C. 4, 21, where it

\* In B. this root is confounded with भाँड् “sweep.” It is closely connected with the root भाट्, the original meaning of which is preserved in Marāṭhī “rush violently into contact with,” and in the Hindi भाट् “quickly.” Hence it comes to mean, on the one hand, “dispute, argue”; on the other hand, “become intermixed confusedly”, “be entangled.” With the latter meaning the root भाट् has been received into Sanskrit; from it comes the Skr. भाट “shrub,” “underwood,” the H. भाट or भाड. The original meaning it has preserved in the Skr. भाटिति “quickly.” The root may possibly be derived (as Bs. I, 177 says) from Skr. अधि+अट्, though the sense of “roam about very much” would be expressed rather by अति+अट्. But अध्यटति or Pass. अध्यटन्ते (in act. sense) would regularly give Pr. अभाटद् or अज्जभाटद् (by elision of अ) भाटद् or भाट्इद्, whence modern भाटै or भाँटै. In the case of the root अट्, ट् does not change to ड. (see H. C. I, 195).

- is said to be a substitute of ङाद्), H. ङकै. (See Wb. p. 43, 64, 67). Perhaps compound root of स्त्रग्-ङ्.
- 106 ङास् *accuse* = Skr. ? Pr. ङसद् (H. C. 4, 118 where it is said to be a substitute for Skr. विटन्), H. ङाँसै. Perhaps a modification of ङाँस्, No. 103.
- 107 ङक् *approach* = Skr. ङेक्, I. cl. ङैकते, Pr. ङुक्कद्, H. ङुकै.
- 108 ङूँद् *search* = Skr. ङुढ्, VI. cl. ङुण्डति, Pr. ङुँदद्, H. ङूँदँ.
- 109 तप् *burn* = Skr. तप्, I. cl. तपति, but also IV. cl. तप्यति, Pr. तप्यद् (see H. C. 4, 140 संतप्यद्), H. तपै.
- 110 तर् *cross* = Skr. तृ, I. cl. तरति, Pr. तरद् (H. C. 4, 86), H. तरै.
- 111 ताक् *attend* = Skr. तर्क्, X. cl. तर्कयति, Pr. तर्कैद् (H. C. 4, 370) or VI. cl. तर्कद्, H. ताकै.
- 112 तान् *stretch* = Skr. तन्, Causal तानयति, Pr. ताणैद् or VI. cl. ताणद्, H. तानै.
- 113 तार् *save* = Skr. तृ *cross*, Causal तारयति, Pr. तारेद् or VI. cl. तारद्, H. तारै.
- 114 तुल् intrans. *weigh, be weighed* = Skr. तुल्, Passive तुल्यते, Pr. तुल्लद्, H. तुल्लै.
- 115 तोड् or तोर *break* = Skr. त्रुट् *bc torn*, Causal त्रोटयति, Pr. तोडेद् or VI. cl. तोडद् (see H. C. 4, 116, where however it is given as intrans.), W. H. तोडै or E. H. तोरै.
- 116 तौल् or तोल् *weigh* = Skr. तुल्, X. cl. तोल्यति or I. cl. तोलति, Pr. तोलैद् or तोलद् (T. V. 2, 4. 97), H. तौलै or तौलै.\*
- 117 थम् or थम् *be arrested, be supported* = Skr. थम्, I. cl. थम्भते, Pr. थम्भद्, H. थम्भै or थम्भै. See my Comp. Grammar § 120.
- 118 थाम् or थान् or थाम् or थम् *stop* = Skr. स्थम् *be firm*, Causal स्थम्भयति, Pr. थम्भैद् or VI. cl. थम्भद्, H. थाम्भै, &c.
- 119 थोप् *pile, prop* = Skr. थूप्, IV. cl. थूयति, Pr. थुप्यद्, H. थोपै.
- 120 दब् *be pressed down, be cowed* = Skr. दम्, Passive दम्यते, Pr. दम्यद् or \*दम्बद्, H. दम्बै (?).
- 121 दल् *split* = Skr. दल्, I. cl. दलति, Pr. दलद् (H. C. 4, 176), H. दल्लै.
- 122 दह् intrans. *burn* = Skr. दह्, I. cl. दहति, Pr. दहद् (Pingala, as quoted by R. M. p. 113; H. C. 2, 218 allows only डहद्; but the root डह् does not occur in H), H. दहै.
- 123 दार् *split* = Skr. दृ, Causal दारयति, Pr. दारेद् or VI. cl. दारद्, H. दारै.

\* H. C. 4, 25 gives Pr. तुलद्; but the root तुल् in a trans. sense does not occur in H., though it is found in M. तुल् or तुळ्. In Skr. the root तुल् admits a X. cl. form तुलयति, from which the Pr. and M. trans. root तुल् is apparently derived.

- 124 दाह् trans. *burn* = Skr. दह्, Causal दाहयति, Pr. दाहेद् or VI. cl. दाहद्, H. दाहै, see No. 122.
- 125 दिस् *show* = Skr. दिग्, VI. cl. दिशति, Pr. दिसद्, H. दिमै.
- 126 दिस् or दीस् to *appear* = Skr. दृग् see, Passive दृश्यते, Pr. दिसद् or दीसद् (H. C. 3, 161), H. दिमै or दीमै.
- 127 दे *give* = Skr. दा, Passive दीयते (used actively), Pr. देद् (Cw. p. 99, H. C. 4, 238), H. देय् or दे. In Pr. also VI. cl. दद् (Spt. v. 216), H. deest.
- 128 देख् *see* = Skr. दृग्, Future द्रक्ष्यति (used in sense of present), Pr. देक्खद् (H. C. 4, 181), H. देखै. See introductory remarks.\*
- 129 धर् *place* or *seize* = Skr. धृ, I. cl. धरति (*seize*) or धरते (*place*), Pr. धरद् (H. C. 4, 234), H. धरै.
- 130 धंस् or धस *sink, be pierced, run into* = Skr. धंस्, I. cl. धंसते, Pr. धंसद् or धसद् (Pingala in R. M. p. 118, said to be a substitute for धावति), H. धंसै or धसै.
- 131 धार् *hold* = Skr. धृ, Causal धारयति, Pr. धरेद् or VI. cl. धरद्, H. धरै.
- 132 धो *wash* = Skr. धाव्, I. cl. धावति (or धू, VI. cl. धुवति), Pr. धोअद् (Dl. p. 77) or (with euphonic व्) धोवद्, or धुअद् (Spt. v. 133, 283) or धुवद् (H. C. 4, 238), H. धोए or धोवै.

\* The Skr. conjunct द्य may in Pr. become क्व or च्च. This will explain the origin of the synonyms of देक्खद्, which are enumerated in H. C. 4, 181; viz., with क्व are formed अक्खद् = Skr. अवद्रक्ष्यति (from root अव-दृग्); the same, contracted, becomes ओक्खद् (with ओ for अव, see H. C. 1, 172); and the latter, expanded, becomes अवक्खद् (with अव for ओ, see my Comp. Gramm. § 48). With च्च are formed अवयक्खद् = Skr. अवद्रक्ष्यति (for अवक्खद्, with euphonic य्, see H. C. I, 180), and निक्खद् = Skr. निद्रक्ष्यति (from नि-दृग्). Again च्च appears to be softened in अवयज्जद्, which is probably identical with अवयक्खद्. From the manner in which Hemachandra places पेक्खद् between निक्खद् and अवयक्खद्, it would almost seem as if he looked upon it as a contraction of पयक्खद् = Skr. प्रद्रक्ष्यति (of प्र-दृग्). In classical Sanskrit the future of दृग् takes the irregular guṇa र (instead of अर्, see Panini VI, 1, 58); but in the ordinary speech, no doubt, both forms द्रक्ष्यति and दक्ष्यति were used. It is the latter of the two, from which the Prākṛit forms are derived; thus अक्खद् = अक्खद् (not = अक्खद्) = अक्खद्. The alternative form of निक्खद् would be निक्खद्; this seems to be intended by the form णिक्खद् in Vr. 8, 69 (with क्क disaspirated for क्क). The Pr. पासद् is regularly formed from Skr. पश्यति = Pr. पसद् (see Delius *Rad. Prae.*) or पासद् (H. C. 1, 43); and Pr. अवपासद् is the Skr. अवपश्यति. In Marāṭhī, the Pr. root पास् becomes पाह्. The Pr. पुलोएद् is derived from Skr. प्रवलोकयति (with अवि contracted to उ, see my Comp. Gramm. § 122); and Pr. पुलएद् is probably a mere corruption of it. None of all these forms, as far as I am aware, has left any representative in modern Hindi.

- 133 नट *dance*, see secondary roots.
- 134 नव् or नौ intr. *bend, bow* = Skr. नम्, I. cl. नदति, Pr. नमद् (see H. C. 1, 183, नमिस 1. pl.) or नवद् (H. C. 4, 226), H. नवै or नौरे.
- 135 नवाव् or निवाव् trans. *bend, fold* = Skr. नम्, Causal नमयति, Pr. नवावेद् or VI. cl. नवावद्, H. नवावै or निवावै (with इ for अ, see my Comp. Gramm. § 55).
- 136 नहा *bathe* = Skr. स्ना, II. cl. स्नाति, Pr. IV. cl. एहाअद् (cf. Dl. 20) or (contr.) एहाद् (H. C. 4, 14), H. नहाय.
- 137 नाच् *dance* = Skr. नृन्, IV. cl. नृत्यति, Pr. नचद् (Vr. 8, 47. H. C. 4, 225), H. नाचै.
- 138 निकाल् or निकार् *pull out*, see secondary roots.
- 139 निक्वाम् *expel* = Skr. निस्-क्वस्, Causal निष्कासयति, Pr. निक्वामेद् or VI. cl. निक्वामद्, H. निक्वामै; cf. No. 138, the Skr. root क्वस् being perhaps adopted from Pr. क्वस् for Skr. क्वष्.
- 140 निखोड् or निखोर् *peel*; see secondary roots.
- 141 निखर् *be cleaned, be peeled* = Skr. नि-क्षर्, I. cl. निक्षरति, Pr. निक्खरद्, H. निखरै.
- 142 निखार् *clean, peel* = Skr. नि-क्षर् (or नि-क्षल्), Causal निक्षारयति, Pr. निक्खारेद् or VI. cl. निक्खारद्, H. निखारै.
- 143 निगल् *swallow*; see secondary roots.
- 144 निघार् *to make clear* = Skr. नि-स्यल्, Causal निस्थल्यति, Pr. नित्यालेद् or VI. cl. नित्यालद्, H. निघारै, applied to water, which is made clear by letting it stand still, till the impurities have settled down, and then pouring it off; hence the root has also the meaning "pour off."
- 145 निवड् *be separated, be decided, be accomplished* = Skr. निर-वट् *divide*, (X. cl. निर्वटयति), Pr. निव्वडेद् or निव्वडद् (H. C. 4, 62, where it is said to mean पृथक् स्पृष्टो वा भवति), H. निवडै. It is the pass. or intrans. form of No. 147. The Skr. root is transitive.
- 146 निवाह् or निभा *accomplish* = Skr. निस्-वह्, Causal निर्वहयति, Pr. निव्वाहेद् or VI. cl. निव्वाहद्, H. निवाहै or निभाय् (with transferred aspiration; see my Comp. Gramm. § 132).
- 147 निवाड् *separate, divide, accomplish* = Skr. निर-वट् *divide*, Causal निवाटयति, Pr. निव्वाडेद् or VI. cl. निव्वाडद्, H. निवाडै. See No. 145.
- 148 निवेड् *separate, divide, accomplish* = Skr. निर-वंड, I. cl. निर्वंडते, Pr. निव्वंडद्, H. निवेडै (with ए for अ, see my Comp. Gramm. § 148). This is merely another form of No. 147.
- 149 निवार् *hinder* = Skr. नि-वृ, Causal निवारयति, Pr. निवारेद् (H. C. 4, 22) or VI. cl. निवारद्, H. निवारै.
- 150 निसर् *come out* = Skr. निस्-सृ, I. cl. निस्सरति, Pr. निस्सरद् (see R. M. p. 107; or नीसरद् H. C. 1, 93. 4, 79), H. निसर.
- 151 नोच् *pinch* = Skr. नि-कुञ्च् *contract*, VI. cl. निकुञ्चति, Pr. निउंचद् H. नोचै (with औ for इउ).

- 152 पच् *be digested* = Skr. पच् *digest*, Passive पच्यते, Pr. पचद्, H. पचै.
- 153 पठाव् *send* = Skr. प्र-स्था, Causal प्रस्थापयति, Pr. पठावेद् or VI. cl. पठावद् (H. C. 4, 37), H. पठावै.
- 154 पड़् or पर् *fall* = Skr. पत्, I. cl. पतति, Pr. पडद् (Vr. 8, 51), W. H. पड़ै, E. H. परै.
- 155 पढ़् *read* = Skr. पठ्, I. cl. पठति, Pr. पढद् (H. C. 1, 199), H. पढ़ै.
- 156 परख् or परक् *examine, test* = Skr. परि-ईत्, I. cl. परीचते, Pr. परिक्वद्, H. परखै. It also has the secondary meaning "become habituated", owing to repeated trial.
- 157 परच् *become acquainted* = Skr. परि-चि, Pr. VI. cl. \*परिचद्, H. परचै.
- 158 पला or परा *run away* = Skr. पलाथ्, I. cl. पलायते, Pr. पलायद् or (contr.) पलाद् (Pingala, quoted by R. M. p. 129),\* H. पलाव् or पराथ्.
- 159 परिहर् *forsake* = Skr. परि-हृ, I. cl. परिहरति, Pr. परिहरद् (H. C. 4, 259 said to be = त्यजति), H. परिहरै.
- 160 परोस् *offer food* = Skr. परि-विष्, Causal परिवेषयति, Pr. पारवेसेद् or VI. cl. परिवेसद्, H. परोसै (with ओ = इवे, see my Comp. Gramm. § 122).
- 161 पसर् *be spread* = Skr. प्र-हृ, I. cl. प्रसरति, Pr. पसरद् (H. C. 4, 77), H. पसरै.
- 162 पसार *spread* = Skr. प्र-हृ, Causal प्रसारयति, Pr. पसारेद् or VI. cl. पसारद्, H. पसारै.
- 163 पसीज् *perspire* = Skr. प्र-सिद्, IV. cl. प्रसिद्यति, Pr. पसिज्जद् (see H. C. 4, 224), H. पसीजै.
- 164 पसृज् *stitch* = Skr. प्र-सिच्, IV. cl. प्रसीयति, Pr. \*पसृज्जद् (perhaps contracted for \*पसिविज्जद्), H. पसृजै.
- 165 पहिनाव् or पिहनाव् *cause to put on, cause to dress* = Skr. पि-नह्, Causal पिनाहयति, Pr. पिनाहावेद् or VI. cl. पिनाहावद्, H. पिहनावै (with transposition of न् and ह्) or पहिनावै (with transposition of इ and अ, see my Comp. Gramm. § 133). See also Nos. 166, 167 for a similar transposition. From this root is formed the derivative root पिहन् or पहिन् *put on, dress*.
- 166 पहिर् *put on, dress* = Skr. परि-धा, Passive परिधीयते (with active sense), Pr. परिधेद् (see Cw. p. 99, sūtra 21 धेद्) or परिधद् (see Wb. p. 59 देद् and दद् of root दा) or परिहद्, H. पहिर्है (with transposition of र् and ह्, see No. 165). This root, however, might be also a derivative root from पहिराच् No. 167. In the Gujarātī form पेहर् the इ of the second syllable has modified the vowel of the first.
- 167 पहिराव् *cause to put on, cause to dress* = Skr. परि-धा, Causal परिधाप-

\* पलाउ, I suppose, is a misprint for पलाद्.

- यति, Pr. परिधावेद् or VI. cl. परिधावद् or परिहावद्, H. पहिरावै (with transposition of र् and ह्, as in Nos. 165, 166).
- 168 पङ्क्च् or पङ्क्च् or पङ्क्च् *obtain, arrive* = Skr. प्र-भ्, I. cl. प्रभवति, Pr. \*पङ्क्च्द् or पङ्क्च्द् (H. C. 4, 390), H. पङ्क्क्वै or पङ्क्क्वै or पङ्क्क्वै. It is formed with the pleonastic suffix क्क्, like the root ह्क्क्, see introductory remarks; only in this case, क्क् changes to क्च् and is afterwards disaspirated. Marāthī has पोह्क्च् or पोह्क्च्, where the उ of the second syllable has modified the first.
- 169 पाङ्क् let fall = Skr. पत्, Causal पातयति, Pr. पाङ्क्द् (H. C. 4, 22) or VI. cl. पाङ्क्द् (H. C. III, 153), H. पाङ्क्क्.
- 170 पार्क् accomplish = Skr. प्र, Causal पारयति, Pr. पारैद् or VI. cl. पारद् (H. C. 4, 86), H. पारै.
- 171 पाल् cherish = Skr. पा, Causal पालयति, Pr. पालेद् or VI. cl. पालद्, H. पालै.
- 172 पाव् obtain, find = Skr. प्र-आप्, V. cl. प्राप्नोति, Pr. VI. cl. पावद् (H. C. 4, 239), H. पावै.
- 173 पिघल् melt = Skr. अपि- or पि-गल्, I. cl. अपिगलति, Pr. पिगलद् H. पिघलै? See my Comp. Gramm. § 131.
- 174 पी् drink = Skr. पा, I. cl. पिबति, Pr. पिक्च्द् (H. C. 4, 10), H. पीयै.
- 175 पीच् tread down = Skr. पिप्, Future पेक्ष्यति, (with meaning of present), Pr. पेक्च्द् or पिक्च्द्, H. पीचै (with disaspiration, as in खेचै, see introductory remarks, p. 40).
- 176 पीङ् be pained = Skr. पीड, I. cl. पीडते, Pr. पीडद्, H. पीङ्क्.
- 177 पीस् grind = Skr. पिष्, VII. cl. पिनष्टि, Pr. X. cl. पिसेद् or पीसेद् (cf. Ls. p. 347) or VI. cl. पिंसद् or पीसद् (H. C. 4, 185), H. पीसै.
- 178 पुराव् fill, thread = Skr. पृ, Causal पूरयति, Pr. पुरावेद् or VI. cl. पुरावद्, H. पुरावै (or W. H. also पिरावै in the sense of *threading, stringing*).
- 179 पूक् ask = Skr. प्रह्, VI. cl. प्रह्वति, Pr. पूक्च्द् (H. C. 4, 97), H. पूक्क्.
- 180 पूङ् or पेङ् wipe = Skr. प्र-उङ्, I or VI. cl. प्रोङ्क्ति, Pr. पेङ्क्द् or पूङ्क्द् (H. C. 4, 105), H. पेङ्क्क्ै or पूङ्क्क्ै.
- 181 पूज् worship = Skr. पूज्, X. cl., but also I. cl. पूजति, Pr. पूजद्, H. पूजै.
- 182 पदर् or पैर् swim = Skr. प्र + तृ, I. cl. प्रतरति or VI. cl. प्रतिरति, Pr. पदरद्, E. H. पदरै or W. H. पैरै.
- 183 पदस् or पैस् enter = Skr. प्र-विष्, VI. cl. प्रविशति, Pr. पविसद् (H. C. 4, 183) or पदसद् H. पदसै or पैसै.
- 184 पेल् squeeze out, shove = Skr. पीड, I. cl. पीडते, Pr. पेङ्क्द् (H. C. 4, 143), H. पेलै. See No. 42, खेलै from root क्रीड्. Perhaps a denominative of पिट् = पेड् = पेह् = पेल.
- 185 पोस् nourish = Skr. पुष्, I. cl. पोषति, Pr. पोसद्, H. पोसै.

- 186 फट् or फाट् *burst* = Skr. स्फट्, Passive स्फटयते, Pr. फट्टइ, H. फाटे or फटै.
- 187 फल् *bear fruit* = Skr. फल्, I. cl. फलति, Pr. फलइ (Spt. 17), H. फलै, Connected with roots स्फट् and पट्; see No. 189.
- 188 फंस् or फाँस् *stick, be ensnared* = Skr. स्यूष्, VI. cl. स्यूश्ति, Pr. फंसइ or फासइ (H. C. 4, 182, probably denom. of फंस or फास = स्पर्श cf. Vr. 4, 15. H. C. 2, 92), H. फंसै or फाँसै. This root is also used transitively, in the sense of “ensnare”, “deceive”, see H. C. 4, 129, where फंसइ is said to be a substitute of विसंवदति.
- 189 फाड् *cleave, split* = Skr. स्फट्, X. cl. स्फाटयति, Pr. फाडेइ or VI. cl. फाडइ, (H. C. 1, 198. 232), H. फाड़ै. Hemachandra refers it to root पट्, X. cl. पाटयति.
- 190 फाँड् *jump* = Skr. स्याँद् *shake*, Causal स्याँदयति, Pr. फाँडेइ or VI. cl. फाँडेइ, H. फाँदे. Observe the same transition of meaning as in No. 191. It is also used transitively, in the sense of “ensnare”, “imprison”, corresponding to the intransitive root फाँद्, see secondary roots. H. C. 4, 127 gives फाँडेइ in its original sense of “shaking”, “quivering” = Skr. स्याँदते; its synonym चुल्लचुलइ, which H. C. also gives, still exists in H. चुल्लचुलै or चुल्लबुलै or चुल्लमुलै or चुल्लचुलवै, &c., “he is fidgety.”
- 191 फाल् *jump* = Skr. स्फल् *shake*, Causal स्फालयति, Pr. फालेइ or VI. cl. फालइ, H. फालै. Probably connected with root No. 189; H. C. 4, 198. 232 give फालेइ as an other form फाडेइ.
- 192 फिट् *be paid off, be discharged* = Skr. स्फिट्, X. cl. स्फिटयति, Pr. फिट्टइ (H. C. 4, 177, said to be = अंश् “cease”, “decline”), H. फिटै; cf. R. स्फट् and स्फुट्.
- 193 फुट् or फूट् *expand, increase, be broken, be dispersed* = Skr. स्फुट्, Passive स्फुटयते, Pr. फुट्टइ (Vr. 8, 53. H. C. 4, 177, where it is said to be a substitute of अंश्, in the sense of “being broken”), H. फुटै or फूटै. See No. 194.
- 194 फुल् or फूल् *blossom* = Skr. स्फुट्, VI. cl. स्फुटति, Pr. फुट्टइ or फुडइ (Vr. 8, 53) or फुलइ (H. C. 4, 387 whence Skr. R. फुल् adopted), H. फुलै or फूलै. See No. 193.
- 195 फेर् or फिर *turn, move round* = Skr. परि + इ, II. cl. पर्यति, Pr. फेरेइ or फेरइ (with change of प to फ and of अर्च् to एर, as in पेरते for पर्यतः), H. फेरै.
- 196 फैल् *spread, be dispersed* = Skr. स्फिट्, X. cl. स्फोटयति, Pr. फेडेइ or VI. cl. फेडइ (H. C. 4, 358; in H. C. 4, 177 the simple form फिडइ is given as a substitute of अंश्) or फेलइ (whence Skr. R. फेल्), H. फैलै. See Nos. 189, 192, 193; the original meaning “split”, hence “expand”, may change either to “increase” or to “decrease”, to growth or to decay.

- 197 फो *unfasten* = Skr. प्र-सुच्, VI. cl. प्रसुच्चति, Pr. पसुच्चद् (cf. H. C. 4, 91), H. फोरे (for पोरे = पउरे).
- 198 फोड़ *break* = Skr. स्फुट्, Causal स्फोटयति, Pr. फोडेद् (H. C. 4, 350) or VI. cl. फोडद्, H. फोड़ै.
- 199 वच् *go away, escape* = Skr. व्रज्, I. cl. व्रजति, Pr. वच्चद् (Vr. 8, 47), H. वच्चे. More likely from root वच्, or from Pass. वृत्ते of Skr. R. वृत्.
- 200 वज् or बाज् *sound* = Skr. वद्, Causal Passive वाच्यते, Pr. वज्जद् (H. C. 4, 406), H. वजै or बाजै.
- 201 बन्ध् *be ensnared* = Skr. बन्ध्, Passive बध्यते, Pr. बन्धद् (H. C. 2, 26, 4, 247), H. बन्धै.
- 202 बट् tr. and intr. *twist, divide* = Skr. बट्, Passive बटयते, Pr. बट्टद्, H. बट्टै.
- 203 बढ् or E. H. बार्ह् *grow* = Skr. वृध्, I. cl. वर्द्धते, Pr. वड्डद् (Vr. 8, 44), H. बढै or E. H. बार्है.
- 204 बढाव् *enlarge, complete* = Skr. वृध्, Causal वर्धयति, Pr. वड्ढावेद् or VI. cl. वड्ढावद्, H. बढावै. (T. V. 3, l. 132 has वड्ढाविचं = समापितं).
- 205 बताव् *show, relate* = Skr. वृत्, Causal वर्त्तयति, Pr. वत्तावेद् or VI. cl. वत्तावद्, H. बतावै.
- 206 बध् *kill* = Skr. बध् (or बाध्, I. cl. बाधते), Pr. बधद्, H. बधै.
- 207 बन् *be made* = Skr. वन्, Passive वन्यते, Pr. वणद्, H. बनै. In Sindhi it means "go, come," cf. the Māgadhī वञ्जदि (H. C. 4, 294) which the Prākṛit Grammarians derive from the Skr. R. व्रज् *go or become*.
- 208 बर्र *marry* = Skr. वृ, V. cl. वृणोति, but also I. cl. वरति, Pr. वरद् (Vr. 8, 12), H. बरै.
- 209 वरिस् or वरस् *rain* = Skr. वृष्, I. cl. वर्षति, Pr. वरिसद् (Vr. 8, 11.; perhaps denom. of वर्ष), E. H. बरिसै or W. H. बरसै.
- 210 बल् *burn* = Skr. ज्वल्, I. cl. ज्वलति, Pr. वलद् (H. C. 4, 416 वलंति), H. बलै.
- 211 वस्  *dwell* = Skr. वस्, I. cl. वसति, Pr. वसद्, H. वसै.
- 212 बह् *flow* = Skr. वह्, I. cl. वहति, Pr. वहद् (H. C. 1, 38), H. बहै. The root वहल् *glide happily, be diverted* is a passive or intrans. of a causal वहलाव् formed like पिलाव् from पीच् *drink*.
- 213 बाँध् *recite, read*; see secondary roots.
- 214 बाँह् *wish* = Skr. वाँह्, I. cl. वाञ्छति, Pr. वाँहद् (T. V. 3, l. 133), H. बाँह्.
- 215 बाँध् *bind* = Skr. बन्ध्, IX. cl. बन्धति, Pr. VI. cl. बन्धद् (H. C. 1, 187), H. बाँधै.
- 216 बाल् or वार् *kindle, light* = Skr. ज्वल्, Causal ज्वालयति, Pr. वालेद् or वालद्, W. H. बालै or E. H. वारै. See No. 210.
- 217 बास् *perfume* = Skr. वास्, X. cl. वासयति, Pr. वासेद् or VI. cl. वासद्, H. बासै.

- 218 विक be sold = Skr. विक्री sell, Passive विक्रीयते, Pr. विक्रेद् or विक्रद्, H. विक्रै (see Vr. 8, 31. H. C. 4, 240, where however the form विक्रेद् is given as act. trans ; in the moderns it is intrans. or pass., and the trans. root is बेच्, cf. No. 242.
- 219 विगड् or E. H. विगर् be at variance, be spoiled = Skr. वि-घट्, I. cl. विघटते, Pr. विगढद् (cf. H. C. 4, 112), H. विगडै (for विगटै). See No. 46.
- 220 विगाड् make discord, spoil = Skr. वि-घट्, Causal विघाटयति, Pr. विगाढेद् or VI. cl. विगाढद्, H. विगाडै (for विगाटै). See No. 54.
- 221 विचार reflect = Skr. वि-चर्, Causal विचारयति, Pr. विचारेद् or VI. cl. विचारद्, H. विचारै.
- 222 बिडर् scatter = Skr. वि-ट्, IX. cl. विट्णति, Pr. I. cl. बिडरद् (cf. No. 102), H. बिडरै.
- 223 बिडार् drive away = Skr. वि-ट्, Causal विदारयति, Pr. बिडारेद् or VI. cl. बिडारद्, H. बिडारै. See No. 102.
- 224 वितर् grant = Skr. वि-तृ, I. cl. वितरति, Pr. वितरद्, H. वितरै.
- 225 विथार् tr. spread = Skr. वि-स्त, Causal विस्तारयति, Pr. वित्यारेद् or VI. cl. वित्यारद्, H. विथारै.
- 226 बिराव् mock ; see secondary roots.
- 227 बिलख् or बिलक् see, be confused = Skr. वि-लक्ष्, X. cl. विलक्षयति, Pr. विलखेद् or VI. cl. विलखद्, H. बिलखै or (corrupt) बिलकै.
- 228 बिलग् intr. separate = Skr. वि-लग्, Passive विलग्यते (with active sense), Pr. विलगद् (cf. Vr. 8, 52), H. बिलगै.
- 229 विलग् ascend = Skr. वि-लम्, I. cl. विलङ्गति, Pr. विलम्बद्, H. विलगै (for विलम्बै).
- 230 विलस् be pleased = Skr. वि-लस्, I. cl. विलसति, Pr. विलसद्, H. विलसै.
- 231 विलाव् tr. and intr. disperse, vanish = Skr. वि-लौ, Causal विलापयति, Pr. विलावेद् or VI. cl. विलावद्, H. विलावै.
- 232 बिहर् enjoy one's-self = Skr. वि-हृ, I. cl. विहरति, Pr. विहरद् (H. C. 4, 259 where it is said to be a substitute of Skr. क्रीडति), H. बिहरै.
- 233 बिहाय् or बिहा leave, spend = Skr. वि-हा, III. cl. विजहाति, Pr. I. cl. बिहायद् or विहायद् or (contr.) बिहाद्, H. बिहायै or बिहाय् ; cf. Vr. 8, 26.
- 234 बिसर् forget = Skr. वि-स्मृ, I. cl. विसरति, Pr. विसरद् (cf. H. C. 4, 74), H. बिसरै.
- 235 बीम् tear, break up = Skr. भिद्, Passive भिद्यते (used actively), Pr. भिज्जद्, H. बीम् (for भीजै, with aspiration transferred ; see my Comp. Gramm. § 132), or perhaps Skr. व्यध्, IV. cl. विध्यति, Pr. विज्जद्, H. बीम्.
- 236 बीत् pass ; see secondary roots.
- 237 बीन् or विन् choose = Skr. व्री, IX. cl. व्रीणाति or त्रिणाति, Pr. VI. cl. वीणद् or विणद्, H. बीनै or विनै.

- 238 वृष् be extinguished = Skr. वि-अव-चै, I. cl. व्यवचारयति, Pr. वोञ्जोद् or वोञ्जोद् (or वु०), H. वृष्. See Weber Spt. p. 32.\*
- 239 वृड् or वृड् dive, sink = Skr. वृड्, VI. cl. वृडति Pr. वृडुद् (H. C. 4, 101), H. वृडै or वृडै or W. H. transposed वृवै or वृवै.
- 240 वृत् be extinguished = Skr. वि-आ-वृत् come to an end, I. cl. व्यावर्त्तते, Pr. व. वत्तद् or वोत्तद् or वृत्तद्, H. वृत्तै. Compare H. वत्ती = वत्तिका light, lit. wick.
- 241 वृहार् gather, sweep = Skr. वि-अव-हृ, Causal व्यवहारयति, Pr. वोहारोद् or VI. cl. वोहारद्, H. वृहारै.
- 242 वृष् understand = Skr. वृष्, IV. cl. वृष्यते, Pr. वृष्णद् (Vr. 8, 48), H. वृष्णै
- 243 वेच् sell = Skr. व्यच् cheat, VI. cl. विचति, Pass. व्यच्यते (used actively), Pr. वेचद् (H. C. 4, 419, T. V. 3, 3. 4, transl. प्रयच्छति?), E. H. वेच्; or perhaps Skr. दि-अति + इ spend, II. cl. व्यत्येति, Pr. वेचोद् or वेचोद्?
- 244 वेद् surround; see secondary roots.
- 245 वैस् or वृस् sit = Skr. उप-विशु, VI. cl. उपविशति, Pr. उविसद् H. वृसै or वैसै (with loss of initial उ, see my Comp. Gramm. § 173).
- 246 वो sow = Skr. वप्, I. cl. वपति, Pr. वोवद् or वोचद् (formed like सोवद् of स्वप्, H. C. 1, 64), H. वोए.
- 247 वोड् immerse = Skr. वृड्, Causal व्रोडयति, Pr. वोडोद् or VI. cl. वोडद्, H. वोडै.
- 248 वोलाव् or वृलाव् or वृलाव् call = Skr. वद्, Causal वादयति, Pr. वोलावेद् or VI. cl. वोलावद्, H. वोलावै, &c. See No. 249.
- 249 वोध् wheedle = Skr. वृध्, Causal वोधयति, Pr. वोधोद् or VI. cl. वोधद्, H. वोधै.
- 250 वोल् speak = Skr. वद्, I. cl. वदति, Pr. वोळोद् (H. C. 4, 2.) or वोळोद् (Cw. 99), H. वोळै. (cf. No. 245 वप् = वोव्, so वद् = वोल्).†

\* The simple root चै would form Pr. भाञ्जद् and contracted भाञ्ज, after the analogy of ठाञ्जद्, ठाञ्ज from स्था, भाञ्जद् or भाञ्ज from चै (Vr. 8, 26); this is born out by Pāli भाञ्जति, and by Pr. विञ्जोद् (H. C. 2, 28 = Skr. वि-चायति); but in compounds the Pr. form might be ०ञ्जोद् or ०ञ्जद्, just like ०टोद् or ०टद् in उटोद्, उटद् form उत् + स्था (H. C. 4, 17); thus we should have regularly वोञ्जोद् or (as o is short before a conjunct) वृञ्जोद्, वृञ्जोद्.

† This root is usually connected with Skr. वद् by Prākṛit Grammarians, see Cw. p. 99, where वोचद् or वोचद्, of root वच्, is mentioned as an analogous formation. Now the latter is derived from the passive \*वृच्यते (वच्यते), in an active sense, as appears from H. C. 4, 161. Similarly, I am inclined to derive वोळोद् from the passive \*वृथ्यते (for वृथ्यते of root वृ), used actively. The conjunct र्थ becomes ल्थ, as in पञ्चार्थ = पञ्चार्थ, सौख्यमल्लं = सौख्यमार्थ (Vr. 3, 21).

- 251 भख् *eat, devour* = Skr. भक्, I. cl. भजति, Pr. भक्खद्, H. भखै.
- 252 भज् *worship* = Skr. भज्, I. cl. भजति, Pr. भजद्, H. भजै.
- 253 भज् or भाज् *stee* = Skr. भज् *break*, Passive भज्यते (used actively), Pr. भज्जद्, H. भजै or भाजै.
- 254 भंज् *break* = Skr. भंज्, VII. cl. भनक्ति, Pr. VI. cl. भंजद् (H. C. 4, 106), H. भंजै.
- 255 भन् *speak* = Skr. भण्, I. cl. भणति, Pr. भणद् (H. C. 4, 239), H. भनै.
- 256 भर् *fill* = Skr. भर, III. cl. विभर्त्ति and I. cl. भरति, Pr. भरद् (cf. Spt. 288 भरंति), H. भर.
- 257 भव् or भौ *revolve* = Skr. भ्रस्, I. cl. भ्रसति, Pr. भ्रसद् (H. C. 4, 161) or भवद् (cf. H. C. 4, 401), H. भवै or भौए. See No. 134 नव् or नौ.
- 258 भंस् *float* = Skr. भृग्, I. cl. भृग्ते, Pr. भंसद्, H. भंसै.
- 259 भाल् *see* = Skr. भल्, X. cl. भालयते, Pr. भालेद् or VI. cl. भालद्, H. भालै.
- 260 भास् *appear* = Skr. भास्, I. cl. भासते, Pr. भासद् (H. C. 4, 203), H. भासै. Pr. has also the form भिसद् which is preserved in the Hindi root भिसल् *dazzle*.
- 261 भीज् *be afflicted* = Skr. भिद् *break*, Passive भिद्यते, Pr. भिज्जद्, H. भीजै. See No. 234. Or from अभि-अर्द् *afflict*, Pass. अभ्यर्द्यते, Pr. अभिज्जद्, H. भीजै (with loss of अभि, see my Comp. Gramm. § 172).
- 262 भीज् *be wet*; see secondary roots.
- 263 भुंज् *eat* = Skr. भुज्, VII. cl. भुनक्ति, Pr. VI. cl. भुंजद् (H. C. 4, 110), H. भुंजै.
- 264 भून् *fry*; see secondary roots.
- 265 भेड़ *close*, for बेढ़ with transposed aspiration, see No. 244.
- 266 भेट् *meet, visit* = Skr. अभि-अट्, I. cl. अभ्यटति, Pr. अब्भट्टद्, H. भेटै (with loss of initial अभि; and with ए for इ; see my Comp. Gramm. §§ 148, 172).
- 267 मच् *be raised up, be made, be stirred up, be excited* = Skr. मच् or मच्, Passive मच्यते, Pr. मच्चद् (H. C. 4, 230 where it is referred to the Skr. root मद्), H. मचै. From it are derived many Hindi nouns, all meaning lit. "an erection", माच्चा or मच्चा or मच्चान or मच्चाला *a large bedstead or stage*, मच्चिय *a small bed, stool*, मच् *drowsiness*; also many secondary roots, as मच्चमच् *creak in the joints* (as a bedstead, &c.), मच्चक् *creak or pain in the joints*, मच्चकाव् *wink*, मच्चल् or मच्चलाव् *be fidgety, be perverse, feel nausea*.
- 268 मंज् *clean* = Skr. मृज्, II. cl. मर्चि and I. cl. मृञ्जति, Pr. मंजद् (whence Skr. R. मंज् X. cl.), H. मंजै.
- 269 मद् *cover* = Skr. मृद्; see secondary roots.

- 270 मन् *be propitiated* = Skr. मन्, Causal Passive मान्यते, Pr. मन्नद्, H. मनै. See No. 277.
- 271 मर् *die* = Skr. म्, VI. cl. म्रियते, but Vedic also I. cl. मरति, Pr. मरद् (Vr. 8, 12), H. मरै.
- 272 मल् *rub* = Skr. मद्, IX. cl. मद्मति Pr. VI. cl. मलद् (Vr. 8, 50), H. मलै.
- 273 म् च *churn* = Skr. मथ्, I. cl. मथति. Pr. मद् (cf. Dl. 53), H. रुद्दे.
- 274 माग् *ask for* = Skr. मार्ग्, X. cl. मार्गयति and I. cl. मार्गति, Pr. मग्द् (Spt. 71), H. मगै. Cp. Skr. R. मग्, IV. cl. मग्यति, which would give the Pr. मग्द् equally well; but the denom. R. मार्ग् is the more probable source, as Pr. and Gaud. have a preference for denominative verbs.
- 275 माज् *scour* = Skr. मार्ज्, X. cl. मार्जयति (or R. मज्, X. cl. मार्जयति, see remarks on No. 274), Pr. मजेद् or VI. cl. मजद्, H. माजै.
- 276 माड् or माड् *rub* = Skr. मद्, IX. cl. मद्मति or I. cl. मर्दति, Pr. मडुद् (H. C. 4, 126), H. माडै or माडै.
- 277 मान् *honor, heed* = Skr. मन्, Causal मानयति, Pr. मानेद् or VI. cl. मानद्, H. मानै, See No. 270.
- 278 माप् or नाप् *measure* = R. मा, Causal Passive माप्यते (used actively), Pr. मापद्, H. मापै. The form नाप is either a mere corruption of माप्, or it may be similarly derived from the Causal Passive ज्ञाप्यते (of root ज्ञा), Pr. नपद्, H. नापै.
- 279 मार् *beat, kill* = Skr. मृ, Causal मारयति, Pr. मारेद् (H. C. 4, 337) or VI. cl. मारद् (H. C. 3, 153), H. मारै.
- 280 मिल् *meet* = Skr. मिल्, VI. cl. मिलति, Pr. मिलद् (H. C. 4, 332), H. मिलै.
- 281 मिस् *be pulverised* = Skr. मृश्, VI. cl. मृशति, Pr. मिसद्, H. मिसै.
- 282 मौद् or मौच् *wink* = Skr. मिष्, future मृष्यति (used in sense of present), Pr. मेच्द् or मिच्द्, H. मौद्दे or (corrupt) मौच्. See introductory remarks pp. 37—40, and No. 175.
- 283 मौज् or मौज् *rub* = Skr. मज्, II. cl. माष्टि or I. cl. मजति, Pr. मिजद्, H. मौजै or मौजै.
- 284 मुँड् *shave* = Skr. मुँड्, I. cl. मुण्डति, Pr. मुँडद् (H. C. 4, 115), H. मुँडे.
- 285 मूस् *steal* = Skr. मूष्, I. cl. मूषति, Pr. मूडद् (T. V. 2, 4. 69), H. मूसै.
- 286 मोद् *allure* = Skr. मुद्, Causal मोदयति, Pr. मोद्दे or VI. cl. मोद्, H. मोद्दे.
- 287 रक् *keep, place* = Skr. रच्, I. cl. रचति, Pr. रक्खद् (H. C. 4, 439), H. रक्कै.
- 288 रच् intr. *be made* or tr. *make* = Skr. रच् *make*, Passive रच्यते (used actively), Pr. रचद् (cf. H. C. 4, 422, 23 रचसि. Spt. 363 रचिञ्च = रचित), H. रचै.

- 289 रम् *roam, enjoy* = Skr. रम्, I. cl. रमते, Pr. रमद् (H. C. 4, 168),  
H. रभै.
- 290 रह् *stop, remain* = Skr. रह्, Passive रच्यते Pr. रक्वद्, H. रचे  
(for रखै)\*
- 291 राज् *be adorned* = Skr. रंज or रञ्, IV. cl. रञ्जति, Pr. रञ्जद्, H. राजै
- 292 रौघ् or रौँघ् *cook* = Skr. रध्, Causal रन्धयति, Pr. रधेद् or VI. cl. रंधद्,  
H. रौघै or (corr.) रौँघै.
- 293 रिस् *be vexed* = Skr. रिष्, IV. cl. (or Pass.) रिष्यते, Pr. रिस्सद्, H. रिस्सै.
- 294 रच् *be agreeable* = Skr. रच्, Passive रच्यते, Pr. रचद् (H. C. 4, 341),  
H. रचै.
- 295 रप् intr. *be fixed, stop* = Skr. रद्, Causal Passive रोप्यते, Pr. रोप्यद्  
or रप्यद्, H. रपै.
- 296 रस् or रस् *be angry* = Skr. रष्, IV. cl. रष्यति, Pr. रस्सद् or रसद् (Vr.  
8, 46), H. रसै or रसै; cf. No. 302.
- 297 रंद् or रँद् or रौँद् or रैँद् *trample on*, probably a corrupt spelling  
of the following, No. 298.
- 298 रंध् or रँध् or रौँध् or रैँध् *enclose, restrain* = Skr. रध्, VII. cl. रणधि,  
Pr. रंधद् (Vr. 8, 49), H. रंधै or रँधै or रौँधै or रैँधै.
- 299 रँग् *creep* = Skr. रिग्, I. cl. रिगति, Pr. रिग्द् or रिग्ग्द् (H. C. 4, 259),  
H. रँगै.
- 300 रो weep = Skr. रद्. II. cl. रोदिति, Vedic also VI. cl. रुदति. Pr. रुवद्  
(H. C. 4, 226. 238) or रुञ्द् (Spt. 311) or I. cl. रोवद् (H. C. 4,  
226. 238) or रोचद् (K. I. 4, 69), H. रोचै or रोरे.
- 301 रोल् *roll, plan* = Skr. लुल्, I. cl. लोलति, Pr. लोलद्, H. रोलै.†  
See Nos. 313, 314.
- 302 रोस् *be angry* = Skr. रष्, Vedic I. cl. रोषति, Pr. रोसद्, H. रोसै;  
cf. No. 296.
- 303 लख् *see* = Skr. लक्ष्, I. cl. लक्षते, Pr. लक्वद्, H. लखै.
- 304 लग् *be applied* = Skr. लग्, Passive लग्यते, Pr. लगद् (Vr. 8, 52),  
H. लगै.
- 305 लंघ् or लाँघ् *jump over* = Skr. लंघ्, I. cl. लंघति, Pr. लंघद्, H. लंघै  
or लाँघै.
- 306 लड् or E. H. लर् *dispute, fight* = Skr. लड्, X. cl. लडयति, Pr. लडेद्

\* The derivation is somewhat obscure; but it can hardly be referred (as Bs. III, 40) to the Skr. root रह् which has a very different meaning "desert". The derivation from रच is supported by the Maráthí form राह् = र ख्. On the change of ख् to च, see my Comp. Gramm. § 116.

† There is a large number of Skr. roots, all closely connected in meaning; viz. बट्, बड्, रोड्, रौड्; लुट्, लुड्, लुल, लोड्, &c.

- or VI. cl. लडइ, W. H. लड़े or E. H. लरै.
- 307 लस् or लास् *shine, be fit* = Skr. लस्, I. cl. लसति or X. cl. लासयति, Pr. लसइ or लासइ, H. लसै or लासै.
- 308 लह् *find, avail, get on well* = Skr. लभ्, I. cl. लभते, Pr. लहइ (H. C. 4, 335), H. लहै.
- 309 लाज् *feel ashamed* = Skr. लज्, I. cl. लज्जति, Pr. लज्जइ (H. C. 4, 103), H. लाजै
- 310 लिख् *write* = Skr. लिख्, VI. cl. लिखति, Pr. लिखइ, H. लिखै The ordinary Pr. root लिह् (H. C. 1, 187 लिहइ) does not exist in Hindi.
- 311 लिप् *be smeared* = Skr. लिप्, Passive लिप्यते, Pr. लिप्यइ. H. लिपै.
- 312 लीप् or लेप् *smear* = Skr. लिप्, VI. cl. लिप्यति, Pr. लियइ (H. C. 4, 149), H. लीपै or लेपै. As to the change of इ to ए, see my Comp. Gramm. § 148.
- 313 लुइ *roll* = Skr. लुड्, VI. cl. लुडति, Pr. लुडइ, H. लुड़ै. See Nos. 301, 314, 317.
- 314 लुट् *roll* = Skr. लुट्, VI. cl. लुटति, Pr. लुटइ, H. लुटै.
- 315 लूट् or लूट् *rob* = Skr. लुंट् or लुंट् I. cl. लुण्टति or लुण्टयति, Pr. लुंटइ or लुंटइ, H. लूटै or लूटै.
- 316 ले *take* = Skr. लभ्, I. cl. लभते, Pr. लहइ or लेइ (H. C. 4, 238), H. लेय् or ले. The syllable लह is contracted into ले; similarly कह *speak* is sometimes pronounced कै, and सह *bear*, से.
- 317 लोट् *roll about* = Skr. लुट्, VI. cl. लुटति, Pr. लाइइ (H. C. 4, 146 in the sense "rolling about in sleep"), H. लोटै.
- 318 लोभ् *be enamoured* = Skr. लभ्, IV. cl. लुभति, Pr. लुभइ (H. C. 4, 153), H. लोभै. As to the change of उ to ओ, see my Comp. Gramm. § 148.
- 319 वार् *surround* = Skr. वृ, Causal वारयति, Pr. वारइ or VI. cl. वारइ, H. वारै.
- 320 सक् *can* = Skr. शक्, Passive शक्यते (used actively), Pr. सकइ (Vr. 8 52), H. सकै.
- 321 संहार or संहार् (or समार्) *destroy* = Skr. सन्-हृ, Causal संहारयति, Pr. संहारइ or संहारइ (cf. H. C. 1, 264) or VI. cl. संहारइ or संहारइ, H. संहारै or संहारै (or समारै). Or a denominative of संहार.
- 322 संच् *collect* = Skr. सन्-चि, Passive संचीयते (used actively), Pr. संचइ (cf. H. C. 4, 241 उचइ) or VI. cl. संचइ (as उडइ for उडइ), H. संचै.
- 323 संट् or सट् *be combined* = Skr. सम्-स्था, Passive संस्थीयते (used actively), Pr. संटइ or VI. cl. संटइ (like उडइ and उडइ), H. संटै or (corr.) सटै.

- 324 सङ् or सर् *rot* = Skr. सद् (or श्द), I. cl. सीदति, but Vedic also सदति, Pr. सडद् (H. C. 4, 219; in Vr. 8, 51 it is ascribed to श्द), W. H. सङ् or E. H. सरै.
- 325 सताव् *persecute, torment* = Skr. सम्-तप्, Causal सन्नापयति, Pr. संतावेद् or VI. cl. संतावद्, H. सतावै.
- 326 सद् *leak* = Skr. स्यद्, I. cl. स्यन्दते, Pr. संद्द्, H. सदै. As to elision of the nasal, see my Comp. Gramm. §§ 143, 146. See No. 353.
- 327 संभाल् or संहाल् or समाल् *sustain* = Skr. सम्-भृ, Causal सन्धारयति, Pr. संभारेद् or VI. cl. संभारद् H. संभालै, &c. Or demon. root of सन्धार.
- 328 समाव् *be contained* = Skr. सम्-आप्, V. cl. समाप्नोति, Pr. X. cl. समावेद् H. C. 4, 142) or VI. cl. समावद्, H. समावै See No. 172.
- 329 समुभ् or समभ् *understand* = Skr. सम्-बुध्, IV. cl. समुध्यते, Pr. संबुज्भद्, E. H. समुभौ or W. H. समभौ. See No. 242.
- 330 सर् *issue, be ended* = Skr. ह, I. cl. सरति, Pr. सरद् (Vr. 8, 12), H. सरै.
- 331 सराह् *commend* = Skr. श्लाघ, I. cl. श्लाघते, Pr. श्लाहद्, (H. C. 2, 101 has श्लहद्?). H. सराहै.
- 332 सल् *pierce* = Skr. शल् or सल्, I. cl. शलति or सलति, Pr. शलद्, H. सलै.
- 333 सवार् or सवार or समार् *prepare* = Skr. सम्-ट्, Causal संवारयति, Pr. संवारेद् or VI. cl. संवारद्, H. संवारै, &c.
- 334 सह् *endure* = Skr. सह्, I. cl. सहते, Pr. सहद् (H. C. 1, 6), H. सहै.
- 335 सहर् *arrange* = Skr. सम् + ह्, I. cl. संहरति, Pr. संहरद् (H. C. 4, 259 = Skr. संहरति, in H. C. 4, 82 also साहरद्), E. H. सहरै.
- 336 साध् *settle* = Skr. साध्, Causal साधयति, Pr. साधेद् (cf. Spt. 188 साहेद्) or VI. cl. साधद् (cf. Spt. 260 साहद्), H. साधै. The form साह् does not occur in Hindî.
- 337 सार् *accomplish* = Skr. ह, Causal सारयति, Pr. सारेद् or VI. cl. सारद् H. सारै.\*
- 338 साल् *pierce* = Skr. शृ, Causal शारयति, Pr. सारेद् or VI. cl. सारद्; H. सालै. Or from Causal of शल्, see No. 332.
- 339 साँच् *threaten, distress* = Skr. संम्, Causal संसद्यति, Pr. संसेद् or VI. cl. संसद् (H. C. 4, 197 where however it is = संसते), H. साँसै.
- 340 सी *sew* = Skr. सिच्, IV. cl. सीद्यति, Pr. VI. cl. सिद्द् or सिद्यद्, H. सीरे. H. C. 4, 230 gives सिव्द् which would be सीवै in H., but it does not exist; there is, however, another reading सिच्चद्, H. सीचै which does exist, see No. 342.
- 341 सीख् *learn* = Skr. शिच्, I. cl. शिचते, Pr. सिक्खद् (cf. Spt. 353), H सीखै.
- 342 सीच् or सीच or शौच् *irrigate* = Skr. सिच्, VI. cl. सिद्यति, Pr. सिंचद्,

\* The root means also "polish" (by rubbing, striking); perhaps this is the सारद् mentioned by H. C. 4, 84 as equivalent to the Skr. प्रहरति,

- (H. C. 4, 239) or सिद्ध (H. C. 4, 230), H. सौँचै or सीचै or (corr.)  
हौँचै (cf. Vr. 2, 41 हत्त० = सप्त०, Ls. 199.)
- 343 सीज *exude, sweat* = Skr. खिद्, IV. cl. खिद्यति, Pr. सिज्जद् (H. C. 4,  
224), H. सीजै. See also No. 344.
- 344 सीज् *seethe, boil, exude, sweat* = Skr. शी (or या), Passive शीयते, Pr.  
सिज्जद्, H. सीजै.
- 345 सीज् *be received (as money) be liquidated (as debt)* = Skr. श्रि, Pas-  
sive श्रीयते, Pr. सिज्जद्, H. सीजै.
- 346 सुधार् *adorn* = Skr. सु-धृ, Causal सुधारयति, Pr. सुधारेद् or VI. cl.  
सुधारद्, H. सुधारै.
- 347 सुन् *hear* = Skr. श्रु, V. cl. श्रुणोति, Pr. VI. cl. सुणद् (Vr. 8, 56),  
H. सुनै.
- 348 सुमर् *remember* = Skr. स्मृ, I. cl. स्मरति, Pr. सुमरद् (Vr. 8, 18), H. सुमरै.
- 349 सुहाव् *be agreeable* = Skr. सुख्, X. cl. सुखयति Pr. सुहावेद् (Spt. 169) or  
VI. cl. सुहावद्, H. सुहावै.
- 350 सूँघ् *smell at* = Skr. सम्-ञा-भ्रा, I. cl. समाजिघ्रति or II. cl. समाभ्राति,  
Pr. समग्घेद् or VI. cl. समग्घद्, H. सूँघै.\*
- 351 सूँज् *swell* = Skr. श्वि, Passive श्वयते, Pr. सुज्जद्, H. सूँजै.
- 352 सूझ् *appear* = Skr. श्रुध्, IV. cl. श्रुध्यति, Pr. सुज्जद्, (cf. H. C. 4,  
217), H. सूझै.
- 353 सैँद् *irrigate* = Skr. खिद्, Causal खिन्दयति, Pr. सिँदेद् or VI. cl. सिँदद्,  
H. सैँदै cf. No. 326.
- 354 सेव् or सेह् *serve, worship* = Skr. सेव्, I. cl. सेवते, Pr. सेवद् (H. C. 4,  
396), H. सेवै or सेहै (with euphonic ह्, see my Comp. Gramm.  
§ 69).
- 355 सोच् *regret, meditate* = Skr. शृच्, Passive शृचते (used actively)  
Pr. सुचद्, H. सोचै.
- 356 सोह् *shine, be fit* = Skr. शोभ्, I. cl. शोभते, Pr. सोहद् (H. C. 1, 187),  
H. सोहै.
- 357 सौँप् *deliver* = Skr. सम्-पृ, Causal समर्पयति, Pr. समप्येद् or VI. cl.  
समप्यद्, H. सौँपै. See No. 349, footnote.
- 358 हन् *kill* = Skr. हन्, II. cl. हन्ति, but Vedic also I. cl. हनति, Pr. हणद्.  
(H. C. 4, 418), H. हनै.
- 359 हर् *take away* = Skr. हृ, I. cl. हरति, Pr. हरद् (H. C. 4, 234), H. हरै.

\* ०भ्रा would form ०ग्घेद् or ०ग्घद् in Pr., just as ०ट्टेद् or ०ट्टद् of ०स्या; and सम् would contract to सूँ in Hindi, just as in सैँपै for Pr. समप्येद्, see No. 357; the intermediate form being सवग्घद् (cf. II. C. 4, 397). The root, however, might be derived from Skr. श्रिंघ्, I. cl. श्रिंघति, Pr. श्रिंघद्; only the Hindi ought to be सीँघै; and the change of ईँ to ऊँ would be very anomalous. (Dr. R. Mitra in his vocabulary quotes घे गन्धोपादाने ?).

- 360 हरिस् or हरस् *be glad* = Skr. हृष्, I. cl. हृषति, Pr. हरिसद् (Vr. 8, 11; perhaps denom. of हरिस् = हर्ष Vr. 3, 62), E. H. हरिस् or W. H. हरसै. See No. 209.
- 361 हलप् *toss about* = Skr. कल्, (Causal Passive कलाप्यते), Pr. हलप्यद्, H. हलपै.
- 362 हवा *scream* = Skr. क्ते, I. cl. कथति, Pr. VI. cl. हवाञ्च् or (contr.) हवाद्, H. हवाच्.
- 363 हंस् or हाँस् *laugh* = Skr. हस्, I. cl. हसति, Pr. हसद् (T. V. 2, 4. 69) or हस्यद् (Passive), H. हसै or हसै.
- 364 हाँप् or हाँफ् *blow* = Skr. ध्वा, Causal ध्वापयति, Pr. धंपेद् or VI. cl. धंपद् or हंपद्, H. हाँपै or (corr.) हाँफै.
- 365 हाल् intr. *shake* = Skr. कल्, Passive कल्यते (used actively), Pr. हलद्, H. हालै. See No. 68.
- 366 हिल् intr. *shake* = Skr. कृ, I. cl. करति, Pr. VI. cl. हिरद् or हिलद्, H. हिलै.
- 367 ऊन् *sacrifice* = Skr. धू, V. cl. धुनोति, Pr. VI. cl. धुणद् or ऊणद् (H. C. 4, 241 where it is referred to Skr. root ऊ), H. ऊनै.
- 368 ह्रल् *drive, goad* = Skr. ह्रङ् *go*, Causal ह्रङयति, Pr. ह्रङेद् or VI. cl. ह्रङद्, H. ह्रलै.
- 369 हो *be* = Skr. भू, I. cl. भवति, Pr. भवद् or हवद् or ऊवद् or होद् (H. C. 4, 60), H. होय

#### PART II.—*Secondary Roots.*

Comp. = compound root; den. = denominative; der. = derivative; N. = noun; P. P. P. = past participle passive.

The Sanskrit equivalents are not given, unless when they actually exist; what theoretically they might have been, has been explained in the introductory remarks; see also my Comparative Grammar, §§ 351—354.

Some of the explanations attempted in this list, are, of course, only tentative; a few such have been indicated by a mark of interrogation.

- 1 comp. अटक *be hindered, stopped* = Skr. अट् + छ, Pr. अट्कोद् or अट्कद्, H. अटकै.
- 2 comp. उचक् *be raised, rise* = Skr. उच् + छ, Pr. उच्चकोद् or उच्चकद्, H. उचकै.
- 3 comp. उवक् *vomit* = Skr. उद्-वम् + छ, Pr. उव्वकोद् or उव्वकद्, H. उवकै.
- 4 comp. उक् or औक् *vomit* = Skr. वम् + छ, Pr. वमकोद् or वमकद्, Ap. Pr. वव्वकद्, H. औकै or ऊकै (with औ for अव or वम, see my Comp. Gramm. § 122).

- 5 der. उखाड़् *be pulled out, slip out*, a passive or intransitive, derived from उखाड़्, see No. 6.
- 6 den. उखाड़् or उखेड़् *pull out, uproot* = Skr. P. P. P. उल्लुह्य, Pr. उक्कडुद् (cf. H. C. 4, 187), H. उखाड़ै (for उकाड़ै, with transferred aspiration, see my Comp. Gramm. § 132) or उखेड़ै (for उकेड़ै with change of *a* to *e*, see my Comp. Gramm. § 148). See No. 13.
- 7 den. ओढ़् *put on, dress* = Skr. उपवेष्ट, I. cl. उपवेष्टवे, Pr. ओवेडुद्. (cf. H. C. 4, 221), H. ओढ़ै (contracting ओवे to ओ). Probably from a P. P. P. of the root विष्.
- 8 comp. कड़क् *crackle, thunder* = Skr. कर्द + छ, Pr. कडुक्केइ or कडुक्कइ, H. कड़कै.
- 9 den. कमाव् *earn* = Skr. N. कर्म; Pr. कम्मावेद् or कम्मावद्, (H. C. 4, 111 has कम्मावद् and gives it as a substitute of the root उपभुज्; the *á* is shortened to *a*, by H. C. 3, 150), H. कमावै.
- 10 comp. कसक् *be painful, be pained* = Skr. कष + छ, Pr. कसक्केइ or कसक्कइ, H. कसकै.
- 11 der. काट् *be cut*, a passive or intransitive, derived from root काट्, see primary roots, No. 27.
- 12 der. कढ् *be pulled out, escape*, a passive or intransitive, derived from root काढ्. See No. 13.
- 13 den. काढ् *pull out* = Skr. P. P. P. छट्; Pr. कडुद् (H. C. 4, 187), H. काढै.
- 14 comp. खरक् or खड़क् *make a tremulous noise, rustle, rattle* = Skr. खल्ल + छ; Pr. खल्लक्कइ or खडक्कइ, H. खरकै or खड़कै. There is also a reduplicated root खरखर् or खड़खड़् of the same meaning. They also occur in Maráthí and Panjábí. The primary meaning of the root is; *slip or glide along with a sound*; this is preserved in the Maráthí खरक् or खड़क् which is used of the running of a stream, or the crashing of a boat, dragged over gravel, &c. The simple root खड़् occurs in Maráthí with its original meaning *be shed, fall off*; also in Panjábí, where however it has become transitive, *carry off*. The change of ल् or र् to ड् or ङ् is anomalous; but it already took place in Prakrit; thus in Spt. 44, अक्खड् for Skr. आखल्लति, Spt. 195 खडिच्च for Skr. खल्लित. Perhaps there may be a connection with the root खँद्; compare also the roots चर् and चल्. See also roots थरक् and फरक्.
- 15 der. गड् *be hollowed, be sunk*, a passive or intransitive, derived from root गाड्; see No. 16.
- 16 den. गाड् *hollow, bury* = Skr. N. गर्त, Pr. गडु (Vr. 3, 25), Pr. गडुद् or गडुइ, H. गाड़ै. Or possibly a mere corruption of root गाढ्, No. 17, by disaspiration.

- 17 den. गाढ् *dig in, fix in, bury* = Skr. P. P. P. गाढ (of root गाह्), Pr. गाढद्, H. गाढै.
- 18 den. गोद् *mark, brand* = Skr. N. गोर्द्; Pr. गोद्देद् or गोद्द्, H. गोर्दै (?); brands being made on the forehead or bosom.
- 19 den. घबराव् *be alarmed, agitated*, perhaps corrupted form गडबडाव् with the same meaning, a reduplicative or alliterative form, made from गड् = Skr. N. गर्द् *noise, cries of alarm* (?).
- 20 den. घिनाव् or घिनियाव् *be disgusted* = Skr. N. घृणा or deminutive घृणिका (of root घृण्), Pr. विष्ण (H. C. 1, 128) or विष्णञ्च; Pr. विष्णवेद् or विष्णञ्चवेद् or विष्णावद् or विष्णञ्चावद्, H. घिनावै or घिनियावै.
- 21 der. घिर् *be collected, surrounded, gather*, a passive or intransitive of root घेर्. See primary roots, No. 64.
- 22 comp. चपक् *be compressed, collapse* = Skr. चप or चर्प + छ, Pr. चपक्केद् or चपक्कद्, H. चपकै.
- 23 comp. चमक् *glitter* = Skr. चमत् + छ, pass. चमक्क्रियते (with active meaning), Pr. चमक्केद् or चमक्कद्, H. चमकै.
- 24 den. चाह् *wish*, corrupted for ब्राह्, see No. 40.
- 25 der. चिर् *be torn, split*, a passive or intransitive, derived from root चीर्; see No. 31.
- 26 den. चिकनाव् *smooth, polish* = Skr. N. चिक्कण (or चिक्किण; perhaps itself a compound word of चित् *bright* = चित्र, and छ = Pr. क्किण; lit. *made clear*); Pr. चिक्कणावेद् or चिक्कणावद्, H. चिकनावै.
- 27 den. चिडाव् or चिडाव् *abuse, vex* = Skr. P. P. P. चिन्न (from root चिप् *abuse*); Pr. चिडावद्, H. चिडावै (with transfer of aspiration) or चिडावै (with loss of aspiration). As to the changes of aspiration, see No. 47 ब्रेड् or ब्रैड्, where it is preserved; also primary root, No. 65 चढ् (footnote, p. 45). As to the change of न्न to न्न to ड (or ड्ड), compare root जुडाव् from P. P. P. युक्त; and primary roots Nos. 92, 93 जुट् and जोड्.
- 28 den. चिन्ताव् *make known to, warn, admonish* = Skr. P. P. P. चित्त; Pr. चित्तावेद् or चित्तावद् (cf. S. B. 11, 1), H. चित्तावै. In Setu-bandha II, 1 occurs the past participle चित्तविञ्च (with *a* for *á*, by H. C. 3, 150), which is correctly explained by the commentator as meaning चेतितं *made known to*, or निवृत्तं *restrained, warned* (or निर्दत्तं), परितोषितं *admonished, comforted*; (see S. Gdt. pp. 84, 156).
- 29 den. चीत् *paint* = Skr. N. चित्र; Skr. चित्रयति, Pr. चित्तेद् or चित्तद्, H. चीत्तै.
- 30 den. चीन् or चीर्ण *recognize* = Skr. N. चिर्ण, Pr. चिर्णह (H. C. 2, 50); Skr. चिर्णयति, Pr. चिर्णहेद् or चिर्णहद्, H. चीर्णै or चीर्णै.
- 31 den. चीर् *tear, cleave* = Skr. N. चीर (rag), whence Skr. चीरयति, Pr. चीरेद् or चीरद्, H. चीरै.

- 32 comp. चुक् *be finished, cease* = Skr. च्युत् + क्; Pr. चुक्कइ (H. C. 4, 177), H. चुकै. H. C. gives it as a substitute of the Skr. root भ्रंश् *fall down, decay*, a synonym of च्युत्; so also the commentator to Spt. 323, see Wb. p. 184. The correct derivation from च्युत् is given by the commentator on Setubandha 1, 9. The Skr. root चुक् *inflict pain*, X. cl. चुक्कयति, is doubtlessly reintroduced from the Prākṛit. See No. 33.
- 33 comp. चूक् *blunder, miss* = Skr. च्युत् + क्; Pr. चुक्कइ, H. चूकै. This is clearly identical with the former, as regards origin. The original meaning "fall," "drop," (from the truth) would easily lead to "blunder." In this sense it is well-known to Prākṛit; *e. g.*, Spt. v, 323, चुक्कसंकेचा "blundered or missed meeting"; again Spt. v. 199, Setubandha 1, 9, where the commentary correctly explains it प्रमादे देशी इति केचित्, *i. e.*, according to some it is a *desī* word meaning "blundering" (See S. Gdt., p. 157). See No. 32.
- 34 den. चोराव *steal* = Skr. N. चार or चौर; Pr. चोरावेइ or चोरावइ, H. चोरावै.
- 35 comp. चौक् *start (from fright)* = Skr. चमत् + क्, passive चमत्क्रियते (used actively), Pr. चमक्कइ or चमक्कइ, Ap. Pr. चवक्कइ, H. चौकै.
- 36 der. हन् *be strained, filter*, a passive or intransitive derived from हान्, No. 38.
- 37 den. हल् *deceive, cheat* = Skr. N. हल; Skr. हलर्याति, Pr. हलेइ or हलइ, H. हलै.
- 38 den. हान् *strain, search* = Skr. P. P. P. ह्यन्न (of root ह्यन्द्), Pr. \*हन्नेइ or हन्नेइ (Ls. 199) or हन्नइ, H. हानै (?).
- 39 den. ह्यप् *stamp, print*; an active or transitive derived from root ह्य्; perhaps merely another form of root ह्यप्; see Appendix Nos. 4 and 13.
- 40 den. वाह् or चाह् *wish* = Skr. N. उत्साह्; Pr. उच्छाहैइ (cf. H. C. 2, 22) or उच्छाहइ, H. वाहै or (disaspirated) चाहै; or from Skr. N. इच्छा, Pr. इच्छाएइ or इच्छाइ, H. चाहै (with transferred aspiration) or वाहै. As to the elision of initial उ or इ, see my Comp. Gramm. § 173 (cf. Addenda); and as to the change of aspiration, *ibidem* § 132.
- 41 comp. बिटक् *be dispersed, be scattered* = Skr. बिप् + क्; Pr. बिट्केइ or बिट्केइ, H. बिटकै. See No. 46.
- 42 den. बिड् *be vexed, take offence*, a passive or intransitive, derived from R. वीड् or वीड्, No. 46.
- 43 comp. बिडक् *sprinkle* = Skr. स्पृष्ट + क्; Pr. बिडक्केइ or बिडक्कइ, H. बिडकै. As to the derivation of बिड from Skr. स्पृष्ट, see No. 45 वीट्; and as to the softening of the final, वीट् is to बिड्, as जुट् to जोड्, q. v.

- 44 den. कीक *sneeze* = Skr. N. क्खिक्खा; Skr. क्खिक्खयति, Pr. क्खिक्खेइ or क्खिक्खइ, H. कीके. The word क्खिक्खा, however, is itself a compound from क्खिन् *sneezing* and क्ख; and the word क्खिन् is probably another form of चुत् *sneezing*, from Skr. root चुत् *sneeze*.
- 45 den. कौट् or कौट् or कौट् *sprinkle* = Skr. P. P. P. स्पृष्ट *sprinkled*, Pr. क्खिट् (with क्खि for स्पृ, as in क्खिइइ or क्खिइइ or क्खिइइ, H. C. 4, 182, 257; see also primary roots Nos. 78, 80); Pr. क्खिट्टेइ or क्खिट्टेइ, H. कौटै or कौटै or कौटै (on disaspiration see my Comp. Gramma. § 145, Exc. 2; on the *anunásika*, § 149; and on the change of इ to ए, § 148). Or from Skr. N. सेक्ख (of root सिच्), see primary root No. 342.
- 46 den. कौड् or कौड् *abuse, vex* = Skr. P. P. P. चिप्प *abused*; Pr. कौडेइ or कौडेइ, H. कौडै or कौडै. See Nos. 27, 42. Probably from चिप्प was derived a root क्खिट्, just as Skr. root जुट् from युक्क; the causal of क्खिट् would be क्खिट्, just as causal जौटि of जुट्; whence we should have Pr. कौडेइ, just as Pr. जौडेइ, and H. कौडै just as H. जौडै. The root क्खिट् which would correspond to जुट् does not exist in Hindi, except in the compound क्खिटक्, see No. 41. A similar series of roots are क्खुट् or क्खुट् and क्खौड्.\* Possibly also Nos. 43 and 45, may be derived from चिप्प.
- 47 den. कौन *take away, snatch* = Skr. P. P. P. क्खिन् (of root क्खिट्), Pr. क्खिन्नेइ or क्खिन्नेइ, H. कौनै.
- 48 den. क्खुट् or क्खुट् *be let off, be released* = Skr. P. P. P. चिप्प, Pr. क्खुत् (H. C. 2, 138) or क्खुट् (S. C. 1, 3, 142 क्खुट्?); Pr. क्खुट्टेइ or क्खुट्टेइ, H. क्खुटै or क्खुटै. See Nos. 46 and 50. The root क्खुट् or क्खुट् has not been adopted into Sanskrit, except in its causal or transitive form चोत्.†

\* There would be the following series of forms :

Skr. युक्क, Pr. जुत्त or जुट्ट; Roots Skr. जुट्, Pr. जुट् or जुड्, H. जुट् or जुड्, Caus. जोड्  
 ,, चिप्प, ,, क्खुत् ,, क्खुट्ट; ,, ,, क्खुट्, ,, क्खुट्ट, ,, क्खुड्, ,, क्खुट्, ,, क्खुड्, ,, क्खौड्  
 ,, चिप्प, ,, क्खिन्, क्खिट्ट; ,, ,, क्खिट्, ,, क्खिट्ट, ,, क्खिट्, ,, क्खिट्ट, ,, क्खेड्.

The Pr. roots in इ would seem to be the original derivatives from the Skr. P. P. P.; they were reintroduced into Sanskrit with one final ट्, and afterwards gave rise to the alternative Pr. root in ड्, by the ordinary phonetic change of ट् to ड्. The two alternative Pr. roots in इ and ड्, reappear in H. as roots in ट् and ड्. As to the Skr. root क्खुट्, see footnote to No. 48. The root क्खिट् appears to have been little used; it is not mentioned among Skr. roots, nor does it survive in Hindi, except in क्खिटक्, see No. 41.

† The root क्खुट् does exist in Skr., but it has assumed a somewhat different, though connected meaning "cut" (whence H. क्खुडौ *knife*). The same transition of

- 49 den. **वेद्** *perforate* = Skr. N. **विद्र** (of R. **विद्**); whence Skr. **विद्रयति**, Pr. **विद्दे** or **विद्द**, H. **वेदै**.
- 50 der. **वेड्** *release*, an active or transitive, derived from R. **वुट्** No. 48. Compare Skr. root **चोट्**.
- 51 den. **जुगव्** *pair off labor* (i. e., *assist another with labor, in expectation of similar assistance being returned hereafter*) = Skr. N. **युग्म**, Pr. **जुग** (H. C. 2, 78); Pr. **जुगावेद्** or **जुगावद्**, H. **जुगावै**. The root comes to mean generally: *be provident, be careful of*.
- 52 den. **जताव्** *make known, warn* = Skr. P. P. P. **ज्ञा** (of caus. of R. **ज्ञा**); Pr. **जचावेद्** or **जचावद्**, H. **जतावै**.
- 53 den. **जस** *germinate* = Skr. N. **जन्म**, Pr. **जभेद्** or **जसद्** (H. C. 4, 136), H. **जभै**.
- 54 den. **जीत्** *overpower, win* = Skr. P. P. P. **जीत** (of R. **ज्या**); Pr. **जितेद्** or **जितद्**, H. **जीतै**.
- 55 der. **जुड्** *be joined*, a passive or intransitive, derived from root **जोड्** see No. 57.
- 56 den. **जुट्** *unite* = Skr. P. P. P. **युक्त**, Pr. **जुत्त** (H. C. 1, 42) or **जुड्**, (see Nos. 46, 48), Pr. **जुडेद्** or **जुडेद्**, H. **जुटै**. Compare Skr. root **जुट्**.
- 57 der. **जोड्** *join*, an active or transitive, derived from root **जुट्**, see No. 56.
- 58 den. **जोत्** *yoke* = Skr. N. **योक्त्र**, Skr. **योक्त्रयति**, Pr. **जोत्तेद्** or **जोत्तद्**, H. **जोतै**.
- 59 den. **जोह्** or **जोव्** or **जो** *see* = Skr. N. **ज्योतिस्** *eye, sight*; Pr. **जोएद्** (H. C. 4, 422, 6) or **जोअद्** (cf. H. C. 4, 332 **जोअतिहे**), H. **जोए** or **जोवै** or **जोहै** (with euphonic **व्** and **ह्**, see my Comp. Gramm. § 69).
- 60 comp. **भटक्** tr. *twitch*, intr. *shake* = Skr. **भट् + छ**; Pr. **भट्केद्** or **भट्कद्**, H. **भटकै**. As to the derivation of **भट्**, see primary root **भौट्** No. 96.
- 61 comp. **भपक्** intr. *spring*; tr. *throw on, move to and fro, snatch* = Skr. **भंप + छ**; Pr. **भंपके** or **भंपकद्**, H. **भपकै**. Hemachandra 4, 161 notices the corresponding uncompounded verb **भंपद्**, but only as an intransitive “move to and fro” (said to be = Skr. **असति**). Hindi and Maráthi have the same uncompounded verb **भंपै**, but as a transitive, “cover with a thatch” (lit. *throw on*, i. e., bundles of

meaning may be observed in another series of Skr. roots, which also are derived from **छिप्र**. The latter becomes in Pr. **खिच** (H. C. 2, 127) or **खुच** (Spt. v. 278) or **खुड्**; whence Pr. den. roots **खुड्** or **खुड्** (H. C. 4, 116 **खुडद्** and **खुडद्** *he breaks*), H. **खूट्** (**खुड्** does not exist). This root **खुड्** as well as the corresponding causal or transitive forms **खोट्** or **खोड्** have been adopted into Sanskrit. See primary root No. 41.

grass.)\* As to the derivation of भंप, see Appendix No. 6. Hindī has an adverb भप् *quickly*; it has also another kind of compound root भपट् with the same meaning as भपक्. On these obscure compound in ट् roots, see my Comp. Gramm. § 354, 2.

- 62 comp. भालक् *shine, glare* = Skr. भाला + छ; Pr. भालक़द or भालक़द, H. भालक़ै. As to the derivation of भाल, see primary root No. 98.
- 63 den. भाँक् *peep, spy* = Skr. N. अश्च; Pr. अजभक़द, H. भाँक़ै (with loss of initial अ, and disaspiration) ?
- 64 comp. भौक् *sigh, lament* = Skr. श्रौत् + छ; Passive श्रौक्तीयते (used actively), Pr. भिक़द or भिक़द, H. भौक़ै.
- 65 comp. भुक् or भोक् *stagger, nod, bend* = Skr. चुम् (acc. sg. neut. चुप्) + छ; Pr. भुक़द, H. भुक़ै or भोक़ै.
- 66 comp. भोक् or भौक् *throw, cast* = Skr. चेष (or चप्) + छ; Pr. भोवक़द, H. भौक़ै or भोक़ै. As to ओ = एव, see my Comp. Gramm. § 122 ?
- 67 der. टिक् *be propped, stay*, a passive or intransitive, derived from No. 68.
- 68 comp. टेक् *prop, support* = Skr. चाय (of root चै) + छ; Pr. टायक़द, H. टेक़ै ?
- 69 den. ठट् *fix, arrange* = Skr. P. P. P. सञ्च (of root संम्); Pr. ठट्टेद or ठट्टेद, H. ठट्टै. The hardening of ट् to ठ is probably caused by the influence of the initial ठ. In old Hindī ठट्टे occurs in the sense of “stopping short”, “standing amazed”. When the past participle is used as such (not as an element of a denominative verb), the original ट् is still preserved in Hindī; thus old Hindī ठाट, modern Hindī ठडा “standing”.
- 70 comp. ठठक् or ठिठक् *stop short, stand amazed* = Skr. सञ्च + छ; Pr. ठठक़द, H. ठठक़ै or ठिठक़ै. As to the derivation of ठठ, see No. 69; as to इ for अ, see my Comp. Gramm § 35.
- 71 comp. ठनक् *jingle, tinkle, &c.* = Skr. सन *sounding* + छ; Pr. ठनक़ेद or ठनक़द, H. ठनक़ै. Compare Skr. टंकार *clang, twang, &c.* from टं + छ; ट or ठ means any “sound.”
- 72 comp. ठमक् *strut* = Skr. सञ्च + छ; Pr. ठमक़द or ठमक़द, H. ठमक़ै. Skr. सञ्च becomes Pr. थंम or टंम (H. C. 2, 9, whence H. थाम् *prop, pillar* and ठाम् *place, residence*. The change of ञ्च to ञ्च to म may be observed in the primary roots Nos. 117, 118.
- 73 comp. ठसक् *knock, chip* = Skr. तच्च + छ, see root ठाँस् No. 10. in Appendix. Hindī has an interjection ठस्, imitating the sound of *knocking* or *hammering*; also ठसनौ *rammer* (an instrument).
- 74 den. ठहर् *be fixed, remain*, another form of No. 75; possibly arisen by

\* Panjābī has भँवे, with व् for प्; and भफ् *thatch*, with फ् for प्. The former might be referred to the Skr. root शंब्.

a mere transposition, ठढ् *tharh* = ठड्ड् *tharah* = ठहड्ड् *thahar* = ठहर् *thahar*. Or the element र may be the same as र or ल in ठहर् or ठहल्, &c. (see my *Comp. Gramm.* § 354, 2), and ठह = Pr. ठह = Skr. स्तब्ध. Hindi has the noun ठाहर् *place*.

75 den. ठाड् or ठाड् *be fixed, be erect, stand* = Skr. P. P. P. स्तब्ध, Pr. ठड्ड् (H. C. 2, 39); Pr. ठड्डे or ठड्डे, H. ठाडै or ठाडै.

76 den. डर् *fear* = Skr. N. दर, Pr. डर (H. C. 8, 217); Pr. डरड् (H. C. 4, 198), H. डरै.

77 den. डाह् *be hot, burn* = Skr. N. दाह, Pr. डाह (H. C. 1, 217); Pr. डाहे or डाह, H. डाहै.

78 comp. ढक् *cover* = Skr. N. स्थग् (acc. sing. neut. स्थक् *covering*) + छ; Pr. ढक्क (H. C. 4, 21), H. ढकै See primary root No. 105.\*

79 der. ढल् or ढर् *flow*, a passive or intransitive of root ढाल् or ढार, see Appendix No. 11.

80 comp. यक् or याक् *be wearied, be fatigued* = Skr. स्तम् (acc. sing. neut. स्तम्) + छ; Pr. यक्क (H. C. 4, 370) or VI. el. यक्क (H. C. 4, 87, 259); where it is said to be a substitute of Skr. फक्नि *move slowly from fatigue*, H. यकै or याकै. In H. C. 4, 16 the root is given as an equivalent of स्था *stand*; the Bangálí has याक् (pronounced *thak*) *stay, remain*. The original meaning of the Hindi is *to come to a stop* (from fatigue). The Skr. passive स्तम्भते (= स्तम् + क्रीयते) means "to be made firm or rigid, be paralysed, be stopped". The original meaning of "rigidity" is preserved in the Hindi यक् or यक् *a congealed lump, a clot*. The stoppage may be owing to fatigue or to wonder; hence Hindi यक्नि *stopped or wearied or astonished*. Other derivatives of the Hindi root are अयक् *unwearied, यकावत् weariness, यक्कफक्क perplexed*.†

81 comp. यपक् *strike, slap, tap* from यप + छ; as to the derivation of यप, see root याप् in the Appendix No. 13.

\* It might be also derived, as a primary root, from Skr. तच्, I. cl. तच्चनि, Pr. तक्क (with transfer of aspiration) = ढक्क (softening and cerebralising य). Compare the roots ढास्, ठक्, ठास्, ठाक् in the Appendix, which show that the Skr. roots तच् and तच् had a tendency in Prákrit to transfer the aspiration (थ) and cerebralise the initial (ठ). The Skr. root तच् means *chipping off* (by striking) and *covering*; a similar change of meaning appears in the Hindi root सड् *cover* from Skr. षट् *rub, strike*.

† S. Goldschmidt, *Prákritica*, No. 7, p. 5 derives it, as a denominative root, from P. P. P. यग्ध of a root यंघ्, which he identifies with the root स्थंभ, and assumes a change of ग्ध to क्. This theory is based on three hypothetical steps: the identity of यंघ् and स्तंभ, the existence of a P. P. P. यग्ध, the change of ग्ध to क्. Pischel in *Bezenberger's Beiträge* III, 235 derives it simply from a hypothetical Skr. root स्थक्.

- 82 comp. थलक् or थरक् *tremble, flutter*; probably a mere various pronunciation of खरक् or फरक्, q. v.; the interchange of फ and थ is shown by the Pr. फक्कइ and थक्कइ (H. C. 4, 87), and that of ख and थ by खभे and थभे (H. C. 2, 8). There is also a reduplicated root थलथल् or थरथर् corresponding to खरखर् and फरफर्.
- 83 comp. थिरक् *be set, be settled, well postured* (e. g., in dancing) = Skr. स्थिर + क्त; Pr. थिरक्केइ or थिरक्कइ, H. थिरकै.
- 84 den. थिराव् intr. *settle* (as liquor) = Skr. N. स्थिर; Skr. स्थिरायति Pr. थिरावेइ or थिरावइ, H. थिरावै.
- 85 comp. थुक् *spit* = Skr. छेव (or स्थेव) + क्त; Pr. थुक्केइ or थुक्कइ, H. थुकै. As to the contraction of एव to उ or ऊ, see my Comp. Gramm. § 122.
- 86 den. दउड् or दौड् *run* = Skr. N. द्रव, Pr. diminutive दवड; Pr. दवडेइ or दवडइ, E. H. दउडै or W. H. दौडै. In Chanda's Prākṛit Lakṣhaṇa C D, II, 27h, there is noticed a root डवडव *run about with lowering face* (अतिरभसाद् ऊर्द्धमुखस्य इतस्ततो गमने डवडव); Marāṭhī has both डवडव and डवड in the same sense; it has also दवड *run*; these two roots are probably identical, the change of initial द् to ड being not uncommon; see H. C. 1, 217.
- 87 comp. दरक् intr. *split* = Skr. दर + क्त; Pr. दरक्केइ or दरक्कइ, H. दरकै.
- 88 comp. दहक् intr. *burn* = Skr. दह + क्त; Pr. दहक्केइ or दहक्कइ, H. दहकै.
- 89 den. दुख् intr. *pain* = Skr. N. दुःख; Skr. दुःखयति, Pr. दुक्खेइ or दुक्खइ, H. दुखै.
- 90 comp. धडक् *blaze, be hot* (from any passion), *be distressed, tremble* (from fear), = Skr. दग्ध + क्त, Pr. दड्कइ, H. धडकै (for दडकै, with transfer of aspiration). There is also reduplicated root धडधड\*.
- 91 den. धार् *pour* = Skr. N. धार; Pr. धारेइ or धारइ, H. धारै.
- 92 comp. धौक् or धैक् *blow, breathe upon* = Skr. धम + क्त; Pr. धमक्केइ or Ap. Pr. धवक्कइ, H. धौकै.
- 93 den. नट् *dance* = Skr. N. नर्त; Skr. नर्तयति, Pr. नट्टेइ or VI. cl. नट्टइ (H. C. 4, 230. 2, 30), H. नटै. The Skr. root नट (I. cl. नटति or X. cl. नाटयति) is adopted from the Prākṛit.
- 94 der. नह् *flow*, a passive or intransitive, derived from primary root नह् No. 136.
- 95 den. नहाट् *flee* = Skr. P. P. P. स्तल (of R. स्तम् *eject*); Pr. नहट्टइ, E. H. नहाटै. Compare Pr. पल्लइ (H. C. 4, 200) from Skr. पर्यस्त.

\* Hindi has a word धड् *body*, and धड् *firm, strong, sound*. This is probably derived from Skr. दह = Pr. दह = H. धड.

- 96 der. निकल् or निकर् *be pulled out, come out*; a passive or intransitive, derived from root निकाल्. See No. 98.
- 97 der. निकस् *be expelled, come out*; a passive or intransitive, derived from root निकाम्. See primary root No. 139.
- 98 den. निकाल् or निकार् *pull out, eject* = Skr. P. P. P. निष्कृष्ट; Páli and Pr. निकड्ड्, Pr. निक्कल्लद् or निक्कालद्, W. H. निकालै or E. H. निकारै. As to the change of ढ to ल्ह, see my Comp. Gramm. § 115.\*
- 99 den. निखोड् or निखोर् *peel, extract* = Skr. P. P. P. निष्कृष्ट; Pr. निकोड्ड् (with *o* for *u*, by H. C. 1, 116) or निकखोड्ड् (with transfer of aspiration, as in अक्खोड्ड् H. C. 4, 188 = अक्कोड्ड्, a denominative of आकृष्ट *extracted*).
- 100 den. निकोस् *grin* = Skr. N. निकुस्मय (from root नि + कु + स्मि); Skr. निकुस्मयते, Pr. निकोस्सेद् or VI. cl. निकोस्सेद् (cf. H. C. 1, 116), H. निकोसै. See my Comp. Gramm. § 148.
- 101 den. निगल् *swallow* = Skr. N. निगल्; Pr. निगलेद् or VI. cl. निगल्द्, H. निगलै. It might, however, be a primitive root = Skr. नि + ग्, VI. cl. निगिलति, with change of इ to अ.
- 102 den. निपट् *terminate* = Skr. N. निप्यत्ति (from root निस् + पट्); Pr. निपट्टेद् or VI. cl. निपट्टेद्, H. निपटै (?). As to the change of dental त्त to cerebral ट्ट, compare Pr. पट्टणं for Skr. पत्तनं, Vr. 3, 23; cf. also Pr. पड्ड् for Skr. पतति Vr. 8, 51.
- 103 der. निवह् or निभ् *be accomplished, succeed*, a passive or intransitive root, derived from the primary root निवाह्, No. 146.
- 104 den. पड् or पैट् *enter* = Skr. P. P. P. प्रविष्ट, Pr. पड्ड् (H. C. 4, 340); Pr. पड्डेद् or VI. cl. पड्डेद्, E. H. पडै or W. H. पैटै.
- 105 den. पक् *ripen* = Skr. P. P. P. पक्, Pr. पक् (H. C. 2, 79); Pr. पक्केद् or पक्कद्, H. पक्कै.
- 106 den. पक्ड् *seize* = Skr. P. P. P. प्रकृष्ट; Pr. पक्ड्ड् (cf. H. C. 4, 187), H. पक्डै (for पक्डै, with lost aspiration, as in root गाड् No. 16, उखाड् No. 6, ठाड् No. 75, and others).
- 107 den. पच्छताव् *repent* = Skr. N. पश्चात्ताप; Pr. पच्छतावेद् or VI. cl. पच्छतावद्, H. पच्छतावै.
- 108 den. पट् *be paid, be roofed, be watered* = Skr. N. पत्र or पट् or पट; Pr. पट्टेद् or VI. cl. पट्टेद्, H. पटै. Skr. पत्र is any "vessel", used for irrigating; पट्ट is the table or leaf on which the accounts of payments are kept; पट means a "roof."

\* So also Bs. I, 354, III, 58. The Hindí root निकाल् is, of course, referable to the Skr. root निस् + कल्; but the latter is most probably itself adopted from the Prákrit; Skr. निक्कालयति = Pr. निक्कालेद्. The Pr. form निक्कालेहि, quoted by Bs. III, 58, is misspelt for निक्कालेहि.

- 109 den. पनप् *expand, grow, prosper* = Skr. N. प्रपच्च (of root प्र-पंच्),  
Skr. प्रपच्चयति, Pr. पपण्डे or पपण्ड (cf. Pr. पणासा = Skr. पंचाशत्  
H. C. 2, 42), H. पनपै (transposed from पपनै, see my Comp. Gramm.  
§ 133, see also primary roots Nos. 165, 166).
- 110 den. पनिथाव् *irrigate* = Skr. N. पानौथ, Pr. पाणिथ (H. C. 1, 101),  
Pr. पाणिथावेद् or पाणिथावद्, H. पनिथावै (see my Comp.  
Gramm. § 25).
- 111 den. परिस् or परस् *touch* = Skr. N. स्पर्श, Pr. फरिस (Vr. 3, 62); Pr.  
फरिसद् (H. C. 4, 182), H. परिसै or परसै (with lost aspiration, and  
change of *i* to *a*; see my Comp. Gramm. §§ 58 note, 130).
- 112 den. पलट् or पलथ् intr. *turn over* = Skr. P. P. P. पर्यत्, Pr. पलट्  
or पलथ् (Vr. 3, 21. H. C. 2, 47), Pr. पलट्टद् or पलथ्यद् (H. C. 4,  
200), H. पलटे or पलथै. In H. C. 4, 200. 258 पलथ्य and पलथ्यद्  
are spelled so; see my Comp. Gramm. § 161.
- 113 den. पद्दिचान् or पद्दचान् *recognise* = Skr. N. परिचयन्; Pr. परिचयण्डे  
or परिचयण्ड, H. पद्दिचानै or पद्दचानै (for पद्दचानै; with elided र  
and inserted euphonic च्, see my Comp. Gramm. §§ 69, 124) (?).
- 114 der. पिहन् or पद्दिन् intr. *dress, put on*, a passive or intransitive,  
derived from the primary root पिहनाव् or पद्दिनाव्, No. 165.\* See  
also primary root पद्दिर् No. 166.
- 115 comp. पिचक् *be squeezed, be shrivelled* = Skr. पिच्च + क्; Pr. पिचक्केद्  
or पिचक्केद्, H. पिचक्कै Compare Skr. पिच्छिद् *squeezed*; and  
as regards the derivation of पिच्च or पिच, see primary root पौच  
No. 175. The word has been adopted into Skr. from the Prakrit.†
- 116 den. पिक्कल् or फिसल् *slip* = Skr. N. पिच्छल or पिच्छल slippery;  
Pr. पिच्छलेद् or पिच्छलेद्, H. पिक्कलै or फिसलै. (transferring the  
aspiration to प and changing क् to स; see my Comp. Grammar §  
11). See No. 125.
- 117 der. पिट् *be beaten*, a passive or intransitive, derived from root पीट  
No. 119.
- 118 der. पिल् *be beaten, bruised*, a passive or intransitive, derived from root  
पेल्, No. 121. See also No. I, 184.
- 119 den. पीट् *beat* = Skr. P. P. P. पिथ्; Pr. पिथेद् (Spt. 173) or पिथद्  
(with ट् for ड्, as in पलट्टद् for पलट्टद् (H. C. 4, 200), H. पीटै.  
See No. 121.
- 120 den. पुकार् *call, shout* = Skr. N. स्फूत्कार or फूत्कार or पूत्कार; Pr. फुकारेद्

\* In Bengálí the root is पिनध्, which is a denominative of the Skr. P. P. P.  
पिनद्ध *dressed*. Possibly the Hindī root may be explained in the same way by a  
further change of घ् to च्.

† In the Skr. word चिपिट् *pressed down* a metathesis of प and च appears to have  
taken place.

- or पुक्कारेद् or पुक्कारद्, H. पुकारै. A similar change of फ to प, in root परिस् No. 111. An intransitive or passive form of this root occurs in the old Hindí of Chand's Prithiráj Rasau: पुक्कर be called.
- 121 den. पेल् *squeeze, beat* = Skr. P. P. P. पिष्ट; see primary root No. 184.
- 122 den. पुन् *revile*, perhaps = Skr. N. पुण्य *blessed*; euphuistically.
- 123 comp. फटक् tr. *separate, winnow*, or intr. *be separated* = Skr. स्फट + छ; Pr. फट्केद् or फट्कद्, H. फटकै. The Pr. doubles the radical ट; see primary root फट No. 186.
- 124 comp. फरक् or फडक् *tremble* = Skr. स्फर + छ; Pr. फरकेद् or फरकद्, H. फरकै or फडकै. The reduplicated root फरफर् or फुरफुर also occurs. See roots थरक् No. 82 and खरक् No. 14.
- 125 den. फिसल् *slip, slide*, see No. 116. For a similar transfer of aspiration on account of change of ह to स, see root ठस् in Appendix No. 8.
- 126 comp. फूक् *blow* = Skr. फूत् + छ; Pr. फूकेद् or फूकद्, H. फूकै. See H. C. 4, 422, 3. फुक्किञ्जंत, and Spt. 178 फूकंतञ्च.
- 127 der. फुक् *be blown*, a passive or intransitive, derived from root फूक् No. 126.
- 128 den. वद्द् or वैट् *sit* = Skr. P. P. P. उपविष्ट, Pr. उवद्दद् (like पद्दद्, No. 104) or ओद्दद् (cf. H. C. 1, 173), H. वद्वै or वैटै (as to change of ओ to व, see my Comp. Gramm. § 71). The initial व for उ is somewhat anomalous, as such an "expansion" व does not ordinarily harden to व. Another way of explaining the Hindí वद्द् is to assume that the initial उ of Pr. उवद्दद् has been dropped (so in my Comp. Gramm § 173, and Bs. I, 179. III, 38); but this does no more obviate the anomaly; for a Pr. व, softened from Skr. प, does not, as a rule, harden in Hindí.
- 129 comp. वक् *talk, chatter* = Skr. वाच् + छ; Pr. वक्कद्, H. वकै. Or possibly a mere corruption for बुक्, Pr. बुक्कद् or बुक्कद् (H. C. 4, 98), Skr. बुक्कति or बुक्कयति a comp. of ब्रू + छ. Hindí does not possess the form बुक्, but it has a derivative of it, बुक्कलाव्; Maráthí has both बुक् and बुक्कल्.
- 130 den. वच् *read, recite* = Skr. N. वाच्य; Pr. वच्चद्, H. वाँचै.
- 131 comp. वदक् *go beyond bounds, stray* = Skr. वद्विस् + छ; Pr. वद्विकेद् or वद्विकद्, H. वद्वकै.
- 132 der. विथर् *be spread*, a passive or intransitive, derived from the primary root विथार् No. 225.
- 133 den. विराव् *mock, jeer* = Skr. N. विराव *sound, noise*; Pr. विरावेद् or विरावद्, H. विराव.
- 134 den. विलट् *become bad*, perhaps connected with P. P. P. विलम्बित (विलम्ब?) *wasted*.
- 135 den. वौट् *scatter, spill* = Skr. P. P. P. व्यल; Pr. विट् (for विट्, as पलट् for पलट्, see No. 112); Pr. विट्टेद् or विट्टद्, H. वौटै.

- 136 den. वीत् *pass* = Skr. P. P. P. वीत्, Pr. वित्त (like निद्धित for Skr. निद्धित, H. C. 2, 99; otherwise the preservation of त् is not explainable); Pr. वित्तेद् or वित्तद्, H. वीत्ते.
- 137 den. वेढ् *enclose, surround* = Skr. वेष्ट्, Causal वेष्टयति or I. cl. वेष्टते, Pr. वेष्टेद् (H. C. 4, 51) or वेष्टुद् (H. C. 4, 221), H. वेढै. The root is probably a denominative of an anomalous P. P. P. or some other derivative of the root विश् or विष्. The so-called Causal shows its denominative form.
- 138 den. बउराव् or बौराव् *go mad* = Skr. N. वातुल; Pr. वाउलावेद् or वाउलावद्, H. बउलावै or बौरावै. See my Comp. Gramm. § 25.
- 139 den. भाग् *flee* = Skr. P. P. P. भग्, Pr. भग्ग (cf. H. C. 4, 354), Pr. भग्गेद् or भग्गद्, H. भागै.
- 140 den. भौग् or भौग् *be wet* = Skr. अभ्यङ्ग; Pr. अन्निंगेद्, or अन्निंगद्, H. भौगै or भौगै (?). As to the loss of initial अ्, see my Comp. Gramm. 172. Compare the primary root भौज् in the Appendix No. 21.
- 141 der. भून् *be fried, be cooked*, a passive or intransitive, derived from भून् No. 143.
- 142 den. भूल् or भोल् or भोर् *forget, blunder* = Skr. P. P. P. भृट्; Pr. भृल्लद् (H. C. 4, 177), W. H. भूल्लै or भोल्लै, E. H. भूरै or भोरै. Skr. भृट् = Pr. भृड् = भूरुद् = भुल्ल; the change of *a* to *u* caused by the labial *bh*. As to the change of *u* to *o*, see my Comp. Gramm. § 148.\*
- 143 den. भून् *fry, cook* = Skr. P. P. P. भूर्ण (Pan 8, 2. 44); Pr. भुण्णद् or भुणद्, H. भूनै.
- 144 den. मढ् *cover, gilt* (*i. e.* encase by rubbing on) = Skr. P. P. P. ऋट्, Pr. मड् or (disaspirated) मडु; Pr. मडुद् or मढद् (H. C. 4, 126), H. मढै. The Skr. root मट् *cover* is adopted from the primitive Prākṛit or Pāli मट्ट (= ऋट्), whence मट् *a covering, hut*, H. मट् or मट्टा. Similarly are formed the roots कढ्, बेढ्, &c.
- 145 den. मत् *consult* = Skr. N. मन्त; Pr. मंतेद् or मंतद् (cf. H. C. 4, 260 मंतिदो), H. मंतै (with elided nasal, see my Comp. Gramm. § 143).
- 146 der. मिट् *be effaced, cease to exist*, a passive or intransitive, derived from the root सेट्, No. 153.
- 147 der. मुंड् *be shaved*, a passive or intransitive, derived from the primary root मूँड्, No. 284.
- 148 der. मुँद् *be closed*, a passive or intransitive, derived from the root मूँद्, No. 151.

\* This derivation I owe to S. Goldschmidt, *Prākṛitica*, No. 8, p. 9. Formerly, looking upon भोल् or भोर् as the more primitive form, I was inclined to consider it a denominative of Skr. भ्रमर, whence comes Hindi भोरा or भोला *a simpleton*.

- 149 den. **मृ** *die* = Skr. P. P. P. मृत, Pr. मृच (H. C. 4, 442); Pr. मृच्यद्, H. मृचे.
- 150 den. **सृ** *discharge urine* = Skr. N. मूत्र; Skr. मूत्रयति, Pr. मुत्तेद् or मुत्तद्, H. मूत्रै.
- 151 den. **सू** *close* (lit. with a seal ring) = Skr. N. मुद्रा; Skr. मुद्रयति, Pr. मुद्देद् or मुद्दद्, H. मुद्दै. See H. C. 4, 401 दिल्ली मुद् *sealed*.
- 152 den. **मू** *be silent* = Skr. P. P. P. मून (of root मू); Pr. मूणेद् or मूणद्, H. मूणै, (or from N. मौन)
- 153 den. **मेट** *effuse* = Skr. P. P. P. मृष्ट, Pr. मिट्टेद् or मिट्टद् (disaspirated for मिट्टद्, cf. Pāli मट्ठ or मट्ठ = मृष्ट), H. मेटै, (with *e* for *i*; see my Comp. Gramm. § 148).
- 154 den. **मौल्** or **मौर्** *blossom* = Skr. N. मौल; whence मौलयति, Pr. मोलेद् or मोलद्, W. H. मौलै or E. H. मौरै.
- 155 den. **मौलाव्** or **मौराव्** *blossom* = Skr. N. मौल; Pr. मोलावेद् or मोलावद्, W. H. मौलावै or E. H. मौरावै.
- 156 den. **रग्** *be attached* = Skr. P. P. P. रक्त, Pr. रग्ग (H. C. 2, 10); Pr. रग्गेद् or रग्गद्, H. रगै.
- 157 den. **रंग्** *dye* = Skr. N. रंग; Skr. रंगयति, Pr. रंगेद् or रंगद्, H. रंगै.
- 158 der. **रक्** *be hindered*, a passive or intransitive, derived from root रोक् No. 162.
- 159 der. **रध्** or **रदु** *be restrained*, a passive or intransitive, derived from the primary root रँध् No. 298.
- 160 den. **रुट्** or **रुढ्** *be angry* = Skr. P. P. P. रुष्ट, Pr. रुट्ट (H. C. 4, 414) or रुड्ड, Pr. रुट्टेद् or रुड्डेद्, H. रुट्टै or रुड्डै.
- 161 comp. **रेक्** *bray* = Skr. रेप् (acc. sg. neut. रेट्) + क्त; Pr. रेक्केद् or रेक्केद्, H. रेक्कै.
- 162 comp. **रोक्** *hinder* = Skr. रध् (acc. sg. neut. रत्) + क्त; Pr. रक्केद् or रक्केद्, H. रोक्कै.
- 163 der. **रोप्** *stop, plant*; a transitive or active, derived from primary root रप्, No. 295.
- 164 den. **लंगड्** *limp* = Skr. N. लङ्ग, Pr. diminutive लंगड; Pr. लंगडेद् or लंगडदेद्, H. लंगडै.
- 165 den. **लव्** or **लौ** *reap* = Skr. N. लव; Skr. लवयति, Pr. लवेद् or लवद्, H. लवै or लौरे.
- 166 comp. **लुक्** *disappear, conceal oneself* = लुप् + क्त; Pr. लुक्कद् (H. C. 4, 55), H. लुक्कै. The word लुप् properly means "dropping out", "elision"; it is derived from the Skr root लुप् *break*. This original meaning of the root is still preserved by the Pr. लुक्कद्, which means both *break, cut of*, (H. C. 4, 116, where it is said to be =

- Skr. नुङ्) and *disappear, conceal oneself* (H. C. 4, 56, where it is given as an equivalent of the Skr. निली) \*
- 167 den. लुभाव् or लुहाव् *covet, be enamoured with* = Skr. N. लोभ; Pr. लोभावद् or लोहावद्, H. लुभावै or लुहावै, (with *u* for *o*, see my Comp. Gramm. § 25).
- 168 der. सज् *be adorned, be prepared, a passive or intransitive, derived from root साज्, see Appendix No. 24.*
- 169 comp. सटक् or सडक् *get away, disappear, conceal oneself* = Skr. सत्र or सद + ङ; Pr. सटक्कद् or सडक्कद्, H. सटकै or सडकै. The word सत्र means *covering, concealment*. The root सद् becomes सड् in Pr.; see Vr. 8, 51. H. C. 4, 219.
- 170 der. सध् *be settled, a passive or intransitive, derived from the primary root साध् No. 336.*
- 171 den. समुहाव् *be in presence of* = Skr. N. संमुख; Pr. समुहावेद् or समुहावद्, H. समुहावै.
- 172 comp. सरक् *be moved, move* = Skr. सर + ङ; Pr. सरक्केद् or सरक्कद्, H. सरकै. Possibly it is a mere variety of the root सडक्.
- 173 den. सराप् *curse, denom. made from the Hindi सराप a corruption of the Skr. श्राप; see my Comp. Gramm. § 135.*
- 174 der. साठ् or साँट् or साँट् *combine, a transitive or active, derived from the primary root संट, No. 323.*
- 175 den. सील् *moisten* = Skr. N. शीतल; Pr. सीअलेद् or सीअलद्, H. सीलै. on the absorption of *a* after *í*, see my Comp. Gramm. § 97.
- 176 der. सुधर् *be correct, mend, a passive or intransitive, derived from the primary root सुधार्, see No. 346.*
- 177 den. सुहाव् *be pleased or give pleasure* = Skr. N. सुख; Pr. सुहावेद् or सुहावद्, H. सुहावै.
- 178 den. सुहाव् *be beautiful or make beautiful* = Skr. N. सोम; Skr. शोभयति, Pr. सोहावेद् or सोहावद्, H. सुहावै. This might, however, be a primary root, from the causal of root शुभ्.
- 179 den. सुख् or सुख् *be dry* = Skr. N. शुष्क, Pr. सुखेद् or सुखद्, H. सुखै or सुखे.
- 180 den. सुत् *sleep* = Skr. P. P. सुप्त; Pr. सुत्तेद् or सुत्तद्, H. सुत्तै.
- 181 den. सेत् or सेत् *adjust* = Skr. P. P. समाहित, Pr. समाहित (cf. H. C. 2, 99 निहित = Skr. निहित), Ap. सञ्जाहित or सञ्जादत्त, H. (contracted) सैत्; whence Pr. समाहितद्, H. सैत्तै or सैत्तै.
- 182 comp. हग् *evacuate* = Skr. हद् + ङ; Pr. हग्गद्, H. हगै (for हकै) ?

\* The root लुक् might also be derived from लुच् + ङ, from the root लुच् which (like लुप्) means both *cut off* and *disappear*. Or it might be derived from लुब् + ङ; the root लुब् meaning *become invisible*.

- 183 comp. हकाव् or हंकाव् *haul, drive away or keep off* (with shouts) = Skr. हक् + छ; Pr. हक्कावेद् or हंकावद्, H. हकावै or हंकावै. This is a pleonastic form of No. 187.
- 184 den. हंकार् *haul, drive away or keep off* (with shouts) = Skr. हकार् ; Skr. हकारयति, Pr. हकारेद् or हंकारद्, H. हंकारै. Connected with roots Nos. 183 and 187.
- 185 हत् *slay* = Skr. P. P. P. हत, Pr. हत् (like निहित H. C. 2, 99); Pr. हत्तेद् or हत्तद्, H. हतै.
- 186 comp. हलक् *move* = Skr. ऋल + छ; Pr. हलक्केद् or हलक्कद्, H. हलक्के.
- 187 comp. हाँक् *haul, drive* (with shouts) = Skr. हक् + छ; Pr. हक्केद् or हक्कद् (H. C. 4, 134), H. हाँक्के. See Nos. 183, 184. Probably connected with root भण् or भञ्ज or भाष् *talk* + छ.
- 188 den. हार् *lose, be beaten, be unsuccessful* = Skr. N. हार, Pr. हारेद् or हारद्, H. हारै. H. C. 4, 31 has हारवद् (for हारावद् by H. C. 3, 150), said to be = नश्ति; it is merely a pleonastic form of हारै. Hindi has हरारै or हिरारै.
- 189 comp. धौक् *blow* = Skr. धस + छ; Pr. धसक्केद् or धसक्कद्, Ap. धवँक्कद्, H. धौक्के (for धौक्के). See No. 92.

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APPENDIX.—Primary Roots.\*

- 1 ऐच् or एच् *pull, attract* = Skr. आ + छप्, future आकष्यति (used in the sense of the present), Pr. आचंक्कद् or आइक्कद् (H. C. 4, 187), H. ऐच्चे or एच्चे (with loss of aspiration). See introductory remarks, pp. 39, 40. This root occurs in the shortened form अच् both in Pr. (H. C. 4, 187 अचंक्कद्) and in old Hindi (Prithiraj Rasau 27, 38 अचै); see No. 2.
- 2 खैच् or खेच् or खेच् or खेच् *pull* = Skr. छप्, future ऋक्ष्यति (used in the sense of the present); Pr. कच्छद् or कंक्कद्, H. खैच्चे, खेच्चे or खेच्चे, खँच्चे (with transfer of aspiration, see my Comp. Gramm. 132). On the inserted nasal, see *ibidem* §§ 149, 158, H. C. 1, 26, 28. On the change of *a* to *ai* or *e*, see my Comp. Gramm. § 148; here it occurred by assimilation to root ऐच् or एच् No. 1. See introductory remarks pp. 39, 40. In old Hindi this root occurs in the form खेच्, which is much nearer the original Prākṛit form कंक्; and corresponding to it, the old Hindi has a root-form अच् which has evidently been modified from the original form ऐच् (see No. 1), in order to assimilate it to खेच्; just as the original form खेच् has

\* These are roots which I was at first inclined to consider to belong to the secondary class.

been modified to खैच् in order to assimilate it to ऐच्. Thus the two forms खंचै and खंचै occur in the Prithirāj Rasau 27, 38.

पां संगोल ललरी वीस टंकी वर पंचे ।

चौतेगी सब्बाज बान अरि प्रान सु चंचे ॥ *i. e.,*

“The Mangol Khán Lalarí draws twenty daggers, and the four-sworded Sabbáj pulls out the enemy’s life with his arrows.”

- 3 झाँड़् vomit, let go, release = Skr. कृद्, I. cl. कर्दति, Pr. कडुद् (H. C. 4, 91), H. झाँड़े. The root is also spelled झाँटे; and it might be derived from कृद्, VII. cl. कृणति, Pr. कडद or कंटद, H. झाँड़े or झाँटे (as Pr. भंजद् for Skr. भनक्ति). It might also be derived from the Skr. denominative root कर्द्. X. cl. कर्दयति; as it seems to have been done in H. C. 2, 36 (कडुद् from कर्दि).
- 4 हप् be pressed down, be stamped, be printed = Skr. चप्, I. cl. चस्पति, Pr. हंपद्, H. हपै. Or perhaps from चम्, IV. cl. चाम्यति.\*
- 5 भंख् or भख् or भक् sigh, chatter (wildly), lament, be sorry for = Skr. धाँच्, I. cl. धाँचति, Pr. भंखद् (H. C. 4, 140), H. भंखै, भखै or (disaspirated) भकै. As to the change of ध्व to भ, compare Pr. भयो for Skr. ध्वजः (H. C. 2, 27). As to the meaning, compare the English “croak.”†
- 6 भाप् throw on, cover = Skr. चप् throw, Passive चणते (used actively), Pr. भंपद्, H. भापै. The भ for क is as in भिज्जद् for चौयते H. C. 2, 3, and the inserted anusvára, as in जंपद् (H. C. 4, 2. 1, 26, for जणद्). Or it might be derived from Skr. अधि + ष्ट, Causal अष्यर्षयति, Pr. भंपद् or भंपद् (for अष्भंपद्, with loss of initial अ see my Comp. Gramm. § 172).
- 7 टक् knock, hammer = Skr. तच्, I. cl. तचति, Pr. टक्खद् (with ट for त as in टगरो H. C. 1, 205), H. टकै (for टखै with transfer of aspiration). Compare Skr. टक्कर. See No. 9.
- 8 टाँस् ram, hammer = Skr. तच्, I. cl. तचति, Pr. टच्छद् (as to ट for त, see H. C. 1, 205), H. टाँसै (for टखै, with transfer of aspiration from क् to ट, and change of क् to स्, see my Comp. Gramm. §§ 11, 132). See No. 10, also Nos. 7 and 9.
- 9 टाक् or टाँक् ram, hammer, drive in, (nail, &c.) = Skr. तच्, I. cl. तचति, Pr. टक्खद् (as to ट for त, see H. C. 1, 205), H. टाकै or टाँकै (for टाखै, with transferred aspiration). See No. 7.
- 10 टास् or टाँस् ram, hammer = Skr. तच्, I. cl. तचति, Pr. टुच्छद् (cf. H. C. 1, 205), H. टासै or टाँसै (for टाखै). See No. 8.

\* The root स्पृष् also might produce a Pr. passive (used actively) ह्यप्द्, analogous to ह्यिप्द् (H. C. 4, 257).

† This verb is noted by Hemachandra not less than five times; in 4, 140 as = संतप् repent, in 4, 148 = विलप् lament or prattle, in 4, 156 = उपालप् scold, in 4, 201 = निःश्वस् sigh, and in 4, 259 = भाप् talk.

- 11 ढाल् or ढार् *send forth, pour out, cast*, a modification of घाड्, No. 14 *q. v.*, cerebralisation transferred to the initial घ from ड.
- 12 थप *fix, settle* = Skr. स्तभ्; Passive स्तभ्यते (used actively), Pr. थप्यद् (formed similarly to द्विप्यद् from स्पृश्यते H. C. 4, 257), H. थपै. See footnote on p. 46; भ्य = थ = थ्व = थ.
- 13 थाप् or ठप् *slap, strike, pat* = Skr. स्तृह्, Passive स्तृह्यते (used actively), Pr. थप्यद् or ठप्यद्, H. थापै or ठपै. See footnote on p. 46; ह्य = थ = थ्व = थ.
- 14 घाड् *send forth, pour out, cast* = Skr. घ्राड्, I. cl. घ्राडते, Pr. घाडद् (H. C. 4, 79), H. घाडै. See No. 11. The Skr. घ्राड् is adopted from the Pr., and is probably a denominative of घ्रष्ट, P. P. P. of घ्रज् *glide, flow*, Pr. घड्डु = घड्डु = घाड.
- 15 फलंग् *leap* = Skr. प्र+लंग्, I. cl. प्रलंगति, Pr. पलंगद्, H. फलंगै (with transfer of aspiration).
- 16 फौक् or फौक् *hurl, fling, throw away* = Skr. प्र-इप्, Future प्रेक्ष्यति (used in sense of present), Pr. पेक्खद् or पेंखद्, H. फेकै or फौकै (with transfer of aspiration).
- 17 विन् *weave* = Skr. वृ, IX. cl. वृणाति, Pr. विणद्, H. विनै; see No. 19; also No. I, 237. The Skr. root for *weave* is वे, I. cl. वयति or IV. cl. जयते; it seems impossible to derive the H. root विन् from it; but the roots वृ and वे are probably connected; both mean *cover*.
- 18 बिह् *be spread* = Skr. वि-सृ, Passive विस्त्रियते (for विस्तीर्यते; like क्रियते, त्रियते), Pr. विच्छेद् or विच्छद्, H. विहै. Compare Pr. विच्छिन्न in Chaṇḍa 2, 21 for Skr. विस्तीर्ण.
- 19 बुन् *weave* = Skr. वृ, V. cl. वृषोति, Pr. वुणद्, H. बुनै, formed like सुन् No. I, 317. See No. 17.
- 20 बोभ् *load* = Skr. वड्, Passive उच्चते (used actively) or Causal Passive वाच्चते, Pr. वुड्भद् (cf. H. C. 4, 245 वुड्भद्), H. बोभै.
- 21 भौज् or भौज् *be wet* = Skr. अभि + वृज्, Passive अभ्यज्यते, Pr. अभिज्जद्, H. भौजै or भौजै (with loss of initial अ; see secondary root भौग No. 140).
- 22 भूक् or भौक् or भौक् *talk foolishly, bark* = Skr. भष्, Future भक्ष्यति, Pr. भुक्खद् (H. C. 4, 186, with disaspiration for भुक्खद्), H. भूकै, &c. The original aspirate form भौखै occurs in Hindī. There is an identically spelled root, meaning *thrust, drive*, which probably has a different origin and may be a compound root.
- 23 भेज् *send* = Skr. अभि + अज्, Passive अभ्यज्यते (used actively), Pr. अभिज्जद्, H. भेजै (with loss of initial अ and change of *i* to *e*, see my Comp. Gramm. §§ 172, 148. As to the change of *ya* to *i*, see *ibidem*, § 121.
- 24 साज् *adorn, prepare* = Skr. संज्, Passive सज्यते (used actively), Pr. सज्जद्, H. साजै. The Skr. root सज् has been adopted from the Prākṛit.

# APPENDIX

## TO "A COLLECTION OF HINDÍ ROOTS."

### INDEX OF SANSKRIT ROOTS AND WORDS OCCURRING IN PAGES 33—80.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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 √ $\overline{p\acute{r}i}$  52.  
 P. prakriṣṭa 72.  
 √ $\overline{prachh}$  52.  
 N. prapancha 73.  
 P. pravishṭa 34, 37, 72.  
 √ $\overline{preksh}$  34, 38.

## फ ph.

√ $\overline{phal}$  53.  
 N. phút 74.  
 N. phútkára 73.  
 √ $\overline{phel}$  53.

## ब b.

√ $\overline{badh}$  54.  
 √ $\overline{bandh}$  54 *bis*.  
 √ $\overline{b\acute{a}dh}$  54.  
 √ $\overline{budh}$  33, 35, 36 *bis*;  
 sam—61.  
 √ $\overline{br\acute{u}}$  56, 74.

## भ bh.

√ $\overline{bhaksh}$  57.  
 P. bhagna 75.  
 √ $\overline{bhaj}$  57.  
 √ $\overline{bhanj}$  35 *bis*, 57 *bis*.  
 √ $\overline{bhan}$  57.  
 √ $\overline{bhal}$  57.  
 √ $\overline{bhash}$  80.

√ $\overline{bh\acute{a}s}$  57.  
 √ $\overline{bh\acute{u}d}$  55, 57.  
 √ $\overline{bh\acute{u}j}$  57.  
 √ $\overline{bh\acute{u}}$  35, 40, 63;  
 ud—43.  
 pra—52.  
 P. bhúrṇa 75.  
 √ $\overline{bh\acute{r}i}$  57; ud—42.  
 sam—61.  
 √ $\overline{bh\acute{r}i\mu\acute{s}}$  57.  
 √ $\overline{bhram}$  57.  
 √ $\overline{bhram\acute{s}}$  53 *bis*, 66.  
 P. bhrashta 75.

## म m.

√ $\overline{mach}$  57.  
 √ $\overline{manch}$  57.  
 √ $\overline{math}$  58.  
 √ $\overline{man}$  58 *bis*.  
 N. mantra.  
 √ $\overline{m\acute{a}}$  58.  
 √ $\overline{m\acute{a}rg}$  35, 36, 58.  
 √ $\overline{m\acute{a}rj}$  58.  
 √ $\overline{mil}$  58.  
 √ $\overline{mish}$  58.  
 √ $\overline{much}$ ; pra—54.  
 √ $\overline{muṇḍ}$  58.  
 N. mudrá 76.  
 √ $\overline{muh}$  58.  
 √ $\overline{m\acute{u}}$  76.  
 N. mútra 76.  
 P. múna 76.  
 √ $\overline{m\acute{u}sh}$  58.  
 √ $\overline{m\acute{r}i}$  58 *bis*.  
 √ $\overline{m\acute{r}iḥ}$  57, 55.  
 P. mṛita 70.  
 √ $\overline{m\acute{r}id}$  58 *bis*.  
 √ $\overline{m\acute{r}i\acute{s}}$  57, 58, 70.

P. mpriṣṭa 75, 76.  
N. mauna 76.  
N. maula 76 *bis*.

## च y.

√yá 41, 46; á—34, 41.  
P. yukta 65, 67, 68.  
N. yugma 68.  
√yudh 46.  
N. yoktra 68.

## र r.

P. rakta 76.  
√raksh 58, 59.  
N. ranga 76.  
√rach 58.  
√raj 59.  
√ranj 59.  
√ram 59.  
√radh 59.  
√ring 59.  
√rish 59.  
√ruch 59.  
√ruṭ 59.  
√rud 59.  
√rud 59.  
√rudh 59.

N. rudh 37, 76.

√rush 59 *bis*.

P. rushta 76.

√ruh 59.

N. resh 76.

√roḍ 59.

√raud 59.

## ल l.

√laksh 59; vi—55  
√lag 33, 36, 59; vi—55.  
N. langa 76.  
√langh 59; pra—80.  
vi—55.

√lajj 60.

√laḍ 59.

√lap; vi—79.

√labh 60 *bis*; ud—42.  
upa—á—79.

N. lava 76.

√las 60; vi—55.

√likh 60.

√lip 60 *bis*.

√lí; vi—55.

ni—77.

√lunch 77.

√luṭ 59, 60.

√luṭ 60.

√luṭh 60.

√luṭh 60.

√luḍ 59, 60.

√lup 76.

N. lup 76.

√lumb 77.

√lubh 60.

√lul 59.

√lok; pra—vi—49.

√loḍ 59.

N. lobha 77.

## व v.

√vach 56.

√vanch 54.

√vaṭ 54; nir—50 *bis*.

√vaṇḍ; nir—50.

√vap 54.

√vad 54, 56 *bis*.

√vap 56.

N. vama 63.

√vas 54; apa—43.

√vah 54, 80; nir—50.

N. vahis 74.

N. vach 74.

N. váchya 74.

√vanchh 54.

N. vátula 75.

√vás 54.

N. viráva 74.

P. vilambita 74.

√viṣ 75; pra—34, 37, 52.  
upa—37, 56.

√viṣh 75; pari—35, 51.

P. víta 75.

√vpi 54, 60, 88 *bis*;

ud—42.

ni—50.

sam—61.

√vpiṭ 54; vi—48.

vi—á—56.

√vpidh 54.

√vpiṣh 54.

√ve 80.

√veshṭ 75; upa—64.

√vyach 56.

√vyadh 55.

P. vyasta 74.

√vraj 54 *bis*.

√vri 55.

√vruḍ 56 *bis*.

## श s.

√śak 35, 60.

√śad 47 *tris*, 61; ud—45.

√śamb 69.

√śal 61 *bis*; ut—42.

N. śápa 77.

√śiksh 61.

√śingh 62.

N. śít 69.

N. śítala 77.

√śuch 62.

√śudh 62.

√śubh 62, 77.

N.  $\sqrt{\text{śushka}}$  77.

$\sqrt{\text{śrī}}$  61.

$\sqrt{\text{śobha}}$  77.

$\sqrt{\text{śchyt}}$  45.

$\sqrt{\text{śrā}}$  62.

$\sqrt{\text{śrī}}$  62.

$\sqrt{\text{śrī}}$  62.

$\sqrt{\text{śru}}$  35, 62.

$\sqrt{\text{ślāgh}}$  61.

$\sqrt{\text{śvas}}$ ;  $\text{niḥ}$ —79.

$\sqrt{\text{śvi}}$  62.

ष sh.

N.  $\text{shṭeva}$  71.

स s.

$\sqrt{\text{sanj}}$  80.

N.  $\text{satra}$  77.

$\sqrt{\text{sad}}$  51, 77.

N.  $\text{sada}$  77.

N.  $\text{sadṛiksha}$  40.

P.  $\text{samāhita}$  77.

N.  $\text{sammukha}$  77.

N.  $\text{sara}$  77.

$\sqrt{\text{sāl}}$  61.

$\sqrt{\text{sah}}$  61.

$\sqrt{\text{sād}}$  61.

$\sqrt{\text{sīch}}$  35, 61.

$\sqrt{\text{siv}}$  61;  $\text{pra}$ —51.

$\sqrt{\text{sukh}}$  36, 62.

N.  $\text{sukha}$  77.

P.  $\text{supta}$  77.

$\sqrt{\text{sprī}}$  61 *bis*;  $\text{nis}$ —50.

$\text{pra}$ —51 *bis*.

N.  $\text{sektra}$  67.

$\sqrt{\text{sev}}$  62.

$\sqrt{\text{skand}}$  43, 64.

$\sqrt{\text{skund}}$  43.

$\sqrt{\text{skhal}}$ ;  $\acute{a}$ —64.

N.  $\text{skhala}$  64.

N.  $\text{stana}$  69.

P.  $\text{stabdha}$  69 *bis*, 70 *bis*.

$\sqrt{\text{stabh}}$  80.

N.  $\text{stabh}$  70.

$\sqrt{\text{stambh}}$  48 *bis*, 69.

N.  $\text{stambha}$  69.

$\sqrt{\text{stup}}$  48.

$\sqrt{\text{stri}}$ ;  $\text{vi}$ —55, 80.

$\sqrt{\text{stṛih}}$  80.

N.  $\text{sthag}$  70.

$\sqrt{\text{sthal}}$ ;  $\text{ni}$ —50.

$\sqrt{\text{sthā}}$ ;  $\text{ut}$ —41, 42, 56.

$\text{pra}$ —51.

$\text{sam}$ —60.

N.  $\text{sthira}$  71 *bis*.

P.  $\text{snasta}$  71.

$\sqrt{\text{snā}}$  36, 50.

$\sqrt{\text{spand}}$  53.

N.  $\text{sparṣa}$  73.

$\sqrt{\text{sprīṣ}}$  46 *bis*, 53, 79.

P.  $\text{sprīṣṭa}$  66, 67.

$\sqrt{\text{sphaṭ}}$  53 *bis*.

N.  $\text{sphaṭa}$  74.

N.  $\text{sphara}$  74.

$\sqrt{\text{sphal}}$  53.

$\sqrt{\text{sphīṭ}}$  53.

$\sqrt{\text{sphīṭ}}$  53.

$\sqrt{\text{sphuṭ}}$  53, 54.

N.  $\text{sphūtākāra}$  73.

$\sqrt{\text{smī}}$ ;  $\text{ni}$ — $\text{ku}$ —72.

$\sqrt{\text{smṛī}}$  62;  $\text{vi}$ —55.

$\sqrt{\text{syand}}$  61, 63, 66.

N.  $\text{syanna}$  66.

$\sqrt{\text{sraṃs}}$  61.

$\sqrt{\text{svid}}$  62;  $\text{pra}$ —51.

ह h.

N.  $\text{hak}$  78 *bis*.

N.  $\text{hakkāra}$  78.

P.  $\text{hata}$  78.

N.  $\text{had}$  77.

$\sqrt{\text{han}}$  62.

$\sqrt{\text{has}}$  63.

$\sqrt{\text{hā}}$ ;  $\text{vi}$ —55.

N.  $\text{hāra}$  78.

$\sqrt{\text{hū}}$  63.

$\sqrt{\text{hūd}}$  63.

$\sqrt{\text{hṛī}}$  62;  $\acute{a}$ —42.

$\text{anu}$ —42.

$\text{pari}$ —51.

$\text{vi}$ —55.

$\text{vi}$ — $\text{ava}$ —56.

$\text{sam}$ —60, 61.

$\sqrt{\text{hṛīṣ}}$  63.

$\sqrt{\text{hval}}$  63 *bis*.

N.  $\text{hvala}$  78.

$\sqrt{\text{hvṛī}}$  63.

$\sqrt{\text{hve}}$  63.

## ERRATA.

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|          |          |                    |                    |
|----------|----------|--------------------|--------------------|
| Page 83, | line 22, | read <i>budhya</i> | for <i>budhga.</i> |
| „ 35,    | „ 38,    | „ Skr. <i>ṣak</i>  | „ Skr. <i>sak.</i> |
| „ 44,    | „ 1,     | „ खिद्             | „ खिद्.            |
| „ 44,    | „ 6,     | „ चीट्             | „ चीट्.            |
| „ 47,    | „ 30,    | „ भाट्             | „ भाट्.            |
| „ 55,    | „ 17,    | „ सृ               | „ स.               |
| „ 57,    | „ 19,    | „ अर्द्            | „ अर्द्.           |
| „ 57,    | „ 41,    | „ ष्टश्            | „ ष्टद्.           |
| „ 59,    | „ 33,    | „ लड्              | „ लड्.             |
| „ 59,    | „ 39,    | „ लुट्, लुल्       | „ लुट्, लुल्.      |
| „ 66,    | „ 30,    | } „ Skr. N.        | } „ Skr.           |
|          | 32,      |                    |                    |
|          | 34,      |                    |                    |
|          | 35,      |                    |                    |
| „ 75,    | „ 13,    | „ Skr. N.          | „ Skr.             |
| „ 76,    | „ 35,    | „ Skr. N. लुप्     | „ लुप्.            |
| „ 77,    | „ 28,    | „ शोभ              | „ सोभ.             |
| „ 77,    | „ 37,    | „ Skr. N.          | „ Skr.             |
| „ 78,    | „ 24,    | „ Prithirāj        | „ Prithiraj.       |

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## CORRIGENDA ET ADDENDA.

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Page 1, for Trichinopoli, read Trichinopoly.

„ 2, for stubi (*passim*), read stúbi.

„ 2, line 19, for purána, read púrana.

„ 2, „ 20, (first word) for n read in.

„ 2, „ 5, from bot., for a high, read high.

„ 3, „ 12, from bot., add the following note :—

‘The projecting beam ends are perhaps carved to represent *Yáli* (? Griffins?) heads, and the spiral lumps noticed may be the *Yáli*'s trunk coiled up above.’

Page 4, line 6, from bot., for Nachaiyár, read Náchaiyár.

„ 5, „ 14, after metal *add*, somewhat like the Sabha (halls) at Chidambaram.

„ 5, „ 8, from bot., insert an asterisk (\*) with foot note :—

On a 2nd visit the former (upper) head appeared to be that of a ram with very curved horns, and its leg and foot cut off and put in its mouth as they still often do at village sacrificial feasts. The buffalo's head below has its tongue hanging out of its mouth.

Page 6, line 1, after Grám-munsif, insert or village officer.

„ 6, „ 17, after new, insert Jaina.

„ 7, „ 12, for Kasi read Kási.

„ 7, „ 10, from bot., after or, insert Coleroon.

### *2nd paper p. 8.*

Page 8, line 12, for flat silled read flat-silled.

„ 8, „ 5, from bot., for shutter stone read shutter-stone.

„ 9, „ 13, for nehropolis read necropolis.

„ 9, „ 19, for similar read *kistvaen*.

„ 9, „ 13, from bot., for *chadud* read *chathut*.

„ 9, last line, for Neilipatla read Nollipatla.

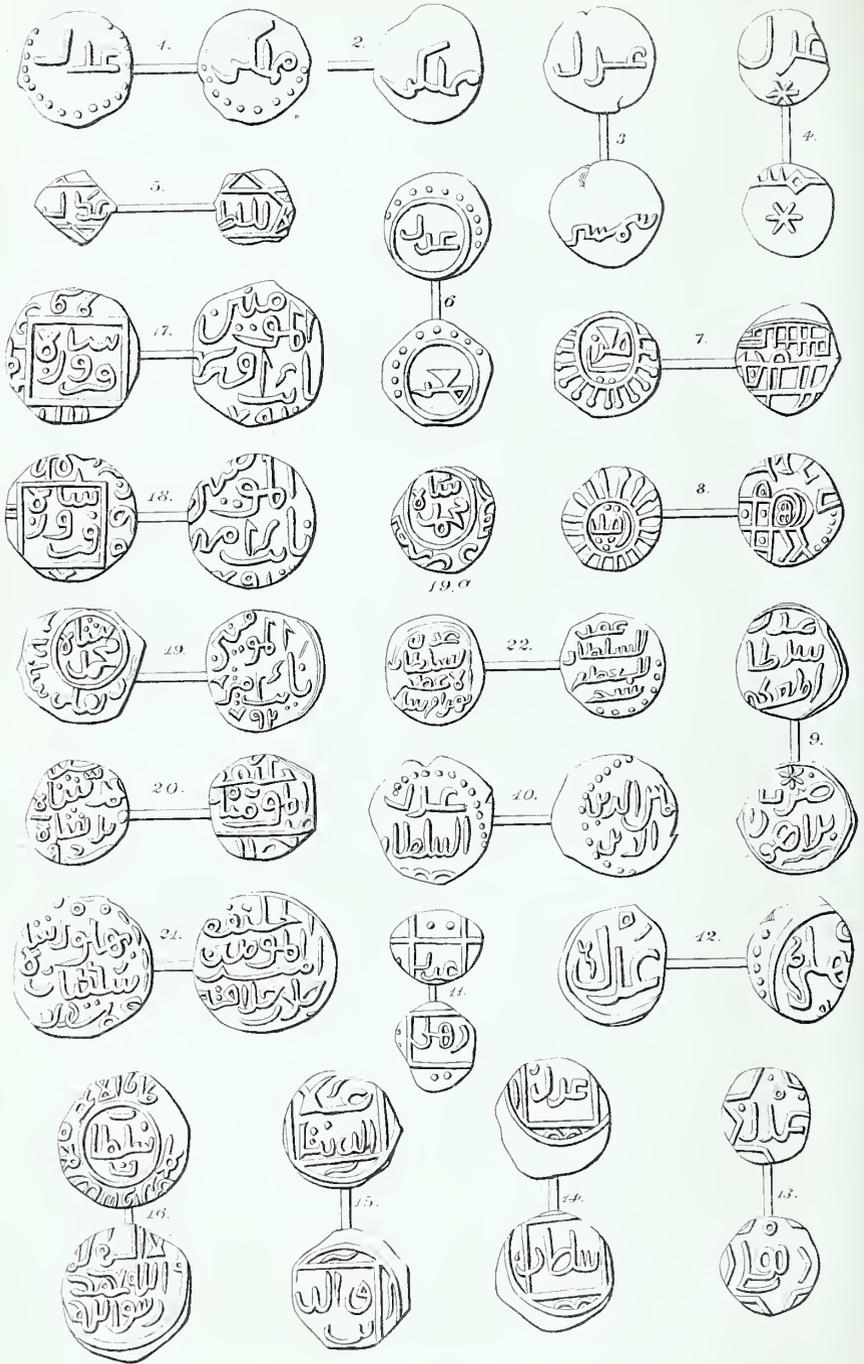
„ 10, line 7, for three or four read six or seven.

B. R. BRANFILLI,

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## ABBREVIATIONS.

|                                                                     |                                                              |
|---------------------------------------------------------------------|--------------------------------------------------------------|
| Bs. = Beames' <i>Comparative Grammar.</i>                           | S. B. = Setubandha (ed. S. Goldschmidt).                     |
| Cw. = Cowell's edition of the <i>Prákríta Prakáṣa.</i>              | S. C. = Śubha Chandra's <i>Prákríta Grammar.</i>             |
| DI. = Delius' <i>Radices Pracritice.</i>                            | S. Gdt. = S. Goldschmidt's edition of the <i>Setubandha.</i> |
| E. M. = E. Müller's <i>Beiträge zur Grammatik des Jainaprákrit.</i> | Spt. = Saptasataka des Hála (ed. A. Weber).                  |
| H. C. = Hema Chandra's <i>Prákríta Grammatik</i> (ed. Pischel).     | T. V. = Trivikrama's <i>Prákríta Grammar.</i>                |
| K. I. = Kramad Iṣvara's <i>Prákríta Grammar.</i>                    | Vr. = Vararuchi's <i>Prákríta Grammar.</i>                   |
| R. M. = Dr. Rajendralala Mitra's <i>Prákríta Vocabulary.</i>        | Wb. = Weber's edition of the <i>Saptasataka.</i>             |
|                                                                     | —————                                                        |
|                                                                     | G. = Gujarátí.      S. = Sindhí.                             |
|                                                                     | M. = Maráthí.                                                |

*Coins supplementary to Thomas' Chronicles of the Pathan kings.—By*

C. J. RODGERS.

(With two Plates.)

The "Chronicles of the Pathan kings" is a very full work. But it is an enlargement of a smaller previous work. Further search brought more coins to light, and the description of these coins has swollen the original treatise to its present size. But large though the work be, it is not *exhaustive*. Finality in our knowledge of the coins of the Pathans has not yet been attained. Continued search will bring out still further coins which from time to time will have to be described. Owing to the nature of my duties I have few opportunities of obtaining fresh coins, but as I have during the past year come across about forty unpublished ones, I thought I might venture to put them forward as a small contribution to a further knowledge of the coins of India.

The word *a'dl* figures largely on the coins of the Gazní rulers. In some modern coins this word occurs together with the sword on several coins of towns in Afghanistan. It must have been for the reason, that might is right, that the early conquerors of India stuck this word on their coins. In Plate V, Nos. 1 and 2 have *a'dl* on the obverse and *mumallikí* on the reverse. I am inclined to ascribe this coin to *Muhammad Sám* or his general *Eibek*. The word I have transliterated as *mumallikí* may be *mumalakat*. No. 6 I regard as a coin of Muizz-ud-dín Muhammad Sám. The word Muizz on this coin is written more like the same word on the coins of Eldoz and of Muhammad Sám, than that on the coins of Muizz-ud-dín Kaikubad or Muizz-ud-dín Bahram Sháh. There is a coin in the "*Ariana Antiqua*," Pl. XX. fig. 14 which is not mentioned by Thomas. Now I got a good specimen of this same coin from Neshápúr with a lot of the coins of A'la-ud-dín Khwárizmí. A glance at No. 15

of Plate V, will show that this very king A'la-ud-dín struck coins of the very same type, using the square area for his name and titles and dividing the latter similarly to Muizz-ud-dín. No. 7, Pl. V, I claim also for Muhammad Sâm. It has Muizzí on obverse and on reverse in Hindí, Srí Samanta Deva.

Nos. 3 and 4, Pl. V, are undoubtedly new types of Shams-ud-dín Altamsh. No. 3 has obv. *a'dl*, rev. *Shamsí*. No. 4 has the same with a star underneath each word. Neither has any ornament.

No. 9 is, I believe, also Shams-ud-dín's. The star seems to indicate this. *A'dl i Sultán ul Muazzim*, the inscription on the obverse is found also on a large quantity of coins of size similar to this one of which Thomas takes no notice. But the *Zarb ba Lahore* with star above it is not on them. They have always *Zarb ba hazrat Dehli*. No. 9 is to me unique. But the other kind I mention are very common indeed. In my own small collection I have no less than 12 duplicates. One of them has *A'dl i Sultán i Muazzim*; the *alif* and *lám* are altogether missing.

No. 10 is undoubtedly Shams-ud-dín's coin. *Obverse: A'dl us Sultán (ul A'zim)*; *Reverse: (Sha)ms ud Dunya (wa) ud dín*. This is a very coarse coin.

Nos. 11, 12 and 13 are I think Shams-ud-dín's. The obverse and reverse are simple *A'dl* and *Dehli*. No. 11 has these words in square areas; No. 12 in round ones with ornaments; No. 13 in a hexagonal star, with dots in the angles.

No. 5 is a very rare coin weighing only the same as No. 109 in Thomas, and half the weight of his No. 52, the inscriptions of which latter coin it possesses. So we may regard this coin as the smallest hitherto discovered of Shams-ud-dín's. It is exceedingly rare as is the one double its size. Thus in all I have had the pleasure of unearthing no less than 10 new types of coins of Shams-ud-dín.

No. 8 I ascribe to *Reziáh*. In the rayed circle is the name *Reziáh*. On the reverse is the *bull* with Samanta Deva above it in Hindí. The whole coin is similar to No. 7 of the same plate.

No. 14, Plate V is evidently a coin of the same king the No. 15 belongs to. And No. 15 is obv. *A'la ud Dunya*, rev. *Wa ud dín*. This is a coin of A'la ud dín Khwarizmí. No. 14 has similar inscriptions to those on No. 5; but the fortunate discovery of No. 15 settles the ascription.

No. 16 is a new coin of the same king. In the central area is the word *Sultán* and on the margin *Ul A'zim A'la ud Dunya wa ud dín Muham-mad (bin us Sul)tán*. Reverse: the *Kalimah*. The whole is in Kufic characters.

Not one of these three coins is in the British Museum or is noticed by Thomas.

No. 17 is a coin of Fíroz Sháh Zafar, son of Fíroz Sháh. The obverse has on it in square area Fíroz Sháh. The margin reads *Zafar ibn Fíroz Sháh Sultán*, the reverse has *naib i amir ul Mominín 791*. No. 18 is exactly the same in date and inscriptions, but the latter are arranged differently on the obverse. *Zafar* beginning above the area and not on the left hand side as in No. 17. They are both of silver and copper. This Zafar Khán, son of Fíroz Sháh, died in Gujráat in 775, A. H. But he had a son also named Zafar Khan, and this coin may have been struck in his honour after the death of Fíroz Sháh.

No. 19 is a coin of Muhammad Shah, son of Fíroz Sháh. It is not in Thomas in this size. This coin is very light. In reading the margin of the large coin of this type, Thomas omits the word *Sultán* which is always on the best preserved specimens. The centre area is *Muhammad Shah*. The margin reads from the outside and is *Sultán, zarb bahazrat i Dehli*. The reverse of this coin is *Naib i Amír ul Mominín 792*.

No. 19a is a coin of similar type without any date on the reverse. Inasmuch as the margin of this coin reads from the inside, I am inclined to ascribe this to Muhammad bin Faríd Sháh, whose coins, when similar in type to the coins of the son of Fíroz, have always some difference in the arrangement of the words.

No. 20 is a coin of Muhammad Sháh son of Faríd Sháh. The inscriptions are, obverse *Sultán Muhammad Sháh, Faríd Sháh zarb Dehli*. Reverse *Khalifah Amír ul Mominín Khallad Khiláfotahu*. There is no date. There is some uncertainty as to the date of the death of this king. Thomas, quoting *Badaoní*, gives his death as 847. I got a coin of this king's during the time this plate was being prepared, dated 848. But this does not prove much; for from the time of Fíroz Sháh, the mints kept on coining in the names of kings who had been long dead; *e. g.*, Mubárah Sháh died in 837. And I have coins bearing the date of 840 and 854. A whole series of posthumous coins of these kings might easily be made.

No. 21 is a coin of Bahlol Sháh. The inscriptions are, substituting *Bahlol Sháh* for Muhammad Sháh, similar to those on the last coin. Coins bearing these inscriptions are somewhat rare in the smaller size. This large-sized coin is to me unique, and it has not as yet been published. This is the third new type of Bohlol's that I have brought to light.

No. 22 has no business in this plate. It was put in to fill up a gap, and because I saw that the coin is new to numismatists, as it is not in the British Museum Catalogue or in Thomas' work on the Gazní coin. It is a binominal coin, struck evidently by Bahrám Sháh. Obverse:—*Adl us Sultán ul Azim Bahrám Sháh*. Reverse:—*A'zd us Sultán ul Muazzim Sanjar*. Here Bahrám seems to arrogate to himself the title of *A'zim* "the greatest" and to give his ally (A'zd) Sanjar who had helped him to retain

his throne only the title *Muazzim* "the great," or "great," simply. Grammatically there is an apparent slight, but conventionally the title of Sanjar is as honorable as that of Bahrám. There is a difference, we know, for Muizz ud dín Muhammad bin Sám during the lifetime of his elder brother Gyás ud dín Muhammad bin Sám always used in his coins *Muazzim* for himself, until his brother's death when he took the title *ul A'zim*. But as I have shown above, Shams ud dín used the title *Muazzim*, as did also *A'la ud dín Masaud*; for I have two unedited small coins of his. Some two months ago I came across a find of Gazni coins in the Umritsur bazaar. There were about 500 in all. They contained several new types of Masaud III, Malik Arslán and Bahrám Sháh. The present war should cause some thousands to be unearthed and we may expect novelties for some time to come.

I now proceed to examine the coins in Plate VI. The first one is a small *Kashmiri* coin with the date (8)74 on it. It is a coin of Haider Sháh and confirms my statement in my paper on the Kashmir Sultans, that this king was reigning at that time, although his accession is usually marked in 878.

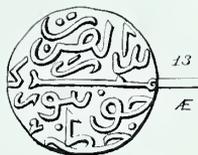
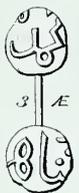
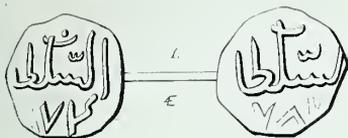
Nos. 2 and 3 are very pretty little novelties, of Muhammad Sháh and Sikandar Sháh. They are of copper. Obverse:—names of kings. Reverse:—the title *Sháh*. They are much smaller than Gyás ud dín's coins with similar inscriptions. They were evidently a revival of the small coins of Shams ud dín and Nasir ud dín Mahmúd and Muizz ud dín.

Nos. 4 and 5 are two anonymous coins of Humáyún, bearing the date 946. No. 4 was struck at Agra.

No. 7 a rupee, full sized, of Humáyún's, struck after his return in 962. It resembles very closely, in its get up, the rupees of Muhammad Súr. As yet all the silver coins of Humáyún which have been described have been thin and light, after the fashion of the *tankahs* of Central Asia. The inscriptions are very distinct. Obverse Area:—*Muhammad Humáyún. Bádsháh Gázi* 962. Margin:—*Us Sultán ul Adil Abú ul Muzaffar, Zarb (Dehli?)*. Reverse Area:—*the Kalimah*. Margin:—names and titles of the four companions of Muhammad.

No. 8 is a rupee of Muhammad Sháh of Bengal. Obverse Area:—*Muhammad Shah Sultan Gázi, Khallad allah mulkahu wa Sultanahu*; margin:—*Shams ud Dunya wa ud dín abu ul Muzaffar, Zarb, Satgáon*. Reverse Area:—*the Kalimah*, with a star; margin:—the names of the four companions and their titles together with the date 962. There is a difference between the titles of Umr in the above two rupees. In Humáyún's it is Al Fárúq, in the Bengal one *al Khattáb*.

No. 9, a new type of Baber's silver coins. It is of the tankah kind, but of uniform thickness and well struck, unlike most of the coins of





Baber. Obverse :—*Zahír ud dín Muhammad Bábar, Bádsáh Gházi* (9)37. *Khallad allah mulkahu wa Sultánahu, zarb Agrah.* (The bars and knots are not peculiar to the Kashmir coinage. They are found on the anonymous coins of both Baber and Humáyún). Reverse Area :—*the Kalimah* ; Margin :—names and titles of the four Companions.

Nos 10, 11, 12, are three varieties of a new type of Humáyún's anonymous coinage. They were all struck at *Champánír*. Firishtah spells this word چانپانير. The coins all agree in giving it حسانير. The inscriptions of these coins give a new feature—a title to a city. *Champánír* is entitled the noble city *Shahr i Mukarram*. It speaks well for Humáyún's nature that he could so style a city he had just conquered ; for the date of the coins is that of the conquest of the city 942. These coins too introduce a second new feature in Humáyún's anonymous coinage. Instead of *Fí ut táríkh*, they have *ba táríkh*. Obverse :—*Zarb Shahr i Mukarram*. Reverse :—*Champánír ba táríkh* 942. No. 11 belongs to Dav. Ross, Esq.

No. 13 is another of the anonymous coins of either Baber or Humáyún. I give it for two reasons: (1) It has full inscriptions. (2) The bar running across the Jaunpur anonymous coins resolves itself into a word *Mutabarrak*, the title of the city—the *Blessed*. Obverse, *Ba Dár ul zarb Khitta i Jaunpúr Mutabarrak*. Reverse :—*Fí ut táríkh san* 937 ; ornaments at the top and bottom. Most of the coins of Jaunpúr have a star on the obverse of one kind or other. But all have the bar, with the first letter and last one missing. All I have, have *dar ul zarb* on them too, although this is omitted by Thomas. The bars on some of the other anonymous coins may by the discovery of fuller specimens turn out to be some words or other.

Nos. 14, 15, 16, 17 and 18 are small copper coins of the Súrí family, forming of themselves a little set, out of which only one, No. 17, has been noticed by Thomas. No. 15 is the first of the set. Obverse :—*Khalifah uz Zamán* 947. Reverse :—*Sher Sháh us Sultán*. This is a very small coin indeed for Sher Sháh.

No. 16 is also Sher Sháh's, but it is larger and heavier than 15 and has a different inscription. Obverse :—*Sultán Khalifah uz zamán*, Reverse :—*Sher Sháh ul A'dil Sultán*.

No. 17 is Islám Sháh's, noticed by Thomas, No. 364, p. 413. I have given it here to complete the set at one view. No. 18 is Muhammad Sháh's Súrí. Obverse :—*Sultán Muhammad A'dil Sháh* ; Reverse :—*Khalifah uz zamán Abú (ul Muzaffar)*.

No. 14 is Sikandar Súrí's. Obverse :—*Khalifah uz zamán* 962. Reverse : *Sikandar Sháh us Sultán* 962. Thomas does not notice any halves of the large copper coins of any of the five Súrí kings. Halves of Sher Sháh are common, those of Islám Sháh are rare, those of Muhammad Adil

Sháh are extremely rare, while I have only seen one of Ibrahím Sháh and not one of Sikandar Sháh's. General Cunningham had a large copper one of Sikandar Sháh. Mr. Delmerick published one of Ibrahím's. The large coins of the other three are common, the greater numbers of course being Sher Sháh's and Islám's. I have not as yet come across a small coin of Ibrahím's. This is one of the things I am looking for. The Sikandar Sháh, whose coin is given in this plate No. 2, I believe to be the one who reigned in 795 for 45 days. A comparison of this coin with No. 275, p. 311 of Thomas, of which I have a most perfect specimen, leads me to this conclusion. Now if a king who reigned only 45 days could in that short time get out no less than *five* kinds of coins, I think we have a right to look out for the same number of varieties in the coins of kings who reigned longer. Scientific and systematic search with duly chronicled results ought to lead to much fuller knowledge respecting the coins of the Pathán's and their successors, and indeed with respect to the whole of the coins of the Empire of India from the time of Alexander the Great and Chandra Gupta to the times of Her Most Gracious Majesty the Empress of India and Queen of England.

As old coins are found, they find their way into the bazaars, where, if there is no purchaser at other than bullion rates, they are ruthlessly melted down, the silver being good, in order to supply metal to the makers of jewels. In this way undoubtedly thousands of coins disappear annually of which our museums and cabinets are standing in need. Meanwhile inasmuch as no Indian museum has its coins catalogued, no one knows what any collection may contain or may be in need of. Collectors would undoubtedly often present coins to museums which want them, if these wants were known. Students cannot use our Indian museums profitably until they know what the museums contain: and yet the end and object of all museums is an educational one. Hence I cannot help bringing this matter forward as one of the greatest importance in making our museums more useful in the promotion of historical studies.

Several other new varieties of coins including a rupee of Shams ud din Altamsh, a tankah of silver of the same king with *rays* round one side to represent *the sun* (Shams), a new variety of Reziáh's and one of Kutub ud dín Mubárah Sháh's together with several others must stand over to a future paper, in which I hope to be able to show that No. 158, p. 190 of Thomas was struck in *Talang* (Telingana), just the same as No. 11 of Plate IV of the Society's Journal of last year.







*Memorandum on Coins of the Sunga Dynasty.*—By H. RIVETT-CARNAC, ESQ., C. S., C. I. E., F. S. A.

(With three Plates.)

I have to offer a few remarks on some more coins of the Sunga Dynasty submitted for the inspection of the Society.

Plate VII, No. 1 is a coin of quite a different type from those already sent. Mr. Carlleyle reads the inscription on it as *Ramadata*.

No. 2, A and B are 2 small coins with the legend *Achya* or *Bhanyya*. (Mr. Carlleyle.) On the other side is what looks like the Buddhist wheel.

No. 3. The legend on this coin of *Bhanu Mitra* corresponds with that on the large coins already submitted to the Society and described by Mr. Carlleyle. The shape of the coin is, however, different, and a figure which Mr. Carlleyle takes for the Nirvána has been stamped in above the legend. There may, however, perhaps be some doubt whether this is intended for a recumbent figure of Buddha. It looks indeed more like a standing female figure on a low platform, a figure somewhat resembling that on the coin of Phaguni Mitra to be noticed later.

No. 4 is a similar coin. The legend not being in quite such good preservation.

No. 5 is a coin of *Agi* or *Agni Mitra* of the same type. In this specimen, however, the figure would seem to be that of a female, the bosoms being distinctly shewn. It is not unlike the rough representation on the Kanauj series of coins, see Plate XXIV, Vol. I, Prinsep.

No. 6, A, B, C are 3 small coins of the same type. The figures are distinct enough, but the inscription in each case is undecipherable.\*

I have already sent to the Society, in illustration of Mr. Carlleyle's paper, specimens of each of the various coins of the Sunga Dynasty. The specimens sent were specially selected on account of the legend and the marks stamped on the obverse. The design on the reverse is hardly of so much importance, but it may be interesting to notice the Monogram or device chosen by each king. From a large number of specimens I have selected those now sent to illustrate as far as possible these points. Unfortunately none of the specimens are in very good preservation. The coins when found looked most hopeless. (See No. 7 specimen in its original condition now sent.) But by a careful process of boiling and cleaning the legends and stamps on the reverse have been rendered sufficiently clear.

\* [They are probably coins of *Súrya Mitra*. On No. 6 B, the letters *s*, *y*, *m*, and on No. 6 A, the letter *s* can be distinguished. ED.]

It is a curious fact that in hardly any case has it been possible to preserve the design on the reverse. Under the process of cleaning, what I may call the back of the coin has almost invariably flaked away. And this will hardly be wondered at when the condition in which the coins were originally found is seen.

The devices of the different monarchs may be noticed as follows:

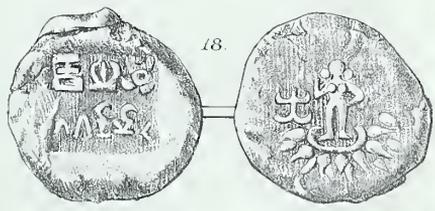
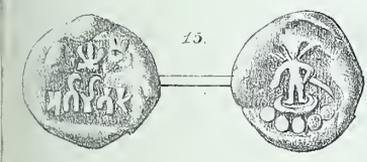
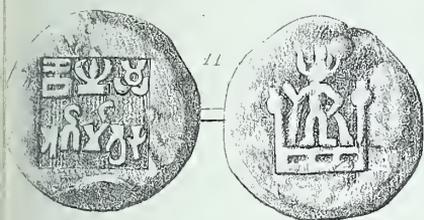
*Bhumi Mitra.* The coins of this king, besides being very numerous, are nearly all in fairly good preservation. The device on the reverse is distinct. A standing figure on a platform, between two poles or pillars of victory, or whatever they may be called, each staff surmounted by three cross-bars, and the head surrounded by rays or flames. In the specimen No. 8 the figure holds what looks like a snake in its hand. The snake or line is not so distinct in all the coins (see Nos. 9, 10).

*Agi or Agni Mitra.* The coins numbered Nos. 11, 12 in Plate VIII bear nearly the same device as those of *Bhumi Mitra*. And of this king also it is to be noticed, that the coins, besides being numerous, are, comparatively speaking, in excellent preservation. Here also is a figure with rays or flames issuing from the head. This figure also stands on a platform between poles or staffs of victory. But in this case each staff is surmounted by what looks like a thistle or a *ghara*, whereas in *Bhumi Mitra's* coins at the summit of each staff are, as already noticed, three cross-bars. The smaller of *Agni Mitra*, Nos. 13, 14, 15, exhibit a different device. The standing figure has in its hand what would seem to be a snake. There are no square platform and no side poles. At the base are rays or flames.\* In fact the device is nearly the same as that on the coins of *Phaguni Mitra* now to be noticed.

*Phaguni Mitra*, Nos. 16, 17, 18, 19. These coins also are numerous and fairly well preserved. The device shews a standing female figure surrounded by what look like rays or flames.\* In the right hand is a club (?), lower down and also on the right side a device or monogram is clearly distinguishable.

The coins of *Bhadraghosa*, *Surya Mitra* and *Bhanu Mitra*, which, together with *Phaguni Mitra*, are, I understand, not only new coins, but also record the names of kings hitherto unknown, are much less numerous than those first noticed and are not generally in such a good state of preservation as those of *Bhumi*, *Agni* and *Phaguni*. Those of *Bhadraghosa* indeed are in most cases scarcely legible. And had it not been for the beautiful little specimen which came into my hands before the find in Barcilly, there might have been some difficulty at first in establishing the legend on these

\* [The base rather resembles the lotus-seat on the reverse of some Gupta coins. Ed.]





coins. Not one single specimen shows, with any distinctness, the design on the reverse. Two of the best in this respect that I have, are marked Nos. 20, 21. On these a female figure, resembling that on the coins of *Phaguni Mitra* can just be made out.

*Bhanu Mitra.* The device on Nos. 22, 23 is tolerably clear. The sun with pointed rays surmounts a semicircle which may be intended to represent a serpent. Below is what may be taken for a squat figure supporting the sun (?) but the device is perhaps hardly sufficiently distinct to admit of any very satisfactory conclusion being drawn. This may possibly be aided by coins of other types in the possession of the Society or figured in books which are not at my disposal.

*Surya Mitra,* Nos. 24, 25. Here, as the name denotes, is the sun surmounting what would seem to be a triangular-shaped altar with the staff of victory on either side. Here also the staff has the cross-bars as in *Bhumi Mitra's* coins.

To these I have added a coin of *Indra Mitra,* No. 26, similar to those already sent. This coin has I believe been found before. The device on the reverse is somewhat different from those already noticed, and shows a standing figure on a square platform, like that on the coins of *Bhumi* and *Agni Mitra.* In the right hand of the figure is a sceptre? The Staff of Victory noticed in the other coins is wanting here.

It will be seen that of the seven kings whose coins are noticed above, six of them adopted a different device. As regards the coins of *Bhadraghosa,* it is not possible to speak with certainty. It will be noticed too that these six *Mitras* have all included the sun, or the rays of the sun on their coins, suggesting possibly their *Mitra* or *Mithraic* origin. The symbols on the obverse of the coins have been described by Mr. Carley, and in all cases the design is the same or nearly the same. There is little or no difference in the shape of the letters used. The legend is surmounted by three symbols which are in all cases the same, although in the coins of *Bhadraghosa* and *Bhanu Mitra* the central symbol appears to have been punched in separately. All this would seem to suggest that these seven kings belong to the same dynasty. Mr. Carley has attributed them to the Sunga kings, who, according to Prinsep and other authorities, commenced to reign over Magadha about 172 B. C.

I shall be glad if the Society can afford me any information regarding these kings—the succession in which they reigned and the probable dates of the coins.

In Prinsep's list *Agni Mitra* appears next after *Pushpa Mitra* the first of the line. And this arrangement coincides with that given by Wilford and others in the *Asiatic Researches.* If the condition of the coin and the quantity in which it is found are of any significance, then *Agni*

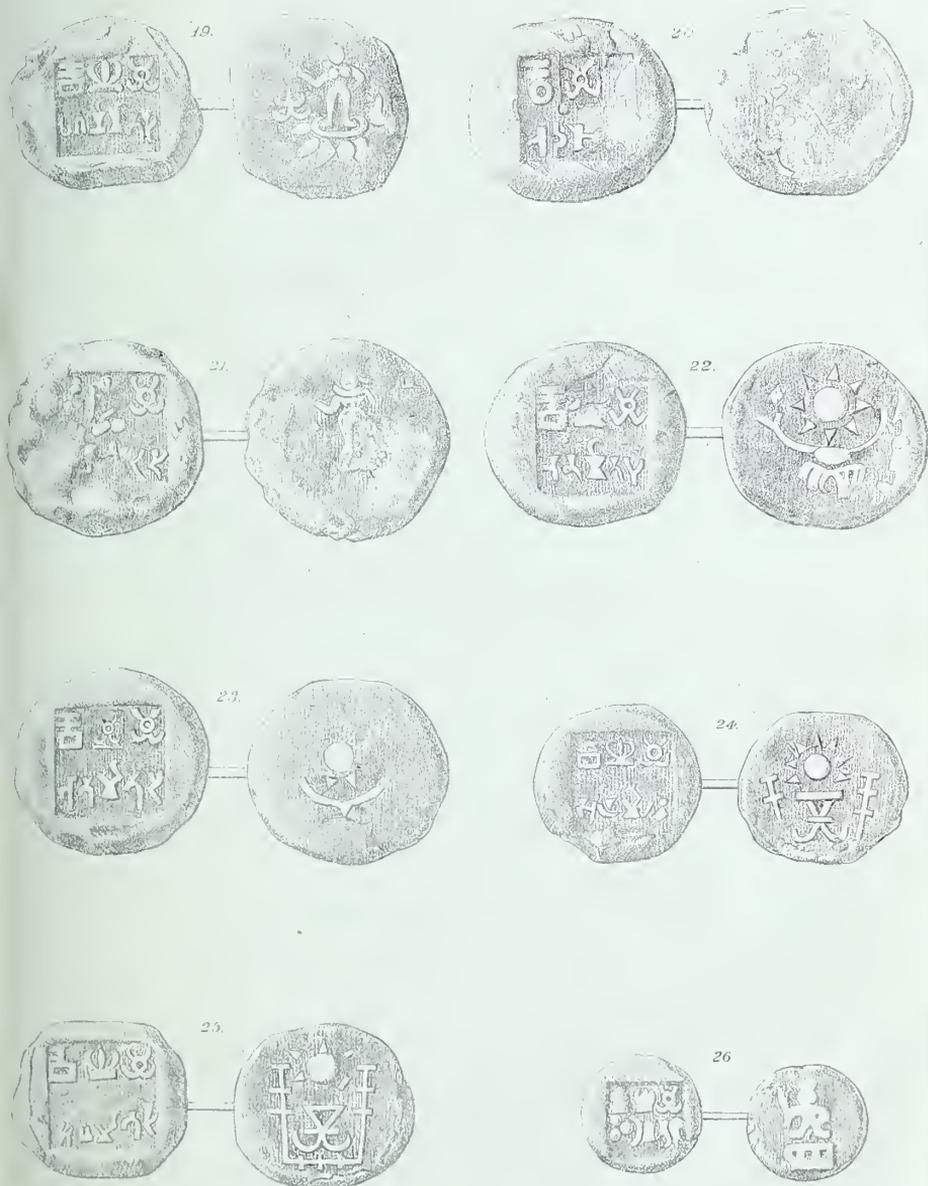
*Mitra* might fairly be supposed to be one of the most recent of these kings.

I have no suggestions to offer regarding any of them, save *Bhadraghosa*. It will be seen from Prinsep's list and also from Wilford's Essay in Asiatic Researches, Vol. XI, that one *Ghosa Vasu* preceded *Vajra Mitra*. Regarding this *Vajra Mitra*, Wilford in his Essay on Vikramaditya and Salivahana (see Asiatic Researches, Vol. IX, page 145,) writes as follows: "The first Vicramáditya is mentioned in the Cumáricá-c'handa; in which it is declared that after 3020 years of the Cali-yuga had elapsed, then would Vicramárca appear. He reigned fourteen years, and of course died in the year 3034, when the era of Yudhishtir ended and his own began. In the list of the kings, who were to appear in the Cali-yuga, to be found in the Bhágavata, Brahmánda, Váyu and Vishnu Puránas, there are two kings, the seventeenth and eighteenth in regular succession from Chandragupta, who reigned seven years each. The first is called *Vierama*, and the other *Mitra*; and they are supposed to have been originally meant for *Vierama mitra* who, according to some, reigned fourteen years; and in these lists, the father, or predecessor of Vierama, is called *Ghosha Rája* or the king of thickets, which is another name for Gandharupa, or Gadhá-rája in the west. This looks like an interpolation; and the more so, as it will appear hereafter, that Ghosha-Rája died in the year 440 of our Era."

The *Vajra Mitra* of Prinsep's list is here supposed to be Vikrama Mitra or Vikramáditya, whose father and predecessor is Ghosa Rája. Wilford thinks that this name Ghosa looks like an interpolation. But perhaps the discovery of a coin belonging to this period, bearing the name of Ghosa, may help to establish the correctness of the entry?

It is perhaps also worthy of notice that Prinsep's list of the Kanva Dynasty gives the name *Bhumi Mitra*, a contemporary of Vikramáditya. The coins of *Bhumi Mitra* and *Bhadraghosa* are certainly of about the same period, and possibly of the same dynasty. I am aware that since Wilford and Prinsep wrote, Mr. Thomas, General Cunningham and others have done much to clear up the doubts existing in respect to early Hindú Chronology. I am in hopes that those who are better informed than myself on the subject may be able to draw some practical conclusion from the coins which I have been able to collect.

I may add that the mass of them have now been tolerably well cleaned. They have been carefully examined and read by Mr. Carlleyle and myself, but no new types save those sent to the Society have been found. They are entirely at the disposal of the Society if they wish to see them, and I hope that a complete set may be accepted for the Society's Museum. The only reservation I have to make is, that a complete selection of the best specimens should be reserved for the British Museum, which Institution ought, I think, to have the first choice.



31.10.81.



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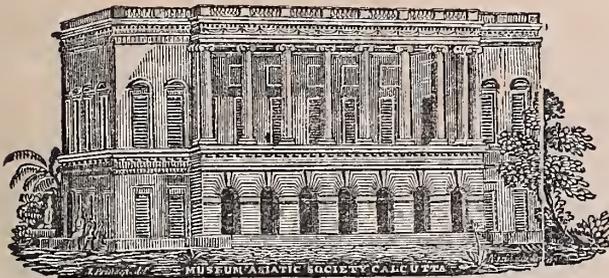
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“The bounds of its investigation will be the geographical limits of Asia: and within these limits its inquiries will be extended to whatever is performed by man or produced by nature.”—SIR WILLIAM JONES.

\*\* *Communications should be sent under cover to the Secretaries, Asiat. Soc., to whom all orders for the work are to be addressed in India; or, in London, care of Messrs. Trübner and Co., 57 & 59, Ludgate Hill.*

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# JOURNAL

OF THE

## ASIATIC SOCIETY OF BENGAL,



Part I.—HISTORY, LITERATURE, &c.

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No. III.—1880.

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*Remarks of the Afgháns found along the Route of the Tal Chotiali Field Force, in the Spring of 1879.—By* LIEUT. R. C. TEMPLE, B. S. C., F. R. G. S., M. R. A. S., &c. (With 3 Plates and 2 Maps.)

### PART I.

This is the last of a series of papers on the march of the Tal Chotiali Field Force in the spring of last year, and closes my observations on the subject.\* As the range of observations to be made along an entirely new and unknown route such as this is necessarily large, I found it impracticable to connect them all into one paper, and this has obliged me to repeat in the several papers certain remarks which were necessary to the exposition of the subject-matter of each, and I trust therefore to be excused for repeating here much that is to be found elsewhere. I have also again to make

\* Journal of the march of the 2nd Column of the Tal Chotiali Field Force communicated to the Quarter Master General in India.

An account of the march of the 2nd Column Tal Chotiali Field Force, to the R. G. S., with map.

Sketch Map of the march of the Tal Chotiali Field Force, published by the Surveyor General of India.

Notes on the Formation of the Country passed through by the Tal Chotiali Field Force, and Rough Notes on the Distribution of the Afghán Tribes about Kandahar, to this Society.

the excuse to be found in all my papers on this subject that my notes were from the nature of the circumstances under which they were made necessarily of a rough and hurried kind and contain doubtless many mistakes, but as it seems the route is to be abandoned, it is likely to be a long while before it is again traversed throughout, and I hope therefore my notes will be found to be of value.

The geography of the route, thanks to the exertions and reports of the officers of the Survey of India\* who accompanied the Force, is now well known and needs no remark here. Suffice it to say that the Force was sent from the Pishin valley towards Dera Gházi Khán viâ the Kákar country and BA'RKHU'M to open up what is known as the Tal Chotiali Route, and that the present writer was attached to the 2nd or principal column of the Force. The route taken and referred to herein is shewn in detail in the map attached, which was published for me by the Surveyor General of India, and in its general aspect in the map attached to my paper on the Geology of the Route in a former number of this Journal.†

## II. *The Tribes en route.*

Before proceeding to discuss what was seen of the various tribes of Afgháns along this march, it may be as well to give a brief account of what is known of the vexed question of the origin of the Paṭhán and Afghán Tribes.

The people of the nation known in India as the Paṭhán Tribes call themselves BANI' ISRA'ÍL or PUKHTU'N (pl. PUKHTA'NA), and the Afgháns, as a race of these Paṭhán Tribes, claim descent from TA'LU'T‡ or SA'RUL (the Saul of the Bible) as their ancestor. According to native accounts SA'RUL had two posthumous sons BARAKÍ'A (BARACHIAH) and IRAMI'AS§ (JEREMIAH), both born in the same hour of different mothers of the tribe of LA'WI' (LEVI). They rose to high positions under David, Saul's successor; thus Barakía became prime minister and Iramía Commander-in-Chief. In SULIMA'N'S (Solomon's) time they were succeeded in their posts each by his son, Barakía by ASAF and Iramía by AFGHA'NA, and Afghána is said to have had the building of the BAITU-L-MUQADDAS or Temple of Jerusalem. Asaf left 18 and Afghána 40 sons, and these founded important families or tribes. When the BAITU-L-MUQADDAS was destroyed by BAKHTU-N-NASR (Nebuchadnezzar) the Afghána Tribe, adhering to their forefathers' religion, were banished from SHAM (Palestine) and took refuge in KOHISTA'N-I-GHOR and KOH-I-FIROZA. Here their neighbours called them Afghán (or Aoghán)

\* J. A. S. B., for 1879, paper by Major Waterhouse.

† J. A. S. B., for 1879, Vol. XLVIII, Part II.

‡ Raverty. Gram. of Pushto. Introd. 1860.

§ BIRKIYA and ARMAH according to Raverty.

or Baní Isráíl. From GHOR by degrees the Afgháns extended to the KOHISTA'N-I-KA'BUL, KANDAHA'R and GHAZNI.

Until the advent of Muhammad the Afgháns followed the religion of the Pentateuch or TAURET KIWA'N. But in the 9th year of the announcement of Muhammad's mission they heard of him from one of the Baní Isráíl by name KHA'LID-BIN-(OR IBN)-WALI'D. A deputation was sent to Medina under one KAIS (also KISH, KESH or KAISH) a leading Afghán, who became a zealous Muhammadan and received several special marks of the Prophet's favour, among which the title of malik or king, originally conferred by the Almighty on Saul, their great ancestor, was conferred individually on the Afgháns.\* Arabic names also were given them; thus KAIS was called ABU-R-RASHI'D (Servant of the Wise). And to him was also given the title of PIHTA'N (PAṬHA'N) meaning in Syriac a rudder, signifying that he, Kais, was the pilot of his people. From this Kais are descended all the Afghán Tribes properly so called, and all Afgháns are Paṭháns, the name by which the nation is most generally known in India. But there are many tribes who are Baní Isráíl and Pukhtún (Pukhtána) who are not Afgháns.

The Pukhtún, erroneously known in India as the Paṭhán Tribes, then are divided into those descended from Kais and those who are not. Those who are so descended are generally known as Afgháns and the others as merely Paṭháns, though the whole nation is also known as Paṭháns.†

The following is a list of the principal tribes of the present day generally acknowledged to be Afgháns :

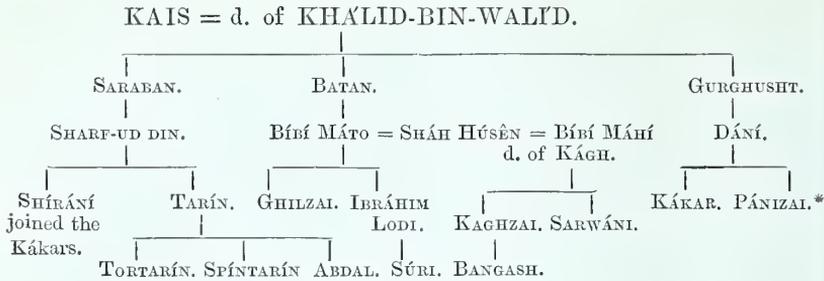
- |              |                |                |
|--------------|----------------|----------------|
| 1. Duránis.  | 8. Túris.      | 15. Mangals.   |
| 2. Taríns.   | 9. Zaimukhts.  | 16. Jadráns.   |
| 3. Kákars.   | 10. Orákzais.  | 17. Shinwáris. |
| 4. Ghilzais. | 11. Dáwaris.   | 18. Mómands.   |
| 5. Povindas. | 12. Khóstwáls. | 19. Yúsufzais. |
| 6. Waziris.  | 13. Afrídis.   | (Kóhistánis.)  |
| 7. Shíránis. | 14. Tájís.     |                |

Kais married a daughter of KHA'LID-BIN-WALI'D by whom he had three sons, SARABAN, BATAN and GURGHUSHT and from them descend some of the principal tribes above mentioned, as may be seen by the accompanying genealogy.

\* At the present day the head of a Paṭhán family or tribal subsection is called malik.

† There are several legends to account for the names of Afghán and Paṭhán, that above given in the text is the commonest. The following are, however, worth noticing.

The word Pukhtún (Pukhtána) is said variously to be of IBRA'NÍ or IBRA'HIMÍ (Hebrew) and of SU'RIA'NÍ (Syrian) origin, and to signify "delivered" or "set free."



The above genealogy which must of course be taken for what it may be worth, includes a good many of the ancestors of the present Afghán Tribes, but not by any means all. Each, however, has its own genealogical legend. It will be observed that the Duránis, the chief or largest tribe are not included in the above genealogy.

The Paṭhán Tribes we have to deal with in this paper are the Duránis slightly, and with the Tarín, Kákars, Lúnis and Zarkhás more fully. Of

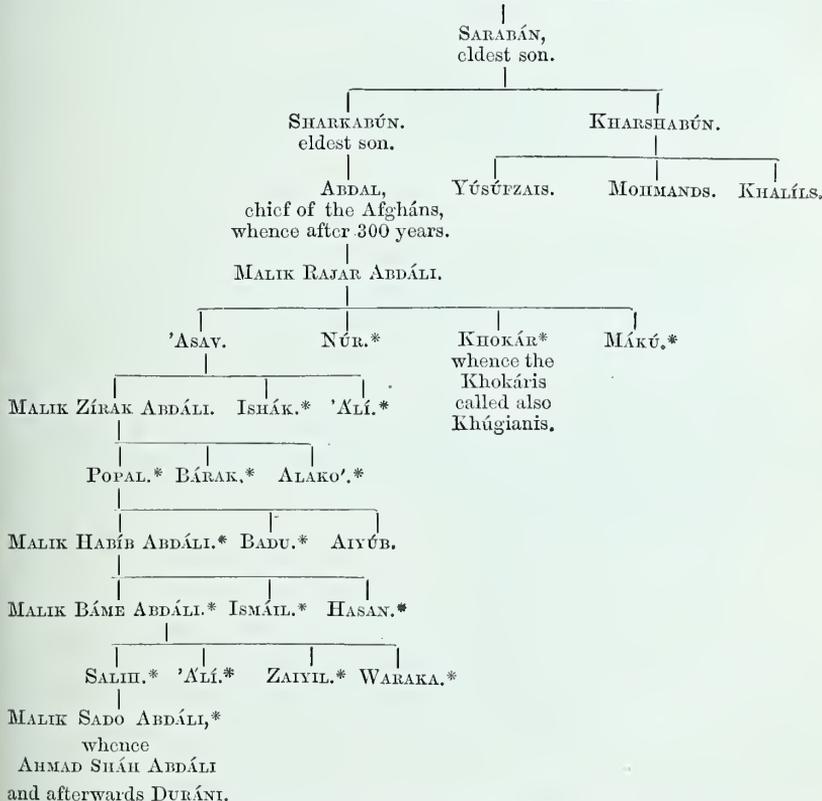
The common tradition about A'ghán is, that the mother of their ancestor Afghána gave him the name because of her exclamation on the favourable answer to her prayers in the pangs of childbirth for a quick delivery, for she said on the birth of the child, "Afghána (I am free)," this being the traditional interpretation of the expression. Another tradition is, that she called out in her pangs "AFGHÁN" or "FIGHÁN" an expression of pain in the Persian language. According to the Kákar legends "Paṭhán" is a corruption of PRET KHÁN, the title given to the KAIS above mentioned by the Prophet. Raverty in the Introduction to his Grammar of Pushto gives an extract from the TAZKIRÁT-UL-MULÚK or History of the SADOZAIS according to which the words PUSHTO (or PUKHTO) and PUSHTÚN (or PUKHTÚN) are derived from PUSHT or PASHT the name of the place Afghána first fixed on as his residence on leaving Palestine. In the same work a characteristically oriental derivation of the word Afghána is thus given. "The original meaning of Afghánah is fighán, a Persian word which means complaint, lamentation, because he (KAIS) was a cause of lamentation to the devil, the jinns and mankind. From the constant use of the word the vowel point *Kasrah* was dropped after which the other letters could not be sounded without the aid of a vowel and *alif-i-wasl* was placed before the *gh* and thus made Afghánah." And the term Paṭhán is further derived from batán or patán which in Arabic (بطان) signifies the keel (Raverty says keelson) of a vessel, "without which it cannot sail, neither can the ship of war sail along without the keel of battle."

\* The true Afghán descent of the posterity of the 2nd son BATAN is more than doubtful. It appears that BÍBÍ MÁTO (or MÁTU) the daughter of Batan formed an illicit connection with Sháh Husein, (or HÚSÈN, called also MAST'ALI) a Persian Prince of Ghór and was made to marry him. The offspring resulting was named Ghalzai that is "the child of theft." She, however, also bore him a son Ibráhim Lódi from whom the former Paṭhán rulers of Delhi sprung. This Sháh Husein was also by a fraud induced to marry BÍBÍ MÁHÍ (or MÍHI) daughter of the KÁGH or bard who managed his marriage with BÍBÍ MÁTO, and from her are descended the present Kaghzai, Bangash and Sarwáni Paṭháns.

these the Duránis, Taríns and Kákars are Afgháns proper and so probably are the Lúnis, but the Zarkháns are merely known as Paṭháns.

First then regarding the Duránis, the chief of the Afghán elans. The origin of this tribe is apparently unknown, but it seems to be generally believed that it emigrated from the mountains of Ghór. According to the TAZKIRA'T-UL-MULU'K above quoted, the Duráni descent is as follows :

## KAIS or ABD-UR-RASHÍ'D.



The old name of the Duránis was Abdáli, till Ahmad Sháh, an Abdáli of the Sadozai family or subsection of the Pópalzai section of Abdális, the hero of Pániyat, in 1747 took the title of DURR-I-DURRA'N, the Pearl of Pearls, and named his tribe after himself Duráuis. The two great divisions of the Duránis are ZÍRAK and PANJPA'Ó, and of these the most honorable by descent are the ZÍRAKS. The ZÍRAKS are usually divided into 4 sections (1)

\* Those marked with an asterisk with the addition of Zai are the names of present Duráni sections or subsections.

POPALZAI, (2) ALAKO'ZAI, (3) BA'RAKZAI, (4) ACHAKZAI and the PANJPA'OS into 5 sections, thus, (5) NU'EZAI, (6) ALI'ZAI, (7) ISHA'KZAI, (8) KHU'GIA'NI, (9) MA'KU'.\* Along our present route, however, only the Achakzais were found in any numbers, but a few of the Pópalzais and Bárakzais were also found in the Pishin. As far as I know there is but one Pópalzai village and one Bárakzai village in Pishin, but there are a good many Bárakzais scattered about the valley formerly concerned with the late government there. The Pópalzais of the valley are of the SADOZAI subsection †

The BA'RAKZAIS met with in the Pishin are all MUHAMMADZAIS, ‡ connected in some way with the late government of the valley. Sirdár KHU'SUDIL KHA'N of the royal house seems to have been Governor of the

\* There is also a low class of Duránis called SÁGZAI found in the ARGHISÁN valley.

† The Sadozais were the old ruling family of the Pópalzais and under KSA'D-UL-LAH (of the Tribe ABDÁLI, sec. Pópalzai, subsec. Sadozai) threw off the yoke of the Persian at Herát in 1716, soon after MÍR VAIS, the Ghilzai, began to assert the independence of the Afghán nation. On the assassination of NÁDIR SHÁH in 1747, AHMAD KHÁN, a Sadozai (afterwards Ahmad Sháh Duráni) gradually conquered for himself all Afghánistán and most of the Panjáb, and at his death in 1773 he was ruling from the Sutlaj to the Oxus and from the Himalayas to Khorásán. Till 1793 TAIMU'R SHA'H his son reigned, but at his death his kingdom was fought for among his children in the way so common in oriental history, mainly resulting in the loss of the Panjáb to the Sikhs. The brothers who were ruling at the time of TAIMU'R SHA'H's death were

ZAMA'N SHA'H in Kábul.

HAMA'UN SHA'H in Kandahár.

MAHMÚD SHA'H in Herát.

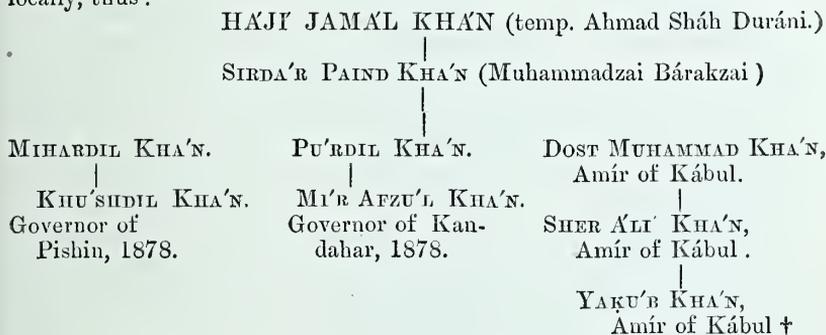
ABBA'S MÍRZA' in Pesháwur.

KO'HANDIL MÍRZA' in Kashmír.

Of these ZAMÁN SHÁH and MAHMÚD SHÁH obtained the throne of Afghánistán with the usual bloodshed, and after them another brother, the famous SHÁH SHÚJAH-UL-MULK, about 1809. Mahmúd Sháh, however, ousted him and again ruled till 1818, when he was deposed by the BA'RAKZAI brothers, sons of PAIND KHÁN, his Wazír, and son of HÁJÍ JAMÁL KHÁN (a MUHAMMADZAI BÁRAKZAI), the Sirdár who had helped Ahmad Sháh in the early days of his sovereignty. Since that date the Mohammadzai Bárakzais have fought among themselves for the throne resulting in the victory and sovereignty successively of the Amirs Dost Mohammad Khán, Shér Ali Khán and YaSúb Khán the later ruler. In 1839 the first Afghán war, the history of which is of course still fresh in our memories, was undertaken to restore Sháh Shújah-ul-mulk, the Sadozai, to his throne at Kábul. The Sadozais are still highly respected, and the Pópalzais from which they sprung are the most honoured among Afghán Tribes. During the greater part of the Sadozai ascendancy, the ministers were chosen from the BÁME'ZAI subsection of the Pópalzais. The chief other subsections of the Pópalzais as far as I could ascertain are (3) MARSINGZAIS, (4) KHA'NZAIS, (5) AIYÚBZAIS, (6) MADOZAIS, (7) NO'AZAIS.

‡ The other subsection of the Bárakzais as far as I could ascertain were (2) ACHALZAIS, (3) SULIMÁNZAIS, (4) KHUNSEI'ZAIS, (5) BALANZAIS.

Pishin under Shér 'Alí, but never to have lived there, and I was quite surprised to find how little appeared to be known about him locally. His fort, called Khúshdil Khán, is in the north-east corner of the Pishin, and from it his Naib or Lieutenant NU'R MUHAMMAD KHA'N (Muhammadzai Bárakzai) seems to have ruled and collected the revenues. This last fled at our advance into the Pishin in 1878, and the valley was handed over for government under Sir R. Sandeman, agent for Beluchistán, with the fort Khúshdil Khán, to another NU'R MUHAMMAD KHA'N, LUGA'RÍ, a Belóch in our service as Názim or ruler.\* This Khúshdil Khán's descent was given me locally, thus :



\* Another and perhaps the most true local story is that Khúshdil Khán died about 7 years ago, say 1872, and in former days ABD-UL-KARÍM KHÁN (Muhammadzai Bárakzai) was his Naib, but on Shér 'Alí's final accession in 1869, Khúshdil Khán lost his government and went to reside in Kandahár, while NU'R MUHAMMAD KHA'N (Muhammadzai Bárakzai) was sent to govern the Pishin direct from Sher 'Alí himself.

† Páind Khán's sons by 5 mothers were—

1. { FATEH KHA'N Wazír of Mahmúd Sháh,  
MUHAMMAD AZIM KHA'N,  
TAIMU'R KHA'N.
2. { PU'R DIL KHA'N, Governor of Kandahár,  
SHERDIL KHA'N, Governor of Kandahár,  
KOHANDIL KHA'N, Governor of Kandahár,  
RAHIMDIL KHA'N,  
MIHARDIL KHA'N.
3. { DO'ST MUHAMMAD KHA'N, Amír of Kábul,  
AMI'R MUHAMMAD KHÁN,  
JAMÁL KHÁN.
4. { SULTÁN MUHAMMAD KHÁN,  
YÁR MUHAMMAD KHÁN,  
PÍR MUHAMMAD KHÁN,  
SAYAD MUHAMMAD KHÁN.
5. { NAWÁB ÁSAD KHÁN,  
NAWÁB SAMÁ'T KHA'N,  
NAWÁB JABAR KHÁN.

The ACHAKZAI section of the Duráns is the tribe inhabiting the mountains known as the KHOJA AMRA'N Range, the TOBA Plateau, and the PISHIN and KADANEI valleys in part. They are said to have been divided off from the Bárakzais by Ahmad Sháh, as that tribe was getting too powerful, and I have met Paṭháns about Kandahár, who classed the Achakzai as a Bárakzai subdivision. The Achakzais are divided into BAHÁ'DURZAIS and GAJANZAIS.

#### BAHÁ'DURZAIS.

|            |            |               |
|------------|------------|---------------|
| GHABEZAIS. | SHAMUZAIS. | BA'KARZAIS.   |
| KA'KOZAIS. | FA'MZAIS.  | ISHDÁ'NIZAIS. |

#### GAJANZAIS.

|             |               |             |
|-------------|---------------|-------------|
| AHMADZAIS.  | HAMZAIS.      | ALOZAIS.    |
| ASIEZAIS.   | MALIKZAIS.    | JULIZAIS.   |
| BURHANZAIS. | LA'LIZAIS.    | MUSHKIZAIS. |
| SHAMAKZAIS. | MA'PIZAIS.    | BA'DAZAIS.  |
| MA'LIZAIS.  | HU'SENZAIS.   | SHAKARZAIS. |
| KA'MILZAIS. | SULIMA'NZAIS. | USMA'NZAIS. |
| ÁDAZAIS.    | ABDULLAZAIS.  |             |
| ADRAKZAIS.  | BA'ZAMZAIS.   |             |

I, however, came across two subsections of Achakzais not here mentioned called HABÍ'BZAIS\* and ABDALS in the Pishin. This name Abdal may perhaps only be the title of the malik or chief as the present Sirdár MÍR ASLAM KHÁ'N of the Achakzais is locally called Mír Aslam Khán Abdal or Abdáli, as also is MADAT KHÁ'N, the head of an Achakzai village in the Pishin, called after him. All the inhabitants of the last village, however, are called Abdals.

The next clan we have to deal with are the Taríns. These are the second of the Afghán Tribes in point of importance and national estimation. Their legendary descent from Kais is clearly made out. SARABAN, Kais's eldest son, had five sons of whom the second was Tarín. Tarín had three sons, Tór Tarín, Spín Tarín and Abdal, and from the two eldest are descended the modern Tarín Tribe. According to a legend Tarín's dark son was called Spín Tarín or Fair Tarín, and his fair son Tór Tarín or Dark Tarín. The Tór Taríns inhabit the Pishin valley and the Spín Taríns the country about Tal and Chotiáli. Lumsden subdivides this clan as follows:

\* Lumsden, however, makes out the HABÍ'BZAIS to be Tór Taríns, but as far as I could ascertain, they are Achakzais.

## TÓR TARÍNS.

|             |                  |             |
|-------------|------------------|-------------|
| BATAZAIS.   | ALÍZAIS.         | HABÍBZAIS.  |
| HAIKALZAIS. | NÚRZAIS.         | HAMRÁNZAIS. |
| MÁLIZAIS.   | KULÁZAIS.        | KARBELAS.   |
| KADAZAIS.   | MÚSIZAIS.        | SÁZAIS.     |
| KHÁNIZAIS.  | ABDURRAHMÁNZAIS. |             |
| KHÁMZAIS.   |                  |             |

## SPÍN TARÍNS.

|            |           |          |
|------------|-----------|----------|
| SHÁDÍZAIS. | LASRÁNIS. | ADWÁNIS. |
| MARPÁNIS.  |           |          |

This list agrees with that given me *en route* as far as the Spín Taríns are concerned, but as regards the Tór Taríns mine differs considerably. First I would remark that the HABÍBZAIS are, as far as I could make out, Achakzais and not Taríns at all. Next as regards the Karbélas, who have been hitherto put down as Taríns somehow connected with the Pishin Sayads, I have ascertained the following particulars. The Karbélas inhabit a village of the same name near SAYAD PAIND in the Pishin and call themselves Sayads. They are, however, disowned by the Sayads and also by the Taríns, Kákars and Duránis. The local legend regarding their origin is this. In days gone by, a little child by name Karbéla, was travelling through the Pishin in a káfila. He lost his party and was seen running along the road, crying, by a kind-hearted SAYAD who took him in and nourished him, but declined to admit him into his family or sect. On growing up, he married a Tarín woman, and from him there sprang by Tarín intermarriages the present race of Karbélas, now said to be 600 strong in men. This is the Sayad version of the story, the Tarín legend is the same except as regarding intermarriages with themselves. They say the mother of the original Karbélas came from no one knows where and disown the whole race. The probabilities are, they sprung from Paṭháns who had to take refuge in the Pishin from some other distant place. The KHÁNIZAIS are divided into LÚR KHÁNIZAIS and DAB KHÁNIZAIS according to my information. In the list of Tór Taríns which I collected, the following do not appear in Lumsden.\*

|           |                 |             |
|-----------|-----------------|-------------|
| MÁLÍKYÁRS | MANZAKAIS       | KAMÁLZAIS.  |
| MÁEZAIS   | HÁRU'NS.        |             |
| KÁDAZAIS  | NÁOZAIS         | HAMRÁNZAIS. |
| KHÁMZAIS  | ABDURRAHMÁNZAIS |             |

While his list contains the following which are not found in mine.

\* There are a few trifling variations in some names regarding which see below on Language.

The probabilities are that a combined list would reach nearest the true statement of their subsections.\*

Like the Taríns, after whom they rank, *i. e.*, third on the list of clans, the Kákars claim direct descent from KAIS. Firstly, Kais's third son was GURGHUSHT who had three sons DÁNÍ, BÁBÍ and MANDÍ. Of these DÁNÍ had four sons, KÁKAR, NÁGHAR, DÁDÍ and PÁNÍ.† Secondly SHÍRÁNÍ the eldest son of SHARÍF-UD-DÍN, eldest son of SARABAN Kais's eldest son, on account of family squabbles joined the Kákars and called himself a GURGHUSHTAI. Such is the common legend. The Kákars themselves vary it thus. Kais went to Mecea and there obtained the name of PRET KHÁN (elsewhere PIHTÁN). His eldest son SHARÍF-UD-DIN or SARABÁN had five sons SHÍRÁNÍ, TARÍN, MYUNÍ, BARECHÍ‡ and UMAR-UD-DÍN. The mother of SHÍRÁNÍ, who was a Kákar, finding that her husband intended making TARÍN, his second son, his heir, left his protection and returned to her own tribe. Her descendants have therefore been included among Patháns and with them the whole of the Kákars under one name. This subverts the other legends which make the Kákars claim descent through GURGHUSHT from KAIS.

The following clans claim relationship with or descent from the Kákars. The GÁKARS of Kashmír along the Jhílām, the TAIMUNIS (EIMAKS) of GHOR, the FIROZKOHÍ HAZÁRAS (EIMAKS) of HERÁT, the KAYANIS of SEISTÁN,§ and lastly the KÁKARS and GHILZAIS also consider themselves nearly related in blood. Taking into consideration the unquestionably mixed blood of the Ghilzais and their legendary relationship with the Kákars, as also that of such pure EIMAKS as the HAZÁRAS and TAIMUNÍS,|| the Kákar descent from Kais would seem to be doubtful.

\* Among the tribes of Tarín descent are said to be the ZAIMUKHTS.

† This would make the PA'NÍ'ZAIS separate from the Kákars, but they seem to be considered a section of them at the present day.

‡ Whence the BARE'CHÍ' Patháns of SHORA'WAK.

§ Usually called Belóchis, but really descendants of SANDAR KHE'L Kákars.

|| A pure EIMAK is perhaps, however, a misnomer. The origin of the race being quite obscure. By features they are TA'TARS and by language Persians. They are divided into TAIMU'NÍ'S, HAZA'RAS, TAIMU'RÍ'S and ZU'RÍ'S. It may help towards the solution of the Eimak origin to quote the following from Yule's Marco Polo, I, 94. "Contemporaneously with the KARAUNAHS (or KARA'WINAHS the celebrated robbers of mediæval Persia) we have frequent mention of predatory bands known as NIGU'DARIS who seem to be distinguished from the KARAUNAHS, but had a like character for truculence. Their head-quarters were about SIJISTA'N, and Quatremère seems disposed to look upon them as a tribe indigenous in that quarter. Hammer says they were originally the troops of Prince NIGU'DAR, grandson of CHAGATAI (CHAGATAI was the ruler and curse of Turkistán and a son of CHINGIZ and therefore brother to OKKODAI and uncle to MANGKU, KUBLAI and HULA'KU), and that they were a rabble of sorts, Mongols, Turk-máns, Kurds, Shúls and what not. We hear of their revolts and disorders down to

The Kákar Territory extends from the Pishin valley to the Borai valley and from the Zhób valley to Quetta, the line of the Bolán Pass and the MARRI (Belóch) country. They are divided into two main divisions, the Great Kákars (LOWE' KÁKAR) and the Lesser Kákars (KUCHINAI KÁKAR). As regards the Great Kákars, the present writer had but little opportunity of learning much. They occupy the Zhób valley and apparently are divided into—

|               |            |             |
|---------------|------------|-------------|
| KHWAIDÁDZAIS, | AKTARZAIS, | MEHTARZAIS, |
| MURSIÁNGZAIS, | AWAZAIS,   | SARGAR AIS. |

And probably also the JALAGAIS, MU'SA KHEL and KARÍZAIS belong to this division.

The Lesser Kákars are divided into SULIMÁN KHEL S; AMAND KHEL S; MEHTARZAIS; PÁNÍZAIS; BÁZAIS; SHAMOZAIS; SURGAR AIS; MALAG AIS; ISÁ KHEL S; SARA'NGZAIS, of which MULÁZAIS and TÁRÁNS are subsections; ZAKHPELS, subdivided into AMAKAIS, KANOZ AIS and NÁOZ AIS; DUMARS; UTMÁN KHEL S; and SANDAR KHEL S, whose known subdivisions are ÁLÍZ AIS, SHABOZ AIS, MU'RS, DARGAIS, WAHÁRS and TENIZ AIS.\* The Kákars about KHUNCHAGAI near Mt. KAND, variously called the SANATÍA and SIMANTHA Kákars, are I believe the AMAND KHEL above mentioned. They were formerly, under the name of TARGHÁNÍ S, under HÁJÍ KHÁN of infamous memory during the war of 1839, and his son KÁMIL KHÁN is now chief of the AMAND KHEL.

The next clan met with *en route* was the LU'NI (properly LONAI) KHEL, about whom very little is known. They are generally supposed to be Kákars by descent, but I should say from what I heard from the LU'NIS themselves and from the Kákars, this is not the case. They call themselves of DURÁNI descent, a claim which is allowed by their neighbours. The HAMZAZAIS are the only known subdivision of this Tribe, but there are

1319, up to which date MIRKHOND says that there had been 21 fights with them in 4 years. Again we hear of them in 1336 about Herát, whilst in Báber's time they turn up as NUKDARIS fairly established as tribes in the mountainous tracts of KARNU'D and GHOR to the west of Kábul, and coupled with the Hazáras who still survive both in name and character. Among them, says Báber, are some who speak the Mongol languages. The Hazáras are eminently Mongol in feature to this day, and it is very probably that they or some part of them are descendants of the KARAUNAHS or NIGU'DARIS or of both, and that the origination of the bands so called from the scum of the Mongol inundation is thus in a degree confirmed. It is worthy of notice that Ab-ul-Fazl who mentions the NUKDARIS among the nomad tribes of Kábul says, the Hazáras are the remains of the Chagataian army which MANGKU KHA'N sent to the aid of HULA'KU under the command of NIGU'DAR OGHZA'N.

\* The Esóts of the DE'RAJA'T are sometimes called Kákars but this is doubtful. KA'SI' KA'KARS are said to inhabit the SHA'L Valley (Quetta), but I did not see any there.

doubtless more, and I think it would be safe to include SARÁGIS amongst them. They inhabit a largish extent of country, for the most part considerably deserted, and used merely as grazing-ground. Their villages are mostly found in what is called the LU'NI Valley to the south of the Bórai, *i. e.*, between it and the Tal Valley. All the country from the Bórai Valley east of the Tal Valley as far as the Belóch Border and the MU'SA KHEL country belongs to them, except the small portion occupied by the ZARKHA'NS near Chótiáli.

Of the ZARKHA'NS nothing more is known except that they are Paṭháns and not of Kákar, Tarín or Lúni extraction. They are to be found about the mountains to the east and south of Chótiáli, in the HANOKAI Pass and BA'LA' DHA'KA'. The MARRIS have nearly wiped them out as a race by continual raids. In Leech's time\* there were three villages belonging to them near Chótiáli, *viz.*, DOST MUHAMMAD, FAZL KHAN and ALÍ KHAN, but I do not know if they still exist.

Perhaps the origin of the Lúnis and Zarkháns and even of some of the Kákars, especially the Sandar Khél, should be sought with that of the neighbouring Belóch Tribes, if one could only ascertain what that is. Indeed the KAYANIS of SEISTAN usually called Belóchis, are Sandar Khél Kákars, and there is nothing repugnant in the history of the Belóch Tribes to the idea of some of them being of the same descent as their deadly enemies the Paṭháns. For the KAIHÍRIS about CHATTAR and PULEJI in KACHI, now acknowledged to belong to the Belóch Tribes, are of unquestioned Paṭhán descent.† And, although the presence of many Belóchi words in their dialects may be the result of propinquity, the similarity of face and figure of the LU'NIS, SANDAR KHEL and ZARKHA'NS to the neighbouring Belóch Tribes of BA'RKHO'M is quite remarkable, and they might well have a common origin with them, especially as the Belóchis can hardly be called a nation, being rather an agglomerate of heterogeneous tribes. Thus the BRAHO'IS are probably aboriginal, the GURCHA'NIS a Sindian Tribe, the RINDS and LU'MRIS probably of Hindú (Rájpút) origin and the GA'DURS of LAS of Arab descent, while the tribes of MAKRA'N are Arabs, Sikhs, Sindhís, Persians, Jats and what not.‡

\* Major Leech's journeys were made about 1839.

† Hughes's Beluehistán.

‡ In connection with the probable Turkmán or Mongol origin of the bulk of the Belóch Tribes, the words TUMAN and TUMANDA'R are interesting. TUMAN or TOMAN was a Mongol division of the army, *viz.*, 10,000, and hence in the Mongol dominions it came to mean 10,000 generally. WASSA'F describing KINSAY (KINGSSE' or HANGCHAU) states it had "70 TOMANS of soldiers and 70 TOMANS of RAYATS." Marco Polo states its revenue in TOMANS of gold and Friar Odoric in TOMANS of BALISH (paper money). TMAN or TMA is still used in Russia for 10,000. In Beluehistán TUMAN means a camp and TUMANDA'R the commander of a camp and thence the chief of a tribe, but whether

While discussing the Paṭhán Tribes something should be remarked about the SAYADS found in every part of Afghánistán\* and in some numbers in the Pishin where they own several villages. Wherever they may happen to be, they are a sect apart from the surrounding inhabitants, are always respected and seem to be more intelligent than the Paṭháns in general. They are not considered Paṭháns and claim to be of Arab descent as their name implies. This claim, however, is I think of a slender description among the Sayads in the Pishin with whom we have now to do. Their sympathies are all Afghán, they are subdivided in a suspiciously similar manner, and the story of their descent confirms the suspicions as to their separate origin from the Paṭháns about them. The story is that HA'RU'N, fifth in descent from Kais, had a daughter who married an Arab Sayad who visited him, and from her are said to be descended all the Pishin Sayads, notably the SHA'DIZAIS and HAIDARZAIS.† The present subdivision of the Pishin Sayads appear to be—

|             |              |              |
|-------------|--------------|--------------|
| GANGALZAIS. | SHA'DIZAIS.  | YA'SINGZAIS. |
| BAGARZAIS.  | BRAHAMZAIS.  | URUMZAIS.    |
| AJABZAIS.   | HAIDARZAIS.‡ |              |

The following table shows the subdivisions of the tribes above discussed as far as known.

| No. | Tribe.                 | No. | Division. | No | Section.   | Subdivision. | No.         | Subsection. |
|-----|------------------------|-----|-----------|----|------------|--------------|-------------|-------------|
| I.  | DURÁ'NI or<br>ABDA'LI. | 1   | ZÍRÁK.    | 1  | POPALZAI.  | 1            | SADOZAI.    |             |
|     |                        |     |           |    |            | 2            | BA'ME'ZAI.  |             |
|     |                        |     |           |    |            | 3            | MARSINGZAI. |             |
|     |                        |     |           |    |            | 4            | KHA'NZAI.   |             |
|     |                        |     |           |    |            | 5            | AIYU'BZAI.  |             |
|     |                        |     |           |    |            | 6            | MADOZAI.    |             |
|     |                        |     |           |    |            | 7            | NOAZAI.     |             |
|     |                        |     |           | 2  | ALAKO'ZAI. | 1            | JALUZAI.    |             |
|     |                        |     |           |    |            | 2            | MELAZAI.    |             |
|     |                        |     |           |    |            | 3            | SARKÁ'NI.   |             |
|     |                        |     |           |    |            | 4            | SANDARZAI.  |             |
|     |                        |     |           |    |            | 5            | KÁ'REZAI.   |             |
|     |                        |     |           |    |            | 6            | NAUSAZAI.   |             |

this is due to the passage of the Mongols through their country on towards Hindustán or to their Central Asian origin does not appear. Yule's Marco Polo, I, 94, 281 and II, 169, 171.—Hughes's Beluchistán.

\* I saw one village of them in BA'RKHO'M among the Independent Bclo'ch Tribes.

† According to one legend, the KARB'ELAS are descended from a waif picked up by this HA'RU'N. See above.

‡ Among the Pishin Sayads faces of a Si'dri' type are not uncommon, and I saw one woman with purely African features near A'LI'ZAI. This may result, however, from their wandering habits and be no indication of descent.

| No. Tribe.                | No. Division. | No. Section.  | Subdivision.   | No. Subsection. |
|---------------------------|---------------|---------------|----------------|-----------------|
| I. DURA'NI or<br>ABDA'LI. | 1 ZIRAK.      | 3 BA'RAKZAI.  |                | 1 MUHAMMADZAI.  |
|                           |               |               |                | 2 ACHALZAI.     |
|                           |               |               |                | 3 SULIMA'NZAI.  |
|                           |               |               |                | 4 KHU'NSEZAI.   |
|                           |               |               |                | 5 BAIANZAI.     |
|                           |               | 4 ACHAKZAI.   | BAHA'DURZAI.   | 1 GHA'BEZAI.    |
|                           |               | 2 KA'KOZAI.   |                |                 |
|                           |               | 3 SHAMUZAI.   |                |                 |
|                           |               | 4 FA'MZAI.    |                |                 |
|                           |               | 5 BA'KARZAI.  |                |                 |
|                           |               | 6 ISHDANIZAI. |                |                 |
|                           |               | 7 ABDAL.      |                |                 |
|                           |               |               | GAIANZAI.      | 8 AHMADZAI.     |
|                           |               |               |                | 9 ASHEZAI.      |
|                           |               |               |                | 10 BURHAMZAI.   |
|                           |               |               |                | 11 SHAMAKZAI.   |
|                           |               |               |                | 12 MA'LIZAI.    |
|                           |               |               |                | 13 KA'MILZAI.   |
|                           |               |               |                | 14 ADAZAI.      |
|                           |               |               |                | 15 ADRAKZAI.    |
|                           |               |               |                | 16 HA'ZUZAI.    |
|                           |               |               |                | 17 MA'LIKZAI.   |
|                           |               |               |                | 18 LA'LIZAI.    |
|                           |               |               |                | 19 MA'PIZAI.    |
|                           |               |               |                | 20 HUSENZAI.    |
|                           |               |               |                | 21 SULIMA'NZAI. |
|                           |               |               | 22 AB'DULAZAI. |                 |
|                           |               |               | 23 BA'ZAMZAI.  |                 |
|                           |               |               | 24 ALOZAI.     |                 |
|                           |               |               | 25 TULIZAI.    |                 |
|                           |               |               | 26 MUSHKIZAI.  |                 |
|                           |               |               | 27 BA'DIZAI.   |                 |
|                           |               |               | 28 SHAKARZAI.  |                 |
|                           |               |               | 29 USMA'NZAI.  |                 |
|                           |               |               | 30 HABI'BZAI.  |                 |
| I. DURA'NI or<br>ABDA LI. | 2 PANJPA'O.   | 5 NU'RZAI.    |                | 1 CHA'LAKZAI.   |
|                           |               |               |                | 2 BA'DIZAI.     |
|                           |               |               |                |                 |
|                           |               | 6 A'LI ZAI.   |                | 1 HASSANZAI.    |
|                           |               |               |                | 2 ALAKZAI.      |
|                           |               |               |                | 3 GWARAZAI.     |
|                           |               | 7 ISHA'KZAI.  |                | 1 HAWAZAI.      |
|                           |               |               |                | 2 TEROZAI.      |
|                           |               |               |                | 3 MANDARZAI.    |
|                           |               |               |                | 4 I'DZAI.       |

| No. | Tribe.                 | No. | Division. | No. | Section.    | Subdivision.      | No. | Subsection.                            |
|-----|------------------------|-----|-----------|-----|-------------|-------------------|-----|----------------------------------------|
| I.  | DURA'NI or<br>ABDA'LI. | 2   | PANJPA'O. | 8   | KHU'GIA'NI. | SIRKI<br>WAZI'RI. | {   | 1 RA'NI KHEL.<br>2 NANI.<br>3 AGA'M.   |
|     |                        |     |           |     |             | MOTIK<br>WAZI'RI. | {   | 4 PI'RA KHEL.<br>5 AHMAD.<br>6 KHOZEH. |
|     |                        |     |           |     |             | KHAIRBU'N.        | {   | 7 NAJI'BI.<br>8 KHARAI.                |
|     |                        |     |           |     |             | SHEZAH.           | {   | 9 PANJPAI.<br>10 DOPAI.                |
|     |                        |     |           |     |             |                   |     | 11 KHIDAR KHEL.                        |

9 MA'KU.  
10 SA'GZAI.

|     |         |   |             |    |                        |  |   |                 |
|-----|---------|---|-------------|----|------------------------|--|---|-----------------|
| II. | TARI'N. | 1 | TOR TARI'N. | 1  | BATAZAI or<br>BADOZAI. |  |   |                 |
|     |         |   |             | 2  | KHA'NIZAI.             |  | 1 | LU'R KHA'NIZAI. |
|     |         |   |             | 3  | A'LI'ZAI.              |  | 2 | DAB KHA'NIZAI.  |
|     |         |   |             | 4  | NU'RZAI.               |  |   |                 |
|     |         |   |             | 5  | KULA'ZAI.              |  |   |                 |
|     |         |   |             | 6  | MU'SIZAI.              |  |   |                 |
|     |         |   |             | 7  | SEGAI.                 |  |   |                 |
|     |         |   |             | 8  | MA'LIKYA'R.            |  |   |                 |
|     |         |   |             | 9  | MAEZAI.                |  |   |                 |
|     |         |   |             | 10 | HAIKALZAI.             |  |   |                 |
|     |         |   |             | 11 | MANZAKAI.              |  |   |                 |
|     |         |   |             | 12 | MA'LIKAI.              |  |   |                 |
|     |         |   |             | 13 | HA'RU'N.               |  |   |                 |
|     |         |   |             | 14 | KAMA'LZAI.             |  |   |                 |
|     |         |   |             | 15 | KADAZAI.               |  |   |                 |
|     |         |   |             | 16 | KHA'MEZAI.             |  |   |                 |
|     |         |   |             | 17 | NAOZAI.                |  |   |                 |
|     |         |   |             | 18 | ABDURRAH-<br>MA'NZAI.  |  |   |                 |
|     |         |   |             | 19 | HAMRA'NZAI             |  |   |                 |

|     |         |   |               |    |            |
|-----|---------|---|---------------|----|------------|
| II. | TARI'N. | 2 | SPI'N TARI'N. | 20 | SHA'DIZAI. |
|     |         |   |               | 21 | MARPA'NI.  |
|     |         |   |               | 22 | LASRA'NI.  |
|     |         |   |               | 23 | ADWA'NI.   |

| No.  | Tribe.      | No. | Division.          | No. | Section.                                    | Subdivision. | No. | Subsection. |
|------|-------------|-----|--------------------|-----|---------------------------------------------|--------------|-----|-------------|
| III. | KĀ'KĀR.     | 1   | LOWE' KĀ'KĀR       | 1   | KHWAIDA'D-ZAI.                              |              |     |             |
|      |             |     |                    | 2   | MURSIANGZAI.                                |              |     |             |
|      |             |     |                    | 3   | AKTARZAI.                                   |              |     |             |
|      |             |     |                    | 4   | AWAZAI.                                     |              |     |             |
|      |             |     |                    | 5   | MEHTARZAI.                                  |              |     |             |
|      |             |     |                    | 6   | SURGARAI.                                   |              |     |             |
|      |             |     |                    | 7   | JALAGAI.                                    |              |     |             |
|      |             |     |                    | 8   | MU'SA KHEL                                  |              |     |             |
|      |             |     |                    | 9   | KABI'ZAI.                                   |              |     |             |
|      |             |     |                    | 10  | BA'RAKZAI.                                  |              |     |             |
|      |             | 2   | KUCHNAT<br>KĀ'KĀR. | 11  | SULIMĀN<br>KHEL.                            |              | 1   | TRAGARAI.   |
|      |             |     |                    | 12  | AMAND<br>KHEL OF SIMAN-<br>THA OF SANATI'A. |              |     |             |
|      |             |     |                    | 13  | MEHTARZAI.                                  |              |     |             |
|      |             |     |                    | 14  | PA'NIZAI.                                   |              | 1   | ADIZAI.     |
|      |             |     |                    | 15  | BA'ZAI.                                     |              |     |             |
|      |             |     |                    | 16  | SHAMOZAI.                                   |              |     |             |
|      |             |     |                    | 17  | SURGARAI.                                   |              |     |             |
|      |             |     |                    | 18  | MALAGAI.                                    |              |     |             |
|      |             |     |                    | 19  | I'SA' KHEL.                                 |              |     |             |
|      |             |     |                    | 20  | SARA'NGZAI.                                 |              | 1   | MULA'ZAI.   |
|      |             |     |                    |     |                                             |              | 2   | TA'RA'N.    |
|      |             |     |                    | 21  | ZAKHPE'L.                                   |              | 1   | AMAKAI.     |
|      |             |     |                    |     |                                             |              | 2   | KANOZAI.    |
|      |             |     |                    |     |                                             |              | 3   | NAOZAI.     |
|      |             |     |                    | 22  | DUMAR.                                      |              |     |             |
|      |             |     |                    | 23  | UTMA'N<br>KHEL.                             |              |     |             |
|      |             |     |                    | 24  | SANDAR<br>KHEL.                             |              | 1   | A'LI'ZAI.   |
|      |             |     |                    |     |                                             |              | 2   | SHABOZAI.   |
|      |             |     |                    |     |                                             |              | 3   | MUR.        |
|      |             |     |                    |     |                                             |              | 4   | DARGAI.     |
|      |             |     |                    |     |                                             |              | 5   | WAHA'R.     |
|      |             |     |                    |     |                                             |              | 6   | TENIZAI.    |
|      |             |     |                    |     |                                             |              | 7   | KAYANI.     |
| IV.  | LU'NI KHEL. | 1   | HAMZAZAI.          |     |                                             |              |     |             |
|      |             | 2   | SARA'GI.           |     |                                             |              |     |             |
| V.   | ZARKHA'N.   |     |                    |     |                                             |              |     |             |

*Tribes of doubtful Afghán descent.*

|           |   |             |
|-----------|---|-------------|
| I. SAYAD. | 1 | GANGALZAL.  |
|           | 2 | BAGARZAL.   |
|           | 3 | AJABZAL.    |
|           | 4 | SHA'DIZAL.  |
|           | 5 | BRAHAMZAL.  |
|           | 6 | HADARZAL.   |
|           | 7 | YA'SINGZAL. |
|           | 8 | URUMZAL.    |

## II. KARBELA.

(To be continued).

*On the Sūryaprajñapti.*—By DR. G. THIBAUT, *Principal, Benares College.*

## PART I.

Until recent times our knowledge of the cosmological and astronomical system of the Jainas was very limited and founded not on an independent investigation of the original Jaina literature, but only on the occasional referenees made to Jaina doctrines by the orthodox Hindu writers on astronomy. For a long time the short account of the subject given by Colebrooke in his "Observations on the sect of the Jainas" (*Asiatic Researches*, 1807; *Essays*, Vol. II), remained the only one, and although accurate as far as it goes, it is very insufficient since it chiefly refers to the one doctrine of the Jainas only, which has at all times struck outsiders as peculiarly strange and absurd, *viz.*, the assertion that there exist two suns, two moons and a double set of constellations. This is indeed the doctrine by which the system of the Jainas could most easily be distinguished from similar old Indian systems, and it is consequently referred to and controverted with preference in the *Siddhántas*. The best known passage from the latter is the one quoted by Colebrooke from Bháskara's *Siddhánta-Síromani*. "The naked sectaries and the rest affirm that two suns, two moons and two sets of stars appear alternately; against them I allege this reasoning. How absurd is the notion which you have formed of duplicate suns, moons and stars, when you see the revolution of the polar fish."

This passage of Bháskara's is manifestly founded on a passage found in Brahmagupta's *Sphuṭa-Siddhánta* where we read in the so-called *Dúshánádhya*:

मानि चतुः पञ्चाशत् द्वौ द्वावर्कौदयौ जिनोक्तं यत् ।  
 ध्रुवमस्य सावर्त्ता भवन्ति यतोऽङ्गा तनसदसत् ॥

“There are fifty-four nakshatras, two risings of the sun ; this which has been taught by Jina is untrue, since the revolution of the polar fish takes place within one day.”

And a passage to the same effect occurs in the 13th adhyāya of Varāha Mihira's Pañchasiddhāntikā.

In 1868 Professor A. Weber, to whom we are indebted for our first acquaintance with so many works of Indian literature, published in the tenth volume of the “*Indische Studien*” a paper on the *Sūryaprajñapti*, being apparently the most important astronomical book whose authority the Jainas acknowledge, and it then appeared that the doctrine of the existence of two suns, moons, etc. constitutes only one feature of a comprehensive system which on the whole is much less fantastical than might have been expected and which, fantastical or not, shows intimate relations to the astronomical and cosmological views which appear to have prevailed all over India before Greek science began to influence the East. Especially it appeared—as pointed out by Professor Weber—that the doctrine propounded in the *Sūryaprajñapti* shows in many points an unmistakable resemblance with that contained in the *Jyotisha-Vedāṅga* the presumably oldest specimen of Indian astronomical literature, and it thus became manifest that the astronomical books of the Jainas do not only furnish information about the opinions held by a limited religious sect, but may, if rightly interrogated, yield valuable material for the general history of Indian ideas. The writer of the present paper has therefore thought it worth while to submit the *Sūryaprajñapti* to a renewed detailed investigation, whereby we should be enabled rightly to esteem its position in the astronomical literature of India, clearly to conceive the peculiar features distinguishing the astronomical system of the Jainas from other systems, and on the other hand to point out what the Jaina system has in common with other systems, and in what way therefore it may be employed for the elucidation of the latter. Professor Weber's paper gives in the main only a short summary of the contents of each chapter of the *Sūryaprajñapti*, following the order of the chapters as found in the work itself and omitting none of them. This was of course the right plan to adopt in a paper giving the first account of a hitherto unknown book. In the present paper it has on the other hand been preferred to give a connected account of the chief doctrines only which are found in the *Sūryaprajñapti*, to combine hints found in the various parts of the work wherever this appeared necessary for the sake of greater clearness, and again altogether to omit relatively unimportant matter. It must be stated at the outset that this paper—like that of Professor Weber—is based more on Malayagiri's commentary on the *Sūryaprajñapti* than on the text of the latter work itself ; which apparently anomalous proceeding finds its explanation in the fact of the Manuscripts

of the Śūryaprajñapti, commonly met with, containing the commentary only *in extenso*, while as a rule only the first words of the passages commented on are given. As it, however, appears that the commentary faithfully follows the text, and as on the other hand the latter, devoid of a commentary, would be hardly intelligible, the absence of a complete text of the Śūryaprajñapti is less inconvenient than might at first be assumed. At any rate we may obtain at present a sufficiently full and accurate knowledge of the contents of the book; and in works of the class to which it belongs the interest attaching to the form is a comparatively small one. As already stated, the present paper is by no means intended as an exhaustive review of the contents of the Śūryaprajñapti; it is rather meant as an introduction to a complete edition of the work itself which, on account of the various old materials it contains, well deserves to be published *in extenso*. And an introduction of this kind could not well be missed, even if we possessed a complete edition or translation of the book, as the reader of the text of the work or of a literal translation of the text would find it by no means an easy task unaided to reconstrue the leading features of the system.

The Śūryaprajñapti is written in Jaina-prākṛit, and divided into twenty books called prābhṛitas, some of these again into chapters, called prābhṛita-prābhṛitas. The arrangement of the matter treated of is by no means systematical, and the text, still more the commentary are full of tedious reiterations. Malayagiri, the commentator, has done his work most conscientiously; too conscientiously, the reader afflicted by his extraordinary diffuseness often feels tempted to say. Especially he delights in illustrating the numerical rules given in the text by at least half a dozen examples, where one would have sufficed, dwelling with evident complacency on each step even of the simplest calculation. But his comments are very perspicuous and certainly deserve to be extracted, although not to be reproduced *in extenso*.

Proceeding now to our proposed task, let us dispose at the outset of the distinctive doctrine of the Jainas according to which there are two different suns, two moons and two sets of constellations. When inquiring into the origin of this certainly peculiar notion, we are led to a very simple reason, an impartial consideration of which makes the Jaina system appear much less fantastical and arbitrary than we at first are inclined to think. This reason has already been pointed out by Colebrooke, Asiatic Researches, Vol. IX, p. 321, where he says "They (the Jainas) conceive the setting and rising of stars and planets to be caused by the Mountain Sumeru and suppose three times the period of a planet's appearance to be requisite for it to pass round Sumeru and return to the place where it emerges. Accordingly they allot two suns, as many moons, and an equal number of each planet, star and constellation to Jambudvīpa; and imagine that these appear on alter-

nate days south and north of Meru.” These words scarcely require anything added to be to them in the way of comment. The Jainas hold (as will be seen in detail further on) the old Indian idea of sun, moon and stars revolving round Mount Meru. To anybody holding this opinion, the question must have suggested itself “In what time is one such complete revolution performed?” The prevailing opinion, represented for instance by the Purānas, was that the whole revolution is performed in twenty-four hours, so that the sun describes during the time when it is day in Bharata-varsha the southern half of his circle, and during the time when it is night to the south of Mount Meru, and day in the countries north of it, the northern half. The Jainas, however, took a different view of the matter. To them it seems to have appeared more appropriate that as there are four directions—south, west, north and east—the sun’s circle should be divided into four quarters corresponding to the four directions, and that he should bring day in succession to the countries to the south, west, north and east of Meru. But then, as it must be supposed that his passing through each of the four quarters occupies the same time, how can it come about that he again appears to rise to the Bharatavarsha after the lapse of a period only sufficient to advance his place by one quarter of the circle? Out of this difficulty the Jainas extricated themselves by simply assuming that the sun rising on a certain morning is not the same sun which had set on the preceding evening, but a second sun similar in every way to the first one. The whole circle is thus described by two suns separated from each other by half the circumference, each of which appears in the Bharatavarsha on alternate days. The same reasoning lead to the assumption of two moons and two sets of stars.

Great as appears to be the difference produced by this hypothesis between the system of the Jainas and the commonly received opinions, it practically is of very small importance and may—as will be done in the following—as a rule be left altogether out of account whenever we have to consider the motions of sun and moon. When for instance the sun having started from *Aśvinī* has passed through the twenty-eight *nakshatras*, he enters, according to the generally received opinion, again into the same *nakshatra* *Aśvinī*, according to the Jaina opinion into a second *nakshatra* called *Aśvinī* too; but as this second *nakshatra* has the same name, the same extent, and the same relative position as its namesake, as like the latter it is preceded by *Revatī* and followed by *Bharanī*, and as at the same time when the sun has entered into the second *Aśvinī*, another sun the exact and indistinguishable counterpart of the former one has entered into the former *Aśvinī*, it is clear that we may, when speaking of the motion of the heavenly bodies, save ourselves the trouble of continually referring to two suns, two moons and two sets of *nakshatras* and, remembering

that there are two of each kind, express ourselves as if there were only one. To proceed.

The astronomic-chronological period on which the system of the Súr্যaprajñapti is based, is the well-known quinquennial yuga or cycle with which we have long been acquainted from the Jyotisha Vedánga. The same cycle is described in the Garga Samhitá as we see from the extant fragments of the latter work, and we learn from Varáha Mihira's Pañchasiddhántiká that it likewise formed the fundamental doctrine of a Paitámaha Siddhánta which, according to Varáha Mihira's judgment, was one of the more important Siddhántas known at his time. It is alluded to and rejected in a few words by Brahmagupta in the dúshanádhyáya of the Sphuṭa Brahma-siddhánta. References to this cycle are met with in the early history of Buddhism. Whether the so-called Vedic literature is acquainted with a cycle of this nature is doubtful.\* It will not be necessary to dwell in this place at length on the constitution of the yuga; it will suffice to state that it is based on the assumption of five sidereal revolutions of the sun being exactly equal in duration to sixty-seven periodical revolutions of the moon and to sixty-two synodical months, while one complete revolution of the sun is supposed to be performed in three hundred and sixty-six days. That a cycle of this nature based as it is on an utterly wrong assumption could maintain itself for a considerable time as it manifestly has done is a matter for legitimate wonder, and does not find a parallel in the history of chronological systems among any other civilized nation. At the end of one yuga already the quantity of the error induced by the mistaken estimation of the length of the solar year amounts to nearly  $5 \times \frac{3}{4} = 3\frac{3}{4}$  days, the accumulation of which quantity after the lapse of a few yugas could not escape the attention, we should think, of even the most careless observers. The matter would indeed lie altogether differently if a conjecture (or as it stands we might almost say, an assertion) of Colebrooke referring to this point had been verified. He—after having given an account of the manner in which the Jyotisha-Vedánga manages to maintain harmony between civil and lunar time—continues “and thus the cycle of five years consists of 1860 lunar days or 1830 nycthemera, subject to a further correction, for the excess of nearly four days above the true sidereal year: but the exact quantity of this correction and the method of making it, according to this calendar, have not yet been sufficiently investigated to be here stated.” The fact is that of this correction which Colebrooke considered so indispensable, that he speaks of it as being actually found in the Vedánga, no

\* The question referred to in the text cannot be discussed here. The writer hopes shortly to find an occasion fully to treat it elsewhere.

traces are to be found either in the Vedánga itself or—and this is of great importance as the Vedánga is still partially unexplained—in the Śúryaprajñapti which illustrates the constitution of the quinquennial yuga in the most diffuse manner, but has nothing to say about a correction of the kind mentioned.—The subdivisions of the yuga are in the Śúryaprajñapti described with great fulness ; what is really essential admits, however, of being stated in a few words. Each solar year is divided into two ayanas of one hundred and eighty-three days each. Each ayana in its turn comprises six solar months, each of which lasts  $30\frac{1}{2}$  days. Two of these solar months constitute a solar season ; the reckoning of the seasons starts, however, not from the beginning of the yuga, but the latter is made to mark the middle of a season, so that the rainy season which counts as the first begins a month before the beginning of the yuga. Again the yuga comprises five years of 360 days each, each year in its turn being divided into twelve months of 30 days each ; in the Śúryaprajñapti this kind of year—commonly known as the *sávana* year—is called the *karma-year* or *ritu-year* which latter name would more properly be given to the solar year. The six days by which this year is shorter than the solar year are called *atirátras*. Again the yuga comprises sixty-two synodical months, the first of whom begins with the moon being full in the first point of *Abhijit*. Each of these months is divided into a light and a dark half ; each half comprises fifteen *tithis* or lunar days of equal duration. Sixty-two of these months being equal in duration to sixty-one *karma-months* of 30 days each, it follows that sixty-two *tithis* are equal to sixty-one natural days ; in order therefore to maintain harmony between the numbers of the natural days and those of the *tithis*, a break in the counting of the *tithis* is made whenever two *tithis* terminate during one natural day, *i. e.*, according to the Śúryaprajñapti on the occurrence of each sixty-second *tithi*. The details of this process are not stated in the Śúryaprajñapti, but there can be no doubt that *mutatis mutandis* it was managed as it has been managed in India ever since. To give an example, the sixtieth natural day, counting from the beginning of the yuga, during which the sixtieth *tithi* terminated was counted as *pañchadaśi* (fifteenth *tithi*), the next following day as *pratipad* (first day of the new lunar half month) and then the day after that not as *dvitíyá*, second lunar day, but as *trítíyá* third lunar day, the second lunar day having already terminated together with the preceding sixty-first natural day. These sixty-two lunar months are divided among five lunar years, the first, second and fourth of which comprise twelve lunations each, while the third and fifth count thirteen each. The technical name of years of the latter kind is *abhivardhita-samvatsara*, the increased year. The method according to which the two thirteenth months are intercalated in the yuga is

not described in detail; it is however clear enough how it proceeded. The thirty-first lunation and again the sixty-second one were not counted, but formed together with the month immediately following a kind of double month taking its name from the second constituting member. Thus there is nominally no thirteenth month, and a proper name for the latter is therefore not required.

Again the yuga consists of sixty-seven periodical lunar months, the moon during it returning sixty-seven times to the place from which she had started at the beginning. No attempt is made in the *Súrjaprajñapti* to group these months into years nor are they subdivided into days of equal duration; they are simply said to comprise  $27 \frac{2}{67}$  days each. They are, however, subdivided into two ayanas each, analogously to the division of the solar year into ayanas. This division is indeed legitimate enough as it is based on the alternate progress of the moon towards the north and south, about which details will be given later on. Less comprehensible is on the other hand the division of each periodical month into six lunar seasons, whose names answer to those of the solar seasons beginning with the rainy season; a division of this kind is of course utterly gratuitous and purposeless, and to us interesting only as a specimen of the Indian's excessive tendency to systematize.

If we now proceed to an examination of the account given in the *Súrjaprajñapti* of the revolutions of sun and moon, we find at the outset that it differs from the statements made by Garga and in the *Vedánga* in one important point. According to the latter authorities (see *Jyotisha-Vedánga*, v. 6; this *Journal* for 1877, p. 415; Weber, *Nakshatras* II, pp. 28, 33), the yuga begins with the winter solstee, at the moment when it is new-moon, sun and moon being in conjunction in the beginning of the nakshatra *Dhanishthá*; according to the *Súrjaprajñapti* the yuga begins with the summer solstee, at the moment when the moon is full in the beginning of *Abhijit* and the sun consequently stands in *Pushya*. The coincidence of the winter solstee with new moon marking, according to the *Vedánga*, the beginning of the yuga may of course actually have taken place at the time when the doctrine of the quinquennial yuga was first established and will have recurred later on from time to time; but it is evident that it could not regularly recur every fifth year. To this fact, however, as well as to the change which in consequence of the precession of the equinoxes gradually took place in the position of the sun at the time of the winter solstee, the eyes of the Hindus seem to have remained shut during a considerable period. Now it is curious to see that in this one point at least the author of the *Súrjaprajñapti* who, on the whole, faithfully adheres to the old system and does not hesitate to take over the quinquennial yuga itself with all its glaring imperfections, considered himself entitled or

obliged to deviate from the received tradition. For once the testimony of the eyes was placed above old authorities. In the first place, the winter solstice had so far receded from the beginning of Dhanishṭhá that the change could not be ignored; in the second place, it must have so happened that at the time of the author of the Sūryaprajñapti no new moon took place together with the winter solstice, while—as we may presume—some full moon happened to coincide or nearly to coincide with some summer solstice. Accordingly the beginning of the yuga was changed. Faute de mieux the summer solstice coinciding with full moon was taken as the new starting-point, and the sun's place at the time was removed from the middle of Āśleshá which it had occupied in the old system to a point in Pushya. The moon's place at the time of the summer solstice, being separated from the sun's place by half the circumference, is then at the beginning of Abhijit; the latter point marks at the same time the sun's place at the time of the winter solstice.

The account given in the Sūryaprajñapti of the position of the sun at the two solstices enables us to enter into a consideration of the approximate time at which either the work itself or some older work on which it may have been based was composed. The expression "approximate" is used on purpose as the general difficulties besetting an estimation of this kind referring to Indian astronomical works are well known, and as in our case special difficulties arise in addition to them. As will be seen later on, the Sūryaprajñapti throughout employs twenty-eight nakshatras of unequal extent, while the Vedānga as well as the bulk of the later astronomical literature make use of twenty-seven nakshatras of equal extent. The relation of these two systems to each other necessitates a short excursus, for the starting-point of which we take a passage in Bháskara's Siddhánta Siromani (Grahagaṇita, Spashṭádhikára, 71-74, p. 93 of Bápu Deva's edition) and a parallel passage from Brahmagupta's Sphuṭa-siddhánta. The former of the two, translated, runs as follows:

"This method of finding the Nakshatras which has thus been taught in a rough manner by the astronomers for the purposes of common life, I shall now teach in an accurate form as it has been proclaimed by the rishis for the purpose of processions, marriages, etc. The experts have declared six (nakshatras) to have one portion and a half, *viz.*, Viśákhá, Punarvasu and the (four) nakshatras called dhruva; six to have half a portion, *viz.*, the constellations presided over by the Sarpas, Rudra, Váyu, Yama, Indra, Varuṇa; the remaining fifteen to have one portion each. The portion of one nakshatra is called the mean motion of the moon (during one ahorátra). The minutes of the circle lessened by the portions of all (the 27 mentioned) nakshatras are the portion of Abhijit, lying beyond the nakshatra of the Viśve Devas, etc." These statements are repeated in Bháskara's own

commentary, the Vāsana, where the common names of the nakshatras (Viśákha, Punarvasu, Rohiṇi, the three Uttaras;—Āśleshā, Ārdrá, Svátí, Bharaní, Jyeshthá, Śatabhishaj) are given and where Pulísa, Vasishtā, Garga and others are said to be the Rishis alluded to in the text. The rough mode of computation referred to in the beginning of the above quotation is the one contained in v. 67 of the same chapter and agrees with the rule given in the Sūrya Siddhánta, II, 64. According to it, when we wish to find the place of sun or moon or one of the planets in the circle of the nakshatras, we have to divide the longitude of the heavenly body expressed in minutes by 800; the quotient then shows the number of nakshatras through which the planet has already passed, and the remainder the traversed part of the nakshatra in which it is at the time. This rule therefore bases on the assumption of twenty-seven nakshatras each of which extends over one twenty-seventh part of the circle. Now, according to Bháskara, the Rishis taught that whenever greater accuracy is required, the nakshatras have to be considered as being of unequal extent. In the first place only fifteen of them are to be regarded as having the average extent, while six exceed that amount by one half and six others remain below it by one half; and in the second place the twenty-seven nakshatras are no longer to occupy the whole circle, but only that part of it which corresponds to twenty-seven times the mean daily motion of the moon, while the remaining part of the circle is assigned to a twenty-eighth nakshatra Abhijit. Bháskara's statements are manifestly founded on a passage met with in the 14th chapter of the Sphuṭa Brahmasiddhánta which gives the same details regarding the different extent of the nakshatras, and is introduced by the following verse—

पौलिशरोमकवासिष्ठचौरपैतामहेषु यत्प्रोक्तम् ।  
तन्नचानयनं नार्थभटेक्तं तदुक्तिरतः ॥

“The calculation of the nakshatras, which has been taught in the Paulísa, Romaka, Vásishtha, Saura, Paitámaha Siddhántas, is not mentioned by Aryabhata; I therefore proceed to explain it.”

And later on—

अथर्थादिच्छेन्नाणि संहिताखभिहितानि गर्गाद्यैः ।  
यस्माद् बहूनि तस्मान्नार्थभटेक्तं तदानयनम् ॥

The explicit statement about number and extent of the nakshatras in the older period of Indian astronomy, which is contained in the two passages quoted from Brahmagupta and Bháskara, is of considerable interest. If the account given by these two writers is correct and there is no reason to doubt of that, it appears in the first place that the mere circumstance of only twenty-seven nakshatras being mentioned in some detached fragment of an astronomical work which we do not possess in its entirety,

would not justify the conclusion of the author of the work having been acquainted with twenty-seven nakshatras only. Nay, even the author of a treatise like the Vedānga who throughout speaks of 27 nakshatras only may have done this simply because he meant his work to be an elementary one, unencumbered by the assumption of 28 nakshatras of unequal extent. In the second place the distinct statement that the old writers on astronomy made use of Abhijit solely when greater accuracy was aimed at, and that they then made its extent to correspond to the excess of a sidereal month above twenty-seven days, certainly seems to point to the conclusion that the introduction of Abhijit into the circle of the nakshatras was an after-thought, consequent on the improved knowledge of the length of the moon's periodical revolution. With regard to the books in which, according to Bhāskara and Brahmagupta, the division of the sphere into 28 nakshatras of unequal extent was taught in addition to the simpler division into 27 equal nakshatras, we have to remark that the Sūrya-siddhānta known to us contains no such statement; the Saura-siddhānta of Brahmagupta may have been a different work. We are unable to control the statement with regard to the Romaka, Paulīśa, Vāsishṭha-Siddhāntas. Of Garga, however, we know from quotations several passages bearing on the point in question: in the first place, the passage quoted by Bhaṭṭotpala (in his commentary on Varāha Mihira's *Bṛihatsaṃhitā*, IV, 7; see Weber, *Nakshatras*, I, p. 309), which corroborates Bhāskara's statement regarding the different extent of the Nakshatras, is, however, silent about Abhijit. As the passage stands, it would lead us to infer that Garga divided the whole circle into twenty-seven parts, the extent of fifteen of which is equal to one, of six to one half and of six to one and a half. The quotation may, however, be incomplete, and at any rate we have Brahmagupta's and Bhāskara's word for Abhijit having been acknowledged by Garga too. However this may be, that Garga, as a rule, introduced into his calculations neither Abhijit nor the inequality of the extent of the twenty-seven nakshatras, appears from the places which he assigns to the sun at the two solstices, *viz.*, at the beginning of Dhanishṭhā and the middle of Āśleshā; for if we calculate the place of the summer solstice by starting from the beginning of Dhanishṭhā and making use of the unequal extent of the nakshatras, we obtain as place of the summer solstice not the middle of Āśleshā but rather the end of it or the beginning of Maghā.

To return. The special difficulty by which we are met when attempting to compare the places assigned to the solstices in the Sūryaprajñapti with the places which they occupy according to Garga and the Vedānga on one hand and the Siddhāntas on the other hand, lies in the circumstance of our not knowing exactly how the two divisions of the sphere—the one into 27 nakshatras of equal extent, the other into 28 of unequal extent—were made

to correspond with each other. If we suppose—and this seems the most likely supposition—that each of the 27 nakshatras was curtailed by the twenty-seventh part of the small portion assigned to Abhijit and that the reckoning started from the beginning of Abhijit, (which according to the system of the Súr্যaprajñapti is the first of the series, as at the beginning of the yuga it is in conjunction with the moon), we may hazard an hypothesis with regard to the time lying between the Vedánga and the Súr্যaprajñapti, or rather between the observations of the solstices recorded in the two works. According to the Vedánga the winter solstiee takes place in the beginning of Dhanishthá, according to the Súr্যaprajñapti in the beginning of Abhijit (which is the place of the full moon on the day of the summer solstiee at the beginning of the yuga, and consequently the place of the sun on the day of the winter solstice); the two places are therefore separated by the whole of Śravaṇa and Abhijit. Having, according to the hypothesis stated above, reduced the extent of Śravaṇa (=  $13^{\circ}33$ ) by the 27th part of the extent of Abhijit, which extent is equal to about  $4^{\circ}12$ , we obtain for Śravaṇa  $13^{\circ}18$ ; to this we add Abhijit =  $4^{\circ}12$ ; the sum *viz.*,  $17^{\circ}3$  indicates the extent of the displacement of the solstiee during the intervening period. Allowing seventy-two years for  $1^{\circ}$  of precession, the length of this period would be about 1246 years. If we therefore knew the absolute date of the Vedánga we might state the approximate absolute date of the observation recorded in the Súr্যaprajñapti, on the supposition always of the manner in which the two divisions of the sphere have been adjusted to each other being the right one. But, as Professor Whitney has shown, it is scarcely possible to form any satisfactory conclusion with regard to the date of the Vedánga, and we therefore abstain from giving a positive opinion about the date of the Súr্যaprajñapti.

We now proceed to a detailed consideration of the hypothesis by which the author of the Súr্যaprajñapti tries to account for the appearances presented by the various motions of the heavenly bodies, beginning with the sun.

The three different motions of the sun which he endeavours to explain are firstly, the daily motion in consequence of which the sun seems to approach us from the East, passes through our field of vision and finally disappears in the West; secondly, the annual motion in consequence of which the sun seems to pass in the course of a year through the circle of the nakshatras, proceeding from the West towards the East; and thirdly the motion in declension according to which the sun ascends towards the north during one half of the year and descends towards the south during the other half. As in all systems which consider the daily motion of the sun to be real (not an appearance produced by the revolution of the earth

round its axis), the annual motion of the sun through the circle of the nakshatras is said to be apparent only, and produced by the circumstance of the motion of the sun being somewhat slower than that of the nakshatras, so that he daily lags behind by a certain quantity which accumulated during a whole year amounts to an entire revolution. How the Sūryaprajñapti supposes the first and third motions to take place will appear from the following.

It must be remembered at the outset that the general conception of the configuration of the world which we find in the Sūryaprajñapti is the same as that known from the Purāṇas. The earth is considered to be an immense circular flat consisting of a number of concentric rings, called dvīpas, separated from each other by ring-shaped oceans. In the centre of the earth stands Mount Meru; around it runs the first dvīpa—Jambudvīpa, the only one which will concern us in the following. It is surrounded by a circular ocean, the water of which is salt (the lavaṇa-samudra). The southern segment of the Jambudvīpa is occupied by the Bhāratavarsha, the northern segment by the Airāvata-varsha; east and west of Mount Meru are the two portions of the Videha-varsha. Sun, moon and stars revolve round Mount Meru, in circles of different height above the Jambudvīpa, the same heavenly body, however, always keeping the same height. The detailed features of these motions are now according to the Sūryaprajñapti as follows.

The circumstance of the sun seeming during one half of the year to approach daily more and more the north, while during the other half he seems to descend towards the south is explained in the following manner. On the longest day of the year which at the beginning of the cycle coincides with the first day of the lunar month S'rávaṇa, the sun describes round the mountain Meru a circle, the diameter of which is 99,640 yojanas. The distance of the sun from the centre of Meru amounts therefore to 49,820 yojanas. On the next day the sun describes a circle concentric with the first, and having a diameter greater by  $5 \frac{3.5}{0.1}$  yojanas, so that the distance of the sun, from Mount Meru now amounts to  $49,820 + 2 \frac{3.5}{0.1}$  yojanas. In the same manner the diameter of the circle described by the sun increases by  $5 \frac{3.5}{0.1}$  on the third day, fourth day, etc., up to the day of the winter solstice, which according to the system is the 183rd day after the summer solstice. On this day the sun describes round Mount Meru a circle, the diameter of which is equal to 100,660 yojanas, so that his distance from Mount Meru amounts to 50,330 yojanas. Beginning from this day the solar circles contract again, by the same quantity daily by which they had expanded during the southern progress of the sun. During the 182 days intervening between the day of the winter solstice and the day of the following summer solstice the sun describes again the same 182 circles in

which he had descended towards the south, only in reverse order, until, on the day of the second summer solstice, he has again reached the innermost circle, from which he had started a year ago. During the second year the same expanding and contracting of the solar circles repeats itself and so on. The fact of the sun seeming to ascend towards the north during one half of the year, while he seems to descend towards the south during the other half is therefore explained by the supposition that he approaches us during the former half, while he recedes from us during the latter half. The system does not assume that he actually ascends or descends; for all the circles described by him are at an equal height above the Jambudvīpa; he only appears to us to stand lower at the winter solstice than he does at the summer solstice, because at the former period he has receded from us to the amount of five hundred and fifty yojanas. The exact localities too above which the sun describes his daily circles are defined. The innermost circle, *i. e.*, the circle nearest to Mount Meru, which the sun describes on the longest day, would, when projected upon the earth, be distant 180 yojanas from the outer margin of the Jambudvīpa. The second circle approaches nearer to that margin, the third still nearer, and so on, until the circles of the sun are no longer above the Jambudvīpa itself but above the salt ocean, the lavaṇoda, which surrounds the Jambudvīpa. Finally on the shortest day of the year the sun describes a circle which, in projection, is distant 330 yojanas from the edge of the Jambudvīpa. After that he again approaches the Jambudvīpa, and on the next summer solstice he has again entered into it to the amount of 180 yojanas. The technical term by which this recurring progress of the sun towards the Jambudvīpa and the salt ocean is denoted in the Sūryaprajñapti, is उगच्छद् or अचगच्छति (-ते); the sun is said to merge himself, or to enter to a certain distance into the Jambudvīpa or into the salt ocean accordingly as his circles are vertically above the land or the surrounding sea.

In connexion with the sun's motion in circles of different diameter, the Sūryaprajñapti treats of the increase and decrease of the length of the day. As in the Jyotisha-Vedānga, the length of the day of the summer solstice is estimated at eighteen muhūrtas, that of the shortest day at twelve muhūrtas. The days between the two solstices are erroneously supposed to decrease or increase by a uniform quantity, which is easily found to be equal to  $\frac{6}{18} = \frac{2}{3}$  of a muhūrta.

A number of opinions of other teachers agreeing with the theory stated above in its general features, but differing in the figures, are likewise given by the Sūryaprajñapti.

Different opinions regarding the extent of the solar circles are given in I, 8 and, which comes to the same, different opinions about the distance of the two suns from each other in I, 4. According to this chapter there

were six different opinions about the distance of the two suns from each other on the longest day when the sun—or the two suns—describe the innermost and smallest circle. According to some teachers, the distance of the two from each other, or in other words the diameter of the circle they describe amounts to 1,133 yojanas, according to others to 1,134 yojanas; according to others again to 1,135 yojanas. Most probably we have to combine with these statements the statements given in the next chapter (I, 5) regarding the different opinions prevailing on the extent to which the sun “immerges” himself into the Jambudvīpa and into the salt ocean. There we read that, according to one opinion the sun moves on the longest day in a circle which projected on the Jambudvīpa is distant 1,133 yojanas from the edge of the latter, while on the shortest day he describes a circle above the salt ocean at the distance of 1,133 yojanas from the Jambudvīpa. According to the opinions of two other sets of teachers, the number of yojanas in both cases is 1,134 and 1,135. If we combine these measures with the measures of the diameter of the innermost solar circle given above (and the sameness of the figures seems to entitle us to do so, although this is by no means explicitly stated), we get for the diameter of the whole Jambudvīpa 1,133 (= diameter of the innermost circle) +  $2 \times 1,133$  (= distance of the innermost circle from the edge of the Jambudvīpa on both sides), therefore altogether 3,399 yojanas; or, starting from the numbers 1,134 and 1,135, 3,402 or 3,405 yojanas. These are very moderate dimensions compared with the 100,000 yojanas, which length the author of the Sūryaprajñapti himself attributes to the diameter of the Jambudvīpa, and we shall not be mistaken in ascribing to opinions of this nature a considerably greater antiquity than to those represented by the Sūryaprajñapti. Besides, there is another circumstance in favour of such a view. The Sūryaprajñapti throughout makes use of the relation  $\sqrt{10} : 1$  for calculating the circumference of a circle. Thus for instance the diameter of the Jambudvīpa being 100,000 (yojanas), its circumference is said to amount to 316,227 yojanas 3 gavy. 128 dhan.  $13\frac{1}{2}$  añg. But those teachers who stated the diameter of the innermost solar circle to amount to 1,133 or 1,134 or 1,135 yojanas stated at the same time that its circumference amounts to 3,399 or 3,402 or 3,405 yojanas, *i. e.*, they made use of the relation 3 : 1 for calculating the circumference of a circle from its diameter. The adoption of this very rough approximate value seems to point back to a comparatively ancient time.\*

\* It seems that all Jaina books take  $1 : \sqrt{10}$  as expressing the relation of the diameter to the circumference. See for instance Bhagavatī Sūtra II, 1. 45 (Weber, p. 264), where, however, some confusion seems to have crept into the figures. The old and simple relation 1 : 3 is found for instance in the Bhūmiparvan contained in the Bhīshmaparvan of the Mahābhārata. There the circumferences of the planets are

Three more opinions concerning the distance of the two suns from each other on the longest day are quoted. According to the first, one whole dvīpa with the addition of the surrounding ocean intervenes between the two; according to the second two dvīpas and two oceans; according to the third three dvīpas and three oceans. The distance in yojanas is not given. Two more opinions concerning the extent to which the sun enters into the Jambudvīpa are stated; according to some the sun enters on the longest day into half the Jambudvīpa and on the shortest day into half the salt ocean; the distances in yojanas are not mentioned. And according to others the sun enters neither into the Jambudvīpa nor into the salt ocean, but moves in the interval (apāntarāla) of the two; how we have to imagine this interval does not appear.

The eighth chapter of the first book contains a long exposition of the dimensions of the circles described by the sun. Four different dimensions are stated. Instead of simply giving the length of the diameter, the length and breadth (áyāma and vishkambha) are given; these two are of course equal in a circle. Then the circumference of the circle is given, according to the ratio  $\sqrt{10} : 1$ , and finally the "vāhalya," the thickness of the circle, *i. e.*, the diameter of the space filled by the mass of the sun or more simply the diameter of the sun himself. This amounts according to the Sūryaprajñapti to  $\frac{4}{61}$  of a yojana. The diameter and the circumference of the circles are of course continually changing, the circle described on the longest day having the smallest dimensions and that described on the shortest day having the greatest. The dimensions of the small circle and the amount of the daily increase have been mentioned above; it is therefore not necessary to follow the Commentator into the very tedious calculation of the dimension of each daily circle. The opinions of three other teachers on the dimensions of the circles, according to which the diameter amounts to 1,133 yojanas etc., have already been mentioned; the thickness of the circle, *i. e.*, the diameter of the sun is held by them to amount to one yojana.

We turn now to the statements regarding the velocity with which the sun moves in his different circles, and among these at first to those made by the Sūryaprajñapti itself. The calculation is a very simple one. Each daily circle being described by two suns, each of which travels through half of it in thirty muhūrtas, the whole circle is described by one sun in sixty muhūrtas, and consequently we have, in order to find the velocity of the sun, to divide the periphery of the daily circle by sixty; the quotient is the number of yojanas travelled through by the sun in one muhūrta. Thus the sun, when travelling in the smallest innermost circle, the circumference

stated in numbers which are the threefold of the numbers expressing the diameters :

चन्द्रमासु सद्यस्वाणि राजनेकादश स्मृतः । विष्कम्भेन कुरुश्रेष्ठ त्रयस्त्रिंशत् सङ्कलम् etc.

of which is 315,089 *yojanas* long, passes in one *muhūrta* through  $5,251 \frac{2}{60}$  *yojanas*. On the following day both suns travel in the second circle which is somewhat larger than the first one, and consequently the suns having to describe a larger space in the same time, *i. e.*, during the duration of a *nycthemeron* travel somewhat faster, pass in one *muhūrta* through  $5,251 \frac{4}{7}$  *yojanas*. Thus day after day the speed of the two suns is increasing in accordance with the continually increasing extent of the diurnal circles, until on the day of the winter solstice both suns travelling in the outmost circle pass through  $5,305 \frac{1}{60}$  *yojanas* in one *muhūrta*. Beginning from this day their speed diminishes as they are again approaching the innermost circle, until on the day of the next summer solstice their rate of speed is again at its minimum. In connexion with this discussion of the swiftness of the sun, the *Sūryaprajñapti* treats of the question of the distance from which the light of the sun becomes visible to the inhabitants of the *Bharata-varsha*. By this distance we have, however, to understand not the distance of the sun from the *Bharata-varsha* in a straight line, but rather that part of the sun's daily circle which lies between the point of the sun's rising and the meridian. It is well known, says the Commentator, that the sun becomes visible to the eye of man at a distance equal to half of the extent (*kshetra*) over which he travels during the whole day, *i. e.*, at the time of his rising, his distance from us (=from our meridian, although this is not expressly stated in the *Sūryaprajñapti*) is half of the arc which he describes during the whole day. The length of this arc has to be measured simply by the time which the sun takes to travel through it. Thus, for instance, on the longest day the sun is visible to the inhabitants of the *Bharata-varsha* during eighteen *muhūrtas* out of thirty; from the moment of his rising he will therefore take nine *muhūrtas* to come up to the point straight in front of us (to the meridian). Now we have seen before that on the longest day the sun travels over  $5,251 \frac{2}{60}$  *yojanas* in one *muhūrta*; consequently he travels in nine *muhūrtas* over  $47,263 \frac{2}{60}$  *yojanas*. This therefore is the distance—expressed as an arc of the diurnal circle—at which he becomes visible to the eye of man. On the shortest day on the other hand the sun is visible for twelve *muhūrtas* only; we have therefore to multiply the amount of his motion in one *muhūrta* by six in order to find the distance at which he first appears to the eye of man on that day.

Regarding the swiftness of the sun four other opinions are recorded by the author of the *Sūryaprajñapti*. According to some teachers, the sun travels in one *muhūrta* over six thousand *yojanas*, and as far as it appears this rate of motion is the same in whatever circle the sun is moving. How these teachers accounted for the fact of the sun taking the same time to travel through a large circle as through a small one is not explained. The

amount of space illuminated on each day (the *tāpakshetra*), expressed as arc of the diurnal circle of the sun, they calculated in the same manner as the author of the *Sūryaprajñapti*, *viz.*, by multiplying the amount of motion in one *muhūrta* by the number of the *muhūrtas* of the day. Thus the *tāpakshetra* on the longest day would amount to 108,000 *yojanas*, that on the shortest day to 72,000 *yojanas*. According to the opinions of two other schools, the motion of the sun in one *muhūrta* amounts to 5,000 *yojanas* or 4,000 *yojanas*. Here too nothing is said about any variation in the sun's speed at different times of the year. The *tāpakshetra* is calculated in the manner stated above. The last opinion mentioned is that of some teachers who held the rate of speed of the sun to be different during different periods of the day. According to them, the sun passes over six thousand *yojanas* in the *muhūrta* after his rising and in the *muhūrta* preceding his setting, over four thousand *yojanas* during the *muhūrta* in the middle of the day and over five thousand *yojanas* in all other *muhūrtas*.

The various opinions prevailing with regard to the rising and setting of the sun are detailed in the first chapter of the second book. The opinion of the author clearly appears from what has already been stated. There is no real sunrise or sunset; the sun or rather the two suns revolving round Mount Meru appear to rise to the inhabitants of some particular place at the moment when they enter their field of vision, and they appear to set when they leave it. In reality they always move above the *Jambudvīpa* at the same height, estimated by the *Sūryaprajñapti* to amount to eight hundred *yojanas*. At the beginning of the *yuga* at sunrise on the first of *Srāvaṇa* the *Bhārata* sun becomes visible to the *Bhārata-varsha* having reached the south-east point of his diurnal circle; diametrically opposite to it, *viz.*, in the north-west point of the same circle the *Airāvata* sun appears to rise to the inhabitants of the tracts north of Mount Meru. During the course of this day the *Bhārata* sun therefore illuminates the countries to the south; the *Airāvata* sun those to the north of Meru. At the time of sunset the *Bhārata* sun having passed through the southern segment of his circle disappears from the view of the people south of Meru and enters the view of those west of Meru; these latter therefore have their day while it is night in *Bhārata-varsha*. At the same time the *Airāvata* sun appears to have set to the people north of Meru and to have risen to those east of Meru. On the second day the *Bhārata* sun rises to the countries north of Meru and the *Airāvata* sun to the *Bhārata-varsha*. On the third morning the *Bhārata* sun has completed a full circle and therefore again rises to the *Bhārata-varsha* while the *Airāvata* sun again rises to the regions north of Meru. And so on *ad infinitum*. We may recall here a parallel passage from the *Vishṇupurāṇa* (II, 8), tending to illustrate how sunrise and sunset were conceived to take place on the hypothesis of the sun (the *Purāṇas*

know of one sun only) moving round Meru. “The sun is stationed at all times in the middle of the day (*i. e.*, it is always midday at that place above which the sun is) and over against midnight in all dvīpas. In the same manner rising and setting are at all times opposite to each other in all the cardinal and intermediate points. When the sun becomes visible to any people, to them he is said to rise, and wherever he disappears from the view there his setting is said to take place. Of the sun which is always (above the earth) there is neither setting nor rising; his appearance and disappearance are called his setting and rising.”\*

The Sūryaprajñapti adds an interesting account of other views regarding the sideways-motion (*tiryag-gati*) of the sun. According to some the sun is not a divinity, but only a mass of rays which in the morning form themselves in the East into a globular shape, pass sideways along this visible world, and in the evening dissolve again in the West. This process repeats itself daily. According to others the sun is the well-known divinity; but each morning he is born anew according to his nature in the ether in the East (*svabhāvād ākāśa utpadyate*), passes along this world and dissolves (*vidhvamsate*) at evening in the ether in the West. According to others the sun is the mighty everlasting god known from the Purāṇas; in the morning he rises in the East, passes over this world, and at evening sets in the West; from thence he returns below to the East, illuminating the parts below. This—the commentator says—is the opinion of those who hold the earth to be a globe; it finds great favour at present among the tīrthāntarīyas and is thoroughly to be studied in their Purāṇas. This opinion has three sub-divisions. Some say the sun returning at daybreak from the parts below rises in the ether (*ākāśe*) and sets in the ether; others say he rises or originates (*uttishṭhati utpadyate*) in the morning on the summit of the mountain of rising (*udaya-bhūdhara-śirasi*) and perishes (? *vidhvamsate*) in the evening on the summit of the mountain of setting (*astamaya-bhūdhara-śirasi*); this repeats itself daily. (But, if he “*utpadyate*” and “*vidhvamsate*,” how can he pass under the earth during the night?). Others say he rises in the morning on the mountain of rising and enters in the evening into the mountain of setting, illuminates during the night the subterraneous world and rises again from the mountain of rising. Others say, he rises, that is, originates from the eastern ocean in the morning, pe-

\* Mr. Fitz-Edward Hall (*Wilson's Vishṇu Purāṇa*, Vol. II, p. 242) directs our attention to the “heliocentricism” taught in this passage. But clearly there is no trace of heliocentricism to be found in it. He apparently is misled by the words अर्कस्य सर्वतः सतः which he translates “of the sun which is always in one and the same place.” But this translation is quite untenable, since the Vishṇu Purāṇa most unambiguously teaches the sun's revolution round Mount Meru.

rises at evening in the western ocean (same objection as above); others again, he rises from the eastern ocean, enters at evening into the western ocean, passes during the night through the subterraneous world, rises again from the eastern ocean. The last opinion mentioned is not very clear and an account of it is therefore not given in this place.

The third and fourth books contain particulars about the tápakshetra, *i. e.*, that part of the Jambudvīpa which on each day is illuminated by the sun or rather by the two suns. The shape of this tápakshetra the Sūryaprajñapti compares to that of a kalambuká-flower turned upwards, a comparison which has to be understood in the following manner. Each of the two suns illuminates a sector of the large circle formed by the Jambudvīpa. These sectors are, however, not complete, but a piece is cut off from each by Mount Meru which standing in the middle of the circle repels by its own superior radiancy the rays proceeding from the two suns and therefore is not included in the tápakshetra. The interior border of the sectors is thus formed by a part of the circumference of Mount Meru, their outward border by a part of the circumference of the Jambudvīpa. Between these two sectors of light there lie two sectors of shade (*andhakāra*); whatever part of the Jambudvīpa is covered by the two former enjoys day at the time while it is night in the regions covered by the dark sectors. As the two suns revolve these four sectors revolve with them, sweeping over the whole extent of the Jambudvīpa and producing alternate day and night in all its parts. The relative magnitudes of the tápakshetra during the different parts of the year is estimated in accordance with the statements about the relative length of night and day. On the longest day the two suns, moving in the innermost circle, together illuminate three-fifths of the Jambudvīpa, each of them three-tenths; on the shortest day they illuminate two-tenths each, together two-fifths. On the day after the summer solstice when the suns have entered into the second circle, and are moving at a greater distance from the centre, the extent of the tápakshetra decreases

accordingly, so that it then equals  $\frac{3}{5} - \frac{1}{5 \times 183} = \frac{3}{5} - \frac{1}{915}$  of the

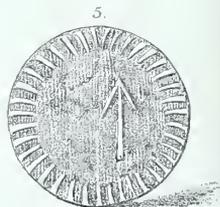
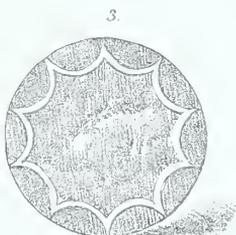
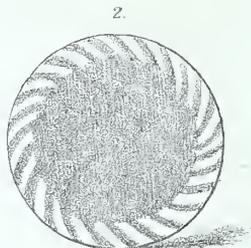
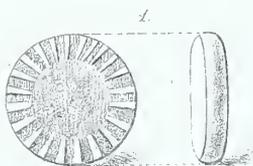
whole Jambudvīpa only; the same decrease repeats itself daily up to the day of the winter solstice when the extent of the illuminated portion of the Jambudvīpa has reached the minimum stated above. From that period it again begins to increase by the same portion daily. From this the absolute dimensions of the tápakshetra or, to express it more conveniently, of one of the two sectors composing the tápakshetra are easily derived. The two straight lines by which it is limited are equal in length to the radius of the Jambudvīpa less the radius of Mount Meru (50,000 — 5,000 = 45,000 *yojanas*). To this we find in one passage of the Sūryaprajñapti added the sixth part of the breadth of the salt ocean surrounding the Jam-

budvīpa, up to the end of which the light of the sun seems to reach, on the longest day at least; this gives altogether  $78,333\frac{1}{3}$  yojānas (=  $45,000 + \frac{200,000}{6}$ ). In the statements regarding the measure of the two arcs limiting the sector, no reference is made to the salt ocean. We find these measures for the longest day by dividing the circumference of Mount Meru as well as that of the Jambudvīpa by ten; three of these ten parts of the first kind give the interior arc of the truncated sector, three of the second kind the exterior arc. On the shortest day we have to take twentieths instead of three, and there is no difficulty in finding the corresponding increase or decrease on all days between the summer and winter solstice. In the same manner the dimensions of the andhakāra, the dark portion of the Jambudvīpa, are readily ascertained. Finally some statements are made about the distances to which the light of the two suns reaches above, below and towards both sides. It is said to reach to a thousand yojanas above (above the chariot of the sun, svavimānād ūrdhvam). Further it is said to reach down to the depth of 1,800 yojanas, for which the following explanation is given. The sun is at the height of 800 yojanas above the earth, and below the surface of the earth at the depth of 1 000 yojanas are the subterraneous regions (adholaukikagrāmāḥ), down to which the sun's rays are penetrating. No further details about these subterraneous dwellings are given. Towards both sides, the east and the west, the light of the sun is said to extend to the distance of  $47,263\frac{2}{10}$  yojanas.

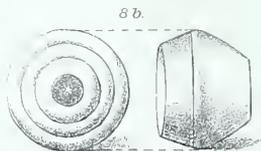
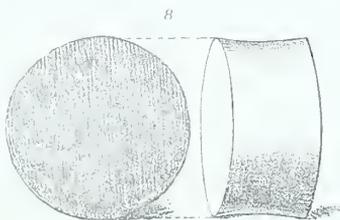
For the sake of completeness, the various other opinions with regard to the subjects treated in the last paragraphs are added. Some say that the sun and moon illuminate one dvīpa and one ocean; while according to others the numbers of dvīpas and oceans illuminated are 3,  $3\frac{1}{2}$ , 7, 10, 12, 42, 72, 142, 172, 1042, 1072. No details are given. One chapter contains the enumeration of a number of very fanciful opinions about the form of the tīpakshetra, which it would, however, be purposeless to extract in this place.

On the assumption that the sun describes every day a circle which is at the distance of  $2\frac{4}{1}$  yojanas from the circle described on the preceding day, the question naturally suggested itself, how the sun passes over from one circle into the next one. This question is treated in I, 6, and II, 2 where two different opinions are expounded which, although the account given of them is not altogether clear, appear to be of the following nature. According to some the sun enters from one circle into the other, "bhedaghātena" which (bheda being explained to signify apāntarāla) seems to mean that the sun passes from one circle into the next one by moving over the distance separating the two all at once. Thus the sun would really move in perfect circles and the motion across from one circle into the





From Alabaster's  
The wheel of the Law.



From Gastaldi's  
Italian Antiquities  
(See No 42.)

SPINDLE WHORLS ETC. FOUND AT SANKISA BEHAR  
AND OTHER BUDDHIST RUINS.

other would be a momentary one only. The other opinion, and to this the Súrýaprajñapti seems to adhere, is that the sun does not in reality move in separate perfect circles, but rather in an uninterrupted spiral line. As the Súrýaprajñapti expresses it, the sun begins from the moment he has entered the first circle to move "śanañ śanañ" across towards the second circle, and as soon as he has reached the second circle, he begins to move towards the third circle, etc. The term "karṇa" which occurs in this description of the sun's motion seems to denote the spiral line which passing across the whole room between the two circles connects the two; a line which might properly enough be called "karṇa," *i. e.*, diagonal. On this hypothesis then we should have to remember that the sun is only for convenience sake said to describe a separate circle on each day, and that in reality he is supposed to describe a continuous spiral line.

After having thus given a succinct account of the Súrýaprajñapti's theory concerning the motion of the sun, we now proceed to consider the statements referring to the motion of the moon.

(*To be continued.*)



*Memorandum on Clay Discs called "Spindle Whorls" and votive Seals found at Sankisa, Behar, and other Buddhist ruins in the North Western Provinces of India.—By H. RIVETT-CARNAC, ESQ., C. S., C. I. E., F. S. A. (With three Plates.)*

Last year I submitted for the inspection of the Asiatic Society specimens of stone and clay discs, similar to what are called "spindle whorls" by the Antiquaries of Europe, found by me at the Buddhist ruins of Sankisa, Behar, &c. in the Fatehgarh District, N. W. Provinces of India. Certain clay seals stamped with the Buddhist formula found in the same localities were also exhibited. The resemblance between these "spindle whorls" and those described and figured by Dr. Schliemann in his work "Troy and its Remains" was briefly noticed by me at the time. Since then I have obtained some more specimens of these discs and seals, and I think it well that they should be submitted for the inspection of the Asiatic Society, and that the attention of its Members and of other Antiquaries should be directed to the resemblance to be traced between these remains and those found in the ruins of Hissarlik and in many parts of Europe.

First as regards so called "spindle whorls." When we were encamped at Kanouj, Sankisa and Behar Khas in the Fategarh district, the village urehins were encouraged to bring to us everything in the shape of "Antiquities" that could be grubbed out from these extensive ruins and from neighbouring mounds. These sites, as is well known, present many features

of resemblance to those which Dr. Schliemann dug through at Hissarlik, described at length in his work upon Troy. That is to say, it is generally found in the case above-mentioned that the site has been selected on account of some Kunker Hill which, rising out of the flat alluvial soil of the Doab, offers a point of vantage for the building of a fort or city. Here, as at Hissarlik, these sites often bear the traces of several distinct colonies. The mud buildings of one set of colonists have been razed by their conquerors or successors to build thereon houses and temples which have again been levelled to form the foundations of the habitations of later settlers. The high mounds, on which part of the present town of Kanouj is perched, is to be accounted for in this way, and there can be little doubt that if shafts were to be earried through the ruins there, after the manner adopted by Dr. Schliemann at Hissarlik, the traces of several distinct periods might be unearthed. What has been said of Kanouj holds good in regard to Sankisa, Ramnuggur and other ruins. Much has not yet been done to explore these localities, and the recent interesting find of Mitra coins, reported by me to the Society, indicates that careful investigation might prove remunerative to antiquarian research. The heavy rains of India are, however, of much assistance in running amateur sections through the ruins, and in exposing from time to time relics of more or less interest. Amongst these may be classed the "spindle whorls" now to be noticed, many of which together with coins, beads, etc. are collected and set aside by the villagers as possessing some mysterious significance, and are brought out for sale when the District Officer or some occasional visitor camps near the place.

Of these clay discs and their stone prototypes four distinct classes are to be noticed:

A. Terra Cotta Discs, plain and ornamented.

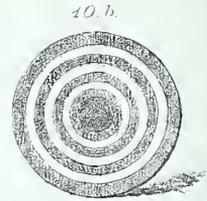
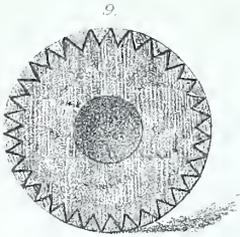
B. Ditto with a hole through the centre.

C. Terra Cottas "in the form of a top and the crater of a volcano" (I use the words of Dr. Schliemann, *Troy*, p. 38 to describe these peculiar specimens).

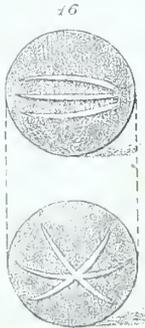
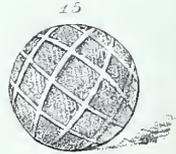
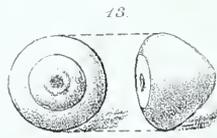
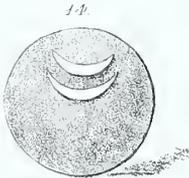
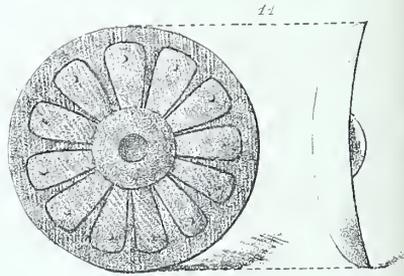
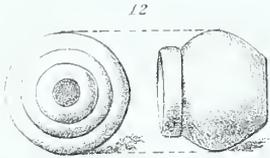
D. Clay Balls, plain and ornamented.

With respect to A, Clay or Terra Cotta discs, these were brought to us in enormous quantities, and, if disposed to do so, we might have purchased and carried off several elephant loads of this description of relic. At the time I did not attach much importance to them, and am sorry now that no careful selection was made of those bearing different styles of ornamentation. They are all of red or black clay well baked. In size they vary from 1 inch to 2 inches in diameter and are about  $\frac{1}{4}$  of an inch in thickness. The majority of them bear a rough ornamentation at the edges only, see Plate XIII, sketches 1 and 2. Others again show traces of more elaborate design and workmanship. Some of these are figured in sketches 3 to 7.





10. From Schliemann (p. 137)



19. Glass Enamelled bead.

Engraved by W. Newman & Co. Calcutta.

H. Rivet-Corner

SPINDLE WHORLS ETC FOUND AT SANKISA BEHAR AND OTHER BUDDHIST RUINS.

On one, No. 5 of my sketch, will be seen the broad arrow noticeable on Sehlmann's No. 458. On another, No. 6, is what looks like the sign of Saturn or what Dr. Sehlmann calls the "mystic rose," well known on Buddhist coins and in Buddhist art. They all have more or less ornamentation at the edges, resembling the spokes of a wheel or possibly the rays of the sun.

I also obtained at Sankisa several stone discs of nearly the same shape as the Terra Cottas. They are all highly polished. One is of black marble, another of crystal. Several are of red marble, and the material must have been brought from a distance, as no stone save kunkur is to be found within many miles of Sankisa. It will be noticed that all these stone specimens are grooved at the edges, see the section in sketch No. 8, whereas but few of the clay specimens have received such treatment.

Type B, sketch No. 9, on Plate XIV consists of clay discs similar in most respects to the foregoing, save that a hole has been drilled through the centre of each. I did not pay any particular attention to the proportion in which these different classes were brought to me in camp. But I find that I have many more of the plain discs than of those which have been pierced. There can be little doubt, however, that many hundreds of the pierced ones might have been obtained on the spot, and I am sending to ascertain whether any more ornamented specimens are procurable. The specimen marked and figured in sketch No. 10 is of grey granite. It bears the same relation to the pierced clay discs as the stone and crystal discs mentioned above bear to the clay whorls of type A. In the centre is a hole, round which are six concentric circles.

The specimen figured in sketch No. 11, is of a somewhat different type from the foregoing, as a section of the sketch will explain. The impressions of the spokes of a wheel with dots between each spoke appear to have been made in a stamp or mould. I find I have only two of this class in my collection. But doubtless hundreds more might have been obtained had I not been afraid of burdening myself during the march with too large a collection of such specimens.

Of type C, Sketches Nos. 12 and 13, on Plate XIV, which may be described in Dr. Sehlmann's words as being in the form of a "top or crater of a volcano" I have, I find, but 4 or 5 specimens; I have little doubt that large numbers were offered to me, but at the time they did not appear to possess any particular significance. It was only in tumbling out a large number of discs from the box, in which they had long been kept, that I recognised this type of the illustrations of Dr. Sehlmann's book, just consulted with reference to the Discs A and B mentioned above. The specimens I have with me do not bear any marks of ornamentation. Further search may perhaps bring better specimens to light. (Since this was written some ornamented ones have been found.)

Lastly we have type D, Clay Balls, Plate XIV, sketches Nos. 14, 15, 16, resembling somewhat those figured by Dr. Schliemann. Several of them are roughly ornamented, and the designs, such as they are, will be seen from the sketches.

I hardly know how it happened that these specimens were carried away by me. Certainly no importance was attached to them at the time; and they would have escaped my notice altogether, had I not seen, when comparing the clay discs, the sketches of somewhat similar balls figured in the last pages of Dr. Schliemann's book.

Lastly, I have also figured two specimens Nos. 17 and 18 which seem to approach type C. And an enamelled glass bead No. 19.

This bead is similar to that figured in Thomas' Prinsep, Pl. IV, No. 13. These beads are found in large quantities together with crystal, onyx cornelian and others at Sankisa and similar ruins. It seems desirable to figure the specimen with this paper in order to ascertain whether similar ones are found in Europe or elsewhere. The village urchins during the rains make a practice of collecting these beads, and they are usually given to *fakirs* or devotees. Seeing such a necklace worn by an old *fakir* led me to enquire whence the beads came. And I had little difficulty in procuring a variety sufficient for about nine necklaces.

I have now to direct attention to the resemblance between the specimens above described and figured, and those discovered by Dr. Schliemann at Hissarlik and noticed at great length and figured in large numbers in his well known work upon Troy.

As regards type A, clay discs more or less ornamented, without the central hole, I cannot be quite certain that this type was found by Dr. Schliemann. I do not see that any distinct mention is made of unpierced discs, and it is not quite clear from the sketches in Dr. Schliemann's work, whether, what is referred to as the Central Sun on the Discs figured in plates 22 and 23, is a hole drilled through the centre or is a depression or ornamentation representing the sun. Still, even if this particular type was not found at Hissarlik, it is found in Italy, and, as will be shewn further on, the resemblance between the remains found at Hissarlik and those of Italy is referred to by Dr. Schliemann.

Dr. Schliemann writing of his discoveries at page 187 of his work above quoted, thus refers to the discs:

"During the last few days we have also found, in the strata next above the primary soil, at a depth of from 46 to 36 feet, a number of round brilliant black terra cottas of exquisite workmanship; most of them much flatter than those occurring in the higher strata and resembling a wheel; many are in the shape of large flat buttons. But we also meet with some in the form of tops and volcanoes which differ from those found in the higher strata only by the

fineness of the terra cotta and by their better workmanship. The decorations on these very ancient articles are, however, generally much simpler than those met with above a depth of 10 meters (33 feet) and are mostly confined to the representation of the sun with its rays, or with stars between the latter, or of the sun in the centre of a simple cross, or in the middle of four or five double or treble rising suns. At a depth of 6 meters (20 feet) we again found a round Terra Cotta in the form of a volcano, upon which are engraved three antelopes in the circle round the sun.

"At a depth of from 5 to 8 meters ( $16\frac{1}{2}$  to 26 feet) a number of terra cotta balls were found, the surface of each being divided into eight fields; these contain a great many small suns and stars, either enclosed by circles or standing alone. Most of the balls, however, are without divisions and covered with stars; upon some I find the swastica and the tree of life, which, as already said, upon a terra cotta ball found at a depth of 26 feet, had stars between its branches." (Schliemann's *Troy*, p. 187.)

The above extract embraces not only the so-called spindle whorls, but mentions the volcano-shaped "whorls" of type C found at Sankisa and type D brought away by me from the same place. The discs were found by Dr. Schliemann of terra cotta, of marble and of crystal. So at Sankisa did we find clay, marble and crystal discs.

A comparison of the Plates appended to Dr. Schliemann's volume with the specimens submitted by me and the sketches which accompany this paper will, I think, shew that there is at least some resemblance between the remains found at Hissarlik and those at Sankisa.

On nearly all these discs will be seen what are constantly referred to as the spokes of the wheel or the rays of the sun. I have placed side by side with my sketches a copy of the whorl engraved by Dr. Schliemann at page 137. It might fairly be taken to be a representation of the whorl given in Plate XIV, Sketch 10 appended to this paper.

Then my collection is unfortunately in no way large or complete. When at Sankisa, I had little idea of the significance of these remains or their resemblance to well known types, and I only purchased a few of them in the manner that I collect everything that seems to be unusual or strange. Further search may possibly bring out even more remarkable points. The few specimens that I have succeeded in obtaining bear, however, a resemblance, not only in shape, but also in ornamentation, to those figured by Dr. Schliemann, sufficient to render the subject interesting. The broad arrow of my Sketch No. 5 and the Mystic Rose or sign of Saturn, or the numeral four of my Sketch No. 6, are all to be traced among Dr. Schliemann's specimens; and then again on the balls some similarity in ornamentation is to be traced.

It would perhaps hardly be right to attach much importance to the

fact, that one or two clay discs were found in Buddhist remains in India, and that discs of somewhat the same type were unearthed at Hissarlik. But here we have, not only pierced discs of type B, but the Volcanoes C and the Balls D, all three types resembling in some degree the three types of Hissarlik and all three types bearing somewhat similar forms of ornamentation.

Again it is to be noticed that the remains at Sankisa are undoubtedly Buddhist. Sankisa as is well known was a celebrated place of pilgrimage, being sacred as the spot at which Buddha is supposed (as described by General Cunningham, Vol. I, *Archæological Reports*) "to have descended from the Trayastrinsa heaven by the ladder of gold or gems, accompanied by the gods Brahmá and Indra."

The place was visited and described by the Chinese pilgrim Fa Hian early in the 5th century, and by Hiouen-Tsang in the 7th century A. D. A detailed account of these interesting ruins will be found in General Cunningham's *Archæological Report* above alluded to.

Now the ornamentations on the Terra Cottas of Hissarlik, if they are not Buddhist, certainly bear a close resemblance to the ornamentations on coins, buildings, etc., which in India are generally supposed to be Buddhist.

Thus the wheel continually recurs in Schliemann's sketches, together with the Swastika. And what Schliemann calls the Mystic Rose, and Fergusson the Trisul ornament is quite as frequent. The Sacred Tree, the Fire Altar and the Deer are also almost as common. In fact, we have every one of the Buddhist symbols of the well known type of the so-called Buddhist coin, figured in No. 1, Plate IV, Thomas' Prinsep, and of which an engraving is given at page 17 of Fergusson's *Indian and Eastern Architecture*. Mr. Fergusson points out, however, that there is some doubt whether these symbols really are Buddhist, and at the page above referred to, writes, "One coin of the period is well known. It belongs to a king called Kunanda or Krananda generally assumed to be one of the nine Nandas with whom this dynasty closed. In the centre on one side, is a dagoba with the usual Buddhist Trisul emblem over it, and a serpent below it: on the right the sacred Tree, on the left the Swastika with an altar (?) on the other side a lady with a lotus (Sri ?) with an animal usually called a deer, but from its tail more probably a horse, with two serpents standing on their tails over its head which have been mistaken for horns. Over the animal is an altar, with an umbrella over it. In fact a complete epitome of emblems known on the monuments of the period, but savouring much more of Tree and Serpent worship than of Buddhism as it is now."

Dr. Schliemann at page 38 of his work refers to the resemblance between the Terra-Cottas of Hissarlik and those of Italy. This directed my attention to Gastaldi's work. The following extract will show that if it be considered that the resemblance between the remains at Sankisa

and Hissarlik is not established, such doubt can hardly exist regarding the Indian and Italian remains.

Gastaldi says: "There are very many of these objects, for the greater part of Terra-Cotta, more or less discoidal, or conical, or spheroidal, pierced in the centre, to which the Archæologists of France and Germany, as well as our own, have given the name of spindle-whorls. The paste of the spindle-whorls is not, for the most part equal to that of earthenware; instead of the grains of sand, we find powdered carbon and ashes; the colour is ashy in the internal parts, and ash colour varying into yellow and red on the outside. Some few spindle-whorls are black, and of a substance probably similar to the thinner vases, and, like a great number of these, are shining externally as if with varnish. They are very various in form; and although eight different ones have been represented by you, from those which, in the course of the summer, we sent from Campeggine, courteously presented by the brothers Coceoni, not one represents the other six, collected in the sequel, in the marl-beds. Some few bear marks scratched upon them, and are among those you have had engraved (Fig. 25).

"Besides all the spindle-whorls of earth, there were dug up from the marl-beds of Castellazzo di Tontanellato, three others, which are cut out of different substances. One was made out of a stag's horn, it is in the shape of a cone, and is very highly polished; the second of stratite, of a greenish tint, and spheroidal; the third, of a whitish limestone (calcare), is disc-shaped, brought to a high degree of polish, and certainly manifests an advanced epoch in art among the people who used such implements. Among the objects in the Museum of Antiquities at Parma, which are of uncertain derivation, there are twenty spindle-whorls, some in limestone, stratite, and even amber, but the greater part of earth; some are polished, some are ornamented with circles, concentric with hole pierced in them, or in concentric lines disposed in groups on the back of the spindle-whorl. We find among these the transition from the more depressed discoidal form, almost medallion (nummulik) to the acute conical. Some one of those in terra cotta is said to have been collected from the ruins of the Roman City of Velieia. The different forms, finish and substances of the spindle-whorls would lead us to suppose that they must have served for various uses in proportion to their diversity; perhaps the most beautiful and carefully worked were amulets, or else buttons; the others weights, used either for nets or in weaving."

"Besides all the earthenware and all the spindle-whorls which we have spoken of, we meet in the marl-beds with other small objects in earth, badly baked, in form disc-shaped, without any hole, sometimes ball-shaped (pallottola), of which it is impossible to divine the use which they served."

(Lake Habitations and Prehistoric Remains in Northern and Central Italy. B. Gastaldi, pp. 44, 45, 46, 47.)

In Italy these mysterious articles are found of clay and marble, as in India. The ornamentation is the same and in Italy also are found the disc-shaped *Terra Cottas without any hole* similar to those of North Western India. It is hardly necessary to burden this paper with any more sketches. The Italian remains are almost exactly the same as those of Schliemann, but I cannot resist the temptation of copying the specimen marked 8 B which will be found figured at p. 45 of Gastaldi's work. It is almost identical with No. 12 of those figured by me.

Next as to the use to which these remains were placed. Dr. Schliemann discusses the subject at length in several places in his valuable work on Troy. And it will be seen that Gastaldi is puzzled as to their significance. Dr. Schliemann arrives at the conclusion that, although some of them may have been used as spindle-whorls, the greater number of them were votive offerings. And Gastaldi considers that some at least were amulets. The symbols on most of those found at Hissarlik would seem to leave little doubt of their religious character. Of the Indian specimens, it is not easy to say why some should have the central hole and others should be unpierced. But, if they are votive offerings, the fact that the pierced ones were found in smaller quantities at Sankisa than those without the hole, may possibly be explained by a practice, which was noticed by me years ago at some shrines of pilgrimage in the Central Provinces. There the pilgrim, when he makes a vow or implores a favour, smears his right hand with red colouring matter, and impresses it, fingers upwards, on the wall of the temple, leaving there a mark like the Red Hand of Ulster. If the favour, the birth of a child or whatever it may be, is granted by the presiding deity, the pilgrim is supposed to return to the shrine the following year, and to impress on the wall a similar mark, the fingers of the hand this time pointing downwards. It was very noticeable that the latter marks were well in the minority, and it was carefully explained by the local priests that this was not to be accounted for by the supposition that the deity was slow in his favours, but that, in truth, the suppliants, when they had obtained what they wanted, were not always mindful to return and to fulfil their vows. Perhaps in this way the proportion of the unpierced to pierced discs may be explained. The unpierced ones being offered when a favour was implored, the pierced ones when it was obtained.

Be this as it may, the view that these discs are votive offerings is supported by the religious character of the symbols, already alluded to, found on the whorls of Hissarlik and Sankisa. Since I commenced to write this paper, I have received a copy of Alabaster's "Wheel of the Law." At Fig. 8 A will be found a copy of the sketch of the Buddhist wheel of the





Length 5 inches

All full size except N<sup>o</sup> 7.

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CLAY SEALS ETC. FOUND AT SANKISA AND OTHER BUDDHIST  
RUINS IN N. W. PROVINCES OF INDIA.

Cole

law given in that work. And it is almost unnecessary to point out the resemblance which the highly ornamented Disc No. 7 bears to this sketch. The other discs, though not so elaborately ornamented, seem to adopt the same idea. No. 11, as far as ornamentation is concerned, undoubtedly resembles a wheel, though, as the section will show, it can never have been used, as some of my friends have suggested, as the wheel of a toy cart; nor indeed are there any marks of wear on any of the wheel-shaped discs to support the view that they were used for miniature playthings of this description. It seems much more probable that they were votive offerings intended to represent, more or less the Buddhist wheel of the law, similar to that stamped on some of the coins recently submitted by me to the Society.

The view that these were indeed votive offerings, and not toy cart wheels or *pachisi* or draughtsmen, as some have suggested, is further borne out by the large numbers of clay discs, of a somewhat similar type, but bearing on them the well known Buddhist formula, found in the same neighbourhood. These seals, as they have sometimes been called, from their bearing a seal-like impress, have been figured by Moor in his Hindu Pantheon and have been described by General Cunningham, by Dr. Rajendralála Mitra, C. I. E. and others. General Cunningham, if I remember right, found large quantities of such "seals" made of lac in the Buddhist ruins of Behar. Though my stay at Sankisa was short, I succeeded in obtaining a considerable number of these seals. Many of them are from the same stamp. Others from different moulds bear the same well known formula commencing "*ye dharma hetavo.*" The character of the legend in all these cases is comparatively modern. Those, however, marked 1 and 2 Plate XV bear the formula in the Gupta character. Others again marked 3 to 6 are deserving of notice from the variety of their ornamentation. They would seem all to have been made and stamped, in what I may call, a cushion-like fashion, after the manner of the quaintly-shaped Mitra coins recently submitted by me to the Society. Some of these seals are I think worthy of being figured in the Society's Journal.

There can be little doubt that these so-called seals, bearing the Buddhist formula, are votive offerings. A friend of mine, Mrs. Murray-Aynsley who recently travelled through a portion of Ladakh, brought me thence two stones, one inscribed with a portion of the Buddhist Formula, Plate XV, No. 7, the other bearing a conventional ornamentation. That these stones are offered in the present day, will be seen from the following extract from Mrs. Murray-Aynsley's work entitled "*Our Visit to Hindostan, Kashmir and Ladakh,*" p. 88.

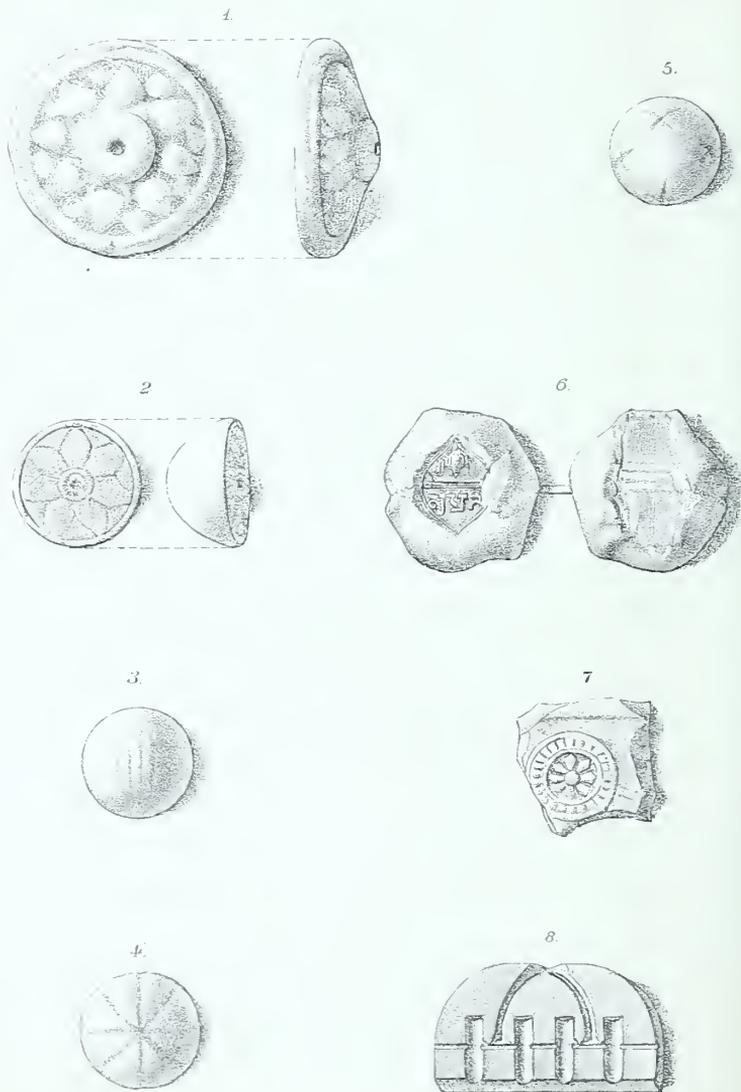
"We there first saw some of the walls called *Mánés*, which are formed of stones placed one upon the other without any mortar, and are

usually about four feet high, and four feet wide. Some of these walls are as much as a quarter of a mile in length, and are made, we were informed, with the following object. When a Buddhist undertakes a journey, or makes a vow, he chooses a flat stone, takes it to a monastery, and gets a lama (or monk) to engrave some rude characters upon it, which are said to be usually, 'Om mani padme Om,' which has been translated to mean, 'All hail to the jewel in the flower of the lotus!' though some give other interpretations to these words. When his stone is thus prepared, the individual places it on the top of one of these walls, which on their upper surface are almost covered with such engraved stones. Thibetans when passing these walls, always keep them on their right hand, and frequently go out of their direct road in order to do this."

There would seem, then, to be little doubt that the Terra-Cottas, plain and ornamented, and those also bearing the formula of the Buddhist faith, were votive offerings of a by-gone age.

In what little I can do to further the objects of the Society, I generally try to content myself with bringing facts to notice, and pointing out the resemblance between the remains found in India and those discovered in other parts of the world. It must be left to those who are better informed than myself, or who are more fortunate in being able to consult what has been written by authorities on the subject, to determine whether there is any real significance in the resemblance between the remains found at Sankisa and those of Hissarlik and Italy. I am not unprepared for the argument that a knife is a knife all the world over, and that this form of implement must have suggested itself to all people at an early stage of civilisation; and that the fact of implements in the form of knives having been found at Hissarlik and at Sankisa would not be sufficient to establish any connection between the settlers at these widely separated sites. It may also be urged that earthen spindle-whorls might naturally enough suggest themselves to different races situated far apart from one another. But surely there is something more than a chance resemblance in the several types of these remains and the style of their ornamentation? And does not the continual recurrence of, what we call, the Buddhist symbols on the Hissarlik finds, suggest the possibility of Hissarlik and Sankisa having been colonized by branches of the same race, be it Buddhist or not, one of which striking west from some point in Central Asia, found its way to the shores of the Mediterranean, whilst another, taking a southerly course, established itself in the Gangetic valley?





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SPINDLE WHORLS ETC FOUND AT SANKISA BEHAR AND OTHER BUDDHIST RUINS

*Supplementary Memorandum.*

(With a Plate.)

Since writing this Memorandum on spindle-whorls, I have received from Sankisa a further consignment of these peculiar remains.

In my paper recently read before the Society I mentioned that the flat discs, plain and perforated, were to be found in large quantities. I have received a further large consignment. But the perforated ones are much less numerous than the others. It is unnecessary to send any more of these types.

Of what Schliemann calls the volcano-shaped *Terra Cottas* I have received several more. This bears out my view that they are numerous. Nos. 1 and 2, Plate XV*a*, are interesting from their decoration. The one it will be seen is decorated on the top. The other is decorated on the base with what would seem to be a flower and in a manner resembling the *Hissarlik* types.

I send also three more balls, Nos. 3-5. These are ornamented with stars, crosses and with lines. Several others of the same type have since reached me.

I have obtained many more clay seals of the same type as those already sent. One only marked No. 6 is different in its character from those already submitted to the Society.

No. 7, is a fragment of pottery highly ornamented with the rosette or wheel of the law, or whatever it may be, common on Buddhist remains.

I should be glad of any explanation of the peculiar piece of soapstone marked No. 8. Its ornamentation is curious. The grooves at the top will be noticed. It may possibly have been worn as an amulet.

Further enquiries are being made at Sankisa, and I hope to be able to obtain many more specimens showing various forms of ornamentation.

It has been suggested that the curious balls of various sizes with their different markings may have been intended to represent the sun, moon and stars.

I see that the genuineness of the antiquities found at Sankisa and Behar is doubted by some. But these sites do not see on an average one European visitor a year; as yet no one save myself has collected there these specimens, and so it is hardly to be supposed that the native mind has yet been sufficiently prepared to attempt to provide forgeries for a possible future trade in such articles.



*Note on some copper Buddhist coins.*—By H. RIVETT-CARNAC, Esq., C. S.,  
C. I. E., F. S. A.

(With two Plates.)

I send for the inspection of the Society, some coins, mostly Buddhist from my Cabinet, some of which may perhaps prove of interest. They will not all, I think, be found described or figured in the works most readily accessible to Members, and it is possible some of them may be new types. I am indebted to Mr. A. Carlleyle of the Archæological Survey for the readings on the coins.

Plate XVI, Nos. 1, 2. Legend *Vaisakha Devasa*. Two coins, if they may so be called, of the same type differing in size. They are evidently *casts, i. e.*, have been made in a mould prior to the time the art of stamping was discovered. On one side is the Bull taking here the place of the Elephant common to the earlier coins. The name tolerably clear above the Bull. On the obverse what looks like the Trisul of the Sanchi Topes, and the snake. I should be glad to know if this coin is known to the Society?

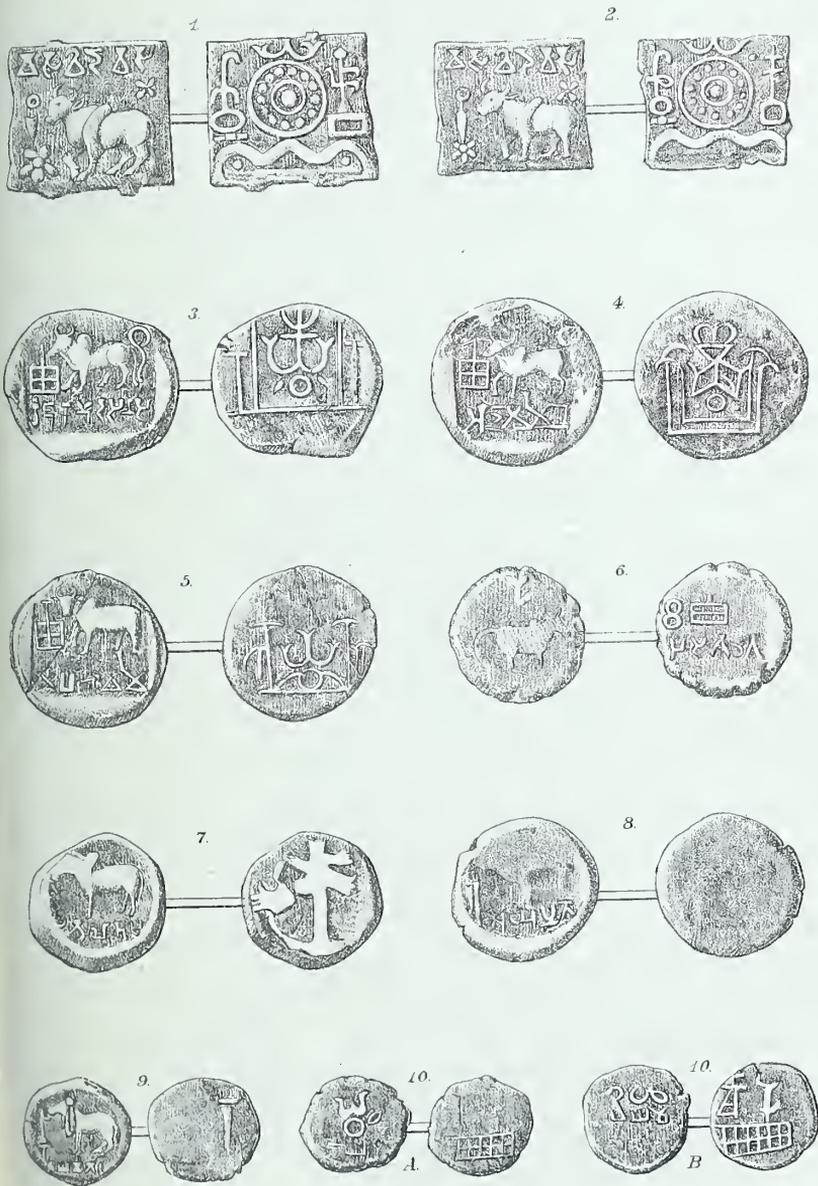
No. 3. Legend *Rāja Kamuda Senasa*. This coin resembles the preceding ones in several respects. The Bull again occupies the most prominent place. The legend is beneath the Bull; near the head of the Bull is the sacred tree. Behind the Bull is the snake. At first sight this has the appearance of an elaborate tail of the Bull. But a careful inspection will show that the tail is separate and quite distinct. On the obverse is the well known ornament which I think Fergusson calls the "Trisul," though it is different enough from Shiva's trident. It will be noticed that the marks on these coins have apparently been stamped in the same manner as those of the Mitras, found near Barelli and recently submitted by me to the Society. The Bull and Legend have been stamped in, as if with a square seal, and cover but a portion of the circular piece of metal. Perhaps these coins represent some of the earliest attempts at coining?

No. 4. Legend *Aja Varmma* or *Asha Varmma*; a coin of the same type as above; the legend differing.

No. 5. Legend *Maphaba Varma*. The same remarks apply here also. The coin has been cut in two, and was just going to the melting-pot when I was fortunate enough to rescue the two pieces from a quantity of rubbish. It is to be feared that a good many coins are thus lost to us. All the above were obtained by me at Faizabád.

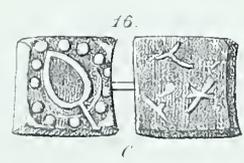
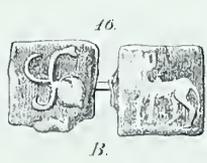
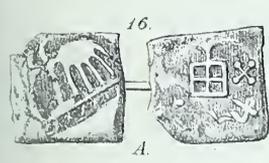
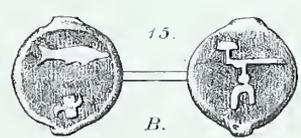
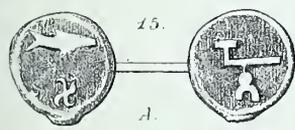
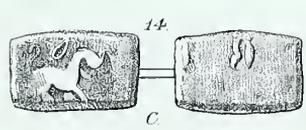
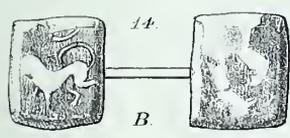
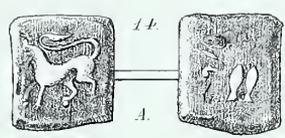
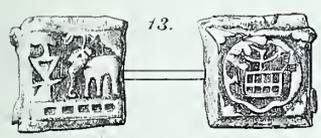
No. 6. *Maha Satama*. A coin apparently of the same type as above but in bad preservation.

No. 7. *Saiya Mitrasa*.



COPPER BUDDHIST COINS.







No. 8. *Ayu Mitrasa.*

No. 9. *Saya Mitrasa.*

All of the well known "Cock and Bull" type, but new names I believe.

No. 10. *Yaya Mitra* (two specimens).

Plate XVII No. 11. *Vyaya Mitra.*

These coins seem much older than the preceding ones.

No. 12. (Lion) *Laranga* or *Larata* or *Lájusa.* (Tree) *Súgáta-Yana-pya.*

This coin is quite a different type from the preceding. On one side is a Lion much resembling the carvings found among the ruins of old Buddhist Temples.

No. 13. A pretty little Buddhist coin of a type I have not yet seen figured. The sacred tree is encircled by the snake forming a sort of rosette in the centre of the coin.

No. 14. These three little oddly-shaped specimens have all well stamped on one side what looks like the conventional Heraldic Lion. On the other side may be traced marks somewhat resembling the sign *Pisces* of the Zodiac.

No. 15. Two specimens of a coin which is perhaps new. On one side what looks like a Fish as in the preceding coins, on the other a Thor's Hammer (?) or perhaps the sign of Saturn combined with some other sign in such a manner as to form a monogram?

No. 16. Three little coins of sorts.

I should be glad for information regarding the dynasties, dates, &c., of these coins.



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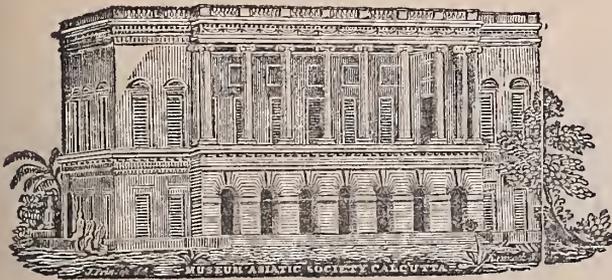
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Vol. XLIX, Part I, No. IV.—1880.

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THE PHILOLOGICAL SECRETARY.



"The bounds of its investigation will be the geographical limits of Asia: and within these limits its inquiries will be extended to whatever is performed by man or produced by nature."—SIR WILLIAM JONES.

\* \* \* *Communications should be sent under cover to the Secretaries, Asiat. Soc., to whom all orders for the work are to be addressed in India; or, in London, care of Messrs. Trübner and Co., 57 & 59, Ludgate Hill.*

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# JOURNAL

OF THE

## ASIATIC SOCIETY OF BENGAL.



Part I.—HISTORY, LITERATURE, &c.

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No. IV.—1880.

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*Remarks on the Afgháns found along the Route of the Tal Chotíali Field Force, in the Spring of 1879.—By* LIEUT. R. C. TEMPLE, B. S. C., F. R. G. S., M. R. A. S. &c. (With 3 Plates and 2 Maps).

(Concluded from page 107.)

### PART II.

#### III. *Distribution of the Tribes.*

In the above description of the Tribes along the Tal Chotíali Route their distribution *en route* has been but briefly referred to. In the next Table the names of the tribes inhabiting the villages on the accompanying map are shown. And it will be seen that as a rule the Pathán Tribes and Sections stick pretty well together and are generally to be found in certain compact districts and nowhere else.\* Thus Achakzais are confined to the region about To'BA and the KHO'JA AMRÁN range, and the To'R TARÍNS to the Pishin Valley. Among the Kákar sections the same thing is to be observed. The AMAND KHE'L occupy the country about the north of the Pishin to Mt. KAND and the SULIMÁN KHE'L the range dividing the Pishin and Do'F Valleys, the MEHTARZAIS all the country to the north of the R. Ro'd Gorge and the PÁNÍZAIS that to the south of it and so on. Even where the country seems to be pretty well divided between sections, as the Do'F

\* Villages of mixed populations are to be found in the more settled parts, such as the Pishin, Do'F, and Gwa'L Valleys, though not commonly, and when it is said that a certain village is occupied by a certain subsection or section it is meant that the main portion of the inhabitants belong to it. As a rule, however, villages are not mixed.

Valley and the Ro'd River Gorge, it is divided only among a few, as only BÁZAIS, SHAMOZAIS, SURGARAI, MALAGAIS, ISA' KHE'LS and SARA'NGZAI amid the surrounding MEHTARZAI and PANÍZAI are found in the districts in question. Sayads do not seem to have penetrated into the Kákar country beyond the R. Ro'd, near which there is one village of them, and a few SPÍN TARÍNS are said to be about ALÍZAI in the Pishin, but practically there seems to be no communication between the SPÍN and the To'R TARÍNS. The DUMARS probably occupy all the country to the south of the SHO'R Valley from Mt. MAZHWO to the TAL Valley, but in the ZHO'B Valley the tribes seem to be mixed, though the ZHO'B Valley Kákars seem to be a section apart and to hang together.

| Tribe.  | Division. | Section.  | Subdivision. | Subsection.    | Village.           | District. |
|---------|-----------|-----------|--------------|----------------|--------------------|-----------|
| DURA'NI | ZI'RAK    | PO'PALZAI | ...          | SADOZAI        | PO'PALZAI          | PISHIN.   |
|         |           | BA'RAKZAI | ...          | MOHAMMADZAI    | ASAD KHA'N         | Do.       |
|         |           | "         | BAHA'DURZAI  | "              | KHU'SHIDIL KHA'N   | Do.       |
|         |           | ACHAKZAI  | "            | KA'KOZAI       | MIR'EKALAM KHA'N   | Do.       |
|         |           | "         | "            | "              | KA'KOZAI           | Do.       |
|         |           | "         | "            | ABDAL          | KALA ABDULLA KHA'N | Do.       |
|         |           | "         | "            | "              | TANGAI             | Do.       |
|         |           | "         | "            | "              | MADAT              | Do.       |
|         |           | "         | "            | HABI'UZAI      | HABI'ULLA          | Do.       |
|         |           | "         | GAJANZAI     | "              | BADWAN             | Do.       |
| TARI'N  | To'R      | BADOZAI   | ...          | LU'R KHA'NIZAI | MOHAMMAD SA'DIK    | Do.       |
|         |           | TARI'N    | ...          | "              | LA'L MOHAMMAD      | Do.       |
|         |           | "         | "            | "              | VAKI'L             | Do.       |
|         |           | "         | "            | "              | DAB KHA'NIZAI      | Do.       |
|         |           | "         | "            | "              | GAURI              | Do.       |
|         |           | ALI'ZAI   | ...          | "              | SAYAMZAI           | Do.       |
|         |           | "         | "            | "              | ALI'ZAI            | Do.       |
|         |           | "         | "            | "              | ATA' MOHAMMAD      | Do.       |
|         |           | "         | "            | "              | SOPANZAI           | Do.       |
|         |           | "         | "            | "              | NU'RZAI            | Do.       |
|         |           | NU'RZAI   | ...          | "              | SKAN               | Do.       |
|         |           | KULAZAI   | ...          | "              |                    |           |



| Tribe. | Division. | Section.  | Subdivision. | Subsection. | Village.         | District            |                    |          |
|--------|-----------|-----------|--------------|-------------|------------------|---------------------|--------------------|----------|
| KA'KAR |           | MEHTARZAI | ...          | ...         | MEHTARZAI        | Do.                 |                    |          |
|        |           | "         | ...          | ...         | BARGAI           | Do'F.               |                    |          |
|        |           | "         | ...          | ...         | TARAI            | Do.                 |                    |          |
|        |           | "         | ...          | ...         | SADOH            | Do.                 |                    |          |
|        |           | "         | ...          | ...         | JAFIR GOT        | GWA'L.              |                    |          |
|        |           | "         | ...          | ...         | SRAGHAR          | Ro'd R.             |                    |          |
|        |           | "         | ...          | ...         |                  | Gorge.              |                    |          |
|        |           | "         | ...          | ...         | ZAGAN KACH       | Do.                 |                    |          |
|        |           | PA'NI'ZAI |              | "           | ...              | ...                 | AMADU'N            | Mt. P'L. |
|        |           |           |              | "           | ...              | ADIZAI              | Go'GAI             | Do.      |
|        |           |           |              | "           | ...              | "                   | Ro'dGAI            | Do.      |
|        |           |           |              | "           | ...              | "                   | SHAMA'WAN          | Do'F.    |
|        |           |           |              | "           | ...              | no subsection named | SA'GHAI            | Do.      |
|        |           |           |              | "           | ...              | ...                 | BALOZAI KA'RE'Z    | Do.      |
|        |           |           |              | "           | ...              | ...                 | KHA'NI'ZAI KA'RE'Z | Do.      |
| "      | ...       |           |              | ...         | SHAKAR           | Do.                 |                    |          |
| "      | ...       |           |              | ...         | GWA'L            | GWA'L.              |                    |          |
| "      | ...       |           |              | ...         | MANZAKAI         | Do.                 |                    |          |
| "      | ...       |           |              | ...         | CHAKU'UL         | Do.                 |                    |          |
| "      | ...       |           |              | ...         | Bo'sTA'N         | Do.                 |                    |          |
| "      | ...       |           |              | ...         | WARFA KACH       | Ro'd R.             |                    |          |
| "      | ...       |           |              | ...         |                  | Gorge.              |                    |          |
| BA'ZAI |           |           |              | "           | ...              | ...                 | BEAHIMA'N          | Mt. P'L. |
|        |           | "         | ...          | ...         | MURGHAI          | Do'F.               |                    |          |
|        |           | "         | ...          | ...         | DILSHO'R         | Do.                 |                    |          |
|        |           | "         | ...          | ...         | SAFKHA'N KA'RE'Z | GWA'L.              |                    |          |
|        |           | "         | ...          | ...         | NI'LAI           | Do.                 |                    |          |
|        |           | "         | ...          | ...         | KARAM            | Do.                 |                    |          |
|        |           | "         | ...          | ...         | AKHUNDZA'DA GOT  | Do.                 |                    |          |
|        |           | "         | ...          | ...         | KO'SH KACH       | Ro'd R.             |                    |          |
|        |           | "         | ...          | ...         |                  | Gorge.              |                    |          |
|        |           | "         | ...          | ...         |                  |                     |                    |          |





| KĀ'KĀR | SANDAR | KHĒ'L             |                     |                  |        |
|--------|--------|-------------------|---------------------|------------------|--------|
|        | "      | "                 | DARGAI              | DARGAI           | Do.    |
|        | "      | "                 | SHABOZAI            | SHABOZAI         | Do.    |
|        | "      | "                 | MU'R                | LO'WE' MU'T      | Do.    |
|        | "      | "                 | ...                 | KUCHNAI MU'B     | Do.    |
|        | "      | "                 | WAHA'R              | KAN WAHA'R       | Do.    |
|        | "      | "                 | "                   | LO WAHA'T        | Do.    |
|        | "      | "                 | "                   | NAVGIYYĀ'LA      | Do.    |
|        | "      | "                 | no subsection named | DI'LAI           | Do.    |
|        | "      | "                 | "                   | KUZARAI          | Do.    |
|        | "      | "                 | "                   | TUGARAI          | Do.    |
|        | "      | "                 | "                   | KO'WANDAI        | Do.    |
|        | "      | "                 | "                   | SARKA'RE'Z       | Do.    |
|        | "      | "                 | "                   | CH'INAI          | Do.    |
|        | "      | "                 | "                   | SARGHARAI        | Do.    |
|        | "      | "                 | "                   | DA'TO'R          | Do.    |
|        | "      | "                 | "                   | KACHAI           | Do.    |
|        | "      | "                 | "                   | KANA'            | Do.    |
|        | "      | "                 | "                   | TO'RA            | Do.    |
|        | "      | "                 | "                   | CHA'GAI          | Do.    |
|        | "      | "                 | "                   | NAVGIYYĀ'LA      | Do.    |
|        | "      | "                 | "                   | MU'ITAT          | Do.    |
|        | "      | "                 | "                   | LA'HO'R          | Do.    |
|        | "      | "                 | "                   | SA'GAI           | Do.    |
|        | "      | "                 | "                   | SHARAN           | Do.    |
|        | "      | "                 | "                   | SHA'BA'N         | Do.    |
|        | "      | "                 | "                   | SHARAN KA'RE'Z   | Do.    |
|        | "      | "                 | "                   | KACH             | Do.    |
|        | "      | "                 | "                   | SARGHAR          | Do.    |
|        | "      | "                 | "                   | BARMINAI         | Do.    |
|        | "      | "                 | "                   | CHINA' KO'T      | Do.    |
|        | "      | "                 | "                   | NAIGWA'L         | Do.    |
|        | "      | "                 | "                   | PAIND KHAN' KO'T | Do.    |
|        | "      | "                 | ...                 |                  | LU'NI. |
|        | LU'NI  | no sections named |                     |                  |        |
|        | KHĒ'L  |                   |                     |                  |        |

| Tribe. | Division. | Section.   | Subdivision.        | Subsection. | Village.             | District. |
|--------|-----------|------------|---------------------|-------------|----------------------|-----------|
|        | LU'NI     |            | ...                 | ...         | LASHKAR KHA'N        | Do.       |
|        | KHE'L     | none named | ...                 | ...         | LU'NI                | Do.       |
|        |           | "          | ...                 | ...         | NU'R KHA'N           | Do.       |
|        |           | "          | ...                 | ...         | ALAB                 | Do.       |
|        |           | "          | ...                 | ...         | SHAGWA'L             | Do.       |
|        |           | "          | ...                 | ...         | SOBA'T               | Do.       |
|        |           | "          | ...                 | ...         | CHI'NAI              | Do.       |
|        |           | "          | ...                 | ...         | MISRI'               | Do.       |
|        |           | "          | ...                 | ...         | SAMANDAR KHA'N       | Do.       |
|        |           | "          | ...                 | ...         | SARA'GI'             | Do.       |
| ?      | SAYAD     | KARBE'LA   | ...                 | ...         | KARBE'LA             | PISHIN.   |
|        |           | SAYAD      | ...                 | ...         | SHA'H DA'D           | Do.       |
|        |           | "          | ...                 | GANGAI'ZAI  | SAYAD PAIYO          | Do.       |
|        |           | "          | ...                 | BAGARZAI    | SAYAD ALAB           | Do.       |
|        |           | "          | ...                 | "           | AJABZAI              | Do.       |
|        |           | "          | ...                 | "           | SHA'DI'ZAI           | Do.       |
|        |           | "          | ...                 | ...         | SAYAD LA'L           | Do.       |
|        |           | "          | ...                 | ...         | SAYAD KHAMA'NDAI     | Do.       |
|        |           | "          | ...                 | "           | SAYAD DO'ST MOHAM-   | Do.       |
|        |           | "          | ...                 | "           | MAD                  |           |
|        |           | "          | ...                 | ...         | HAIDARZAI            | Do.       |
|        |           | "          | ...                 | ...         | SAYAD TO'TI          | Do.       |
|        |           | "          | ...                 | ...         | SAYAD SHE'RBAT       | Do.       |
|        |           | "          | ...                 | ...         | SAYAD SA'LO          | Do.       |
|        |           | "          | ...                 | URUMZAI     | SAYAD MU'LLA ALLA'H- | Do.       |
|        |           | "          | no subsection named |             | DAD                  |           |
|        |           | "          | ...                 | "           | SAYAD PAIND          | Do.       |
|        |           | "          | ...                 | "           | HAI'ZI'              | Do.       |
|        |           | "          | ...                 | "           | TURKHE'L             | Do.       |
|        |           | "          | ...                 | "           | SHAGHI'N             | Do.       |
|        |           | "          | ...                 | "           |                      | Ro'd R.   |
|        |           | "          | ...                 | "           |                      | Gorge.    |

IV. *Polity.*

The portion of Afghánistán along the route may be divided into that formerly subject to the Amír of Kábul, and that acknowledging no superior authority, into, in fact, the Amír's Territory and the country of Independent Tribes. The Amír's power never seems to have extended beyond the Do'F Valley to the eastwards further than ÍSAF KACH, or further north in that direction than Mt. KAND, *i. e.*, the inhabitants of the ZHO'B Valley and all the country south of it eastwards of the Do'F Valley have never recognised him as their ruler. The tribes then under the Amír's sway were the Durá-nis, the Tór Taríns and such Kákars as inhabited the Do'F and GwÁL Valleys, while the bulk of the Kákars, the Lúnis, the Zarkháns and the Spín Taríns have always been independent. For the purposes of this paper the country will be divided into Amír's Territory and YA'GHISTÁN or Independent Territory.

Under the Amír, Government in our sense of the term there was none, though the head of the Governmént nominally ruled through his Sirdárs or heads of tribes and sections, having, however, little real control over them. And how this system was worked has been thus described.\* “The Sovereign is absolute and makes any and every change which may appear to him necessary or proper in the government and administration. He can dispose of the lives and property of his subjects and is kept within certain bounds in these respects only by the calculations which prudence dictates. Religion is the counterpoise to his authority. This gives the clergy great influence, one that he might try in vain to subject to his will and pleasure, and vainer still would be the attempt to infringe and invade the rights and privileges of the sirdárs or chiefs of tribes, who would never consent to resign a certain influence in the affairs of government. It may be said in Afghánistán that there are as many sovereigns as sirdárs, for each of them governs after his own fashion. They are jealous, turbulent and ambitious, and the sovereign can restrain and keep them in some order only by taking advantage of their rivalry and feuds and opposing one to the other. There is no unity, nothing is permanent, everything depends on the pleasure or caprice of a number of despots always at variance with each other and making their tribes espouse their personal quarrels. A constant feeling of irascibility is the result which finally leads to sanguinary civil wars and throws the country into a state of anarchy and perpetual confusion. The sirdárs are at one and the same time the strength and the curse of the monarch. Prompt to take arms and defend him when a good understanding between them exists, they are as ready to revolt against him when they find or think they have the smallest interest in doing so. In anything,

\* Macgregor's Gazetteer.

however, to which they are disinclined, they would not obey even the sovereign of their choice but with reluctance; moreover they are always impatient to see him replaced by another from whom they hope to obtain greater advantages. Each subdivision of a tribe is, according to its numerical force and extent of territory, commanded by one or more sirdárs. These chiefs may be compared to the dukes and barons of the middle ages in France, the more powerful to the knights bannerets, and those having authority over only a few families to the esquires who in time of war enrol themselves and their men under the orders of the chief that inspires them with the greatest confidence and can pay them best.\* The most powerful amongst them are caressed by the sovereign who attaches them to his interests much more by the concessions he makes than by the fear he inspires. Ordinarily and with a view to preserve a nominal authority over them, he remits the whole of the taxes and imposes in their stead the obligation to furnish a contingent of troops in the event of war being declared against him by his neighbours. This wretched system gives too much power to the Sirdárs. The sovereign is at their mercy, and it is the ambition of these men that gives birth to the numerous civil wars in Afghánistán; for they are constantly in revolt."

Such being the state of civil government in the Amír's Territory, the only difference to be observed in the Independent Territory is, that the local Sirdár, or whatever other local chief happens at the time to be the most powerful, is absolutely uncontrolled even by the semblance of superior power. The above-mentioned independence of the Sirdárs and their impatience of superior control is to be observed in numerous instances even in the Kháns or rulers of villages, being of course more pronounced in YA'GHISTA'N than in the Pishin and other portions of the Amír's Territory. To give an example. In the Pishin the ruins of a village called SAYAD SA'LO or URUMZAI were passed. It had been but recently destroyed by a more powerful neighbouring village called SAYAD PAIND in a quarrel between the two Kháns. The URUMZAI'S had to fly altogether out of Afghán Territory across the Belo'ch Border to KHU'SHLA'K where they settled. They appear to have been hunted across the Border by the other village without any attempt at interference on the part of the neighbours. Again not far from this last were two villages, Old and New MA'LIKYA'R, the old village having been deserted on account of an internal dispute and a new site selected a few miles off. The same thing was to be observed at a place called WARIA'GAI in the Bo'RAI valley, where an evidently lately ruined village called Old WARIA'GAI was passed. I was informed it had become so about five years before on account of an internal squabble. Like the

\* The very remarkable parallel to be observed politically between the Afgháns and the Mainotes of Greece I have elsewhere pointed out. J. U. S. I. of India, 1880.

Barons of European feudal times these village Kháns seem to exercise the right of private war on their neighbours without control or interference. Certain villages have acquired an evil name for this kind of truculence. KACH in the SHO'R valley is such a village. Nor is a fight or quarrel always a necessary reason for a change of site, any caprice or change of owners is sufficient. A case in point is the fort of HA'JÍ KHÁ'N (AMAND KHE'L) in the Pishin. And towards the Border by the HAN Pass, in the long stretch of disputed land about the passes, ruined villages are naturally to be seen in the more exposed parts of the LU'NI KHE'L, ZARKHÁ'N and SPÍN TARÍN country on the Afghán side and in BA'RKHO'M on the Beloch side, the result of endless border raids. The lawlessness of the GHILZAIS along the roads between Kandahár and Kábul has been noticed by former travellers, one of whom has written : \* " Every man distrusts his neighbour or is at open feud with him. It is the custom of the country to throw a heap of stones over murdered travellers, and in the ravine leading from SHILGAR to ZURMAT (Ghilzai country) the frequency of these heaps is sickening. In many cases they are to be found at the closed end of the ravines showing how the poor travellers have run as far as possible and then been cut down." The same may be remarked of almost any part of the Kákar country, and in that portion about Mts. MA'ZHWÖ and SPINSKHAR where the heights are crossed between the USH and NANGALU'NA Passes, there is a long narrow valley between low hills to be crossed, and in this it is hardly any exaggeration to say that these heaps may be seen but a few yards apart. The reason appears to be that persons going from the SHO'R and BO'RÁI Valleys or the DUMAR country from the south towards the Pishin must pass this way through a country which is for some thirty miles utterly uninhabited. In the wild uninhabited border tract about the HAN, HANOKAR and TRÍKH KURAM passes they may be seen in clusters in many places telling of some fights either among the local tribes themselves or with the Belóchis.

The mutual distrust among the tribes and even sections inhabiting different districts is so great as to result in an almost absolute ignorance of each other. They appear to have a real fear of going into each other's country and invariably give one another a bad character. Thus KÁ'KARS are an abomination to TARÍNS and ACHAKZAIS and LU'NIS to KÁ'KARS, while the wretched ZARKHÁ'N is harried on all sides. The ÍSA' KHE'L Kákar and the inhabitants of the GWA'L valley manifested an extraordinary fear of the PA'NÍZAI Kákar of the hills to the east of them. SANDAR KHE'L Kákar could not be induced to venture into the neighbouring LUNÍ territory and I did not personally meet a man who had been towards GHAZNI by the TO'BA Plateau or along the Tal Chótiáli Route. A guide

\* Macgregor's Gazetteer.

from the DO'F Balley an I'SA' KHE'L, showed the liveliest anxiety to get back again from ISPIRA RA'GHA and would not venture into the ZAKIPE'L Territory and an old UTMA'N KHE'L guide told me he had never ventured beyond the territories of his section of the KÁkars.

The structure of the houses in the more civilized parts, which in the hills consist of nothing more than rough mud and thatch, is a further proof of the general lawlessness of the population. In the GHAZGAI, BO'RAI and LU'NI Valleys, among the UTMA'N, SANDAE and LU'NI KHE'LS a house is nothing less than a fort round which, frequently within walls, is the cultivation necessary to support life, and when the crops are gathered they are stored in little round mud towers which I have shown elsewhere to contain just enough grain for one family for a year. In the DO'F Valley, however, I only saw one fort in a village called KIA'NIZAI KA'RE'Z and in the Pishin the villages were all open. Life in the Pishin among the TARÍNS and SAYADS seems to have been much more settled than elsewhere, but the ACHAKZAIS have a bad name as thieves and robbers.

Government among the Duránis differs considerably from that of the other tribes, noticeable chiefly in its regularity and order. Each section of the Duránis is governed by a sirdár and each subsection by a MALIK or MUSHIR. The principle is election qualified by hereditary claims, *i. e.*, the sirdár is elected from the chief family of the clan or section, and the malik from the chief family of the subsection. The sirdár has a deputy or naib always a near relative appointed by himself. Their occupation of the land is directly from the Amír on the condition of military service. Among themselves the Duránis do not as a rule resort to private revenge, hence internal blood-feuds do not exist among them as among other tribes. Their disputes are settled by the "JIRGA" backed up by the sirdár, by the interposition of the elders, by friends of the parties, by the priests (MULLAS), or by the civil and ecclesiastical judges (KA'ZI'S). The ACHAKZAIS, the section of the Duránis met with en route, are the wildest of those inhabiting South Afghánistán and are entirely a nomad race, hardly ever living in a house. They inhabit the TO'BA Plateau and during the summer roam over it with their flocks and spread themselves over the lower slopes of the KHO'JA AMRA'N Range about the KADANEI and Pishin Valleys during the winter, where their black tents or KIZHDAIS are to be seen everywhere. Their Sirdár is at present MÍR ASLAM KHA'N, son of MÍR ABDULLA KHA'N who built the well known fort or village of that name at the Pishin entrance of the KHO'JAK Pass.

The KÁkars and Independent PaṭhÁns do not apparently recognise any particular sirdár or chief, and probably any man rules who has the requisite force of character, though birth, on which an Afghán always sets such an extravagant value, is pretty sure to exercise considerable weight in

the selection of a ruler. Thus SAMANDAR KHA'N of the LU'NIS, now their leader, is the son or near relative of PAIND KHA'N their late ruler. SHA'H JEHA'N of KHASNO'B (ZHO'B valley) is a great man among the Kákars and GWARAT KHA'N among the SANDAR KHE'L.

#### V. *Civilization.*

As regards civilization, except as to dress, methods of cultivation and dwellings, but little could be observed in such a hurried journey as mine.

On the first point there is little to be noticed beyond what has been already written about it by the authors of the following:\* “The Afgháns wear their clothes long. They consist of two large very ample robes and are either of cotton or a cloth made of camel's hair† called BAREK: this is the dress of the people. The only difference in the garments of the rich is the material, which is silk, cloth or Kashmír. In summer they are made without lining, but in winter they are wadded with cotton or lined with fur. The under-garment is confined by a piece of muslin or long-cloth which is wound round the body. The outside one, and sometimes a third robe, is used as a cloak, and a person would be considered as wanting in politeness if on visiting a superior he did not put it on. The shirt is very full and the sleeves which reach below the hands particularly so.‡ The former is open to the sides from the neck to the waist and falls over the trousers, and these which are excessively large, open at the foot and are drawn in at the waist with a string. The head is covered by an enormous blue or white turban and the feet with slippers without quarters. The upper classes are for the most part simply dressed and consider luxury in this respect as enervating, but some young chiefs have their robes embroidered with gold thread and ornamented with gold lace. This is done in the harems by the women who excel in this kind of work, particularly in Kandahár. The Afgháns are not careful of their clothes and soil them the very first day they are put on, for they squat on the ground without taking the least thought whether the spot on which they sit is clean or dirty. They never change their garments, not even the shirt, until they are completely worn out, and as they rarely wash themselves they are constantly covered with vermin great and small.”

In the matter of dress excepting the Achakzais, the Duránis show as usual a considerable superiority over the other tribes. The following was found to be a fairly true description of their dress.§ “The Duránis about

\* Macgregor's Gazetteer.

† A thick white material like felt for the outer cloak is common about Kandahár and the Pishin, and to this is often added a “pósh'tín” or coat of skin with the hair turned inwards.

‡ The cloaks about Kandahár and all over the South have frequently long false sleeves reaching nearly to the ground.

§ Macgregor's Gazetteer.

towns, most of those in villages and all those of the shepherds who are in easy circumstances wear a dress nearly resembling that of Persia, which though not very convenient is remarkably decorous and with the addition of a beard gives an appearance of gravity and respectability to the lowest of the common people. The poorer Duránis, particularly among the shepherds, wear a wide skirt and mantle. The poor only change their clothes on Fridays and often only every other Friday, but they bathe once a week at least, and their prayers require them to wash their faces, beards and hands and arms many times in the course of the day. The little Kháns all over the country wear the Persian dress. Their coats are made of silk, satin, and a mixture of silk and cotton called *GARMSUT*, and sometimes of brocade, and they all wear shawl girdles and a shawl round their caps. Their cloaks also are of broadcloth often red or of silk of different colours." To the Achakzais the above remarks hardly apply except in a very general way. Their manner of dress is the same, but they seldom or never change their clothes as long as they last, and consequently go about in filthy rags often half tumbling off them. They are in dress as in everything else the most uncouth and uncivilized of the great clan to which they belong.

With regard to the Sayads, Taríns and Kákars, etc. met with en route there is little to be remarked except that they all wore the unmistakable Afghán dress. In the more civilized valleys as the Pishin, Dóf, Gwál, Ghazgai and the Bórai the dress was better and more respectable answering to the above given description of the Duráni dress.\* But in the hill districts especially in the elevated region about Mt. MÁZHwö the dress merely appeared to be a collection of dirty rags, the remains of what was originally the national costume. The PÁNÍZAIS, MEHTARZAIS, SARÁNGZAIS, AMAND and SULIMÁN KHE'LS, DUMABS and ZAKHPE'LS among the Kákars bear off the palm for dirt and squalor. The Ísá, UTMÁN and SANDAR KHE'LS are much cleaner and neater in appearance and altogether better dressed. The LU'NIS and ZARKHÁNS met with wore the dirtier and more ragged class of dress, but with the exception of the SANDAR KHE'L Kákars the Pishin Sayads were the best-dressed people I recollect to have seen on the road.

The dwellings were found to differ considerably in different parts of the route. Those about the Pishin and Dóf valleys were apparently constructed on the same principles, whether Sayad, Tarín, Achakzai or Kákar. Tribe indeed does not apparently affect the construction of dwellings so much as locality.

The most noticeable construction of hut is that to be found every-

\* Among the Sayads it was to be observed that the articles of dress were not homespun but of foreign manufacture, obtained probably during their many visits to Hindustán.



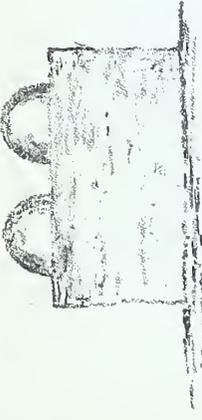


Fig. 1. Pathán Hut, Kandahar District.

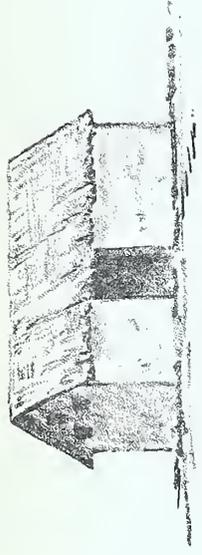


Fig. 2. Pathán Hut, Pishin Valley.



Fig. 3. An Achakzai Kizhdai or semi-permanent tent. Pishin and Kadaneí Valleys.

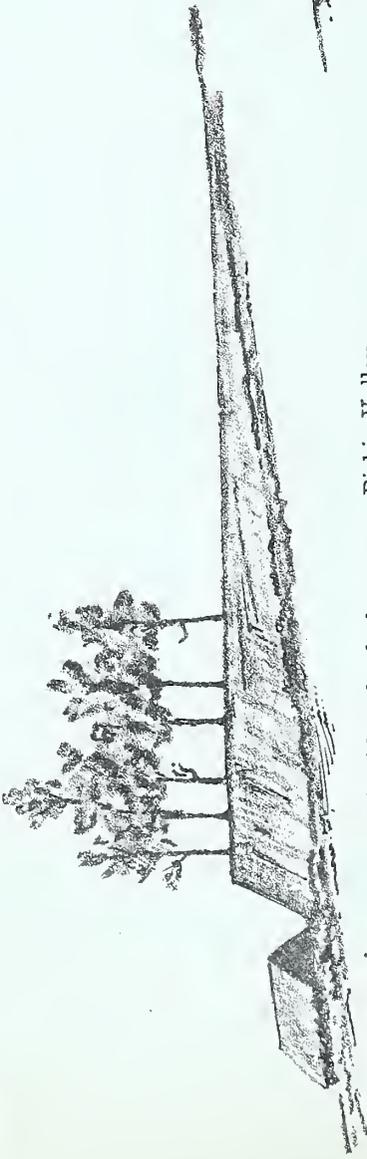


Fig. 4. Ásyá (watermill) with embanked stream. Pishin Valley.

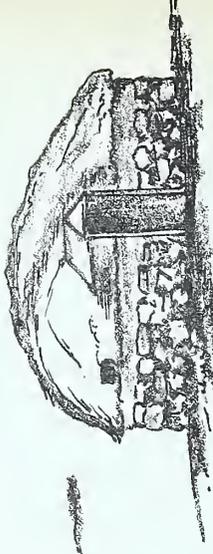


Fig. 5. Kákar Hut. Lower Gorge of the R. Ród (Ísaf Kach.)



Fig. 7. Mt. Syáigai, 9,000 feet (a landmark of the Shór Valley near Chirmján) from Khwárá looking east.



Fig. 8. Zakhpél (Kákar) Hut. Shór Valley. Chirmján.

where to the west of the ΚΠΟΪΑ ΑΜΡΑΝ Range. These are square dwellings of mud (kachhá) bricks about 20 feet by 12 feet and some 6 to 8 feet high surmounted by one or more small domes. In this method of construction wood is not required for the roof, a great consideration in a treeless country like South Afghánistan (*vide* fig. 1). But the hut of the Pishin Valley and neighbourhood has a sloped roof (fig. 2) supported on strong rafters, thatched and finally covered with mud. This roof is by far the most valuable part of the structure, and during their numerous migrations they carry away the wood-work to be set up in the new site. The usual measurements of such a hut are roughly: length 18 feet, breadth 6 feet, height of wall 6 feet and of roof 10 feet. They have no windows but usually three small holes at either end for air and smoke. A hut generally stands in a small yard surrounded by a rough stone or mud wall and sometimes there are two or three huts in the same enclosure.

As the mountainous regions between the Pishin and Shor Valleys are approached, the huts become much rougher though constructed on the same principles. They are irregular structures of mud over foundation walls of large unhewn and uncemented stones from the nearest stream or hill-side, and frequently also the back wall is the hill-side itself. The roof as before is of thatch covered with mud. There is also often a small window hole and the door frequently stands out from the roof on the principle of a dormer window (fig. 5). The general dimensions are height 10 to 12 feet, height of rough stone-work 3 feet, of mud wall 1 to 2 feet, length 10 to 12 feet.

Up in the mountains and in the upper gorge of the R. Ro'd the dwellings degenerate into a mere irregular thatch of leaves and brushwood of a pyramidal or conical form supported by a centre pole and having a door or entrance at one side. Frequently a hole is scooped out from the hill-side and thatched in, so as to form a rough kind of hut or dwelling. These conical huts measure generally: height 10 feet, diameter at base 10 feet (*vide* fig. 4).

On reaching the lower lands about O'BUSHKAI, KHWÁRA and CHIMJÁN, a hut very similar in appearance to that of the lower Ro'd Gorge is to be seen, the roof of which is irregular and of thatch covered with mud and supported on irregular rough stone walls cemented, so to speak, with mud. There is usually no gap for a window (*vide* fig. 8). The measurements are: length about 12 feet, height of wall 3 feet, total height 8 feet.

In the mountainous tract between the SHO'R and ZHO'B valleys the huts are very wretched and have the appearance of being of a temporary character. The floor is scooped out of the ground on the hill-side so as to save a back-wall, and a wall about 3 feet high is built up on three sides

surmounted by the usual mud-and-thatch roof. The interior height is about 6 feet and the length some 10 or 12 feet, breadth 6 feet.

But on reaching the GHAZGAI and BO'RAI Valleys, *i. e.*, the territories of the UTMÁN and SANDAR KHE'L Kákars, a notable difference in dwelling structure is observable. The houses, rather than huts, now to be seen are of mud, as in Belochistán, Sind and the Panjáb.\* In the GHAZGAI Valley they are all fortified after the fashion of these people, having frequently a look-out tower, which is sometimes square but generally circular, attached to them. The body of the building has the sloped thatch-and-mud roof of the Pishin valley. The entrances or doors are very low, being only 3 feet or so in height; the tower has also a separate entrance of a similar construction, and round the top of it is a row of loop-holes. The usual dimensions are: height of wall 4 feet, of hut 8 feet, of tower 12 feet, base of tower 6 feet square (diameter, if round, 6 feet), length of hut 16 feet (*vide* fig. 9).

In the BO'RAI and LU'NI Valleys were the best dwellings (figs. 10, 11, 13) I saw outside Kandahár in all S. Afghánistán, and I can hardly do better regarding them than repeat what I have elsewhere said.† “They are no longer huts, but have become houses with dimensions varying considerably; fig. 10 represents one of the smaller ones. They are built entirely of mud with flat roofs from which the water is carried by projecting spouts. They are generally fortified and have towers attached and usually only one door. Fig. 11 represents one of these fortified houses. The bulk of the houses, however, in the BO'RAI Valley are much larger than those above mentioned, and may be described as fortified structures of mud, surrounded by a mud wall some 12 feet high and covering sometimes nearly an acre of ground (*vide* fig. 13). They have usually several towers attached and one door; within the outer wall are a quantity of fruit trees, and the house probably contains a whole family. Generally also there is a low 3 foot mud wall extending round the fields belonging to the house probably for their protection. Three or four such houses often constitute a village. The fortifications of an UTMÁN KHE'L village are often supplemented by a small regular square mud fort or redoubt with corner towers. Forts of a similar description are also to be observed about the SANDAR KHE'L and LU'NI Territory, where the villages are generally a straggling collection of

\* In the Panjáb the walls of such a house (*kaehchá makán*) are built simply of wet mud (*gónghá*) without foundation (*bunyád*), then smoothed over with liquid mud (*kaigal*) and finally covered with a wash of cowdung and mud (*góbri*) and often also with whitewash (*sufédi*) or a coloured lime-wash (*rang*). The roof (*ehhat*) is of rafters (*khari*) covered with a light reed thatch (*sirki*), plastered over with mud or earth (*miṭṭhi*) and cowdung (*góbri*).

† J. R. G. S., 1880.

the large fortified houses above described. They have a well-built, substantial and prosperous appearance not often seen in the East. Sometimes a MALIK or petty chief will build himself a fort apparently as much for show as anything else. CHINÁ KO'T in the BO'RAI valley (fig. 14) is such a fort. The main interest in it is that it is quite new, not more than 20 years old, and so is a specimen of the modern method of KÁKAR fortification. It is on a small isolated hillock rising out of the valley, and is constructed as usual of mud on a rough stone foundation. The owner is one MALIK SANDÍ, an ALÍZAI SANDAR KHE'LS. The approach is by a causeway of very rough construction, and it is entered as usual by a single door so situated as to be easily commanded. The whole structure covers about an acre of ground".

The nomadic habits of the Duránis and especially of the Achakzai section of that tribe have been frequently noticed by former writers. Among the Kákars, too, are found several nomad sections, such as the SULTMÁN and AMAND KHE'LS of the Pishin and the bulk of the PÁNIZAIS, DUMARS, and ZAKHPELS; even the more fixed and agricultural sections of the Kákars, as the SANDAR and UTMÁN KHE'LS, and the LU'NIS have the nomadic instinct strong in them and spend all the hotter weather roaming with their flocks in the neighbouring hills. By far the greater part of the ACHAKZAIS have no fixed abode, but live in a curious kind of hut called a KIZHDAI, which has been thought peculiar to the Duránis, but as far as I could ascertain, it is common to all the nomad sections whether DURÁNI or KÁKAR. The KIZHDAI is a structure of bent willow rods or withies covered over with black felt-like blankets and sometimes with black matting (*vide* fig. 3). There are generally four or five of these willow supports in a row over which the covering is stretched. I saw one in the course of construction near ALÍZAI in the Pishin and the method of putting up the supports is that shown in fig. 15. The Kizhdais are very warm in winter and can be made, by opening out the sides, cool and pleasant in summer, and are also, from the closeness of the strands of the covering which swell with moisture, impervious to rain. They have for a nomad race the advantage of being as easily moved as an ordinary tent. In several Kizhdais of a permanent kind near villages I saw a regularly railed in space in the middle for goats and sheep. The usual dimensions are: height 4 feet, length 12 feet, opening or doorway 3 feet by 3 feet.

There are two other kinds of structure which are interesting in this connection. In the BO'RAI valley the SANDAR KHE'LS build small circular mud towers of peculiar make (*vide* fig. 12), raised on piles about 2 feet from the ground, in which they store grain containing as I have elsewhere shown\* about enough for five persons for one year. BUUSA (chaff or chop-

\* J. R. G. S., 1880.

ped straw for fodder) is kept in round mud-covered heaps containing about 100 to 200 maunds, as are turnips etc. in England for the winter. Grain of all sorts is also stored in sacks weighing about 100 seers, which are kept in the huts and sometimes buried in some place known only to the owner to save them from the rapacity of the numerous hangers-on of the Sirdárs or of the Amír.

Secondly, *ÁSYÁS* or watermills are noticeable objects everywhere. Their general features have been frequently before described, as they are common to Afghánistán, Persia and Turkistán, and the following from MacGregor will answer the internal description of them all: "The wheel is horizontal and the feathers are disposed obliquely so as to resemble the wheel of a smoke-jack. It is within the mill and immediately below the mill-stone, which turns on the same spindle with the wheel. The water is introduced into the mill by a trough so as to fall on the wheel. The wheel itself is not more than 4 feet in diameter."\* Externally they have always the appearance of the ordinary habitations round them, whatever the prevailing construction may be. They are to be found along the line of a *KŪL* or of a natural running stream, and often, to give the water greater power, a portion of the stream will be banked up for some distance before it reaches the mill (fig. 4). The roof is usually on a level with the banks of the stream. In places, as at *ÁLÍZAI* in the Pishin, long lines of *ÁSYÁS* and embankments are to be seen along the same stream (fig. 17).

There is little to be remarked under the head of cultivation beyond a notice of such methods of irrigation, etc., as came prominently under observation, for my journey was of too hurried a nature to admit of any investigation. In irrigation considerable skill is everywhere evinced in S. Afghánistán, especially in the direction of *KŪL*s or artificial water-courses, of *KÁRÉZES* or underground water-courses, and of groins and river dams. Wells are not seemingly in use for cultivation as in the Panjáb and Persia. The *KŪL* is well-known in all the northern districts of India and there is little to be added here, except to notice the general prevalence of this style of irrigation in S. Afghánistán, where along the *TARNAK* Valley it is used to such an extent as to dry up and disperse the water of the river: a state of things also noticeable along the rivers running towards the Indus and the *KACHÍ* Plain of Belúchistán. The entire flow of many mountain streams is frequently thus utilised, and great skill is often to be observed in the preservation of the levels; and in one place in the *BO'RAT* Valley I observed a *KŪL* carried under the stony bed of the *R. TO'E KHAIZE'* by a rough but practicable siphon.

\* Such watermills are common enough in the Himalayan districts, and I have in my possession a wooden bowl turned by a lathe worked by a water-wheel in a remote valley in *KŪLU'*.



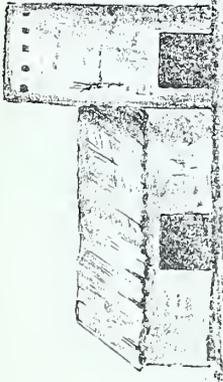


Fig. 9. Utmán Khél (Kákar) Hut. Ghazgai Valley. Ningánd.

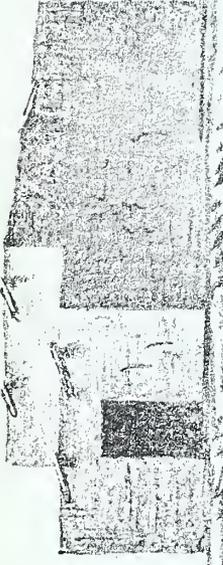


Fig. 10. Sandar Khél (Kákar) House. Bórai Valley. Waráagai.

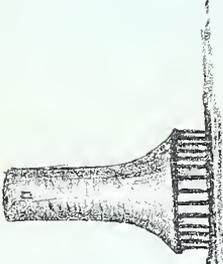


Fig. 12. Sandar Khél (Kákar) Granary. Bórai Valley. Waráagai.

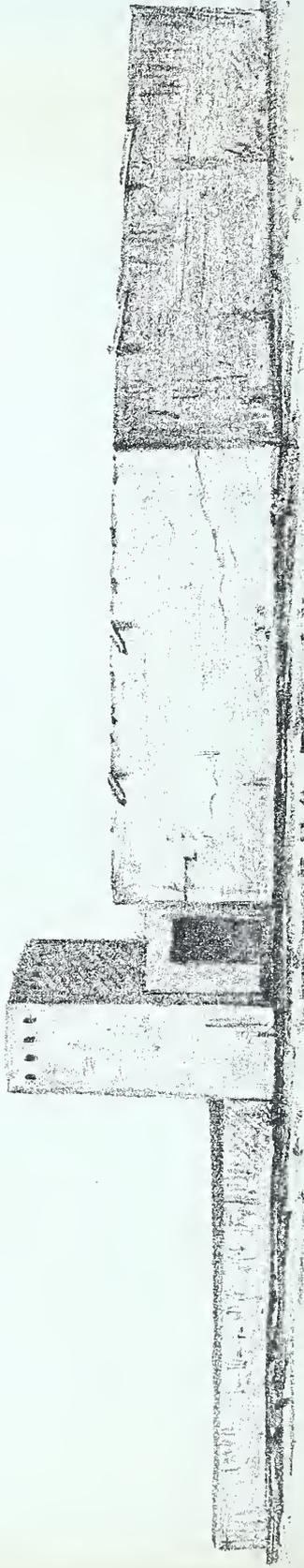


Fig. 11. Sandar Khél (Kákar) House. Bórai Valley. Waráagai.

R. C. Temple, del.

Zinographed at the Surveyor General's Office, Calcutta.

SKETCHES FROM AFGHANISTAN.

The KÁRE'Z has been frequently noticed by travellers in Central Asia beginning with Marco Polo, who, according to Ramusio's version, writes about "the wearisome and desert road in KERMÁN (KIRMÁN)", that\* "after those days of desert you arrive at a stream of fresh water running underground, but along which there are holes broken in here and there, perhaps undermined by the stream, at which you can get sight of it. It has an abundant supply and travellers worn with the hardships of the desert here rest and refresh themselves and their hearts." Col. Yule remarks on this (p. 116) "the underground stream was probably a subterranean canal (called KANÁT and KÁRE'Z) such as is common in Persia, often conducted from a great distance. Here it may have been a relic of abandoned cultivation". Khanikoff on the road between KIRMÁN and YEZD, not far west of that which I suppose Marco to be travelling, says: "At the fifteen inhabited spots marked on the map they have water which has been brought from a great distance and at considerable cost by means of subterranean galleries to which you descend by large and deep wells. Although the water flows at some depth its course is marked upon the surface by a line of more abundant vegetation." Elphinstone says he has heard of such subterranean conduits 36 miles in length" MacGregor describes the construction of a KÁRE'Z thus: "a shaft 5 or 6 feet in depth is sunk at the spot where the stream is to issue on the surface, and at regular intervals of from 20 to 50 or more paces in the direction of the hill, whence it has been previously ascertained that a supply of water will be obtained, other shafts are sunk and the bottoms of all connected together by slightly sloping tunnels. The depth of the shafts increases with their distance from the original according to the slope of the ground. Their number and the length of the KÁRE'Z depends on the supply of water met with, the quantity required and the distance of the habitable or cultivable spot. The position of the shafts is marked by circular heaps of earth on the surface and their orifices are usually closed, the covering being removed at intervals of a year or more for the purpose of cleaning and repairing the shafts and tunnels. Much experience is required to select a spot from which a plentiful and lasting supply will be obtained. Some KÁRE'ZES afford a constant supply of water for ages whilst others become exhausted before they have paid for the cost of construction." To this I may add the advantage of the KÁRE'Z is the prevention of the rapid evaporation the water would undergo in such a climate if freely exposed to the air. KÁRE'ZES are frequently very deep, 40 feet and more below the surface. Judging from one seen under construction in the Pishin, the shafts or wells are sunk as usual with pick and shovel and with crate and windlass, and the water-passage tunnelled out afterwards. One cause of the per-

\* Yule's Marco Polo I, 115.

manent drying up of KÁRE'Z is the shifting of the subterraneous water lodgment, and it is not uncommon to see parallel lines of KÁRE'Z wells close to each other. KÁRE'Z digging is a special occupation, the GHILZAIS being famous for it.

The system of irrigation by tanks or open reservoirs so successfully used in MAISŪR and many parts of the Madras Presidency is only sparingly used in Afghánistán, and I only observed a few small irrigation tanks in the Pishin and KADANEI Valleys, though from the universal presence of uneven country in Afghánistán it would appear that the MAISŪR system of *bands* and tanks should succeed as a means of irrigation if regularly introduced.

The method of irrigation by means of groins and reclamation of river-beds to be observed in the high lands along the valley of the R. RO'D and in the SHO'R Valley in the neighbourhood of CHIMJÁN is very remarkable. These groins are constructed at a great cost of labour with rough stones and tree trunks and are frequently turfed over and planted with willows and small bushes. In the RO'D Gorge the main portion of the cultivable land has been obtained in this way.

There is one more point to be noticed in this connection. Elphinstone states (Kingdom of Kábul) that it seems to be only in the very poorest parts of the country that land is allowed to lie fallow for a year. This, however, is apparently not the case in the KÁKAR Country generally, especially in the BO'RAI Valley, where the large area under cultivation is only to be accounted for by a large portion of it being allowed to lie fallow every year.

Madder, which, as MacGregor observes, is common in the west of Afghánistán and sold all over India by Paṭháns as MAJÍT or MANJÍT, is to be found in the DO'F Valley in highly cultivated lands deeply furrowed and manured. The leaves are used for cattle and the roots for the dye. This cultivation is elaborate, good and costly, and the yield in the DO'F Valley is said to be worth Rs. 1000. The people there believe apparently that it is not grown elsewhere; it is, however, to be seen about TAKHT-I-PU'L near Kandahár.

Graveyards deserve mention in this place. These are to be found scattered over the land in places quite remote from population. In fact the dead are frequently carried to long distances from their place of decease in order to be buried at a particular spot. This system of carrying the dead to certain places belonging to the family is prevalent among the Panjáb Muhammadans, the YŪ'SUFZAIS and other such Paṭháns as inhabit British Territory. I saw the body of a SUBAHDÁN of the 26th Panjáb Native Infantry who had died at Quetta being carried down the Bolán Pass to be buried in the Pesháwar District, and on the Panjáb Railways

there are special rates and arrangements for the carriage of corpses. On the other hand among the Patháns travellers and often the dead on a field of battle are buried where they die, and the GHILZAIS are always so buried. The reason given for conveying corpses to certain burial grounds is, that a Pathán should be buried by the tomb of the PÍR or Saint he followed in life, at whatever distance it may be. This accounts for graveyards on the summits of mountains, as on Mt. KHWÁJA AMRÁN in the GWÁJA Pass, and in the TRÍKH KURAM and PÁLKAI Passes miles away from habitations.\* I was told that parties on the road to and from a burial place were never molested. MacGregor† states with reference to the GHILZAIS that it is the custom of the country to throw a heap of stones over a murdered traveller and that the road leading from SHILGHAR to ZURMAT the frequency of these heaps is sickening, in many cases being found at the closed ends of ravines, showing that the poor travellers have run as far as possible and then been hewed down. The same remarks would be perfectly true of the long and narrow TO'POBARGH Valley near Mt. MÁZHWÖ in the highlands separating the country of the ZAKHPE'LS and PÁNÍZAIS, a place particularly favourable for such murders, and the large number of such heaps as above described, sometimes three or four together, is horrible to contemplate. This method of forming cairns is common also in the Himalayan Districts, and I have seen GURKHÁS in passing these Pathán cairns throw stones on them from sheer habit.

The LUNIS form little pillars of rough stones to mark the spots of victories over the Belúchis, and several such pillars (fig. 16) are to be found in the HAN Pass and about the Debatable Lands.

As might have been anticipated, of historical remains there are practically none. Indeed such could hardly be expected in a country which has no history to speak of, beyond petty internal squabbling, and no means of constructing buildings on any scale or of durable materials. In the Pishin there is an old ruined fort of the HÁRU'NS (TARÍNS) on a hill called SIRE' KHILA deserted about 60 years ago; and near SAMÁLZAI, not far from KHU'SHDIL KHÁN, a small artificial mound with some fortifications on it like those at Quetta, with which it has probably a similar origin. It is called SPÍN KHILA (White Fort) but has apparently no local history. The only distinctly historical traditions which the Kákars appear to have relate to NÁDIR SHÁH's time, *i. e.*, only a century back, and in the BO'RAI all

\* The ZAKKA KHE'LS, a wild troublesome tribe about the KHAIIRAR, who have a bad name, are said to have stolen a saint from the YU'SUFZAIS and murdered him to obtain the PÍR round whose grave they bury their dead. Tradition says that they are such scoundrels, that no man among them could be found whom even they could reverence after death as a saint.

† Quoted above in the section on Polity.

remains are locally referred to him. In the centre of the Valley a fort of some size built on the same principle as that at Quetta, but not so high and much more extensive, is called SHAHR-I-NÁDIR. It is now deserted and considerably ruined. The principle on which these forts were built is a very sound one in such a country, as the most desirable position from which to watch a valley is from an eminence so situated that all parts of the valley are visible at once, and at the same time that an enemy advancing from the hills must show himself. As it is very seldom that such eminences are natural they had to be constructed where necessary. This is the governing principle in the selection of the sites of Quetta and Kandahár, in fact the attempt to build Kandahár alongside one of the apparently strongly situated hills near it failed as a military measure.

In the BO'RAI Valley and along the route thence, *viâ* the HANUMBÁN, TRÍKHI KURAM and HAN Passes, towards BÁRKHO'M a remarkable set of remains are found everywhere in the shape of large quantities of pieces of burnt bricks and pottery\* of a manufacture and excellence not now known in these parts. These are found in all kinds of places, on the hill tops, in the valleys and passes and alongside streams. The inhabitants say they are the remains of NÁDIR SHÁH's army, but as this was an old KÁFILA route, the present one *viâ* MEKHTAR being not far distant, it is as likely that the presence of the remains is due to this as to NÁDIR SHÁH's march in this direction; it is, however, more than likely that he and his successor AHMAD SHÁH, the first DURÁNI and hero of PÁNÍPAT, or portions of their forces made more than one march along this route.

The state of civilization varies considerably with the locality, the inhabitants of the valleys being of course more civilized than their hill neighbours. As has been above observed, the more hilly the country the more scarce and rough the dwellings become, a sure indication of the general civilization of the occupants. The ZARKHÁNS and among the KÁKARS the DUMARS, ZAKHPE'LS, PÁNÍZAIS and AMAND KHE'LS bear off the palm for wildness, and their civilization is merely nominal. The UTMÁN and SANDAR KHE'LS present a substantial, though rude, form of civilization of the patriarchal type, as shown in their buildings, their husbandry, their better class of wearing apparel and the quantity of food supply, much of it foreign, which they possess, and the same is true of the LUNÍ KHE'LS. The Kákars of the DO'F and GWÁL Valleys resemble their Pishin neighbours in almost everything, even to their habit of visiting foreign countries, and many an ISÁ KHE'L or SHAMOZAI Kákar is to be found, who has been in Karáchi and Bombay and even served as a sailor. In the Pishin there are many indications of a superior civilization, notably in the presence of

\* Several specimens were sent to this Society by the present writer with the Geographical collection he made in the districts under discussion.



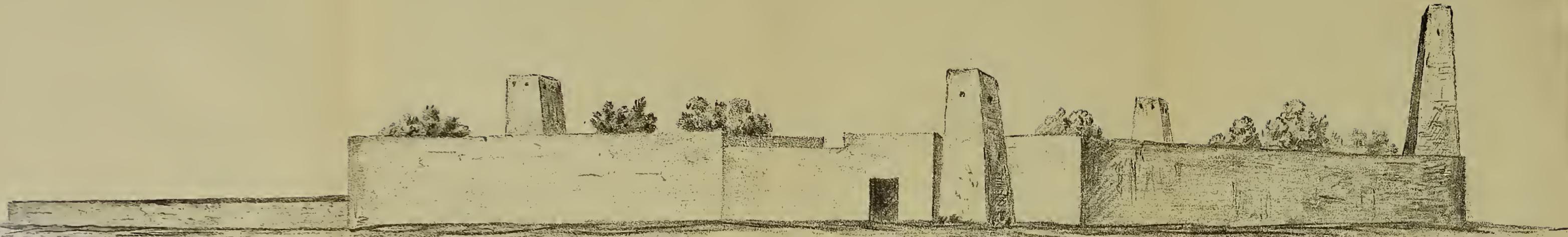


Fig. 13. Sandar Khél (Kákar) House. Bórai Valley. Sharan.

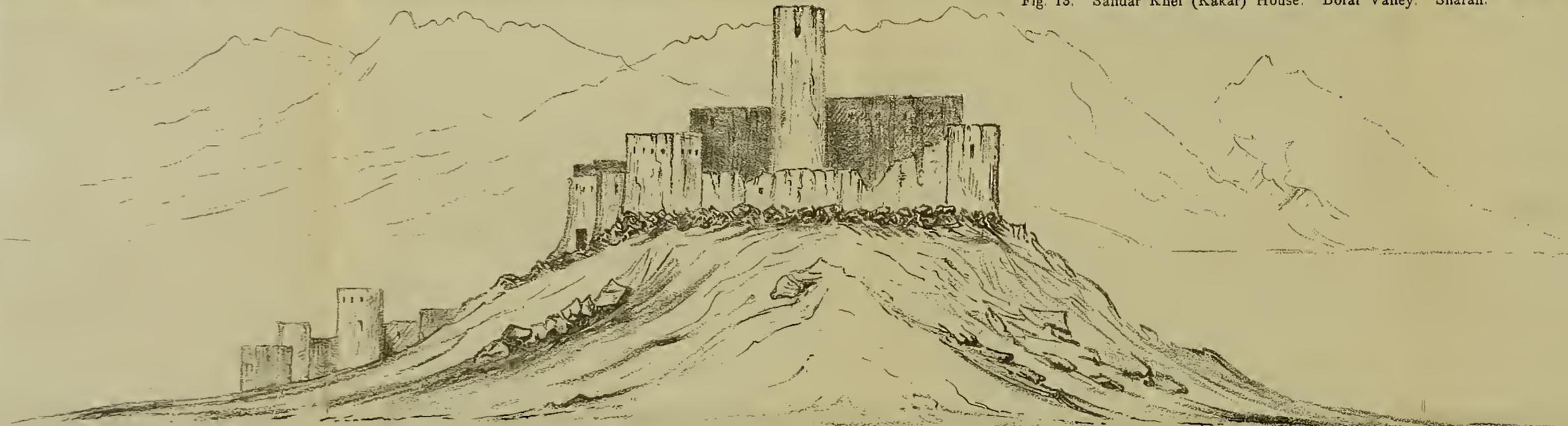


Fig. 14. Borai Valley House. Chíná Kót, Bórai Valley. Sandar Khél Kákar Fort.

No Scale. Hillock about 50 Feet high. Gadwár Hills in the distance.



Fig. 16. Victory Pillars. Lúni Khél. Han Pass.



Fig. 15. Showing construction of a Kizhdai.

- I Showing method of placing the bent withies or main props.
- II Showing method of supporting withies.
- III Showing method of joining withies. Side view.

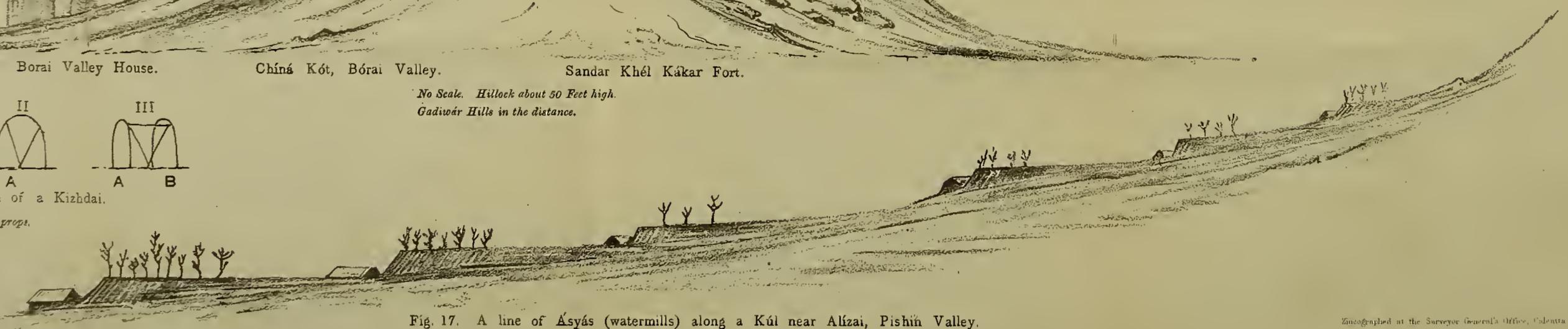


Fig. 17. A line of Ásyás (watermills) along a Kúl near Alízai, Pishin Valley.

Zincographed at the Surveyor General's Office, Calcutta.

SKETCHES FROM AFGHANISTAN.

women and children in the villages passed by the army, the knowledge of Hindústání, which is there so frequent as to carry one anywhere through the valley, and the travelling habits of the people. These traits are more specially to be observed among the Pishin SAYADS, than among the TARÍNS, though many of these speak Hindústání fluently, as also can some of the DO'F and GWÁL Valley KÁKARS. Many of the so-called PAṬHÁNS who travel to all parts of India and even to Burmah selling horses are Pishin Sayads, some of whom make it a yearly practice to do so, keeping regular agents at BANGALU'R (in MAISU'R) and other horse marts. When the field telegraph was first opened at GULISTÁN KÁRE'Z in the Pishin, all private messages had to be countersigned by the Political Agent, whose tent was besieged by applications for telegrams from the Sayads and Taríns, who sent messages to all parts of India, one being addressed to Kandy in Ceylon.

### VI. *Language.*

My observations under this head were the most unsatisfactory of all, as I was enabled to do little more than observe the variations in the pronunciation of place names.

The language spoken is PUSHTO\* in dialects not, however, differing so much from the standard Pushto of our army as to prevent the soldiers from being readily understood. Its most prominent feature, the excessive gutturalness, seen in such words as GHWAZH, UKHMUGHDAI, ZHIZHA TANGAI, is apparently such as is commonly to be found in the language, as also are the harsh cerebral *ṭ*, *ḍ* and *ṛ*, so frequently heard all along the route.†

The next most important feature for the purposes of this paper is the interchange of consonants in place names. Those that came under observation are the following, some of which are doubtless due to local dialectic variation.‡

#### *Changes of J.*

into *d* and *z*. NGÁNDEH = NGÁNJEH: SYÁJGAI = SYÁDGAI = SÁZDAI.

into *zh* and *y*. ZHO'B = JO'B = YO'B.

into *z*. ZAI (the termination) = ZO'I = JAI = JÍ.

into *sh*. KHÚSHLÁK = KHUJLÁK.

\* Or PUKHTO. KH (خ) and SH (ش) are convertible sounds in the language.

† This is especially the case in the BO'RAI Valley and in the country approaching the Belóch Border. But this might be due to the propinquity of the Belóchhi dialects in which *ṭ* and *ḍ* are very hard.

‡ All such interchanges are valuable for comparing and identifying the names given by various authors to places along the same route.

into *ch.* KHUNCHAGAI = KHUNJAGAI.

Changes of *Z.*

into *d.* DARGAI = ZARGAI : MANZAKAI = MUNDAKAI : SANDAR  
KHE'L = SANZAR KHE'L,

into *ḍ.* TŌ'R KHAIZE' = TŌ'R KHAIḌE'.

into *zh.* ZAWAR = ZHAWAR : ZADŪN = ZHADŪN.

into *g.* MULÁZAI = MALAGAI.

Changes of *R* and *Ṛ.*

*r* into *r.* BO'RAI = BO'RAI : WARIÁGAI = WARIÁGAI.

*r* and *r* into *l.* MÚLTAT = MURTAT : KALA = KIRE' = KILE' :  
SHNAGÁL = SHNAGHAR = SHNAGHÁL.

*r* into *ḍ.* KHWÁRA = KHWÁḌA.

*r* into *zh.* KIZHAI = KIRḌAI.

Changes of *D.*

into *g.* ANGÁND = NGÁNG = NIGÁND : SYÁJGAI = SYÁJDAL.

Changes of *G.*

into *k.* KO'T = GO'T.

into *gh.* SHNAGÁL = SHNAGHÁL : GHWAND = GUND : GHUNDAMARAI  
= GUNDAMARAI.

into *kh.* GWÁJA = KHWÁJA.

Changes of *KH.*

into *k.* KSHŌ'I KÁRE'Z = KHSHŌ'I KÁRE'Z.

into *gh.* IGHARG = IKHARG.

Changes of *F.*

into *v* and *b.* ÍSAF = ÍSAB = ÍSAV.

Changes of *B.*

into *p.* ALAB = ÁLIP.

Changes of *S.*

into *sh.* LASTAI = LASHITAI.

Changes of *TS.*

into *ch.* TSAMAULANG = CHAMÁLANG.

Changes of *V.*

into *w.* VATA'KRI = WATA'KARI.

Instances of the loss and addition of consonants are :

of *G.* PLA'NGZHARA = PLA'NZHARA.

of *D* and *G.* ANGA'ND = NIGA'N = NGA'NG.

of *R.* DUMAR = DUMA' : BAGHA'WA = BAGHAWAR.

of *K.* LASHITAI = LASHITKAI.

And instances of the transposition of syllables and consonants are :

of *R.* SURGIHWAND = SRAGHA'ND.

of *Gh.* GHOBARGAI = OGHARGAI : ZAGHLŪN = GHAZLŪN.

of *N.* ANGA'ND = NIGA'ND = INGA'ND.

From the above examples it will be observed that the most unstable consonants are *j, z, zh, r, d, g, kh, f, b, s, ts,* and *v,* with their counterparts *sh, ch, zh, k, gh, b,* and *w.*

Regarding consonantal interchanges peculiar to the Pushto language, Raverty (Gram. Pushto, p. 3) has noticed that *kh* (خ) is changed into *sh* (ش), *g* (گ) into *zh* (ژ), *ts* and *dz* into *ch* and *j*. And of the *KHAI-BARIS* he observes that they so transpose their letters as to be almost unintelligible. In his Dict. of Pushto (xxii) he further notices the interchange of *z* into *dz*.

Of vowel sounds I noticed as peculiar an *o* pronounced in several words as the close German *ö*, thus, *UZHÖ*, *MA'ZHWÖ*. And also the common termination *ai* (written by Raverty *ay*) which is sounded with a closed mouth and sharply as one syllable, though it partakes of the nature of two; thus, *ái*. The frequent recurrence of this last gives the language an uncouth sound, and, coupled with the prevalence of guttural consonants, an unpleasant harshness to English ears.

The vowel changes are not important, the following being the most noticeable.

*Changes of A and A'.*

*a into i.* ANGÁND = INGÁND: KAZHDAI = KIZHDAI: KALA = KILE' = KIRE': TSAMAULANG = CHIMÁLANG: ALAB = ALIP.

*a into u.* MULÁZAI = MALAGAI: MANZAKAI = MUNDAKAI.

*a and á into au.* TSAMAULANG = CHIMALANG = CHIMÁLANG.

*Changes of AI.*

*into i and o'z.* ZAI = ZO'I = ZÍ: LÁKAI = LÁKÍ: BO'RAI = BO'RÍ: LÚNAI = LÚNÍ: DARGAI = DARGÍ.

*into a.* MANGAL = MAINGAL.

*Changes of U.*

*into o.* LÚNAI = LO'NAI.

*Changes of I.*

*into e.* YSAF = E'SAF.

*Changes of WA.*

*into au.* WARÍA = AURÍA.

*into u and au.* GHWAND = GUND: WARIÁGAI = URIÁGAI = AURIÁGAI.

*into á.* SURGHWAND = SURGHÁN.

*into o.* BAGHÁWA = BAGHÁO.

Among local peculiarities a tendency to shorten and nasalize long vowel syllables was frequently to be noticed, thus—

AMANDÚN for AMADÚN: ADINZAI for ADIZAI: BÁNZAI for BÁZAI: AJJÍ KHÁN for ҲА'ҶÍ KHÁN: HANUMBAR = ANUBAR: ANGÁND and NINGÁND =

NIGA'N: BAHGA'WA = BAGHAWAR: and numerous other instances could be adduced.

The Persian silent w Raverty (Gram. Pushto 4) observes is always sounded in Pushto; thus خراب is pronounced KHWA'B, not KHA'B, خوان; is KHWA'N, not KHA'N. My observations in Kákar-land did not quite bear him out in this; for the following I found to be synonymous pronunciations. AKHUND and AKHWAND: ZARKHA'N and ZWARKHA'N: SURKHWA'B and SURKHA'B, (where the w is a gratuitous insertion, the word being SURKH + A'B, red water): SURGHWAND and SURGHAN.

Before leaving the vowels a curious insertion of Y in the following word is worthy of remark. CHO'TIA'LI is locally CHO'TA'LAY: ZAKHPE'L and ZAKHPYE'L are synonymous and so are SYA'JGAI and SA'ZGAL.

The following is a list of the various forms under which place names were found by myself and on which the foregoing observations are based.

1. ANGA'ND = NGA'NJEH, NIGA'NJEH, NIGA'N, INGAN, NINGA'N, NGA'NG, NIGA'ND, ANGAND, NGA'NDEH.\*
2. MUZARAI = MZARAI.
3. AJJÍ KHA'N = HAJÍ KHA'N.
4. GWA'JA = KHWA'JA.
5. SKAN = ISKAN.
6. ZAI = JAI, JÍ, ZO'I.†
7. ZHO'B = JO'B, YO'B.
8. YSAF KACH = YSAB KACH, E'SAB KACH, E'SAF KACH, YÚSUF KACH.‡
9. KHARZANGAI = KHABARZANGAI.
10. ALLA'IDA'D = KHA'LAKDA'D.§
11. KHÚSHLA'K = KHUJLA'K.
12. KIZHDAI = KIRDAI, KAZHDAI, KIZHDÍ.||
13. KALA = KILE', KIRE', KO'R.||
14. SURKHWA'B = SURKHA'B.
15. KHUNCHAGAI = KHUNJAGAI.
16. GO'T = KO'T.||
17. KISHO'Í KA'RE'Z = KSHO'Í KA'RE'Z.

\* JEH is for DEH, a village. These words represent the LÚR ANGÁNG and KÚZ ANGÁNG of the map (Do'F Valley).

† To show pronunciations of ai: this is a termination not a word.

‡ These names arise from the confusion between YSAV and YÚSUF (Esau and Joseph).

§ These words have the same meaning, viz. God-given: there is a similarly named village near Kandahár.

|| These are not place names.

18. ZHAWAR = ZAWAR.
19. IGHBARG = IKHBARG.
20. AMADÚN = AMANDÚN.
21. ADIZAI = ADINZAI.
22. ZADÚN = ZHADÚN.
23. MANGAL = MAINGAL.
24. BA'ZAI = BA'NZAI.
25. SURGHWAND = SURGHÁ'N, SURGHÁ'ND, SRAGHÁ'ND, SURGHAN,  
SURGHAND, SRAGHAND.
26. SHNAGA'L = SHNAGHAR, SHNAGHAL, SHNAGAI, SHNA' KHORAI.
27. WARÍA KACH = AURÍA KACH.
28. WARGAI = BARGAI.
29. MULA'ZAI = MALAGAI.
30. ZAKHPE'L = ZAKHPYE'L = ZAKHWAI.
31. GHOBARGAI = OGHBARGAI.
32. DUMAR = DUMA'.
33. SYA'JGAI = SYA'DGÍ, SYA'DGAI, SA'ZAI, SYA'JDAL, SAZDAL.
34. KHWA'RA = KHWA'DA, KHWA'R.
35. ZAGHLÚN = GHAZLA'NA, GHAZLÚN.
36. DARGAI = ZARGAI, DARGÍ.
37. GHUNDAMARAI = GUNDAMARAI.
38. GHWAND = GUND.
39. PLA'NZHARA = PLA'NGZHARA.
40. SURMASTALI = SURMASTA'LI.
41. BATA'NAI = BIA'NÍ.
42. SANDAR KHE'L = SANZAR KHE'L.
43. TO'R KHAIZE' = TO'R KHAIDE'.
44. CHO'TIA'LI = CHO'TA'LAI.
45. BO'RI = BO'RAI, BO'RAI.
46. LASHTAI = LASTAI, LASHTKAI.
47. WARIA'GAI = WARIA'GAI, URIA'GAI, AURIA'GAI.
48. HANUMBA'R = ANUBA'R, ANUMBA'R, HANUBA'R.
49. MÚLTAT = MURTAT.
50. LÚNI = LO'NAI, LÚNAI.
51. LA'KAI = LA'KÍ.
52. TSAMAULANG = CHIMALANG, CHAMALANG, CHAMAULANG, CHA-  
MA'LANG, CHA'MALANG.
53. ALAB = ALIP.
54. SOBA'II = SOBA'T.
55. BAGHA'WA = BAGHA'O, BAGHAWWA'R.
56. VATAKRI = WATA'KARI.
57. ZARKHA'N = ZWARKHÁN.

58. TO'R TSAPPAR = TO'R 'TSUPPRÍ.\*  
 59. PASTÉ' = PASTO'.  
 60. MANZAFÁI = MUNDAKAI.

The frequent recurrence of certain names on the map leads to the supposition that many of them are merely descriptive and on examination the meanings of a great portion become apparent, the descriptive words having changed very little on becoming names of places.† And though it is always treading on dangerous ground to give derivations of place names, I think the following are worth hazarding:

1. TANGAI means a gorge or pass, so SPÍR TANGAI would be the White Gorge (SPÍR for SPÍN) and TÚR TANGAI the Black Gorge (TÚR for TO'R.)
2. GHUND is round, globular and the GHUND Peak would mean the Round Hill, and Mt. SURGHWAND the Red Round Hill. Again GHUNDA is a detached hill and GHUNDAMARAI is Adam's apple in the throat, and as applied to a village would mean the village by the round detached hill.
3. LWA'RA means hilly and as applied to a valley would signify the hilly or upland valley.
4. CHOR means a ravine or water furrow and is applied to a steep-banked stream in the Pishin.
5. SIRE' KHILA would be the Inn or Caravanserai Fort. It was the old rendezvous of the HÁRÚN TARÍNS in the Pishin. This is probably also the meaning of ZARA KHILA in the Pishin.
6. The GAZ Hills might mean the Long Hills from كَرّ a yard-measure or the Tamarisk Hills from غَرّ a tamarisk.
7. MZARAI means a particular kind of reed and is applied to a river, a valley, and some marshy springs and the hills near these last.
8. SURKHÁ'B is the Red River.
9. ZARGHÚN means green, verdant, fresh and is applied to a range of mountains covered with forest in the heights and to a village by a stream.
10. LÚR means Upper and KÚZ, Lower, when found in composition with place-names. LO'WE' and LO' mean Greater: KUCHNAI and KAUN, Lesser.
11. In MEHTARZAI, MEHTAR is Persian meaning "master, ruler." MEHTARZAI would mean the Ruling Clan.
12. GHWAZH means a sluice and also the ear, and is found applied to a stream and a range of the hills, the SPÍN GHWAZH, (?) the White Ear Hills. ZHWAZH means the murmuring of a brook and may be the deriva-

\* A corruption of KÁLÍ CHUPPRÍ the Belóeh name for the same place with the same meaning, *viz.*, Black Rock. Thus TRÍKH KURAM is called also SO'R KURAM, which has the same meaning, Salt Springs.

† I do not here refer to such purely men's names as HABÍBULLAH, KHÚSHDIL KHÁN, transferred to the villages owned by the persons of these names.

tion of the river name, whence perhaps also ZHIZHA TANGAI (?) the Rippling Pass.

13. Mt. KAND may derive its name from KAND a chasm or KANDAI broken ground.

14. Mt. PÍL from its fancied resemblance to an elephant, PÍL or FÍL.

15. SHARAN KA'REZ and SHARAN occurring two or three times and once as SHE'RÍN, are probably for SHÍRÍN, sweet.

16. SÚR or SURAI is red and is met with in several words. SURAI also means a passage and the so-called SURANA'RÍ Pass (the SURAI Pass of my maps) is for SURAI NAṘAI, the Slender Passage. Cf. also LA'NDAI SURAI (?) the Lower Passage. MO'MAND SARA'I (?) the Momand's Passage.

17. The word GHBARĠ, as in OGHBARG, IKHBARG, IHGBARG and in the plural forms GHOBARGAI and OGBARGAI, occurs several times. It means the flat land between two hills, and upland valley: also double, two, twins. In which latter sense it is probably used when applied to hills. And hence also NARAIGHBARG Hills may mean the Narrow Valley Hills.

18. RO'D means merely a river: RO'DBA'R, a valley stream.

19. KSHAI means in, between, etc. and KSHO'I KAREZ might mean the Middle Káréz.

20. KHWARA is probably for KIHWARA, a sandy stream-bed, as several such beds debouche into the SHOR valley at the spots so named.

21. SAGAR, SRAGHAR, SARGHAR, SURGHAR all common names mean the Red Hills (SUR + GHAR). So the SAGARBAND Pass would be the Red Hills Pass.

22. SURKAI ZANGAL is the Red Forest.

23. DARGAI, a very common name, is the plural of DARGA, a copse, a place where trees and brush-wood grow together. DARGA also means a shrine and this may account for its application to villages.

24. GURKHAI is applied to a mountain stream and its defile and may mean rattling, noisy, as GARKAI is the rolling of a carriage and GARKANDA a rolling stone from a mountain.

25. ZAWAR or ZHAWAR (ZAWAR) is a slope, declivity. LWAR ZWAR is uneven ground. ZHAWAR also means a deep or hollow place.

26. USH or UKH is the camel. The USH Pass means the Camel's Pass, and the UKHUGHDAI Pass the Camel's Mouth Pass. (UKH + MAKH).

27. UZIDÖ, the name of a peak, is apparently the plural of UZID, UZID and UKD, long, lengthy, stretched out.

28. TSA'RU Peak = ? the Look-out Peak.

29. The MO'SAI Pass may derive its name from MO'SAI, a child's marble, a round stone, or from MO'ZI', troublesome.

30. KACH is the cultivation by a stream-bed and is seen not only by itself as a name for a stream, a village and a hill, but constantly in compo-

sition, as YSAF KACH, Esau's Plot, TA'ZI' KACH, Greyhound Plot, KO'SH KACH, Crooked Plot, WARÍA KACH, the Free Plot, SÚR KACH, the Red Plot, ZAGAN KACH (?) the Rough Plot.

31. SHO'R which constantly appears as a name is probably for SHO'RA or KHO'RA, saltpetre, nitre: a common property of the soil along the route. It appears again in SO'R KÚRAM, the Salt Springs.

32. SHNA' KHORAI occuring as a synonym for SHNAGHA'L, a village name, would mean a Mastic Eater.

33. TRI'KH is salt, bitter, and appears in TRIKHA'DAGH, the Salt Hillside, if DA'GH is for TA'K, or the Salt Plain, if DA'GH is for DA'G: and in TRI'KH KÚRAM, the Salt Springs.

34. CHAPPAR or TSAPPAR, a corruption of Hind. CHHAPPAR a thatched roof appears as a hill name in Mt. CHAPPAR and in TO'R TSAPPAR, the Black Roof, a hill in the Han Pass. Both peaks have rounded tops. It is worth mentioning here that TSAPA means a wave, billow.

35. CHI'NAI is a common village name and is the plural of CHI'NA, a spring, fountain.

36. GHAR, a hill, appears in Mt. SPINSKHAR, the White Hill: SPE'RA-GHAR Hills, the Grey Hills: TANG GHAR, the Narrow Hills. ZHAR, appearing in several hill names, is probably for GHAR: ZHARPITAU Peak, the Sunny Peak, PLA'NZHARA Hills, the Broad Hills; ZHARUBAND Peak, Hills End, is given to the last hill of a line in the SHO'R Valley.

37. ISPRA RA'GHA, the Open Meadow (SPARAI + RA'GH); the place is an open spot near Mt. MA'ZHWÖ. SPARAI, open, also turns up once or twice as SAPURAI.

38. Mt. SURLO' (?) the Red Tablet.

39. TANG TO'R Peak, the Narrow Black Peak.

40. SURFAK Peak, the Red Precipice.

41. MALE'WA Peak (?) The Camel Saek (MALAV).

42. LA'NDAL Peak, the Lower Peak.

43. PLA'N Springs, the Wide Springs.

44. KHÚNI' Hills, the Bloody Hills.

45. SHAKA'RE'Z (?) The Baek Káréz and JALKA'RE'Z, the Thorn Káréz; two villages near each other in the BO'RAI valley. SHAKA'RE'Z occurs twice.

46. KUTSA or KUCHA Valley means perhaps the Little Valley.

47. TSA'HAN Wells. TSA'HAN is the plural of TSA', a well, pit. The word appears again as UCHSAHA'N Springs. (?) The Upper (ÚJ) Springs.

48. BA'GHU TO'R Peak (?) The Black Bogie. BA'GÚ is a bugbear, bogie.

49. BA'LA DIA'KA (?) The Upper Plain (PA'G).

50. HANOKAI is probably a diminutive of HAN, the two passes being near each other.

51. TOGHAI, a river name, is Turkí for a reedy plain.

In a former paper in this Journal\* I remarked that a village may be called by six different names by guides, those thoroughly acquainted with the locality would recognise it by any one of them, others less well acquainted will only know it by some of them. Thus a village may be called (1) after the district or tract of land in which it is situated. TAKHT-I-PÚL is such a name, MEL MANDA is another; villages 10 miles apart are called TAKHT-I-PÚL and MEL MANDA simply because they are situated in the tracts so called. (2) It may be called after the section of the tribe which inhabits it, thus, BA'RAKZAI; (3) after the subdivision, thus, KHUNSE'ZAI or MOHAMMADZAI, (4) after its late owner if recently dead, (5) after its present owner, thus, KALA-I-NÚR-UD-DI'N KHÁ'N merely means NÚR-UD-DI'N KHÁ'N's village, and the owner's is usually the proper name of a village, (6) after its own name. To give an example; the village marked AMI'N KALA in my map of the ARGHISA'N valley was named to me as BA'RAKZAI, MUHAMMADZAI, AMI'N KHAN and LATI'F KHÁ'N. LATI'F KHÁ'N is its present owner: AMI'N KHAN was the late owner, MUHAMMADZAI is the subdivision and BA'RAKZAI the section of the tribe inhabiting it. It will be easily seen that the more general terms are known at a distance and the more specific ones only in the immediate neighbourhood of a village. Complicated as this system of nomenclature looks, it is natural enough in a country where the individual occupies such an important place in men's minds and nationality so little. It is not difficult to deal with in practice, after a slight knowledge of the country is acquired, but it accounts for the great apparent discrepancy in names and distances met with on maps and in routes. These remarks are true also of the TARI'N and KA'KAR country. Thus in the PISHIN, GANGALZAI and SHAMDA'D are names for the same place, and so are URUMZAI and SAYAD SA'LO and also BRIJA'N KALA and AULIA KALA. Several villages are called BRAHAMZAI, *viz.*, SAYAD DO'ST MOHAMMAD, SAYAD KHAMA'NDAI, SAYAD LA'L. Three are called LÚR (Upper) KHÁ'NIZAI, *viz.*, MOHAMMAD SA'DIK, VAKI'L, and LA'L MOHAMMAD and two BAGARZAI, *viz.*, SAYAD ALAB and SAYAD PAIYO; two YA'SINGZAI, *viz.*, SAYAD SHE'RBAT and SAYAD TO'TI. The more specific are the malik's (or owner's) names. In the case of the BRAHAMZAI villages, that of DO'ST MOHAMMAD may be called BRAHAMZAI proper, and the same is to be observed of the three KA'KOZAI villages in the same neighbourhood, one is called KA'KOZAI and the other two also MADAT and ATA' MOHAMMAD. On entering the DO'F valley the two villages known in the Pishin by several variations of the word ANGA'NG or NINGA'ND are found to be locally LÚR and KÚZ ANGANG, Upper and Lower ANGA'NG. Names, however, are more specific in the DO'F, and villages of the same name are distinguished by the tribal name in addition, thus TLARAI (I'SÁ KHE'L) and

\* Rough notes on the Distribution of the Afghán Tribes about Kandahár. Vol. XLVIII, pt. I, 1879.

TLARAI (MEHTARZAI). In the BO'RAI valley, however, WAZIA'GAI and KHANKAI seem to be general names for groups of villages and we have two MÚRS and two WAHA'RS. In the wilder parts names become more general and merely descriptive, everything in the neighbourhood, valley, river, village and hills, all being known by the same name. Such are, O'BUSHTKAI, KHWA'RA, CHIMJA'N, KACH, BATA'NAI in the SHO'R valley, and in still wilder regions NANGALÚNA, TO'POBARGH, TRI'KH KÚRAM, TSAMAULANG and BA'LA DHA'KA. Towards the Belóch Border double names, the Pathán and the Belóch are met with, as TO'R TSAPPAR and KA'LI' CHUPPRI, both of the same meaning, the Black Hill: and BA'HAN KUND (Pathán) = BANI'WA'LA' KACH (Belóch).

Some names are corruptions and abbreviations; such as SAYAD SA'LO and SA'YAD ÁTU probably, and perhaps SKAN and ISKAN for Alexander (ISKANDAR): AJJI' for HA'JI': SAMALZAI for ISMA'ILZAI: BRAHAMZAI for IBRA'HIMZAI: ÁLIP and ALAB for HALAB (ALEPPO): and perhaps SOPANZAI for ISFAHA'NZAI.

In places there seems to be a tendency to call villages after the names of celebrated places, thus we have DI'LAI, LA'HO'R and MÚLTAT in the BO'RAI valley.

Before leaving this point I would remark that across the Belóch Border in BA'RKHO'M (or BA'RKHA'N) a similar if not a greater confusion of nomenclature exists. Thus the place called LUGA'RI' BA'RKHA'N is also called BANGALA': HASNI' KO'T = TA'NKHI SHAHR: CHA'HE'N = BA'BUL KHA'N KA KO'T or SHAHR: NA'NDHA' = SHE'KH KO'T while all the NA'HAR villages are sometimes grouped as NA'HAR KO'T, and finally the valley itself is variously called BA'RKHO'M, BA'RKHA'N, LUGA'RI BARKHÁN, LÚNDI'ÁN and KAHO.

Having now explained as far as possible the reasons why the nomenclature of travellers\* along the same route in Afghanistan should differ so greatly, and in order to clear the way for future students of this particular route, I close this paper by a comparison and identification of names found in the journals of other travellers with those to be found in my maps. Included among these are the nomenclature in Capt Holdich's plane-table sketch-map of the Route and in the Quarter Master General's Departmental sketch-map, and also the names given in Major Waterhouse's paper in this Journal.†

\* Capt. Heaviside remarks on the difficulty of obtaining Afghán names, in Major Waterhouse's report, pp. 53. J. A. S. B. Vol. XVIII, pt. II, 1879.

† The works referred to in the comparison are Notes on the Survey Operations in Afghanistan in connection with the Campaign of 1878-9 by Major Waterhouse, J. A. S. B. 1879. Maekenzie's Routes in Asia, See. II, Afghanistan. Macgregor's Gazetteer, Afghanistan, Leech's Route: Dera Gházi Khán to Kandahár. Lumsden's Mission to Kandahár. A more detailed identification of the names along the route will be found in the appendix to my paper in the J. R. G. S. above referred to.

I.—Han Pass and Neighbourhood.

| Temple.           | Macgregor.          | Sandeman.    | Holdich.    | Q. M. G.     | Waterhouse.  |
|-------------------|---------------------|--------------|-------------|--------------|--------------|
| MA'R PASS         | MA'R                | ..           | MA'R        | MA'R         | ..           |
| ISHANI            | ISA'NI              | ..           | ..          | ..           | ..           |
| DA'KA (BA'RKHA'N) | DAKKU KO'T          | ..           | DAKKU KHA'N | DAKKA        | ..           |
| TO'R TSAPPAR      | KA'LA CHAPRI        | ..           | ..          | ..           | ..           |
| KA'LI' CHUPPRI    | KA'LA CHAPR         | ..           | ..          | ..           | ..           |
| HANOKAI PASS      | HANKI' SAR          | ..           | HANNOKAI    | HANNAKAI     | HANUKAI.     |
| KUTSA Valley      | KUCHA               | ..           | ..          | ..           | ..           |
| TRIKH KURAM       | SO'R KURAM          | ..           | TREKH KURAM | TREKH KURAM  | TRIKH KURAM. |
| PAIND KHA'N KO'T  | PAINDEH KHA'N KO'T  | ..           | ..          | ..           | ..           |
|                   | PAINDEH KHA'N LUNI  |              |             |              |              |
|                   | PAINDEH KHA'N SHAHE |              |             |              |              |
|                   | PAINDEH KHA'N KO'T  |              |             |              |              |
|                   | LUNI                |              |             |              |              |
| PAINDEH SHAHE     | ..                  | ..           | ..          | ..           | ..           |
| BA'LA DHA'KA      | BA'LA DA'KA         | BA'LA DHA'KA | BA'LA DA'KA | BA'LA DA'KA  | BA'LA DA'KA. |
| BA'LA DHA'KI      | ..                  | ..           | ..          | ..           | ..           |
| CHO'R TRAP        | CHO'R TRAP          | ..           | ..          | CHO'R KI TAP | ..           |
| JA'NDHRA'N Hills  | JA'NDRA'N           | ..           | JA'NDRA'N   | JA'NDRA'N    | ..           |
| DHAULA Hills      | DHA'OLA             | ..           | DHOWLA      | DHOWLAH      | ..           |
| R. KA'HAN         | R. KA'HA            | ..           | ..          | ..           | ..           |
| TSAMAULANG        | CHUMA'LANG          | ..           | CHAMA'LANG  | CHAMA'LANG   | CHAMA'LANG.  |
| R. LA'KI          | R. LA'KI LAHAB      | ..           | ..          | ..           | ..           |
| BA'RKHO'M         | ..                  | ..           | ..          | ..           | ..           |
| BA'RKHA'N         | BA'RKHA'N           | ..           | BA'RKHA'N   | BA'RKHA'N    | BA'RKHA'N.   |

| Temple.                  | Macgregor.         | Sandeman. | Holdich. | Q. M. G.          | Waterhouse. |
|--------------------------|--------------------|-----------|----------|-------------------|-------------|
| MITHÍ KHÚN               | MITHA KOH          | ...       | HAN KÚA  | HAN KÚ'A          | ...         |
| BA'HAN KUND              | BA'TEANWA'LA' KACH | ...       | ...      | BA'HANWA'LA'KA'CH | ...         |
| BARBÚZ HILLS             | BARBO'J            | ...       | ...      | ...               | ...         |
|                          | BARBO'Z            | ...       | ...      | ...               | ...         |
| BAGHA'O                  | BAGHA'O            | ...       | ...      | ...               | ...         |
| SRAGHAR<br>(LÚNT Valley) | ? SHINGHAR         | ...       | ...      | ...               | ...         |
|                          | ? SANGHAI          | ...       | ...      | ...               | ...         |

II.—*Tal, Chotiali, and Neighbourhood.*

| Temple.    | Macgregor. | Sandeman.  | Holdich.   | Q. M. G.   | Waterhouse. |
|------------|------------|------------|------------|------------|-------------|
| CHO'TIA'LI | CHO'TIA'LI | CHO'TIA'LI | CHO'TIA'LI | CHO'TIA'LI | CHO'TIA'LI. |
| KO'LU      | KO'LU      | KO'LU      | KO'LU      | KO'LU      | ...         |
| TAL        | TAL        | TAL        | TUL        | TULL       | TAL.        |
| RA'TIA     | RA'U       | ...        | RA'TIA     | REHI       | REHL.       |
|            | RA'HI      | ...        | ...        | ...        | ...         |
| BAGHA'WA   | BAGHA'O    | ...        | BAGHA'O    | BAGHA'O    | BAGHA'O.    |
| SMALAN     | SMALAN     | ...        | SMALAN     | SMALAN     | SMALAN.     |
| SHINJE'Z   | ...        | SHINJA'ZAI | SHINLAZE   | SINGLAZI   | ...         |
| SINJA'VAI  | ...        | SHINJA'VI  | SINGA'VI   | SANJA'VI   | SAGA'WE.    |



| Temple.     | Macgregor.                   | Sandeman.  | Hollich. | Q. M. G.                | Waterhouse. |
|-------------|------------------------------|------------|----------|-------------------------|-------------|
| KACH        | ? KATGAI                     | ...        | ...      | KATS                    | ...         |
| DUMAR       | DUMAD                        | ...        | ...      | DUMAR                   | ...         |
| SPE'ZHANDAI | ...                          | SPINZANDAI | ...      | SPE'ZANDAI              | ...         |
| ISAF KACH   | { YU'SAF KACH }<br>ISAB KACH | ...        | ...      | YU'SUF KACH YU'SAF KACH | EUSAF KACH. |
|             |                              |            |          |                         |             |
| NINGA'ND    | ...                          | NAGA'ND    | ...      | ANGA'ND                 | NINGA'N.    |
| ANGA'NG     | { ... }<br>KAKAB             | KAKAR      | ...      | KAKUR                   | KAKAR.      |
| KAKAB       |                              | ...        | ...      | ...                     | ...         |

| Temple.                  | Macgregor.     | Sandeman. | Hollich.     | Leech.   | Iamsden.  | Q. M. G.                  | Waterhouse.        |
|--------------------------|----------------|-----------|--------------|----------|-----------|---------------------------|--------------------|
| AMAND KHE'L              | SANATYA        | ...       | ...          | ...      | SIMANTHA  | ...                       | ...                |
| SHAHIDA'D                | ...            | ...       | ...          | ...      | SHAHIDA'D | ...                       | ...                |
| KALA-I-ABDULLA.<br>KHA'N | { ... }<br>... | ...       | KILA ABDULLA | ...      | ...       | { KILA ABDUL-<br>LA KHA'N | KILA ABDUL-<br>LA. |
|                          |                |           |              |          |           |                           |                    |
| PISHIN                   | PESHIN         | PESHIN    | PESHIN       | PESHIN   | PESHIN    | PESHIN                    | PESHIN.            |
| KHO'JAK                  | KHO'JAK        | KHO'JAK   | KOHLAK       | KHO'JAK  | ...       | KO'JAK                    | KHO'JAK.           |
| BARSHO'R                 | BARSHO'RA      | ...       | BARSHO'R     | BARSHO'R | ...       | ...                       | ...                |
| SAYAD PAIND              | PAIN KALA      | ...       | ...          | ...      | ...       | SAPA'N                    | ...                |
|                          |                | SAIPA'N   | SAIPA'N      | SAIPA'N  | SAIPA'N   | SAIPA'N                   | ...                |

V.—*Pishin Valley and Neighbourhood.*

A comparison of the names to be found on the three latest maps of this route, namely, those of my own, Capt. Holdich, and the Quarter-Master General's Department, will complete my observations.

*From the Pishin eastwards.*

| Temple.             | Holdich.                  | Quarter-Master General. |
|---------------------|---------------------------|-------------------------|
| KADANEI Valley      | KADANAI                   | KADANEI.                |
| KHO'JA AMRA'N Hills | KHO'JA AMRA'N             | KHO'JEH AMRA'N.         |
| KHWA'JA AMRAN Peak  | KWA'JA AMRAN              | ...                     |
| KALA ABDULLAH KHA'N | KILLA ABDULA              | KILA ABDULA KHA'N.      |
| GWA'JA Pass         | GWA'JA                    | GWAJA.                  |
| TANGAI              | TANGI                     | ...                     |
| KHO'JAK Pass        | KHO'JAK                   | KO'JAK.                 |
| ARAMBI              | ARUMBI                    | ARUMBI.                 |
| RAHAMDIL KHA'N      | RA'MDIL KHA'N             | ...                     |
| BADWA'N             | BUDWA'N                   | BADWA'N.                |
| TURKHE'L            | TURKHE'L                  | TURKHAIL.               |
| BRIJA'N KALA        | MAISAI & PAIZI            | ...                     |
| SAYAD SALO          | URAMZAI                   | ...                     |
| URUMZAI             |                           |                         |
| SHA'HDA'D           | GANGALZAI                 | ...                     |
| GANGALZAI           |                           |                         |
| AJABZAI             | AJABZAI                   | AJABZAI.                |
| SAYAMZAI            | SE'MZAI                   | SE'MZAI.                |
| ALIZAI              | ALAZAI                    | ALI'ZAI.                |
| R. TO'GHAI          | TO'GHAI                   | ...                     |
| R. MUZARAI          | MUZARAI                   | ...                     |
| SOPA'NZAI           | ZE'RI'                    | ...                     |
| BRAHAMZAI           | { BRAHAMZAI<br>BRAINZAI } | ...                     |
|                     |                           |                         |
| MA'LIKAI            | MA'LIZAI                  | ...                     |
| BAGARZAI            | BAGGARZAI                 | BAGARZAI.               |
| SAMA'LZAI           | SMA'LZAI                  | SMA'LZAI.               |
| SAYAD PAIN          | SAIPA'N & SAIPAIN         | SAIPA'N & PAIN KALA.    |
| NOA' BA'ZA'R        | ...                       | NOA' BA'ZA'R.           |
| MANZAKAI            | MANZAKAI                  | MANZAKAI.               |
| KHA'NZAI            | KHA'NZAI                  | KHA'NZAI.               |
| SHE'KHA'LZAI        | SHEIKHA'RI                | SHEIKHHA'RI.            |
| KHU'SHDIL KHA'N     | KUSHDIL                   | KHUSHDIL.               |
| R. BARSO'           | BARSO                     | BARSO'.                 |
| MA'LIKYA'R          | MA'LIKYA'R                | MA'LIKYA'R.             |

| Temple.          | Holdich.                   | Quarter-Master General. |
|------------------|----------------------------|-------------------------|
| KAMA'LZAI        | KAMA'LZAI                  | KAMA'LZAI.              |
| NU'RZAI          | NA'RIA'N                   | NA'RIA'N.               |
| YA'SINGZAI       | A'SIMZAI                   | A'SIMZAI.               |
| TARI'N           | TURI'N                     | TURI'N.                 |
| SURAI Pass       | SURINA'RI                  | SURUNA'RI.              |
| ANGA'NG          | ANGA'ND                    | NINGA'ND.               |
| R. SURKHA'B      | SURKHA'B                   | SURKHA'B.               |
| MOHAMMAD SHARFI  | SARIA'DA KA'RE'Z           | SAREA'DA KA'RE'Z.       |
| MT. KAND         | KUND                       | KAND.                   |
| MEHTARZAI        | ME'TRAZAI                  | ME'TRAZAI.              |
| TLARAI           | TALARAI                    | LARAI.                  |
| MURGHAI          | MURGHA'                    | MURGHA'.                |
| SHARAN           | SHIRAN                     | ...                     |
| NARI'N           | ...                        | NARI'N.                 |
| BALUZAI KA'RE'Z  | BALUZAI                    | BULUZAI.                |
| SA'GHAI          | SARGAI                     | SARGAI.                 |
| SAMA'WAN         | ZEMIRSTA'N                 | ZEMIRSTA'N.             |
| KHA'NZAI KA'RE'Z | KHA'NZAI                   | KHA'NZAI.               |
| SHAKAR           | SAKKAR                     | SAKKAR.                 |
| ZARGHU'N KA'RE'Z | ZERGU'N KA'RE'Z            | ...                     |
| KSHO'I KA'RE'Z   | KUSO'I                     | KUSO'I.                 |
| R. RO'D          | TO'GAI                     | TO'GAI.                 |
| GWA'L            | GWA'L                      | GWA'L.                  |
| PISHIN           | PISHIN                     | PE'SHI'N.               |
| MT. TAKATU'      | TAKATU'                    | TA'TUCKA.               |
| WOCHAKHLA        | TURA KALA                  | ...                     |
| UKHMUGHDAI Pass  | OKHMUKHZAI                 | UCHMUCHZAI.             |
| R. ZADU'N        | ...                        | ZERDU'N.                |
| AMADU'N          | AMADU'N                    | AMADU'N.                |
| MT. ZARGHU'N     | ZERGHU'N                   | ZERGHU'N.               |
| KA'KAR           | KA'KUR.                    | KA'KUR.                 |
| YSAF KACH        | YUSUF KACH                 | YUSAF KACH.             |
| USH PASS         | USHTA'RA                   | USHTA'RAH.              |
| MT. MAZHWO       | MASHKWAR                   | MASHKWAR.               |
| SPE'ZHANDAI      | SPE'ZANDAI                 | SPE'ZANDAI.             |
| ISPIRA RAGHA     | { SPIRARAGHA<br>SPIRARGH } | SPIRARAGHAH.            |
| MT. SPINSHAR     | ...                        | SPINSHAR.               |
| DUMAR            | DUMAR                      | ...                     |
| MT. SURGHWAND    | SURKAND                    | ZERGU'N.                |
| ZHO'B Valley     | ZHO'B                      | ZHO'B.                  |

| Temple.            | Holdich.                         | Quarter-Master General.     |
|--------------------|----------------------------------|-----------------------------|
| NANGALU'NA Pass    | } MO'MANDGAI                     | MAMANAGI.                   |
| MO'MAND SARA'I     |                                  |                             |
| MO'MAND            |                                  |                             |
| O'BUSHTKAI         | O'BOSKOI                         | O'BOSKOI.                   |
| CHIMJA'N           | CHIMJA'N                         | CHINJA'N.                   |
| PA'LKAI Pass       | PA'LKI'                          | PA'LKI'.                    |
| WARGHAS            | WERGUS                           | ...                         |
| HINDU BA'GH        | HINDU BA'GH                      | HINDOO BA'GH.               |
| GURMAI             | GURMI'                           | GURMI'.                     |
| MT. MATKHILAR      | MASHKHILAR                       | MASHKILAR.                  |
| MT. SYA'JGAI       | SIA'SGAI                         | SIA'SGAI.                   |
| DARGAI             | DARGAI                           | DARGAI.                     |
| CHINA'LI           | CHINA'LI                         | CHINA'LI.                   |
| SUNGALU'N          | SHUNDLU'N                        | SHU'N LU'N.                 |
| KA'SAI Hill        | MANA'RA                          | MANA'RA'.                   |
| KACH               | KATS                             | KATS.                       |
| BAIA'NAI           | BIA'NI                           | BIA'NI.                     |
| SARKAI ZANGAL      | SKAIJANGAL                       | SKAIJANGAL.                 |
| NINGA'ND           | NINGA'N                          | NINGA'N.                    |
| GHOBARGAI Hill     | GOBARGI'                         | GOBARGI'.                   |
| SMALAN             | SMALAN                           | SMALAN.                     |
| SINZAWAI           | SINGA'VI                         | SANJA'VI.                   |
| SHINLE'Z           | SINGLAZE                         | SINGLAZI.                   |
| BAGHA'WA           | BAGHA'O                          | BAGHA'O.                    |
| JALKA'RE'Z         | KA'RE'Z                          | KA'RE'Z.                    |
| SHAKA'RE'Z         | SHAHKA'RE'Z                      | SHAHKA'RE'Z.                |
| TO'R KHAIZE' Hills | { DURGAINNI }<br>{ DARMANGARIH } | DURGUNNY.                   |
| LASHTAI            | LASHTAI                          | LUSHTAI.                    |
| WARIA'GAI          | URIASGAI                         | URIAGAI.                    |
| ZANGIWA'L          | ZANGIWA'L                        | ZANGIWA'L.                  |
| KHANKAI            | { KONKAI }<br>{ CHAPLAI }        | { KONKAI. }<br>{ CHAPLAI. } |
| RO'DLI'N           | KUDISAI                          | ...                         |
| NAVGIYVA'LA        | MALAIYAM                         | MALAIAN.                    |
| LA'HO'R            | LA'HOR                           | LAHORE.                     |
| DI'LAI             | DELHI                            | DELHI.                      |
| MU'LTAT            | MUDDUK                           | MUDDUH.                     |
| DARGAI             | DARGAI                           | DARGAI.                     |
| SHABOZAI           | SHABOZAI                         | SHABOZAI.                   |
| SHARAN             | SHO'RA'N                         | SHORA'N.                    |

| Temple.                                                                                                                                                                                                                                                                                                                                                                                                                     | Holdich.                                                                                                                                                                                                                                                                                                                                                        | Quarter-Master General.                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BARMINAI }<br>DA'LO'R<br>SAGHARAI<br>CHINA' KO'T<br>KACHAI<br>KANA'<br>KACH<br>SHARAN<br>SHA'BA'N<br>KAUN WAHA'R<br>KURU<br>HANUMBA'R<br>GADIWA'R<br>SARGHAR Peak<br>LU'NI<br>SHAUGWA'L<br>TREKH KURAM<br>RAHA<br>TAL<br>CHO'TIA'LI<br>KO'LU<br>BRAHAMZAI KHELA'T<br>MA'R Pass<br>TSAMAULANG<br>HANOKAI Pass<br>BA'LA DHA'KA<br>MITTHI' KHU'N<br>HAN Pass<br>JA'NDHRA'N Hills<br>CHO'R TARAP<br>BA'HAN KUND<br>CHAPAR Hills | }<br>BARANMAI }<br>BA'MEMAI }<br>DALU'R<br>SAGRE'<br>CHINNA<br>KATSAI<br>KHANA<br>KATS<br>...<br>SHAMURLAK<br>AWAHA'R<br>KHURU<br>ANUMBA'R<br>GADBA'R<br>TATRI<br>LU'NI<br>SHANGOLAI<br>TREKH KURAM<br>RAHA<br>TULI<br>CHO'TIA'LI<br>KO'LU<br>PA'RAMZAI<br>MA'R<br>CHAMA'LANG<br>HANNOKAI<br>BA'LLADA'KA<br>HANKU'A<br>HAN<br>JA'NDRA'N<br>...<br>...<br>CHAPAR | BAMEMAI.<br>DALUR.<br>SAGRE'.<br>CHINNA.<br>KATSAL.<br>KHANA.<br>KHAS.<br>SHORAN.<br>SHAMARLAK.<br>AWA'HAR.<br>KHURU.<br>ANAMBAR.<br>GADBAR.<br>TATARI.<br>LU'NI.<br>SHANGOLAI.<br>TREKH KURRAM.<br>REHI.<br>TAL.<br>CHO'TIA'LI.<br>KO'LU.<br>BA'RAMZAI.<br>MA'R.<br>CHAMA'LANG.<br>HANNAKOI.<br>BA'LLADA'KA.<br>HANKU'A.<br>HAN.<br>JA'NDRA'N.<br>CHO'R KI' TAP.<br>BA'HANWA'LA' KACH.<br>CHAPAR. |



*On the Sūryaprajñapti.*—By DR. G. THIBAUT, *Principal, Benares College.*

PART II.

(Continued from p. 127.)

Although ancient Indian astronomy was chiefly interested in the moon and although the greater part of the *Sūryaprajñapti* treats of her, especially of the places she occupies at different times in the circle of the nakshatras, a detailed connected account of her motions is not given anywhere, and we must combine the hints we meet with here and there, in order to understand the theory by which the old *tīrthan-kāras* tried to explain to themselves her motion. In doing this we are of course greatly aided by the full and unambiguous account given of the sun's motion, since it will not be presuming too much that the theory which had been applied to the one luminary would be applied to the other one also. As we have seen above, the sun's daily apparent motion is regarded to be his true one and considered to take place round Mount Meru; his yearly motion is the consequence of his moving more slowly than the stars; his motion in declination is the result of his describing round Mount Meru circles of varying diameter. All this is applied to the moon too. The moon describes (or the two moons describe) circles round Mount Meru at the height of eight hundred and eighty *yojanas* above the earth, so that her place is eighty *yojanas* above that of the sun. She moves slower than the stars and slower than the sun; while the latter describes during one *yuga* 1,830 (or strictly speaking 915) circles, the moon describes only 1,768 (or again on the assumption of two moons 884) such circles; the difference of the two numbers = 62 indicates the number of times the moon enters into conjunction with the sun. During the same period, *viz.*, the quinquennial *yuga*, the moon completes sixty-seven sidereal revolutions. Each of these revolutions is, analogously to the sun's revolutions, divided into two *ayanas*, an *uttarāyana* and a *dakṣiṇāyana*, according as the moon is proceeding towards the north or the south (of the equator as we should add). In reality, it is true, the motion of the moon is much more complicated, as it is not only oblique to the equator, like the ecliptic in which the sun is moving, but also inclined to the ecliptic itself at an angle of about 5°, while moreover at the same time the points in which the moon's path cuts the ecliptic are continually receding. One of the consequences of the revolution of the nodes did, as we shall see below, not escape the observation of the author of the *Sūryaprajñapti*, but he was manifestly unable to account for it by a modification of his theory. According to him the moon, like the sun, simply describes concentric circles round Mount Meru, some-

times approaching it sometimes receding from it. While, however, the period of the sun's progress from and towards Mount Meru comprises one year—the time which the sun employs in arriving again at the same star—the corresponding period of the moon embraces one nakshatra month = 27 days,  $9 \frac{27}{67}$  muhūrtas. From this it is easy to find the number of the circles the moon describes. She performs during one yuga 1,768 complete revolutions, consequently during one nakshatra month  $\frac{1768}{67} = 26 \frac{26}{67}$  revolutions, and during one ayana or sidereal half month  $13 \frac{13}{67}$  revolutions. The moon therefore proceeds towards the north during the time which she wants for describing  $13 \frac{13}{67}$  circles, and after that she proceeds towards the south for the same length of time. From this it follows that, while the sun has 184 different circles to describe, the moon has fifteen such circles only. At the beginning of the yuga she leaves the outermost circle and begins her uttarāyana, describes the thirteen circles intermediate between the outermost and the innermost ones and enters into the fifteenth (innermost) circle, through  $\frac{13}{67}$  parts of which she passes. After that the sidereal half moon has elapsed, and the moon has to retrace her steps towards the south. She therefore leaves the innermost circle unfinished, returns into the next one, passes again through the 13 intermediate circles and enters into the 15th (outermost) circle. After she has passed through  $\frac{13}{67}$  parts of the latter, the sidereal half moon is again over and the progress towards the north recommences. Thus the moon moves in 15 circles of different diameter, but only 13 she passes through in their entirety while a fractional part only of the two exterior circles are touched by her. We have seen above that the vikampa-kshetra of the sun, *i. e.*, the extent to which the sun moves sideways in his northern and southern progress is estimated at 510 yojanas (=  $183 \times 2 \frac{48}{61}$ ; the latter quantity being the amount of the daily vikampa); the vikampa-kshetra of the moon is estimated at nearly the same amount, *viz.*,  $509 \frac{53}{61}$  yojanas (it has been already remarked that the inclination of the moon's path to the ecliptic is not known to the Sūryaprajñapti). The diameter of the moon herself is estimated at  $\frac{56}{61}$  yojanas, the interval between consecutive circles described by the moon at  $35 + \frac{30}{61} + \frac{4}{7 \times 61}$  yojanas; the sum of these two quantities is  $36 + \frac{25}{61}$

$+\frac{4}{7 \times 61}$ , which multiplied by 14, gives the above stated amount  $\left(509 \frac{53}{61}\right)$  as the whole vikampakshetra during one lunar half month.

Here—as likewise above with reference to the sun—the Sūryaprajñapti does not directly speak of the diameter of the moon, but of the measure of the breadth of the circle described by the moon; but the two things come to the same. The manner in which the moon, after having completed one of her circles, passes over into the next one is not expressly detailed; we must imagine it similar to that of the sun.

In connexion with this account of the moon's motion, the Sūryaprajñapti enters into a curious calculation, of no practical, and it can hardly be said any theoretical interest, which, however, may be mentioned here as a specimen of the accuracy with which the system is worked out into its minutest details. The question is raised: what circles are common to the sun and moon and how far are those of the moon's circles which belong to the sun also touched by the latter? As the moon's circles are elevated above those of the sun by the amount of eighty yojanas, strictly speaking not any circle is common to both; common to both are, however, said to be those circles of the moon which when projected upon the plane in which the sun describes his circles partially or entirely coincide with the latter. The vikampa-kshetras of the two being nearly equal, while 15 circles of the moon correspond to 184 circles described by the sun, the consequence is that the by far greater portion of the sun's circles do not coincide with the moon's circles, but fall into the wide intervals separating the latter, one from another. Thus for instance the first (innermost) circle of the sun coincides with the first circle of the moon, so that when both luminaries move in their innermost circles their distance from Mount Meru is equal; only the circle of the moon overlaps that of the sun by  $\frac{8}{61}$  yojanas, this being the difference of the breadth of the circles described by the two (of the diameters of the two bodies). The next twelve circles of the sun all fall into the interval between the first and the second circle of the moon; for this interval (plus the overlapping  $\frac{8}{61}$  of the first circle) amounts to  $35 + \frac{38}{61} + \frac{4}{7 \times 61}$  yojanas, while the vikampa-kshetra of twelve solar circles amounts to  $33 \frac{27}{61}$  yojanas only. After that two yojanas are occupied by the interval between the 13th and the 14th solar circles, and then the fourteenth solar circle begins, which therefore partly coincides with the second lunar circle. By continuing these calculations for all lunar circles, it is

found that the first up to the fifth inclusive, and again the eleventh up to the fifteenth inclusive are "sūrya-sammiśrāṇi," *i. e.*, partly coincide with solar circles, while the sixth up to the tenth do not coincide with solar circles, the latter falling entirely into the intervals between the named lunar circles. To reproduce here all the details of the calculation would be purposeless.—That the preceding account of the moon's motion agrees with the ideas of the author of the *Sūryaprajñapti* is to be concluded from the formulas given in different parts of the work for the performance of certain calculations. Thus for instance the question is raised, in what ayana and what circle each parvan takes place, *i. e.*, how many ayanas have elapsed at the different times when the moon enters into conjunction or opposition and in which of the fifteen circles she is moving just then. This question is answered by some ancient gāthās quoted in the commentary, according to which the calculation has to be made as follows. The constant quantity—the  $\frac{9}{31 \times 67}$ —which is to be used for the calculation of each parvan, is equal to  $1 + \frac{4}{67} + \frac{9}{31 \times 67}$ , *viz.*, of one of the circles described by the moon. This quantity is of course easily found by the following consideration. The moon which describes in one yuga 1,768 circles describes in one parvan  $\frac{1768}{121} = 14 \frac{8}{31}$  circles and in one ayana  $13 \frac{13}{67}$  circles; the difference of these two quantities is the above mentioned constant quantity. The rule for finding the places of the parvans is now as follows: The way accomplished by the moon during one parvan being equal to the way accomplished during one ayana plus  $1 + \frac{4}{67} + \frac{9}{31 \times 67}$  circles, take at first as many ayanas as the number of the parvan whose place is wanted indicates, multiply then the constant quantity by the number of the parvan, and if the result exceeds  $13 \frac{13}{67}$ , deduct it from this latter quantity (which subtraction if necessary has to be repeated until the remainder is less than  $13 \frac{13}{67}$ ); as often as this subtraction is performed as many unities are to be added to the number of ayanas found above and—unless the subtraction leaves no remainder—one additional unity is to be added; add two to the remainder; the resulting sum will indicate the circle in which the moon stands at the parvan. Regarding this latter point it is to be remembered that the circles are to be counted from the innermost circle when the number of the parvan is an even one and from the outermost circle when it is an odd one. To illustrate this let us take one of the many examples given by the Commentator. Required the place of the moon at the fourteenth parvan. Multiply at first one by fourteen, that means: fourteen ayanas have elapsed

at the time. Then multiply  $1 + \frac{4}{67} + \frac{9}{31 \times 67}$  by fourteen; the result is  $14 + \frac{56}{67} + \frac{126}{31 \times 67} = 14 + \frac{60}{67} + \frac{2}{31 \times 67}$ . This is the number of circles which the moon has passed through during fourteen parvans in addition to fourteen ayanas. As this number exceeds the number of circles passed through in one ayana (*viz.*,  $13 \frac{13}{67}$ ), the latter number has to be deducted from it and one has to be added to the number of ayanas. So we see that the moon has performed 15 ayanas at the end of the 14th parvan. The remainder left after the above deduction shows the number of circles which the moon has passed through in addition to the 15 complete ayanas; in our case these amount to  $1 + \frac{47}{67} + \frac{2}{31 \times 67}$ . As there is an excess above 15 complete ayanas, we have according to the rule to add one to their number, *i. e.*, the parvan takes place in the sixteenth ayana. And since the moon enters at the beginning of the ayana into the second circle (the circles being counted from the innermost as well as the outermost) and since in our case the moon has completed more than one full circle, two has to be added to the number of circles found above in order to obtain the ordinal number of the circle in which the moon stands at the expiration of the 14th parvan. The full answer is therefore: the 14th parvan takes place in the sixteenth ayana, in the third circle (reckoning from the innermost circle),  $\frac{47}{67} + \frac{2}{31 \times 67}$  of this circle having already been passed through. In the same manner the places of all other parvans may be easily found; the commentator gives the places of parvan I—XV; but it would serve no purpose to extract them here. What has been given will suffice to justify the hypothetical account of the moon's motion detailed above.

The question regarding the relative velocity of sun, moon and stars which is raised in the 15th book finds its answer in accordance with the general principles of the system. The apparent daily motion being considered as the real one, it follows that the nakshatras travel faster than the sun, and the sun again faster than the moon; the space passed through by each of these bodies during a month, day, muhūrta, etc. is calculated and exhibited in detail; we need, however, only remember that the sun describes in one yuga 1,830 circles, while the moon describes only 1,768 and the nakshatras—through whose circle the sun passes five times—describe 1,835. From these relations all special values can be easily derived. It is just mentioned—no details being given—that the planets (graha) travel faster than the sun and the stars (tārāḥ) faster than the nakshatras. It is needless to discuss the former of these two assertions; the latter is of course

entirely indefensible and no reason leading to it can well be imagined. This is the only time that the stars—excluding the nakshatras—are mentioned in the Súr্যaprajñapti as far as we can judge from the commentary.

The next point to be considered is the information the Súr্যaprajñapti furnishes with regard to the nakshatras. Incidentally it has already been remarked that the number of the nakshatras is invariably stated as being twenty-eight, and that the nakshatras are as invariably treated as being of different extent. The particulars are as follows :

According to their extent or, to look at it from another point of view, according to the time during which sun and moon are in conjunction with them, the nakshatras are divided into four classes. Firstly, those with which the moon is in conjunction during one ahorátra = thirty muhúrtas; to this class belong Revatí, Aśviní, Kṛittiká, Mṛigaśiras, Pushya, Maghá, Púrvaphálguní, Hasta, Chitrá, Anurádhá, Múla, Púrváshádhá, Śravaṇa, Śravishṭhá, Púrvabhádrapadá. The one ahorátra for which the conjunction lasts may be expressed as  $\frac{2010}{67}$  muhúrtas, the convenience of which expression will appear at once. The second division comprises those nakshatras which are in conjunction with the moon for half a nycthemeron = fifteen muhúrtas =  $\frac{1005}{67}$  muhúrtas; to this division belong Śatabhishaj, Aśleshá, Bharaní, Jyeshṭhá, Árdra, Svátí. To the third division belong those nakshatras with which the moon is in conjunction for one and a half nycthemeron = 45 muhúrtas =  $\frac{3015}{67}$  muhúrtas; these nakshatras are Uttaráshádhá, Uttaraphálguní, Uttara-bhádrapada, Punarvasu, Viśákhá, Rohiní. The fourth division comprises one nakshatra only, *viz.*, Abhijit, with which the moon is in conjunction for  $9\frac{27}{67} = \frac{630}{67}$  muhúrtas. We see now for what reason the time of conjunction has been expressed throughout in sixty-sevenths of a muhúrta; it was done for the purpose of obtaining homogeneous expressions for all nakshatras. At the same time these fractions furnish us with an easy means for calculating the time during which the sun is in conjunction with each nakshatra; for five revolutions of the sun occupying the same time as sixty-seven revolutions of the moon, we have only to replace the denominator of the above fractions by five. The result of this operation having been turned into nycthemera, we find as the expression for the time during which the sun is in conjunction with the nakshatras of the four divisions the four following terms: 13 days, 12 muhúrtas; 6 days, 21 muhúrtas; 20 days, 3 muhúrtas; 4 days, 6 muhúrtas.—According to the space the nakshatras occupy they are either samakshetra, occupying a mean (medium) field or apárdhakshetra, occupying

half a field or *dvyardhakshetra*, occupying one field and a half. There is no special name for the extent of *Abhijit*.

In connexion with this division of the *nakshatras* into different classes according to the space they occupy or the time during which they are in conjunction with the moon, there is another one referring to the time of the day or the night at which they enter into conjunction. This classification is, however, connected with considerable difficulties. It is nowhere clearly stated on the conjunctions of what particular month this division is based; that such a statement ought to have been given, appears from the consideration that the periodical month during which the moon passes through all *nakshatras* comprises 27 days plus  $\frac{27}{67}$  days, and that there-

fore in the second, third, fourth, etc. months the times at which the moon enters into conjunction with the single *nakshatras* will all differ from the times of the first month. If for instance the moon at the beginning of the first month enters into conjunction with *Abhijit* in the early morning, she will at the beginning of the second month again enter into conjunction with it  $9\frac{27}{67}$  *muhūrtas* later, that is, in the afternoon and so on. Other

difficulties will appear from the following detailed reproduction of the *Sūryaprajñapti*'s account concerning this point. The *nakshatras* are either "*pūrvabhāga*" *i. e.*, such as enter into conjunction with the moon during the forenoon; or "*pāśchādbhāga*" *i. e.*, such as enter into conjunction during the afternoon or "*naktambhāga*" *i. e.*, such as enter into conjunction during the night or "*ubhayabhāga*" which term will be explained further on. The *nakshatras* of the two first classes are the *samakshetras*, those of the third class the *apārdhakshetras*, those of the fourth class the *dvyardhakshetras*. It certainly does not appear why the *samakshetras* should enter into conjunction with the moon during the day only and the *apārdhakshetras* during the night only; in reality there is no connexion between the extent of a *nakshatra* and the time when the moon enters into it. Let us, however, follow the detailed statements about each single *nakshatra*. The first aphorism of the *Sūryaprajñapti* appears to be "*Abhijit* and *Śravaṇa* are *pāśchādbhāga samakshetra*." To this the commentator rightly objects that *Abhijit* is neither *samakshetra*, since it occupies only  $9\frac{27}{67}$  *muhūrtas* of

the moon's periodical revolution, nor *pāśchādbhāga*, since at the beginning of the *yuga* the moon enters into conjunction with it in the early morning. At the same time he tries to obviate these objections by remarking that *Abhijit* is called *samakshetra* and *pāśchādbhāga*, because it is always connected with *Śravaṇa* to which both these attributes rightly belong, or that it may be called *pāśchādbhāga* with a view to conjunctions other than the

first one which may take place in the course of the yuga. But these both attempts at reconciling contradictions are very unsatisfactory. Howsoever this may be, the commentator goes on to explain that Abhijit and Śravaṇa, after having finished their conjunction with the moon, hand her over to Dhanishṭhā at evening (Abhijit-śravaṇo dve nakshatre śáyam-samayād árabhya ekám rátrim ekam cha sátirekam divasam chandreṇa sárddham yogam yuktaḥ etávantam kálam yogam yuktvá tad-anantaram yogam anu-parivartayataḥ átmanas̄ chyávayataḥ yogam chánuparivartya śáyam divasasya katitame paśchádbháge chandram dhanishṭháyáh samarpayataḥ). For this reason Dhanishṭhā also is paśchádbhága. After having been in conjunction with it for thirty muhúrtas the moon enters Śatabhishaj at the time when the stars have already become visible (parishphuṭanakshatramañḍalávaloke); Śatabhishaj is therefore naktambhága. How Śatabhishaj enters into conjunction at night, while exactly one ahorátra before Dhanishṭhā has been said to enter into conjunction during the afternoon, is not explained. Śatabhishaj being apárdhakshetra, the moon remains in conjunction with it for fifteen muhúrtas only and enters on the next morning into conjunction with Púrva-proshṭhapada, which being samakshetra remains in conjunction during one whole ahorátra. On the following morning the moon enters Uttara-proshṭhapada, which therefore would be púrvabhága. But the matter is looked at in a different light, Uttara-proshṭhapada is dvyardhakshetra, *i. e.*, remains in conjunction for 45 muhúrtas. If we now deduct from this duration the fifteen first muhúrtas and imagine Uttara-proshṭhapada to be samakshetra, the conjunction of the moon with it—looked at as samakshetra—may be said to take place at night and in consequence one—the real—conjunction taking place during the day and the other—the fictitious one—taking place at night the nakshatra is called ubhayabhága (idam kilottarabhádrapadákhyaṃ nakshatram uktaprakáreṇa prátas̄ chandreṇa saba yugam adhigachchhati, kevalam prathamán pañehadaśa muhúrtán adhikán apaníya samakshetram kalpayitvá yadá yogaś chintyate tadá naktam api yogo 'stítý ubhayabhágam avaseyam). Uttara-bhádrapada remains in conjunction for one day, one night and again one day, on the evening of which the moon enters Revatí; Revatí is therefore paśchádbhága. After it has remained in conjunction for one nychthemeron the moon passes into Aśviní at evening time. Aśviní is therefore likewise paśchádbhága. From it the moon passes on the next evening into Bharaní, at the time, however, when the stars have become visible and night may be said to have begun; Bharaní is therefore naktambhága. Being at the same time apárdhakshetra, the moon leaves it on the next morning to enter Kṛittiká, which therefore is púrvabhága. On the next morning the moon enters Rohiní which is dvyardhakshetra and, on account of that, ubhayabhága. Mṛigaśiras which she enters forty-five muhúrtas

later at evening is paśchádbhága; Árdrá which enters into conjunction thirty muhúrtas later, at the time when the stars have come out, is naktam-bhága; Punarvasu into which the moon enters on the next morning, being dvyardha, is uhayabhága. Pushya comes into conjunction on the evening of the following day and is paśchádbhága; Áślesha thirty muhúrtas later, when the stars have come out, and is naktambhága; Maghá and Púrva-phalguní into which the moon enters on the mornings of the two following days are púrvabhága; Uttara-phalguní which comes into conjunction on the morning after that is ubhayabhága, because it is dvyardhakshetra. Hasta and Chitrá enter into conjunction on the evenings of the two following days, before night has set in, and are therefore paśchádbhága. Then again follows one naktamhbhága nakshatra, *viz.*, Svátí which enters into conjunction after nightfall, and upon this a dvyardhakshetra and consequently ubhayabhága nakshatra, *viz.*, Viśákhá. Then Anurádhá paśchádbhága, after this Jyeshthá, apárdhakshetra and naktambhága, remaining in conjunction from nightfall to the morning only; after this two samakshetra and púrvabhága nakshatras, *viz.*, Múla and Púrváshádhá. And finally Uttaráshádhá, which enters into conjunction on the morning, is, however, as a dvyardhakshetra, reckoned among the ubhayabhága. It remains in conjunction for one nycthemeron and the following day, in whose evening the moon arrives at Abhijit whence she had started a (periodical) month ago.

The difficulties involved in all the preceding statements are increased by an assertion made in another chapter of the Sūryaprajñapti, *viz.*, that no nakshatra always enters into conjunction with the moon at the same time of the day. This is indeed true, but it contradicts the preceding statements. It may be that this whole classification of the nakshatras according to the time of the day at which they enter into conjunction with the moon is a remainder of an earlier stage of knowledge, when the periodical month was supposed to last just twenty-seven days without an additional fraction, and when it therefore was possible to assign to each nakshatra one fixed hour at which it entered into conjunction during each periodical revolution of the moon. It is true that actual observation would speedily have shown the error of such an assumption, but this remark would apply to almost all hypotheses of the Indians of that period, and we may therefore suppose that in this point too the desire of systematizing prevailed during a certain period over the testimony of the eyes. Later on when the duration of the periodical month had become better known, the old classification lost its foundation entirely and ought to have been dropped; but through the force of custom it maintained its place and was justified some how, although not with the best success, as we have had occasion to observe above.

On the places of the nakshatras with regard to the moon we receive

the following information (X. 11). Six nakshatras, *viz.*, Mṛigaśiras, Ārdra, Pushya, Āśleshá, Hasta, Múla always stand to the south of the moon whenever she enters into conjunction with them. Twelve nakshatras—Abhijit, Śravaṇa, Dhanishṭhá, Śatabhishaj, Púrva-bhádrapadá, Uttara-bhádrapadá, Revatí, Áśviní, Bharaní, Púrva-phálguní, Uttara-phálguní, Svátí always stand to the north of the moon. Seven nakshatras—Kṛittiká, Rohiṇí, Punarvasu, Maghá, Chitrá, Viśákhá, Anurádhá—sometimes stand to the north of the moon entering into conjunction with them; sometimes, however, the moon enters into conjunction with them “pramardarúpeṇa” *viz.*, in such a manner that she passes right through them. To this class, the commentator remarks, some teachers holding an opinion different from that of the Sūryaprajñapti add also Jyeshṭhá. Two nakshatras, *viz.*, the two Āshádhás stand at the time of conjunction either to the south of the moon or the latter passes right over them. Both these nakshatras consist of four stars each, two of which are situated inside, *viz.*, to the north of the fifteenth circle of the moon, while the two remaining ones are placed outside, *viz.*, to the south of the same circle. Now whenever the moon enters into conjunction with either of the two nakshatras, she passes right between the former pair of stars and may therefore be said to be in conjunction “pramardarúpeṇa.” Finally one nakshatra, *viz.*, Jyeshṭhá, always enters into conjunction with the moon pramardarúpeṇa. Regarding the relation of the nakshatras to the fifteen circles of the moon, the following statements are made. Eight circles always are “undeprived” (avirahitáni) of nakshatras. The twelve nakshatras mentioned above, beginning with Abhijit, are in the first circle; in the third circle there are Punarvasu and Maghá; in the sixth, Kṛittiká; in the seventh, Rohiṇí and Chitrá; in the eighth, Viśákhá; in the tenth, Anurádhá; in the eleventh, Jyeshṭhá; in the fifteenth, Mṛigaśiras, Ārdra, Pushya, Āsleshá, Hasta, Múla and the two Āshádhás. For although the first six of the last mentioned class in reality move outside the fifteenth circle, they are—the commentator says—so near to it that they may be said to be in it. In order to form a right estimate of the meaning and the value of these statements, we must recall to our mind what has been remarked above about the Sūryaprajñapti’s theory of the moon’s motion. The moon is supposed to proceed alternately towards the south and the north in the same way as the sun does, following—as the Sūryaprajñapti seems to assume—the same path; that she in addition to the movement in declination has a movement in latitude, and that the points in which her orbit cuts the ecliptic are continually receding is ignored, theoretically at least, although it had been observed that the position of the moon with regard to some nakshatras is different at different times, that she sometimes passes on the north or south-side of a constellation and at other times moves right through it. Now comparing the particulars

with the information given about the position of the nakshatras in the Siddhāntas, we find that the Sūryaprajñapti agrees with the latter with regard to five out of the six nakshatras said always to stand south of the moon (Mṛigaśiras, Ardra, Āśleshā, Hasta, Mūla), the latitude of all of them considerably exceeding the highest latitude the moon ever reaches. The case lies differently with regard to Pushya, which according to the Siddhāntas lies in the ecliptic, so that it almost appears as if the Pushya of the Sūryaprajñapti were an altogether different asterism. From among the twelve nakshatras said to stand always north of the moon ten (Abhijit, Śravaṇa, Śravishṭhā, Pūrva-Bhādrapadā, Uttara-Bhādrapadā, Āśvinī, Bharanī, Pūrva-Phālgunī, Uttara-Phālgunī, Svātī) may be identified with the nakshatras of the Siddhāntas whose latitudes—excluding Abhijit—vary from  $9^\circ$  to about  $39^\circ$  north. Strange it is only that these nakshatras occupying a zone of about  $21^\circ$  breadth are said to be in one and the same circle of the moon, and still stranger that Abhijit too is classed among them, the latitude of the latter—if identical with the Abhijit of the Siddhāntas—exceeding the latitudes of the other nakshatras, with which it is here thrown into one class, by about  $30^\circ$ . The Śatabhishaj and Revatī of the Siddhāntas are situated in and close to the ecliptic; here too therefore we might doubt if the Sūryaprajñapti denotes by these two names the same stars as the Siddhāntas. The remaining nakshatras may be identified with those of the Siddhāntas, the latitude of none of the latter much exceeding the greatest latitude reached by the moon; a considerable margin must of course be allowed for the inaccuracy of the observations on which the statements of the Sūryaprajñapti are based. Quite unfounded is the statement about the moon always passing right through Jyeshṭhā; it looks as if it had originated at some period when one of the moon's nodes had about the same longitude as that asterism.

The order of succession of the nakshatras is treated in X. 1. Of five different pratipattis regarding this point the author details only one, *viz.*, that one according to which Kṛittikā stands first. The author of the Sūryaprajñapti for his part calls Abhijit the first nakshatra, since according to his system at the beginning of the yuga on the day of the summer solstee early in the morning the moon which is full at that time stands in Abhijit. He therefore altogether abandons the principle, sometimes followed, according to which the enumeration of the nakshatras begins with that nakshatra in which the sun stands on the day of the vernal equinox; if he too had chosen this principle he would of course have begun his enumeration with Āśvinī. It may here be mentioned by the way that the Sūryaprajñapti does not occupy itself at all with the equinoxes, the name of which is not even mentioned in the whole work.

We now proceed to consider some specimens of the numerous cal-

culations, rules for the performance of which are contained in the Śúryaprajñapti itself as well as in a great number of old *karāṇa-gáthás* quoted by the commentator; remarking at once that the rules contained in the *gáthás* presuppose exactly the same system as the rules of the Śúryaprajñapti itself. A comparison of these calculations with those contained in the *vyotisha-vedāṅga* shows the extreme likeness and in many cases the complete identity of the two sets; a result which supplies another reason for looking on the Śúryaprajñapti as—in all essential points—a fair representative of Indian astronomy anterior to the period of the *Siddhántas*. Several of these calculations have already been reproduced above incidentally; in the following a detailed account of the more important ones among those not yet touched upon will be given.

It appears that before the influence of Greek astronomy made itself felt in India, the division of the sphere into 27 or 28 *nakshatras* was the only one employed and that no independent subdivisions of the *nakshatras* were made use of. This want was, however, supplied by a simple transfer of the subdivisions of time to the *nakshatras*. In accordance with this principle the Śúryaprajñapti divides the sphere into  $819 \frac{27}{67}$  *muhúrtas*, this

being the duration of the periodical revolution of the moon, and allots to each *nakshatra* a certain number of *muhúrtas* according to its greater or smaller extent. Fixed subdivisions of the *muhúrta* such as are commonly met in Indian astronomical works are, however, nowhere employed by the author of the Śúryaprajñapti; he apparently preferred to keep himself perfectly free from restrictions of this kind and uses throughout those fractions of the *muhúrta* only which were immediately suggested by the various calculations in hand. From the general nature of the *yuga* it is manifest at once which fractions will present themselves most readily; they are sixty-seconds and sixty-sevenths ( $62 =$  number of synodical months in a *yuga*,  $67 =$  number of periodical months) and, whenever lunar months of both kinds enter into the calculations, sixty-sevenths of sixty-seconds.

One of the most important rules is that which teaches how to find the place of the moon on any *parvan*. In the following the details of the calculation furnished by the commentator will be stated in *extenso*, so that at least one complete specimen of computations of this kind may be exhibited.—If we wish to devise a rule for calculating the place of the moon in the circle of the *nakshatras* at any *parvan*, we must at first find the constant quantity—the *dhrubarási*—entering as a multiplicand into all calculations of this kind. This in our case is clearly the space passed through by the moon during the lunar month, or more simply, because entire revolutions which bring the moon back to the same place can be neglected, the excess of the lunar synodical month above the periodical

month. From what is known about the general constitution of the yuga this quantity is of course readily found to be equal to  $66 + \frac{5}{62} +$

$\frac{1}{62 \times 67}$ . The commentator calculates this quantity as follows. If the

sun performs during 124 parvans five complete revolutions, how much does he perform during 2 parvans (= one synodical month); answer:  $\frac{5 \times 2}{124} =$

$\frac{5}{62}$  rev. This therefore is the excess of the synodical month above the periodical one. In order that the division can be carried out, the  $\frac{5}{62}$  rev.

are turned into nakshatras by multiplying them by  $\frac{1830}{67}$  (*i. e.* by  $27 \frac{21}{67}$ ,

the duration in ahorátras of the periodical month or, if we like, the extent of the nakshatras; 27 entire nakshatras plus the fractional nak-

shatra Abhijit). Result of the multiplication  $\frac{9150}{4154}$ . Again—in order to

turn the days or nakshatras into muhúrtas—the numerator is multiplied by 30. Result =  $\frac{274500}{4154}$ . This division being performed gives as result

66 muhúrtas. The remainder 336 is multiplied by 62 and the product again divided by 4154. Result =  $\frac{5}{62}$  muhúrtas. The remainder—62—

should again be multiplied by 67 (the fractions employed being throughout sixty-seconds and sixty-sevenths) and divided by 4154; but 4154 being itself =  $62 \times 67$ , it is seen at once that the result is 1. Thus the

whole quantity is  $66 + \frac{5}{62} + \frac{1}{62 \times 67}$  muhúrtas. If now the place of

the moon at any amávasyá or pūrṇamásí is wanted, the above quantity has to be multiplied by the number of the parvan; for instance, by one if the moon's place at the first full moon after the beginning of the yuga is wanted. The product shows how far the moon at the time has advanced beyond the place she had occupied at the beginning of the yuga, if full moons are concerned, or beyond the place she had occupied at the new moon preceding the beginning of the yuga, if new moons are concerned, (the new moon immediately antecedent to the beginning of the yuga having been selected as starting-point for all calculations concerning new moons). So far the place of the moon is expressed in muhúrtas only; now in order to find from these the nakshatra in which the moon stands at the time, we should

have to deduct from the muhúrtas found the extent of all the nakshatras through which the moon has passed one after the other, until the sum would be exhausted. Thus, for instance, if we wanted to find the place of the moon at the third new moon after the beginning of the yuga, the constant quantity  $66 + \frac{5}{62} + \frac{1}{62 \times 67}$  would have to be multiplied by 3, so that we should have  $198 + \frac{15}{62} + \frac{3}{62 \times 67}$  muhúrtas. Now the moon standing at the new moon preceeding the beginning of the yuga in Punarvasu, of which she has still to pass through  $22 \frac{46}{62}$  muhúrtas, we should have to deduct this last quantity from  $122 + \frac{10}{62} + \frac{2}{62 \times 67}$ ; from the remainder we should have to deduct 30 muhúrtas (the extent of Pushya); from the remainder again 15 (Āśleshá); again from the remainder 30 (Maghá), and so on, until in the end the fact of the remainder being smaller than the next following nakshatra would show that new moon takes place in that nakshatra.—In order, however, to shorten this somewhat lengthy process, certain subtrahends are formed out of the sum of the extent of several nakshatras, which materially alleviate the work by substituting one subtraction for a number of subtractions. Thus with reference to new moon—the subtrahend (śodhanaka) for Uttara-phálguní is said to be 172, for Viśákhá 292, for Uttara-ásháḍhá 442; *i. e.*, if from the product of the constant quantity by the number of the new moon 172 can be deducted, we see at once that the moon has advanced beyond Uttara-ásháḍhá; if 292 can be deducted, she has passed the limits of Viśákhá and so on. The subtrahends are not carried on from Punarvasu beyond Uttara-ásháḍhá, but make a fresh start from Abhijit, apparently in order to make them available for the calculation of the places of the full moons too. Thus the subtrahend for Abhijit is 9 and a fraction, of Uttara-bhádrapadá 159, of Rohini 309, of Punarvasu 399, of Uttara-phálguní 549, of Viśákhá 669, of Múla 744, of Uttara-ásháḍhá 819.

The places in which the different full moons of the yuga occur are found by an exactly similar proceeding; only all calculations have to start not from Punarvasu, but from the beginning of Abhijit where the first full moon which coincides with the beginning of the yuga takes place. The text enumerates the places of all full moons and new moons of the yuga at length, carrying in each case the calculations down to sixty-sevenths of sixty-seconds of muhúrtas. It is needless to reproduce these lists here in extenso, as any place wanted can be calculated with ease from the general rule given above.

The same result, *viz.*, to find the place of the moon on a given parvan is obtained by following another rule contained in some gáthás quoted by the commentator. Their purport is as follows. Multiply sixty-seven (the number of periodical revolutions which the moon makes during one yuga) by the number of the parvan the place of which you wish to find and divide this product by one hundred and twenty-four (the number of parvans of one yuga). The quotient shows the number of whole revolutions the moon has accomplished at the time of the parvan. The remainder is to be multiplied by 1830 (*viz.*, 1830 sixty-sevenths which is the number of nyethemera of one periodical month) or more simply by 915 (reducing 1830 as well as the denominator *viz.*, 124 by two). From the product (remainder multiplied by 915) deduct 1302, which is that part of a whole revolution which is occupied by Abhijit (Abhijit occupies  $\frac{21}{67}$  days, but as this amount is to be deducted from the numerator of a fraction the denominator of which is 62, 21 is to be multiplied by 62; product = 1302). The portion of Abhijit, from which the moon's revolutions begin, is deducted at the outset, because it is greatly smaller than the portion of all other nakshatras and would disturb all average calculations. After it is has been deducted the remainder is divided by  $67 \times 62$ ; the quotient shows the number of nakshatras beginning from Śravaṇa which the moon has passed through, in addition to the complete revolutions. The remainder is again multiplied by thirty, the product divided by 62; the quotient shows the number of muhúrtas during which the moon has been in the nakshatra in which she is at the time. And so on down to small fractions of nakshatras. The following is an example. Wanted the place of the moon at the end of the second parvan. Multiply 67 by 2; divide the product by 124. The quotient (1) indicates that the moon has performed one complete periodical revolution. The remainder (10) is multiplied by 1830 or more simply by 915 (see above); from the product (9150) the portion of Abhijit (1302) is deducted. The remainder (7848) is divided by  $67 \times 62 = 4154$ ; the quotient (1) shows that after Abhijit the moon has passed through one complete nakshatra, *viz.*, Śravaṇa. The remainder (3694) is multiplied by 30; the product (110820) again divided by 4154; the quotient (26) shows that the moon has moreover passed through 26 muhúrtas of Śravishtá. By carrying on this calculation we arrive at the result that at the end of the second parvan the moon stands in Śravishtá, of which she has passed through  $26 + \frac{42}{62} + \frac{2}{62 \times 67}$  muhúrtas.

Analogous calculations are made for the sun too. For instance, in what circle does the sun move at the time of each parvan? The rule here is very simple. Multiply the number of the parvan by fifteen (the number

of tithis of one parvan) and from the product deduct the number of avamātrās (excessive lunar days) which occur during the period in question. If the parvan occurs during the first ayana of the sun, the remainder immediately indicates the number of the solar circle which is in fact the same as the number of the civil day on which the parvan happens; if the parvan takes place during one of the other nine ayanas, the remainder must at first be divided by 183 (number of circles described by the sun during one ayana); etc. The rule is simple and needs no illustration.

The rule for finding the nakshatra in which the sun stands at the time of each parvan (the śūryanakshatra) is quite analogous to the rule given above for the moon. The sun makes in one yuga five complete revolutions, in one parvan  $\frac{5}{124}$  revolutions. This quantity is to be multiplied by the number of the parvan and then we have as above to descend by continued multiplication and division to nakshatras, sixty-second parts of nakshatras and sixty-seventh parts of sixty-second parts. Instead of deducting the portion belonging to Abhijit at the beginning of which the moon stands on the first day of the yuga, we have to deduct that part of Pushya which the sun has not yet passed through at the beginning of the yuga; it amounts to  $\frac{44}{67}$  of a nycthemeron. All the remainder of the calculation is the same as in the moon's case and illustrative examples are therefore not wanted.

Besides there is another and considerably simpler method for finding the sun's place at the end of a parvan; it is likewise contained in some old karaṇa-gāthās. The rule again assumes a "dhrubarāśi", a constant quantity, to be used in all calculations of this kind. This quantity is  $33 + \frac{2}{62} + \frac{34}{62 \times 67}$  muhūrtas; for if we divide the whole circle of the nakshatras into  $819 \frac{27}{67}$  muhūrtas (which is the time occupied by a complete revolution of the moon) the above amount expresses the way the sun accomplishes during one parvan. This quantity has therefore to be multiplied by the number of the parvan required, and by subtracting from the product at first the  $19 + \frac{43}{62} + \frac{33}{67 \times 62}$  muhūrtas belonging to Pushya, after that the 15 muhūrtas of Āśleshā, after that the 30 muhūrtas of Maghā etc., we find in the end the nakshatra in which the sun completes the parvan. In order to facilitate these somewhat lengthy subtractions, the muhūrtas of a certain number of nakshatras are again added and presented in a tabular form. So for instance 139 muhūrtas ( $19 + 15 + 30 + 30 + 45$ ) lead us up to

the end of Uttara-phālgunī, and if therefore the product found in the manner shown above exceeds 139, we may at once subtract 139 instead of performing five separate subtractions and know that the sun has at the time passed beyond Uttara-phālgunī. The procedure is analogous to the one described above and needs no further illustration.

For finding how many seasons have elapsed on a certain tithi, the commentator quotes some gāthās of the old teachers. The rule they contain is as follows. Multiply the number of the parvans which have elapsed since the beginning of the yuga by fifteen, and add to the result the number of tithis which have elapsed in addition to the complete parvans; deduct from this sum its sixty-second part; multiply the remainder by two and add to the product sixty-one; divide the result by one hundred and twenty-two; the quotient shows the number of seasons elapsed (which when exceeding six will have to be divided by six, since so many seasons constitute a solar year); the remainder divided by two shows the number of the current day of the current season. This rule seems not very well expressed, although it may be interpreted into a consistent sense. At first it must be remembered that the yuga does not begin with the beginning of a season, but with the month śrāvaṇa, while the current season—the rainy season—has begun a month earlier with āshāḍha. The calculation would then, strictly expressed, be as follows. Take the number of parvans which have elapsed since the beginning of the yuga, add to it the tithis which have elapsed of the current parvan and add again to this sum  $30\frac{1}{2}$  tithis (the tithis of āshāḍha plus half a tithi of the month preceding āshāḍha) and deduct from this sum its sixty-second part, *viz.*, the so-called avamarātras, *i. e.*, the lunar days in excess of the natural days (according to the Śūryaprajñapti's system each sixty-second tithi is an avamarātra). The remainder of the calculation needs no explanation; the formula enjoins the addition of 61 instead of  $30\frac{1}{2}$  and division by 122 instead of 61 (the number of days of a season) in order to get rid of the fractional part of  $30\frac{1}{2}$ .

In order to find the number of the parvan during which an avamarātra occurs and at the same time the tithi itself which becomes avamarātra, the following rule is given. The question is assumed to be proposed in the following manner. In what parvan does the second tithi terminate while the first tithi has become avamarātra, or in what parvan does the third tithi terminate while the second is avamarātra? and so on, (kasmin parvaṇi pratipady avamarātrībhūtāyām dvitīyā samāptim upayāti, etc.) The answer is: if the number of the tithi which becomes avamarātra is an odd one, one has to be added to it and the sum to be multiplied by two; the result shows the number of parvans elapsed before the first tithi becomes avamarātra. If the number is an even one, one is added to it, the sum multiplied by two, and to the product thirty-one is added; the result again shows the

number of parvans elapsed. Thus for instance if it is asked : when does the first tithi become avamarātra ? add one to one (number of the tithi) result two ; this multiplied by two gives four ; therefore pratipad is avamarātra in the fifth parvan, after four parvans have elapsed. Or again it may be asked : when does the second tithi become avamarātra ? add one to two ; result three ; this multiplied by two gives six, to which thirty-one are added. The result—thirty-seven—shows that in the thirty-eighth parvan the second tithi is avamarātra. Thus all the avamarātras for the first half of the yuga are found and the same numbers recur during the second half. The rationale of this rule is obvious.

A simple rule is given for finding the tithis on which the ávrittis of the sun, *i. e.*, the solstices take place. Multiply the number of the solstice whose date you wish to know by 183 and add to the result three plus the number of the solstice ; divide this sum by fifteen ; the quotient shows the number of parvans elapsed, the remainder the number of the tithi of the current parvan. This rule—being based on the relation of tithis to sāvana days needs no explanation. The following list for the whole yuga results from these calculations.

1st Summer solstice ( = 10th solstice of the preceding yuga).

|                           |                            |
|---------------------------|----------------------------|
|                           | 1st dark half of śrávaṇa.  |
| 1st Winter solstice,..... | 7th " " " mágha.           |
| 2nd S. S., .....          | 13th " " " śrávaṇa.        |
| 2nd W. S., ..             | 4th light half of mágha.   |
| 3rd S. S.,.....           | 10th " " " śrávaṇa         |
| 3rd W. S., .....          | 1st dark half of mágha.    |
| 4th S. S.,.....           | 7th " " " śrávaṇa.         |
| 4th W. S., .....          | 13th " " " mágha.          |
| 5th S. S.,.....           | 4th light half of śrávaṇa. |
| 5th W. S., .....          | 10th " " " mágha.          |

The places which the sun occupies in the circle of the nakshatras at the time of the solstices have been mentioned before ; the places of the moon at the same periods can of course be easily calculated when it is remembered that at the beginning of the yuga the moon just enters Abhijit. It is unnecessary to reproduce here the rule given for that purpose ; it may only be mentioned that the  $\frac{7}{10}$  of a sidereal revolution which the moon performs during one solar ayana in excess of six complete revolutions constitute the "dhruva rásí" for our case. The Sūryaprajñapti likewise states the places in which the lunar ávrittis take place ; from the circumstance that at the beginning of a yuga the moon is full in the first point of Abhijit and at the same time commences her progress towards the north, it follows

that her next progress towards the south takes place exactly on the same spot on which the sun was standing at the beginning of the yuga. At all following lunar ávrittis the places of the two first ones of course recur.

Incidentally another rule is mentioned which certainly was of frequent application, *viz.*, how to find on what natural day and at what moment of time during that day a given tithi terminates. The rule which is contained in an old *karana-gáthá* is of course very simple. Add together all tithis which have elapsed from the beginning of the yuga up to and including the tithi in question; divide this sum by sixty-two; multiply the remainder by sixty-one and divide again by sixty-two. The remainder is then the wanted quantity. The first division by sixty-two has the purpose to shew by its quotient—the number of complete *avamarátras* elapsed since the beginning of the yuga; this number has therefore to be deducted from the number of tithis elapsed. The remainder of the above division shows the number of tithis which have elapsed since the occurrence of the last *avamarátra*; to find by how much they remain behind the same number of natural days, they are multiplied by 61 and divided by 62 (61 natural days = 62 tithis); the remainder then indicates how many sixty-second parts of the current natural day have elapsed at the moment when the tithi in question terminates.

Another old rule has the purpose of teaching how to find the number of *muhúrtas* which have elapsed on the *parvan*-day at the moment when the new *parvan* begins. When the number of the *parvan* divided by four yields one as remainder (in which case it is called *kaly-oja*) we must add ninety-three to it; if divided by four it yields two (in which case it is called *dvápara-yugma*), we add sixty-two to it; if it yields three (*tretá-oja*), we add thirty-two; if there is no remainder (*kṛita-yugma*), we add nothing. The sum which we obtain in each case is halved, then multiplied by thirty, finally divided by sixty-two. The quotient shows the number of *muhúrtas* of the *parvan*-day which have elapsed at the moment when the new *parvan* begins. The rationale of this rather ingenious rule is as follows. The

duration of one *parvan* is  $14 \frac{94}{124}$  days. The first *parvan* therefore termi-

nates when  $\frac{94}{124}$  of the day =  $\frac{94 \times 30}{124} = \frac{47 \times 30}{62}$  *muhúrtas* have elapsed.

The number 94 may be obtained by adding 93 to 1, the number of the first *parvan*. The second *parvan* ends  $29 \frac{64}{124}$  days after the beginning

of the yuga; 64 equals 62 + 2, the number of the second *parvan*. The

third *parvan* terminates  $41 \frac{34}{124}$  days after the beginning of the yuga; 34

equals  $31 + 3$ , the number of the third parvan. The fourth parvan terminates  $59 \frac{4}{124}$  days after the beginning of the yuga ; 4 without any addition is the number of the parvan. The fifth parvan again terminates  $73 \frac{98}{124}$  days after the beginning of the yuga ; 98 is equal to  $93 + 5$ , the number of the parvan. And so on through the whole yuga.

The above examples fairly represent the more important rules contained in the Sūryaprajñapti. Now it will be apparent to every one who is to some extent familiar with the Jyotisha-vedānga\* that the rules contained in the, as yet partly unexplained, verses of the latter refer to calculations exactly analogous to those contained in the Sūryaprajñapti and the old gāthās quoted by the commentator.

From this it might be concluded that it is now easy for us to explain whatever has up to the present remained unexplained in the Vedānga, possessing as we doubtless do a clear insight into the general nature of the calculations for which it furnishes rules. But close as the connexion between the contents of the two treatises manifestly is, there are two reasons which preclude the direct application of the rules of the Sūryaprajñapti to the elucidation of the Vedānga. In the first place the Vedānga divides the sphere into twenty-seven nakshatras only and, as far as has been ascertained up to the present, these twenty-seven nakshatras are considered to be of equal extent ; while as we have seen above the Sūryaprajñapti throughout employs the division of the sphere into twenty-eight nakshatras of unequal extent. In the second place the starting point for all calculations (*viz.*, the places of the winter and summer solstice) is not the same in the two works. The consequence of these two fundamental discrepancies is that although the questions treated of are essentially the same and although the modes of calculation are strictly analogous the results arrived at in the two treatises necessarily differ in all cases, that for instance the place of a certain full or new moon during the quinquennial yuga can never be the same according to the Sūryaprajñapti as it is according to the Vedānga, etc. Nevertheless it is highly probable that somebody who should apply himself to the study of the obscure portions of the Vedānga after having made himself thoroughly conversant with the contents and methods of the Sūryapra-

\* Since the publication of the paper on the Jyotisha-vedānga in the 46th volume of this Journal, the writer has received some very important contributions to the explanation of the Vedānga from Dr. H. Oldenberg, the well-known editor of the Vinaya-piṭakam, who working altogether independently had succeeded in explaining a number of hitherto obscure rules. The writer intends to revert to the Vedānga before long and will then avail himself of the new results most kindly placed at his disposal by Dr. Oldenberg.

jñapti, would succeed in solving some more of the riddles presented to us by the former work.

It must be remembered that there is no indissoluble connexion between that part of the system of the Śūryaprajñapti, which might be called the chronometrical one, *viz.*, the doctrine of the quinquennial yuga and its various subdivisions and that part which propounds the theories accounting for the apparent motions of the sun and the moon; it might therefore be that the Vedāṅga agrees with the Śūryaprajñapti only in the former point and follows a different course with regard to the latter. There occurs, however, one expression in the Vedāṅga which makes it appear likely that the analogy between the two books extends to the second point also, *viz.*, the “sūryamaṇḍalāni” mentioned in verse 22.

अतीतपर्वभागेभ्यः शोधयेद् द्विगुणां तिथिम् ।

तेषु सण्डत्तभागेषु तिथिनिष्ठां गतो रविः ॥

It certainly looks as if by these “sun circles” in which the sun is said to be at the end of a tithi, we had to understand daily circles of the same kind as those which, according to the Śūryaprajñapti, the sun describes round Mount Meru.

A few words may here be added on the principal feature common to the cosmological systems of the Purāṇas, Buddhists and Jainas, *viz.*, the doctrine of sun, moon and constellations revolving round Mount Meru. In order rightly to judge of these conceptions we must remember that they arose at a time when the idea of the sphericity of the earth had not yet presented itself to the Indian mind, at a time (—if we may assume that the Purāṇic-Buddhistic cosmological system is not later than the period of the rising of Buddhism—) when this then truly revolutionary idea first suggested itself to the early Greek philosophers. And if we carry our thoughts back to that early stage of the development of scientific ideas and try to realize the conceptions which then were most likely to present themselves to enquirers, the old Indian system will lose much of its apparent strangeness and arbitrariness. How indeed could men ignorant of the fact that the earth is a sphere freely suspended in space explain to themselves the continually recurring rising and setting of the heavenly bodies? what could their ideas be regarding the place to which sun and moon went after their setting, and the path which unseen by man they followed so as to return to the point of their rising? Certainly the difficulty was a very great one to those as well who had some vague notion about the earth extending in all directions to an unlimited distance as to those who imagined it to be bounded at a certain distance by a solid firmament surrounding and shutting it in on all sides. We may recall, as one of the fancies to which the difficulty of this question gave rise, the old poetical idea, pre-

served, for instance, in a beautiful fragment of Stesichorus, of Helios when he has reached Okeanos in the west embarking in a golden eup which carries him during the night round half the earth back to the east whence he rises again. Under these circumstances we must admit that the old Indian idea of the constitution of the world, according to which the rising and setting of sun, moon and stars is only apparent, cannot by any means be called an unnatural one, and it is interesting to consider the counterparts it finds among what is known of the opinions of the oldest Greek philosophers.\* So it is reported of Anaximenes that he supposed the sun not to descend below the earth, but to describe circles above it and to pass during the night behind high mountains situated in the north; an exact parallel to the Indian conception. Of Xenophanes we hear that he declared the sun, moon and stars to be only accumulations of burning vapour, fiery clouds kindling and extinguishing themselves by turns, that these clouds move in reality in straight lines and only appear to us to rise and to set in consequence of their varying distance, in the same way as the common clouds seem to rise from the horizon when they first become visible to us and seem to sink under the horizon when they pass out of our field of vision. These opinions too find their exact counterpart in the *Sūryaprajñapti* and kindred works where the rising and setting of the heavenly bodies is declared to be an appearance caused by their consecutive approaching and receding, and where their movement is said to take place not indeed in a straight line but at any rate in a plane parallel to the plane of the earth. The first mentioned opinion of Xenophanes about the constitution of the heavenly bodies finds its analogon in one of the different *pratipattis*, mentioned in the *Sūryaprajñapti*, according to which the sun is nothing but a “*kiraṇasamghāta*,” an accumulation of rays forming itself every morning in the east and dissolving itself in the evening in the west. The cognate views held by Heraclitus concerning the nature of the sun are well known. Of Xenophanes it is further reported that he supposed different climes and zones of the earth, far distant from each other, to have different suns and moons; which is another striking parallel to the view held by the Jainas with reference to the different suns, moons and stars illuminating the different concentric *dvīpas* of which the earth consists. In both cases the assumption of the rising and setting of the heavenly bodies being an appearance, caused by their becoming visible and invisible in turns when having approached us or receded from us by a certain amount, seems to have led to the conclusion that the light of the one sun and the one moon appearing to us cannot illumine the whole vast earth, since it only reaches to a certain limited

\* For the particulars mentioned in the following: comp. Mullach's collection of the fragments of the Greek philosophers, Zeller's history of Greek philosophy, Lewis's historical survey of the Astronomy of the Ancients.

distance.—On the other hand it is true enough that, notwithstanding these similarities of Indian and Greek ideas, books of the nature of the Sūryaprajñapti serve clearly to show the difference of the mental tendencies of the two nations. Both in an early age conceived plausible theories, in reality devoid of foundation, by which they tried to account for puzzling phenomena ; but while the Greeks controlled their theories by means of continued observation of the phenomena themselves and replaced them by new ones, as soon as they perceived that the two were not in harmony, the Hindus religiously preserved the generalisations hastily formed at an early period, and instead of attempting to rectify them, proceeded to deduce from them all kinds of imaginary consequences. The absurdity of systems of the nature of the Jaina system lies not in the leading conceptions—these can as a rule be accounted for in a more or less satisfactory manner—but in the minute detail into which the followers of the system have without scruple and hesitation worked it out.

Before this paper is brought to a conclusion, the writer wishes to draw attention to the—in his opinion very striking—resemblance which the cosmological and astronomical conceptions, contained in an old Chinese book, bear to the early Indian ideas on the same subject, more particularly to the Jaina system as expounded in the Sūryaprajñapti. The Chinese book alluded to is the *Tcheou-Pei* of which a complete translation was published for the first time by Edward Biot in the *Journal Asiatique* for 1841, pp. 592—639. It consists of two parts of different ages ; the first part which apparently is of considerable antiquity, has been known since the time of Gaubil, who inserted a translation of it into his history of Chinese astronomy, published in the *Lettres édifiantes* ; that part, as is well known, shows that the ancient Chinese were acquainted with the theorem about the square of the hypotenuse of a right-angled triangle. The second and more recent part, which E. Biot thinks cannot be later than the end of the second century of our era, contains a sort of cosmological and astronomical system, and here the traits of resemblance alluded to above are to be found. As the arrangement of topics in the *Tcheou-Pei* is by no means systematic, so that it is not easy to form a clear conception of the essential points, a short abstract of the work, as far as it lends itself to a comparison with the Jaina system, is given in the following.

According to the *Tcheou-Pei* the sun describes during the course of the year a number of concentric circles of varying diameter round the pole of the sky. On the day of the summer solstice the diameter of this circle is smallest ; it then increases during the following months, up to the day of the winter solstice when it reaches its maximum. Beginning from this day the solar circles again decrease, until on the day of the next summer

solstice they have reached the original minimum. On the day of the winter solstice the diameter of the solar circle amounts to 476,000 li (the li is a certain Chinese measure of length); its circumference to  $3 \times 476,000 = 1,428,000$  li. The corresponding numbers for the circle, described on the day of the summer solstice, are 238,000 and 714,000. Between the innermost and the outermost circle there lie five other circles, which the sun describes in the months intervening between the two solstices, so that there are altogether seven circles; the six intervals between these are said to correspond to the months of the year ( $2 \times 6 = 12$ ). So it appears that the Tcheou-Pei assumes separate solar circles for each month only, not for each day. Each circle is at the distance of  $19,833\frac{1}{3}$  li from the two neighbouring circles.

The terrestrial place for which all the calculations of the Tcheou-peï are made is said to have such a situation that it is distant 16,000 li from the spot lying perpendicularly under the sun on the day of the summer solstice and 135,000 li from the spot lying perpendicularly under the sun on the day of the winter solstice; the distance of the place of observation from the pole, *i. e.*, the spot at the centre of the earth which lies perpendicularly under the celestial pole, is said to amount to 103,000 li. Round the terrestrial pole there extends a circle of 11,500 li radius, which is the terrestrial counterpart of the circle described by the polar star round the celestial pole. The light of the sun extends 167,000 li in each direction, so that on the day of the winter solstice when the sun moves in the exterior circle it extends at midday only 32,000 li beyond the place of observation and so does not reach up to the polar circle. On the days of the two equinoxes when the sun is moving in the fourth circle—the diameter of which amounts to 357,000 li—the rays of the sun just reach up to the polar circle. On the day of the summer solstice when the sun moves in the interior circle his rays reach beyond the pole to the extent of 48,000 li, so that then the whole polar circle is continually illuminated. When the sun in his daily revolution has reached the extreme north point, it is midday in the northern region and midnight in the southern region; when he has reached the east point, it is midday in the eastern, midnight in the western region; when he has reached the south point, it is midday in the southern, midnight in the northern region; when he has reached the west point, it is midday in the western, midnight in the eastern region. As the light of the sun always reaches 167,000 li each way, we must add  $2 \times 167,000$  to the diameter of the circle, described on the day of the winter solstice, in order to obtain the diameter of the circle representing the outmost limit reached by the rays of the sun; the diameter of this circle is therefore 810,000 li.

On the day of the winter solstice the space illuminated by the sun

stands to the space not reached by his rays in the relation of three to nine ; this proportion is to be reversed for the day of the summer solstiee. The day of the winter solstiee is the shortest during the year ; the day of the summer solstiee the longest. On the day of the winter solstiee the shadow of the gnomon is 13·5 feet long ; beginning from this day it goes on diminishing by equal quantities during equal spaces of time up to the day of the summer solstiee when its length is reduced to 1·6 feet. It then increases again in the same uniform manner up to the day of the next winter solstiee.

The circumference of the sky is divided into twenty-eight stellar divisions of unequal extent, through the circle of which sun and moon are performing their revolutions. Kien-nieou is the asterism in which the sun stands at the winter solstiee ; Leou the asterism of the vernal equinox etc. A procedure is taught how to find the place of the sun at any time. The whole circle of the asterisms is divided into  $365\frac{1}{4}$  degrees corresponding to the number of the days of the year. A year is the period which the sun requires for returning to the same star from which he had set out. The meeting of sun and moon constitutes a month. A period of nineteen years of  $365\frac{1}{4}$  days each contains 235 lunations. Arithmetical rules are given how to find the place of the moon at the beginning of each year etc.

The Teheou-peï contains some additional matter about observations of the polar star etc., but by far the greater part of the topics it treats have been touched in the above summary. The similarity of this system and the old Indian systems particularly, as far as some details are concerned, the Jaina system is obvious. The same supposition is made use of in both to account for the alternating progress of the sun towards the north and the south. In the Jaina system the sun revolves round Mount Meru, in the Chinese system, to which the idea of a central mountain seems to be foreign, round the pole of the sky ; Mount Meru finds, however, a curious eounterpart in the Chinese polar circle, the projection of the circle described by the polar star. Both systems state the dimensions of the circles described by the sun ; both state in figures the extent to which the rays of the sun reach. Both hold the same opinion about the alternation of day and night in the different parts of the earth. Both are interested in finding out what places sun and moon occupy in the circle of the nakshatras. Both teach the increase of the shadow by an equal quantity in each month. On the other hand there are important points in which the two systems differ. The Chinese appear from comparatively ancient times to have had a knowledge of the fact that the approximate duration of the solar year amounts to  $365\frac{1}{4}$  years and that a period of nineteen years comprises 325 lunations. This of course makes the system of the Teheou-peï to differ from the Jaina system in all those details which depend on the fundamen-

tal period and the advantage is of course altogether on the side of the Chinese. On the whole the Teheou-pei is much superior to works of the stamp of the Súryaprajñapti, as in midst of all the fantastical and unfounded ideas it contains there are found some positive elements, observations of stars which admit of control etc., features altogether absent in the Súryaprajñapti. But in spite of these points of difference the similarities of the two works remain striking, especially if we take as one member of the comparison not the Súryaprajñapti itself but some hypothetical older work of the same class, less elevate and more moderate in the statement of dimensions, figures etc. That such works if not existent at present must have existed at some earlier period is manifest from the remarks the Súryaprajñapti in many places makes about the opinions of other teachers, several of which have been extracted above. That two different chronological periods, the quinquennial yuga and so called Metanic cycle, from the foundation of the two systems does after all not interfere very much with their similarity. We might imagine the Jainas adopting the more correct cycle of nineteen years instead of the quinquennial one and work out all the new details necessitated by such a change, calculate all the places of moon and full moon during nineteen years instead of five etc., nevertheless the new system would immediately suggest the idea of the old one. An essential feature in the resemblance of the Chinese and the Hindu system is more over the circumstance of both limiting themselves to the treatment of a certain number of topics. The following paragraph of the Teheou-pei (p. 603) which shortly states the questions to be treated in the work, might with hardly any change be taken as a summary of the contents of the Súryaprajñapti.

“I have heard people speak of the knowledge of the great man. I have heard it said that he knows the height and the size of the sun, the extent which his light illuminates, the quantity by which he moves in the course of one day, the quantity by which he recedes and approaches, the extent which the eye of man embraces, the position of the four extreme (cardinal) points, the divisions of the stars arranged in order, the breadth and length of the sky and the earth.”

The question whether the similarity of the two systems justifies us in assuming a historical connexion between the two or would be an interesting one, but cannot be treated in this place, especially as its solution could only be attempted together with the solution of a number of cognate problems.



*Coins supplementary to Thomas' "Chronicles of the Pathán kings of Delhi."*—By CHAS. J. RODGERS. (With a Plate.)

Steady research is always followed by constant results. These results are as a rule insignificant discoveries which are individually small, but collectively they all go to swell the sum of human knowledge. In my last small supplement to Thomas' "Chronicles of the Pathán kings of Delhi" I promised to give some additions which I had then in hand. But as I went on with two other papers and my researches for them, I found that incidentally my matter for the second supplement grew more interesting, and at last I found to my surprise that I had more coins in hand than would fill two plates; so I began to draw at once and simultaneously to put away for a third supplement all coins for which I could not now find a place. Strange to say just as I had made up my mind about these plates a find of about 500 coins of five Ghazni kings, all struck at Lahore, came to hand, some quite new and unpublished, and after that a batch of silver coins of Ala-uddin Khwárizmí of whose coins I gave three new types in my first supplement and of whose I give one great beauty in my present paper. These silver coins were struck at *Ghazni* and *Farwán* or as Thomas calls it '*Perwán*.' He gives no drawings of them and only alludes to them as giving us the mint of *Perwán*. These Ghazni kings' and the Khwárizmí king's coins must stand over for the present. I scarcely dare make a promise about them. About a year ago I came across a find of Ghazni coins, in number about 500, and up till now I have had no time to work at them and say what was in them, although there were several novelties of historic value. As I personally go to the bazars I see for myself what comes into them. And when I see what comes into them and what finds a lodgement in our museums, I am astonished and dumb-founded to think that coins of whose existence we are unaware are daily being brought in from the villages and fields and ruins which abound here and there in the country and are simply handed over to the smelting pot as common silver,—bullion in fact which is purchased at a little less than its intrinsic value. And all this, while there is in India no Imperial Cabinet of Coins and no one appointed to collect for it and arrange it and make it a thing worthy of the historical associations, India as an Empire and as a collection of ancient kingdoms and states, possesses. India is a continent: but it is too poor to possess one Imperial Cabinet of coins which would serve as a metallic record of past emperors and rulers, past glories and shames, in fact, which would be a history of the past in metal manuscripts. With the present rage for melting down

everything it is high time something were attempted. Our only relics will soon be empty, worn out, burnt up smelting pots.

In the present supplement the coins I give are chiefly varieties of coins already known. The inscriptions are sometimes longer than those given in Thomas: sometimes they correct his readings; sometimes the coins reveal new mints, sometimes they are quite new types of coins.

Plate I, No. 1. Obv. *Tij ud dawlat Khusrau Malik.*

Rev. Bull with new mark on its *jhál*.

This coin is quite a new type of Khusrau Malik's coins.

No. 2. Obv. (*As sultán ul*) *Azim Tij ud Dawlat Khusrau Malik.*

Rev. Bull with new mark on its *jhál*.

No. 3. Obv. (*Us sultán al*) *Azim Rukn ud dunyá wa ud Dín Fíroz (Sháh).*

Rev. Remains of a horseman and his steed.

Thomas gives three coins belonging to this king (Pl. I, fig. 24, 25, 26). I ascribe these three to Rezia. The *Rukn* is unmistakable in my coin. I give in No. 4 a drawing of a coin I have, which is exactly like one of Thomas' (No. 24). A careful study of it will at once show that it reads Obv. "*Us sultán al Muazzim Rezia ud Dunyá wa ud Dín.*" Rev. Horseman and steed, exactly like Thomas'. In my coin the *zuád* (ضی) is more fully developed and it must be a coin of Rezia's.

In Pandit Ratan Narain's list of coins I find a rupee of *Rukn ud Dín Fíroz Sháh's*. Obv. *As sultán ul 'Azim Shams ud Dunyá wa 'd Dín, abú 'l Muazzar Rukn ud Dunyá wa 'd Dín Fíroz Sháh.* Rev. *Fi ahd il Imám Al Mustansir, Amír ul Mominín, fi shahúr i san thaláth wa thaláthín wa sita mi'ata.* In this rupee the letters of *Rukn* are exactly as in my coin. It has no margins, the date is given in the square area. This rupee is quite unique. I should very much like to know its whereabouts. Such a coin should by no means leave the country. I may add that Ratan Narain gives in his list a copper coin like mine, and, being misled by Thomas, gives also two of Rezia's coins as *Rukn ud Dín's*. I have four coins of Rezia's of this kind, as well as four of the type I published in my last paper, and one each of Thomas' Pl. I, figs. 28 and 29. On comparing them I have no hesitation whatever in assigning Thomas' Pl. I, Nos. 24, 25, 26 to Rezia.

In my last paper I gave a coin of Sanjar and Bahrám Sháh. In it the title of *Muazzim* was given to Sanjar. In my present paper I give coins which shew that this title was given to several kings, who rejoiced however, as is shown by their numerous coins, in the title *al Azim*.

No. 5. Obv. "*As sultán ul Muazzim, Alá ud Dunyá wa 'd Dín.*" Rev. Horseman and steed.

No. 9. Obv. *As sultán ul Muazzim Eltamsh as Sultán.* Rev. Horseman and steed and remains in Hindi of *Sri Hamírah*.

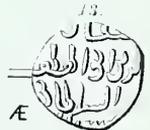
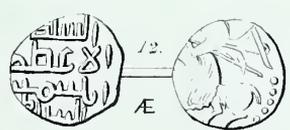
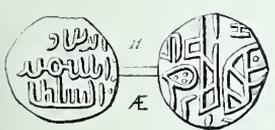
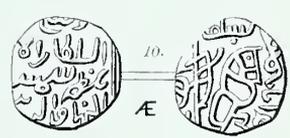
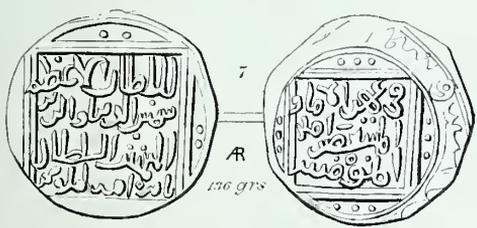
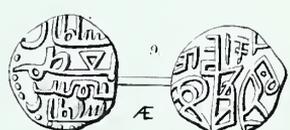
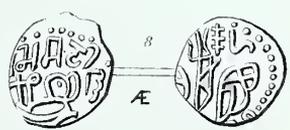
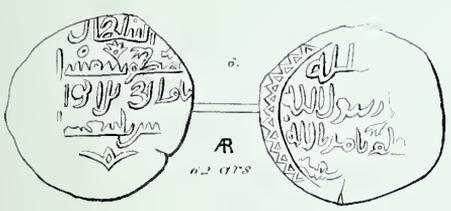
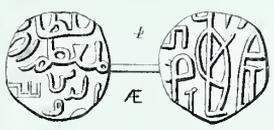
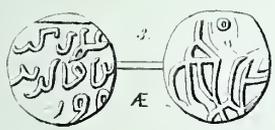
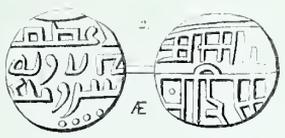
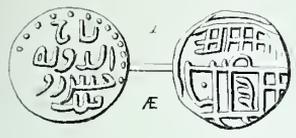




Plate II, No. 2. Rev. *Us sultán ul Muazzim.*

Obv. *Gyás ud Dunyá wa ud Dín.*

In these three coins Alá ud Dín (Masaud Sháh) and Shams ud Dín Altamsh and Gyás ud Dín (Balban) we have the title *Muazzim*. And it comes also in No. 6 which I now proceed to describe.

No. 6. Obv. in florid Kufic "*As sultán ul Muazzim Shams ud dunyá wa 'd dín Abú 'l Muza'ffar (Eltamash?)*". Rev., in a rayed circle, the Kalimah, under which (*Al Mustansir*) *biamri 'Uah Amír ul Mominín*. This coin weighs 62 grs. only. It is therefore a tankah. It came to hand with three *Bahá ud Dín Sám's* silver tankahs.

No. 7. A rupee of Shams ud Dín Altamsh.

Obv. "*As Sultán ul Azim Shams ud Dunyá wa 'd Dín Altamsh as Sultán Násir i Amír ul Mominín.*" Rev. *Éi ahd il Imám Al Mustansir Amír ul Mominín.* Margin illegible alas!

No. 8. Obv. in Hindí above bull, *Samasa Dín.*

Rev. above horse *Ha* and no other letter of Hamírah.

This type is quite new.

No. 10. Obv. *As Sultán ul Azim Shams ud Dunyá wa 'd Dín.*

Rev. Horseman, to right of which *Eltatamsh*, and above horseman *us Sultán*. Thomas' coin had not any inscription in front of the horse. I have seen several of this type.

No. 11. Obv. (*Shams*) *ud Dunyá wa (ud Dín) Eltamamsh as Sultán.*

Rev. Horseman and *Srî Hamírah*.

No. 12. Obv. *As sultán ul 'Azim Eltamamsh as sultán.*

Rev. Horseman at charge.

No. 13. Obv. *Shams ud Dunyá wa 'd Dín Abú 'l Muza'ffar us Sultán.*

Reverse, not given.

These three coins Nos. 11, 12 and 13 give more than do Thomas' Nos. 47, 46, and 48. A comparison of them with Thomas' coins will at once show the additional information these supply.

No. 14. This is the same as Thomas' No. 50, with the addition of the word *as Sultán* on the obverse plainly visible.

Nos 15, 16, 17, 18 show at one view four types of coins of Elduz, the general of Muhammad bin Sám. Three of them are binominal.

No. 15. Obv. *Muizz ud Dunyá wa 'd Dín, Abd Yalduz.*

Rev. Bull over which "*Srî Muj*," in Hindí.

There cannot be much doubt about the reading of the Hindí. *Srî Hamírah* it cannot be. It is an attempt I think by a Musalmán at *Srî Muizz*.

No. 16. Obv. *Muizz ud Dunyá wa 'd Dín.*

Rev. *Abd Yalduz.*

There are floral ornaments about the inscriptions.

No. 17. A similar coin to *Ariana Antiqua*, Pl. XX, fig. 18, but much fuller.

Obv. "*As Sultán ul Azim Muizz ud Dunyá wa 'd Dín.*"

Rev. '*Abdu 'l Malik ul Muazzim, Táj ud Dunyá wa 'd Dín Yalduz.*

No. 18. Obv. "*As sultán ul Muazzim Abú' l Fath Yalduz as Sultán.*

Rev. Horseman with remnants of *Srí Hamírah* and Star underneath horse.

Plate II. No. I. Gold Mohur of Sher Sháh. Obv. in Mahrábí area "*As Sultán Sher Sháh, khallad Allah Mulkahu.*" Rev., in square area, the Kalimah. Both margins are illegible: this is a great pity, as the coin is in every other respect one of great beauty.

No. 3. Obv.—"*Sultán Sher Sháh, zarb i Sambhal.*" Margin obliterated. Rev. not given.

No. 4. Obv.—"*Sultán Sher Sháh, zarb i Alwar.*"

These are two new mints of Sher Sháh.

No. 5. Rupee of Sher Sháh. Circular areas on both sides. Obv. "*Sher Sháh Sultán, khallad Allah &c.*

Margin:—" *Faríd ud Dunyá wa 'd Dín abú 'l Muza'ffar*" and in Hindí, *Sher Sháh*, and in Arabic figures 949. Rev. the Kalimah: Margin, the names of the four companions: and "*As Sultán ul Adil, zarb Ujain.*" This is also a new mint of Sher Sháh's.

No. 6. Rupee of Sher Sháh's: Square areas surrounded by double lines.

Obv. *Sher Sháh Sultán, khallad Allah mulkahu.*" Margin "*Faríd ud Dunyá wa 'd Dín, zarb i Shergarh*, in Hindí "*Sher Sháhi.*"

Rev., kalimah in area. Margin, the names of the four companions and their titles. This coin has not been figured before. Unfortunately mine has lost a piece out of its centre and it has not been mended very cleverly. But the workmanship is very superior.

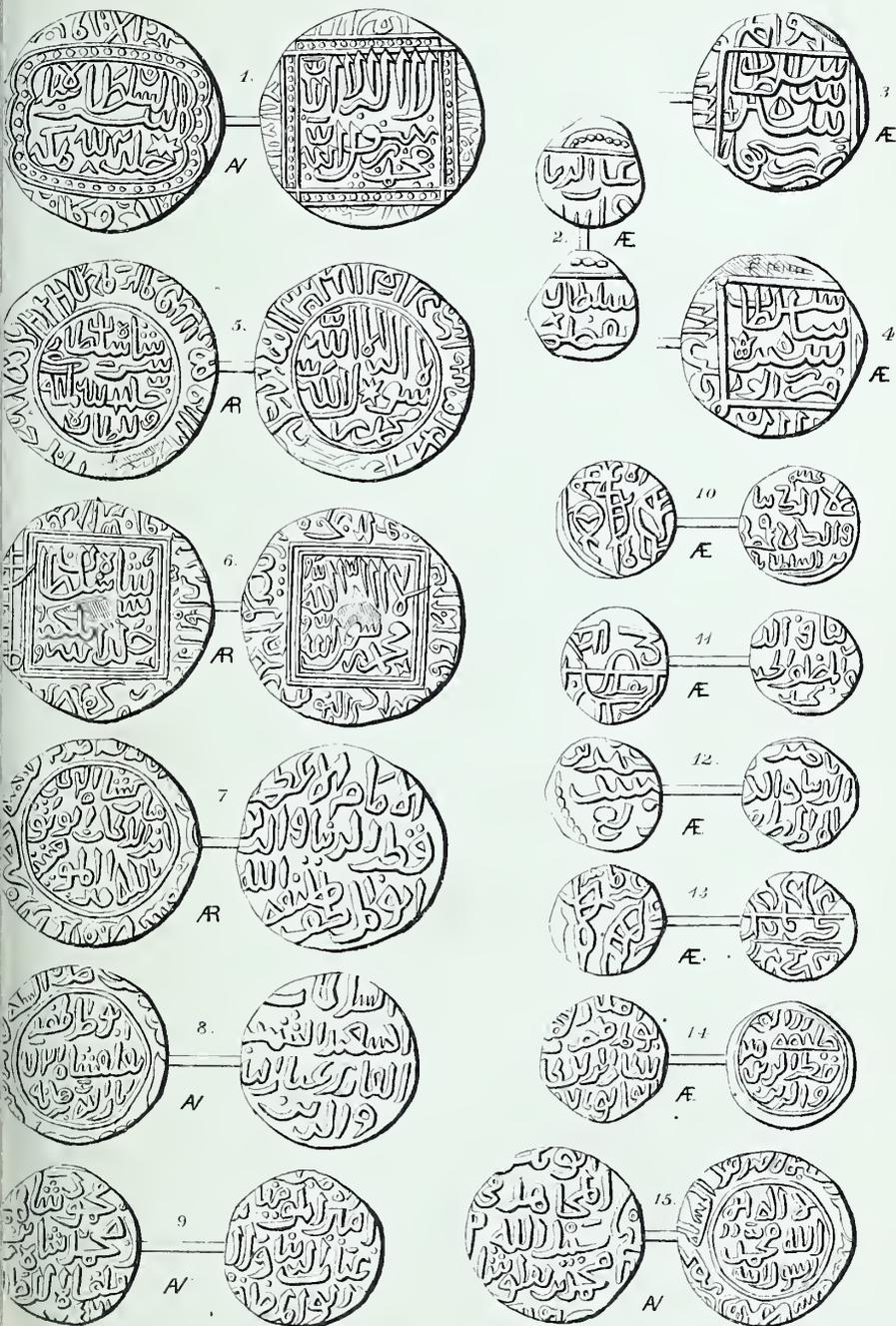
No. 7. Rupee of Kutub ud Dín Mubárah Sháh. New type.

Obverse: "*Al Imám ul Azim, Kutub ud Dunyá wa 'd Dín, Abú 'l Muza'ffar, Khalífatu'lláh.*"

Rev. central area: "*Mubárah Sháh as Sultán, ibn us Sultán Al Wásiq billah, Amír ul Mominín.*"

Margin.—"*Zarb házá il Fizzat bi Hazrat dár il Khiláfat, Fí sanat, saba ashrata wa saba miata.*

This coin has on it exactly the same as Thomas' No. 146. But his is a square piece. On Mr. Delmerick's coin are similar inscriptions, with the mint place however termed "*dár ul mulk*," not "*dár ul khiláfat.*"





No. 8. Gold coin of Gyás ud Dín Tuglaq. This coin is the same as Thomas' No. 158. In his coin the margin stops short when it gets to the mint. This goes on three words "*fi mulk i Talang.*" It was struck in Telingana.

No. 9. A gold mohur. Rev. *Mahmúd Sháh, bin Muhammad Sháh bin Tuglaq Sháh as Sultán 752.*"

Obv. *Fi zaman i Amír ul Mominín, Gyás ud Dunyá wa 'd Dín, Abú 'l Muzaffar.*"

When Muhammad Tuglaq died, Fíroz Sháh was with him at Tatta in Seinde. Ahmad Ayáz Khwájah i Jahán set up in Dehli a boy of six years of age as king. Ferishta says that he was called Gyás ud Dín *Muhammad*, but the coin shows that his name was *Mahmúd*. On Fíroz Sháh's arrival in Dehli *Mahmúd* was deposed.

No. 10. New type of Alá ud Dín Khwárizmí's coin struck at *Kishm*. Obv. "*Kishm, Ala ud Dunya wa 'd Dín, Muhammad bin us Sultán.*" Rev. horseman by side of spear "*(A)mír.*" Above the horse "*ul Azim.*"

No. 11. Obv. "*(Saif) ud dunyá wa 'd Dín, Abú ul Muzaffar, al Hasn, bin Muhammad.*"

Rev. Bull on which "*Kirmán,*" over it in Hindí *Srí H?*"

No. 12. Obv. "*Násir ud dunyá wa 'd Dín, Abú 'l Muzaffar.*"

Rev. "*Muhammad bin Hasn Karlagh.*"

No. 13. Obv. in Hindí round a bull "*Srí Jalál ud Dín.*" On the bull in Arabic "*Kirmán.*"

Rev. Horseman over which words which may be Hindí "*Srí Hamírah,* but they look like Persian "*Farmán rawá.*"

These last four coins are all new types. *Kirmán*\* may be the Persian province and town. Jalál ud Dín Khwárizmí went there by way of *Mekrán* after he left India. At least so says the author of the "*Rauzat us Sifa.*"

No. 14. Obv. "*Khalífatu Rabb il Alamín Kutub ud Dunyá wa 'd Dín.*"

Rev. "*Abú 'l Muzaffar Mubárah Sháh as Sultán ibn us Sultán Al wásiq billah.*"

No. 15. Obv. "*Al Mujáhid fi sábil i 'Ulah Muhammad Tuglaq.*" Above, "*Abubákr;*" to right, "*Alí;*" to left "*Umr*" under "*Othmán.*"

Rev. the Kalimah in a circle. Margin: "*Zarb házá us Sikka, bi Hazrat Dehli, fi sanat Khams asharín wa saba míata.*" This coin is a very

\* Thomas identifies it with *Kurron* near Bunnú. *Kishm* is I suppose the island and town at the entrance to the Persian Gulf. If so, there is no reason why *Kirmán* should not be the Persian one, except this one, that here we have coins struck in Hindí.

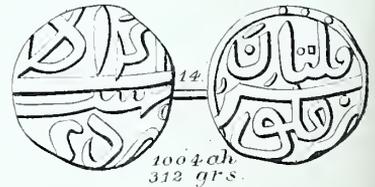
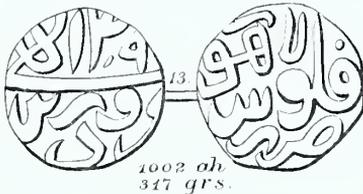
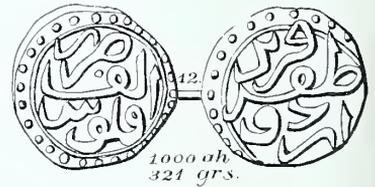
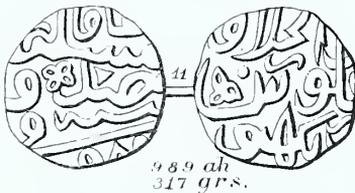
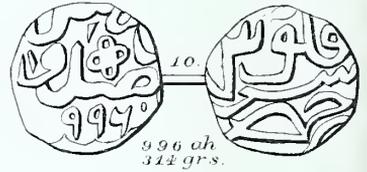
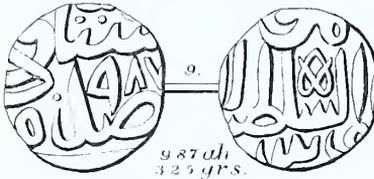
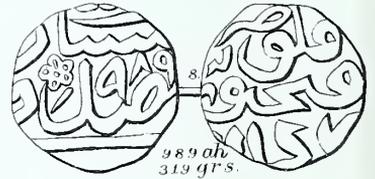
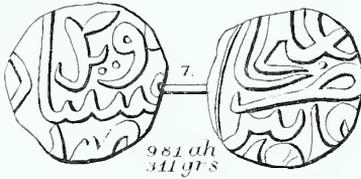
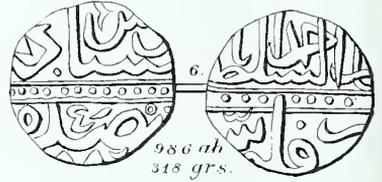
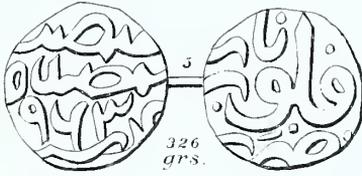
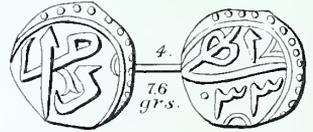
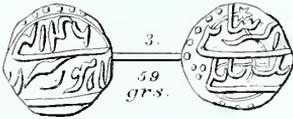
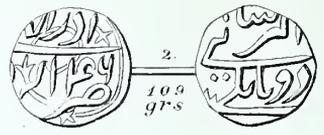
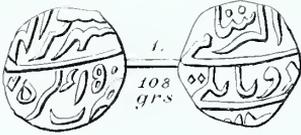
much better specimen than the one given in Thomas which was struck in *Dár ul Islám.* Thomas calls his *unique*, but I have one also struck at “*Dár ul Islám,*” and during the last five years I have seen about half a dozen of them. *Dehli* and *Dár ul Islám* were favourite mints of Muhammad Tuglaq, but I have coins of the type of No. 159 in Thomas that were struck at not only these two places, but at “*Takhtgáh i Dehli,*” “*Arsa i Satgáwn,*” and at “*Iqlím i Tuglaqpúr urf* (known = *i. e.*) *Tirhut.*” There are coins extant which were struck at *Daulatábád.* Thus there were six mints of this one type of coins. The simply *Dehli* marked coins and the *Tuglaqpúr* and *Satgáwn* types have not yet been published. Thomas' No. 173 was struck at Dehli. The Lahore Museum possesses three similar gold mohurs. Of these, two were struck in 734 and one in 735 and all at *Satgáwn* in Bengal.

In Sir Alexander Burnes' “*Travels in Bukhara*” Vol. II, two plates of coins are given. This book was printed in 1834. Masson's researches in Afghanistan produced over 60,000 coins. From them Wilson compiled the *Ariana Antiqua* which contains 21 plates of coins, Grecian, Greco-Bactrian, Indo-Scythian, Sassanian and Indian. General Cunningham in his “*Coins of the Successors of Alexander in the East*” gives fourteen plates which deal only with Grecian and Greco-Bactrian coins. Late discoveries have produced so many new coins that a supplement equal in size to the original book might easily be published. The coins of each dynasty that has reigned in India supply matter enough for a volume. These coins are purchased by private individuals and of course kept in their cabinets, each new type being hailed with numismatic delight. When these private individuals go home, of course they take their acquisitions with them. So that private enterprise in Indian numismatics simply robs the country of its treasures. When a poor student wishes to see the coins about which he reads, he cannot do it. The museums have not got them. The Calcutta Museum is I am credibly informed destitute of coins. It seems to me there is only one way of meeting this difficulty. The Museums of India must have grants made to them for the purchase of coins just the same as Museums at home have. The Berlin museum gets everything good in Europe, simply because it gives good prices. Here in India those who can pay get the best coins. And if the Government of India desires that the museums should possess cabinets of coins, men must be appointed and money granted, or nothing will ever be done except opportunities lost.

I have shown above how our knowledge of the different kinds of coins has increased. What I desire to see is an increase in the number of coins in our museums.

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15.



995 A.H.  
348 grs.



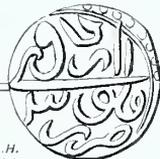
16.



1004 A.H.  
308 grs.



17.



1005 A.H.  
345 grs.



18.



1009 A.H.  
327 grs.



19.



1007 A.H.  
345 grs.



20.



1000 A.H.  
346 grs.



21.



1006 A.H.  
295 grs.



22.



39 grs.



23.



37 grs.



24.



149 grs.



25.



38.5.



26.



140 grs.



27.



40 grs.



28.



1006 A.H.  
625.5.  
grs.

28 o

*Copper Coins of Akbar.* By CHAS. J. RODGERS, *Anwitsar.*

(With two Plates.)

In this paper I propose first to make a list of the coins I have drawn in the two plates accompanying this paper and secondly to offer a few remarks which seem to suggest themselves from a study of the inscriptions on the coins.

No. Wt. in grs.

|    |     |                                                                                                                 |
|----|-----|-----------------------------------------------------------------------------------------------------------------|
| 1  | 108 | { Obv. <i>Do tánke i Akbar Sháhi.</i><br>{ Rev. <i>Zarb i Agrab, (Shahrewar ?) 50 Ilahí.</i>                    |
| 2  | 109 | { Obv. <i>Do tánke i Akbar Sháhi.</i><br>{ Rev. <i>Zarb i Agrab, Azr 46 Ilahí.</i>                              |
| 3  | 59  | { Obv. <i>Yak tánke i Akbar Sháhi.</i><br>{ Rev. <i>Zarb i Láhor (?) 46 Ilahí.</i>                              |
| 4  | 76  | { Obv. <i>Dám.</i><br>{ Rev. <i>33 Ilahí.</i>                                                                   |
| 5  | 326 | { Obv. <i>Zarb i Fulús i Nárnol.</i><br>{ Rev. <i>Fí san i Nuhsad wa shast, 963.</i>                            |
| 6  | 318 | { Obv. <i>Zarb i Fulús i dár us saltanat, Ahmádábád.</i><br>{ Rev. <i>Fí san i Nuhsad wa hashtád wa shash.</i>  |
| 7  | 311 | { Obv. <i>Zarb i Fulús i Dehlí.</i><br>{ Rev. <i>Nuhsad wa hashtád wa yak.</i>                                  |
| 8  | 319 | { Obv. <i>Zarb i Fulús i Dár us saltanat, Fathpúr.</i><br>{ Rev. <i>Fí san i nuhsad wa hashtád wa nuh, 989.</i> |
| 9  | 325 | { Obv. <i>Fulús i Dár us saltanat Láhor.</i><br>{ Rev. <i>Fí san i nuhsad wa hashtád wa haft, 987.</i>          |
| 10 | 314 | { Obv. <i>Zarb i Fulús i Hissár Firozah.</i><br>{ Rev. <i>Fí san i nuhsad wa nawad wa shash, 996.</i>           |
| 11 | 317 | { Obv. <i>Fulús i Dár ul Khiláfat, Lakhnau.</i><br>{ Rev. <i>Fí san i nuhsad wa hashtád wa nuh, 989.</i>        |
| 12 | 321 | { Obv. <i>Urdú Zafarfarín.</i><br>{ Rev. <i>Zarb i Fulús. Alif = 1000 A. H.</i>                                 |
| 13 | 317 | { Obv. <i>Zarb i Fulús i Láhore.</i><br>{ Rev. <i>Farwardín, 39 Ilahí.</i>                                      |
| 14 | 312 | { Obv. <i>Zarb i Fulús i Multán.</i><br>{ Rev. <i>Urd i bihisht, 41 Ilahí</i>                                   |
| 15 | 318 | { Obv. <i>Zarb i Ilahábás.</i><br>{ Rev. <i>San i, 36 Ilahí.</i>                                                |
| 16 | 308 | { Obv. <i>Zarb i Fulús i Dehlí.</i><br>{ Rev. <i>Farwardín, 38 Ilahí.</i>                                       |
| 17 | 315 | { Obv. <i>Zarb i Fulús i Urdú i.</i><br>{ Rev. <i>Zafarfarín, 42 Ilahí.</i>                                     |
| 18 | 327 | { Obv. <i>Zarb i (Gobi)ndpur, Sikka i Akbar Sháhi.</i><br>{ Rev. <i>Urd i Bihisht, 46 Ilahí.</i>                |
| 19 | 315 | { Obv. <i>Dokáni ? or Dogánw ? Sikka i Akbar Sháhi.</i><br>{ Rev. <i>Urd i Bihisht, 44 Ilahí.</i>               |

| No. | Wt. in grs. |                                                                                           |
|-----|-------------|-------------------------------------------------------------------------------------------|
| 20  | 316         | { Obv. <i>Zarb i Fulús i Attak Banáras.</i><br>Rev. <i>Amr Dád, 37 Ilahi.</i>             |
| 21  | 295         | { Obv. <i>Zarb i Fulús i Láhor.</i><br>Rev. <i>Shakrewar, 43 Ilahi.</i>                   |
| 22  | 39          | { Obv. <i>Zarb i Fulús i Láhor.</i><br>Rev. ————— 38 <i>Ilahi.</i>                        |
| 23  | 37          | { Obv. <i>Zarb i Fulús i Nárnol.</i><br>Rev. <i>Nuhsad wa shast wa nuh.</i>               |
| 24  | 149         | { Obv. <i>Fulús i Kábul.</i><br>Rev. <i>San, 33 Ilahi.</i>                                |
| 25  | 385         | { Obv. <i>Fulús.</i><br>Rev. <i>Urdú zafarfarín.</i>                                      |
| 26  | 140         | { Obv. <i>Zarb i Dár ul Khiláfat, A'grak.</i><br>Rev. <i>Fí san i nuhsad wa shast wa.</i> |
| 27  | 40          | { Obv. <i>Damrí.</i><br>Rev. 33 <i>Ilahi.</i>                                             |
| 28  | 625·5       | { Obv. <i>Zarb i Dehlí, Sikka i Akbar Sháhi.</i><br>Rev. <i>Máh i zí, 43 Ilahi.</i>       |

28a. The space between the two lines shows the thickness of No. 28.

It will be at once seen that each of these coins with the exception of No. 26, has its own designation upon it. Thus Nos. 1 and 2 are called *do tánke* pieces; No. 3 is a *yak tánke* piece. No. 4 is a *dám*. Nos. 5—17 inclusive and Nos. 22—25 inclusive are *fulús* pieces. No. 27, is a *damrí*. Nos. 18, 19 and 28 are called *Sikka i Akbar Sháhi*. The term *fulús* is applied to coins varying from 37 to 326 grains, one struck at Kábul weighing 149. The word *falas* in Arabic means want, indigence, hence *fals* or *filis*, a small coin, an obolus, money given to relieve poverty, or small change or copper, as we say in English.\* *Fulús* is the plural of *fals*. The first coin I have seen with *fulús* upon it is dated 946 A. H. It is evident that a term used so loosely as is this one could never have been brought forward in accounts or revenue statements.

Again the *sikka* has three weights 625·5 grains and 327 and 315 grs. I have three which I have not figured which weigh little more than 37 grains each. Hence *sikka* could not well be used as a definite value.

We have left the *dám*, *damrí* and *tánke*. We know that the last of these was a name applied to coins from the time of Mahmúd of Ghazní. We know also that *tánkes* were of two kinds, silver and copper. The weights of *tánkes* varied as did also their values. The *tánkes* of Sikandar Lodí were of different mixtures of silver and copper. Sometimes they contained only a little more than a grain and a half of silver in each, sometimes as much as eight grains and sometimes as much as sixteen, seventeen or even thirty-two. Hence it is evident that such coins could

\* [This derivation is doubtful. For *fals* signifies a fish scale as well as a copper coin. Ed.]

not be used in revenue returns. It became incumbent on Akbar, therefore, when he made a demand from his ministers for revenue returns to fix a standard. The *yak tánke i Akbar Sháhí* seems to be such a standard value. In the *Ain i Akbarí* we are told that the *dám* was a coin of the value of five *tánkes*. And further we are told that there were forty *dáms* to the rupee. Hence we may judge that there were 200 *tánkes* to the rupee. Now the total revenues of Akbar are put down by Nizám-uddín at 640,00,00,000 *tánkes*. This at the rate of 200 to the rupee would be equal to 3,20,00,000 rupees or £3,200,000.

Now in our list of coins we have a *dám* which weighs only 76 grains. And Abúl Fazl gives Akbar's revenues as 5,67,63,83,383 *dáms*. Now if a coin of 59 grains is valued at 200 to the rupee, a coin of 76 grains would be worth about 160 to the rupee. According to this account Abúl Fazl's statement stands at about 3 krons 54 laes of rupees or £3,540,000.

These statements are small compared with those arrived at by Thomas who makes the first equal to 32 millions and the latter to 16 millions, a discrepancy rather startling. And the magnitude of the sums is somewhat appalling. For when we turn to the prices of the produce of the land we are astonished to find that wheat sold for two maunds per rupee, barley at four maunds, mutton at about a fortieth of a rupee per lb. And we must remember that nearly all Akbar's revenues were from land.

Now if things sold so cheaply there must have been a vast amount of land under cultivation, in order to realize a revenue of £32,000,000, which is only a fractional part of the value of the whole of the crops. And India in those days must have been an enormously rich country, for Akbar had only a fraction of it in hand.

Thomas in his calculations does not give one coin of Akbar's. He gives statements from contemporary writers. These men were often wrong. Certainly five *yak tánke* pieces of 59 grains could not be equal to the *dám* of 76 grains.\*

Akbar's copper coins seem to follow the copper coins of the Súrí dynasty. Sher Sháh put an end to a mixed currency. But on no one of Sher Sháh's copper coins have I as yet been able to find a coin-name.

Abúl Fazl's statement is for the year 1003 A. H. or Akbar's 40th year and Nizám-uddín's is for 1002 or for his 39th year. The *dám* I figure is for the 33rd year and the *yak tánke* piece is for the 46th year. It is quite possible that these values were those the authors had in view.

I leave this part of the subject. It is one of great importance and one on which authorities differ widely. If Akbar out of the portion of India which he conquered could realize three hundred years ago 32 millions sterling, he in fact realized more than the English Government of India now does. For if we take away from the revenue all the extra sources

\* See note on page 191.

which have accrued to it since the time of Akbar we leave a much smaller amount for land revenue simple than that realized by the third Mogul. I strongly suspect that the whole of these returns are paper sums which were never realized.

Let us now look at some other features in the coins:—the mint towns claim a word. They are A'grah, Láhor, Nárnol, Ahmadábád, Dehlí, Fathpúr, Hissár Firozah, Lakhnau, Urdu Zafarfarín, Multán, Ilahábás, Gobindpur, Dogánw (?), Attak Banáras, Kábul, in all sixteen mints. I have in my cabinet some half dozen to-me-illegible mints more of Akbar. In the Lahore Museum is a great heap of Akbar's large copper *fulús*, as yet unarranged.

Nárnol is not given in Thomas, neither is Fathpúr or Dogánw or Gobindpúr. Fathpúr is Fathpúr Sikrí near A'grah. It rejoices in the title of Dár us Saltanat on both gold and silver coins of Akbar. I have one rupee of Sháhjahán struck at the same place. Attak Banáras is undoubtedly Attock on the Indus; for interesting remarks on this place I must refer the reader to General Cunningham's *Archæological Survey Report*, Vol. II, pp. 93, 94.

The years and months deserve notice. No sooner had Akbar proclaimed the change in the year than he began to strike coins according to his new system. The coins of the year 30 Ilahí are very rare indeed. I have two rupees of that year but no copper coins. (This was the year of the change.) Akbar reverted to Kalimah rupees after this. His square rupees with *alif* (= in Arabic 1000) are somewhat common. They all have the Kalimah on them. I have two square rupees of 1000 and 1001, with the date *in figures*, and with the Kalimah on them. The months also figure on the coins. Thus we have *Shakrewar*, *Azr*, *Farwardín*, *Urd i Bihisht*, *Anr Dád*, and *Zí*, or six months out of the twelve on the few copper coins here put forward. In rupees I have all the months. I am going to try to complete one year, having already of some years four months. I suppose the dies used must have needed constant replaëing. Some of them were very sharp and deep and would soon be the worse for wear.

Of some places I have only figured one coin. I have several of most of them. Thus of Narnol I have four and five of 963, and one of an illegible mint of 966. The whole of the 50 years of Akbar's reign are I believe obtainable in all the metals, gold, silver and copper. I have every year in rupees, except 965. During the last five years I have come across many mohurs of different years. Some of these are of rare beauty. Systematic research ought to bring these to light. The British Museum has *dirhams* of the Khalifas which go year by year from the commencement of their minting to the time when they ceased striking. And what makes these series the more interesting is the fact that each mint is thus represented year by year, sometimes for nearly a hundred consecutive years. In India, one

object to be had in view is a complete series of coins of all the Sultáns whether Pathán or Mogul, and of the Mahárájahs and Rájahs. Another object should be series of local mints. Thus Lahore, from the time of Mahmúd of Gazní to that of the latter Moguls, was a very famous mint town. But in the museum of that city no attempt has been made to secure complete series of Lahore coins. Those of the early Moguls are of great beauty and deserve to be gathered. The large mohurs and square rupees of Jahángír struck at Lahore are most especially worthy of notice. Of course the price of such coins would amount to a large sum. But if a museum is worthy of being kept up, surely the things in it should be worth looking at. The coins in the Lahore Museum are now being catalogued, and when the catalogue is issued, the deficiencies and redundancies of the collection will be seen at once. It is to be hoped that when the deficiencies are made manifest, some attempt will be made to make them good.

For coins Nos. 1 and 3, I am indebted to Dav. Ross, Esq., Traffic Manager, Scinde, Punjab and Dehli Railways for permission to make copies of them. For permission to draw No. 28, I am indebted to Mr. Ibbetson, C. S. of Kurnál.

With respect to the *fulús* coins I may add that these are probably the coins of which Bernier says that Aurungzib had bags of 1000 *peyssas* ready for distribution. In a loose fashion the term *dám* seems also to have been given to the large *fulús* pieces. And generally we see that with respect to Akbar's copper coins there was a want of definiteness which precludes the possibility of arriving at exactness with respect to his revenues. For we must always remember that copper was the standard of value in Akbar's time.

*Note.*—There is some confusion in the names of the copper coinage of the East India Company. Accounts are kept in rupees, annas and pies. There are 12 pies to an anna. But on the quarter anna we have in Persian distinctly پای یک one pie. According to this therefore there are only four pies in an anna. The coin we call a pie has on it in Persian ثلث پای *gulá pái*, the third part of a pie. If the accounts of the Company had been kept in pies only, there would have been tremendous confusion until the value of the pie had been fixed.

The modern pie weighs about 100 grains. Hence a rupee is worth about 6400 grains. If a *dám* weighed 320 grains and a rupee were worth forty *dáms* then in Akbar's time a rupee represented 12,800 grains. But if also the *dám* weighed 80 grains only, and there were 160 of them, the same result is arrived at. Now nearly the same result is arrived at with reckoning the rupee to be worth 200 *tanke*s at 60 grains each.

If the relative values of silver and copper were the same in Akbar's time as now, then taking our coins the *tanke* and *dám* at 60 and 80 grains we have 106 and 80 to the rupee respectively. Taking these values, which are probably the correct ones, the revenues of Akbar according to Nizám-uddín and Abúl Fazl are £6,000,000 and £7,095,000 respectively.



CONTENTS  
OF THE  
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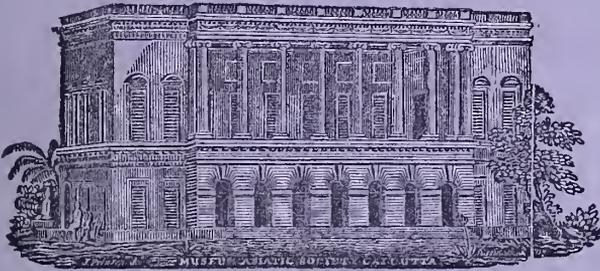




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AN INTRODUCTION  
TO THE  
MAITHILÍ LANGUAGE  
OF  
NORTH BIHÁR  
CONTAINING  
A GRAMMAR, CHRESTOMATHY & VOCABULARY.

BY  
GEORGE A. GRIERSON, B. C. S.

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## INTRODUCTION.

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IN submitting the following somewhat full Grammar of the Maithili dialect to the Society, I wish to explain the sources of my information.

They may be divided into two classes.

1st.—Forms obtained by translating into Maithili.

2nd.—Forms obtained by translating from Maithili.

The first I obtained as follows. I printed paradigms of all the forms in Hindí and Samskrít Grammar and circulated them as widely as possible amongst the Paṇḍits, Village School Masters and educated Native Gentlemen of Northern Mithilá, with directions to give the exact translation of each of these forms in their own native language.

I was enabled in this way, to collect some fifty most useful books of forms, supplied by representatives of all classes of society, from the village *guru*, who knew little more than the herd-boys he taught, to the most learned Paṇḍits of Mithilá. I am glad to say that the utmost interest was taken in my design, for the people are proud of their language and were pleased at the idea of its being made a polite one, by obtaining the honour of print. I shall have more to say on this point bye and bye. These books of paradigms formed the basis of this Grammar. They were compared with each other; and where one was found wanting, another supplied the deficiency. At the same time, it must not be imagined that they showed many mutual discrepancies: on the contrary, considering the many varied sources from which they were derived, their unanimity was wonderful and justifies me in hoping that what I here publish will be found fairly accurate.

With regard to the forms obtained by translating from Maithili, they were obtained in various ways. In cutcherry I collected myself a large number of words from the mouths of the witnesses who came in from a distance. These I found very useful in checking the books of forms above referred to. I also collected a number of country songs, which afforded invaluable materials when properly sifted.

From these two sources, aided by the practical knowledge possessed by myself and one or two native friends, the following grammar has been compiled. I wish I could believe that it is thoroughly accurate; all I can say is that we have done our best to make it as accurate as possible.

Our greatest difficulty has been experienced from the luxuriance of the language. The verb, especially, much tried our patience. Maithili is a *bolí* in the literal sense of the word. Beyond a History of Krishna and

the songs of Vidyapati Thákur, I know of no literary work which it possesses. It is emphatically a spoken language. There is no standard to which it can be referred, and hence no form can be put aside as vulgar or impure. It is hoped, not only by myself, that the publication of a treatise like the present will tend to fix a standard and to foster a literature which might easily arise in so raey and fluent a language.

For Maithilí is a language and not a dialect. It is the custom to look upon it as an untaught dialect of untaught villagers, but it is in reality the native language of more than seven and a quarter\* millions of people, of whom, as will be borne out by every official having experience of North Bihár, at least five millions can neither speak nor understand either Hindí, or U'rdú without the greatest difficulty. It differs from both Hindí and Bangálí, both in Vocabulary and in Grammar, and is as much a distinct language from either of them as Maráthí or Uṛiyá. It is a country with its own traditions, its own poets, and its own pride in everything belonging to itself.

For this reason, I hope that this grammar may be found useful to the officials who are brought into every day contact with the country, and that the too often, I fear, contemptuous ignorance exhibited of the *gāṓwārí*, may be superseded by a desire to learn a language, which cannot fail to be useful to them, and the acquirement of which is now made easier.

Maithilí is spoken by all the Hindús and Muhammadans, who inhabit the great plain which is bounded on the North and South by the Himálayas and the Ganges, and on the East and West by the Kośí and Gaṇḍak respectively. It is thus the native language, not only of the 7½ millions of North Bihár, but also of the unnumbered millions of the Nepál Taráí, bordering on the districts of Champáran, Tirhut and Bhágalpúr. It has various dialects, differing slightly from each other, the two extremes being that of Champáran on the west, which approaches the language of Chaprá, and that of Bhágalpúr on the east which contains a few forms tending towards Bangálí. The dialect which I have adopted as a standard is that of the Madhubaní Sub-division, which is centrally situated, and which is admitted by all Bráhmaṇs to be the head-quarters of Mithilá. I have a practical and personal knowledge of the dialects of North Bhágalpúr,

---

\* POPULATION OF—

|                                   |     |     |           |     |       |     |           |
|-----------------------------------|-----|-----|-----------|-----|-------|-----|-----------|
| Champáran                         | ... | ... | ...       | ... | ...   | ... | 14,40,815 |
| Tirhut                            | ... | ... | ...       | ... | ...   | ... | 43,84,706 |
| Begu Sarai Sub-Division of Munger | ... | ... | ...       | ... | ...   | ... | 5,37,725  |
| Supaul                            | „   | „   | Bhágalpúr | ... | ...   | ... | 5,65,747  |
| Madhaipúrá                        | „   | „   | „         | ... | ...   | ... | 3,91,086  |
|                                   |     |     |           |     | TOTAL | ... | 73,20,079 |

Darbhanga (including Madhubani) and Muzaffarpur districts. The dialect of Champaran I only know through writings, and through information acquired from natives of that district whom I have met.

As to the character of the language, it is comparatively free from admixture with foreign words. It abounds in words of Hindú origin, is composed mainly of words derived through Prákrít from Samskrít, and at the same time borrows freely from Samskrít itself. Even the Musalmáns, while of course using more Arabic and Persian words than the Hindús, abstain from using them to anything like the extent to which their U'rdú speaking brethren of the north-west affect them, not excepting their sacred hymns connected with their religion. I give a few examples of these in the Appendix, and it will be noticed how extremely free they are, for their subject, from foreign words.

In conclusion, I have only to put on record my indebtedness to Mr. Etherington's excellent Hindí grammar. I have had it constantly by my side, and I have made its arrangement the skeleton which I clothed with Maithilí forms. In some paragraphs I have actually used Mr. Etherington's language; and I offer no excuse for doing so, as it would be impossible for me to express the subject-matter in clearer language, or in fewer words.





# MAITHILÍ GRAMMAR.

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## PART I.

### CHAPTER I.

#### THE ALPHABET.

§ 1. The Alphabets in use in Mithilá are three.—The Deva-nágari, the Maithilí, and the Káyathí. The first is familiar to every reader of this, and need not be described here. It is not much used in common life, and seldom even in manuscripts.

§ 2. The Maithilí is the character used by the Maithil Bráhmaṇs, both in the affairs of common life, and in their sacred books. Few of the Bráhmaṇs, who are not professed paṇḍits, can read the Deva-nágari character. The Maithilí character is also affected by Maithil Káyasthas, who pretend to be better educated than their fellows. The Maithilí character is nearly the same as Bangálí, differing only in one or two letters.

§ 3. The Káyathí character is that in general use throughout Mithilá by all educated persons who are not Bráhmaṇs. It is a corruption of the Deva-nágari, and can be written much faster than the latter, or even than *shikasta* U'rdú. There is a clerk in my office in Madhubaní, who can write excellent Káyathí much quicker than even the most practised of the old "Persian" muharrirs. Besides the speed with which it can be written, it has the advantage of thorough legibility. It is being gradually introduced by Government into official documents and with considerable success, in spite of the opposition of the old Persian School of Government officials.

§ 4. A lithographed comparative table, giving specimens of these three alphabets, will be found at the end of this grammar.

#### *Pronunciation.*

##### *(a.) Vowels.*

§ 5. The vowels should be pronounced as in Saṃskṛit, with the following exceptions.

§ 6. The pronunciation of the vowel अ *a* is peculiar. It is not so broad as that of the corresponding vowel in Bengálí, but on the other hand it is broader than that of the neutral vowel in High Hindí. I know of no

sound exactly equivalent to it in any language with which I am acquainted. The best way of describing it is by saying that it is half way between the *o* in *not*, and the *u* in *nut*, when preceded by a hard guttural cheek, and followed by a soft labial check. It thus may be said to be the *u* in *cub*, rounded, or the *o* in *cob*, neutralized.

§ 7. *In words of more than one syllable*,—the short vowels अ *a*, इ *i*, and उ *u*, when final and preceded by consonants are not pronounced in prose and conversation. This is absolute in the case of अ *a*. E.g., फल, is pronounced *phal*, and not *phala*. With respect to इ *i* and उ *u*, the sound of the vowel, when written, does not entirely disappear. It however is pronounced very slightly indeed, being little more than an aspirate with the colour (*timbre, tonfarbe*) of the vowel.\* When इ *i* and उ *u* are thus pronounced, I shall throughout this grammar represent them (in transliteration) by a simple apostrophe, and not by *i* or *u*, in order to prevent a tendency to mispronunciation. E.g. हूँ, will be written *hūn'*. It must be remembered however that this apostrophe must, in pronunciation, be coloured by the omitted vowel. Thus the pronunciation of the apostrophe in *hūn'*, for हूँ, is very different from that of the apostrophe in *ah'* for अह. In the first it is coloured by the tone of the palatal vowel *i*, while in the second it is coloured by the tone of the labial vowel *u*. This final apostrophe can be nasalized by *anunāsika*. E.g. नहँ *nah'n̄*.

As in High Hindí, अ *a*, when unaccented and falling between two consonants, is frequently omitted in pronunciation in prose and conversation. This is especially noticeable in the conjugations of verbs. Throughout this grammar, I shall represent this unpronounced, unaccented अ *a*, in transliteration, by an apostrophe, ' , which in this case will have a slight colour of the tone of the guttural vowel अ *a*. E.g. देखलिये, *dekh'liai*.

§ 8. It will thus be seen that I shall employ this apostrophe (') to represent three distinct colours of tone, a guttural colour, when medial and representing a medial अ *a*, and a palatal or labial colour, when final and representing a final or nasalized final इ *i* or उ *u*, respectively. And logically, I ought to represent the inert final अ *a* also by a guttural apostrophe, but this is neither customary nor necessary and would only tend to confusion. It is simpler to remember that medial apostrophe stands for guttural अ *a*, and that a final apostrophe or a final apostrophe nasalized, stands for a palatal इ *i* or a labial उ *u*, either simple or nasalized, respectively.

§ 9. ऐ *ai* is pronounced like the English word "I," and never like *oi*. It thus differs from अय् *ay* which has a broader sound. E.g. हैव *hai'b* is pronounced very differently from हयव *hay'b*.

§ 10. (°) *Anunāsika* is pronounced like the nasal sound in the French word "bon". It will, throughout this grammar, except when final after a

\* A similar peculiarity is observed in Sindhí and Telugu.

short vowel which is not pronounced, be represented in transliteration by a circumflex over the qualified vowel. Thus अँ will be represented by  $\tilde{a}$ , आँ by  $\tilde{a}'$ , ईँ by  $\tilde{i}$ , औँ by  $\tilde{i}'$ , and so on. E.g. बौँह्  $b\tilde{a}'h'$ . When final, after a short vowel which is not pronounced, as explained in § 7, it will be represented by  $\tilde{n}$ . Thus, नहँ  $nah'\tilde{n}$ .

*Anusvára* (ँ) will only be used throughout this grammar as a *compendium scripturae* for उँ  $u'$ , ङँ  $\tilde{ng}$ , णँ  $\tilde{ṇ}$ , नँ  $n'$ , or मँ  $m'$  before another consonant of the same class. Thus वुँदा instead बुँदा  $bundá$ . It will hence be represented in transliteration by  $n'$ ,  $\tilde{n}$ ,  $n'$ ,  $n$ , or  $m$ , according to circumstances. This distinction between *anunásika* and *anusvára* is adopted in order to prevent any misapprehension as to pronunciation.

(b). *Consonants.*

§ 11. क  $k$ , ख  $kh$ , ग  $g$ , घ  $gh$ , ङ  $n'$ , च  $ch$ , छ  $chh$ , ज  $j$ , झ  $jh$ , ञ  $\tilde{n}$ , ट  $t$ , ठ  $th$ , ड  $d$ , ढ  $dh$ , ढ  $ṛh$ , त  $t$ , थ  $th$ , द  $d$ , ध  $dh$ , न  $n$ , प  $p$ , फ  $ph$ , ब  $b$ , भ  $bh$ , म  $m$ , य  $y$ , र  $r$ , ल  $l$ , व  $v$ , श  $s'$ , स  $s$ , and ह  $h'$  are usually pronounced as in Samskrit. As usual in modern A'ryan languages, ज and य, and ब and व are frequently confounded both in pronunciation and in writing. I shall endeavour throughout this grammar to represent all  $j$  sounds by either ज or य,  $y$  sounds by य,  $b$  sounds by either ब or व, and  $v$  and  $w$  sounds by व respectively. It is not usual, however, to make these distinctions in writing.

§ 12. The pronunciation of ण  $\tilde{ṇ}$  is peculiar. The lingual nature of its sound is much more marked than in the Samskrit of Western India. It has more the sound of a muffled lingual  $r$  followed by a lingual  $n$ ; e.g. रावण is pronounced almost like *Rábarṇ*, the  $r$  in  $rṇ$  having a peculiar muffled sound, impossible to describe in writing. न  $n$  is occasionally substituted for ण  $\tilde{ṇ}$  and is then pronounced as  $n$ .

§ 13. ष  $sh$ , when standing alone and not compounded with another consonant, is always pronounced as ख  $kh$ . Thus षट्  $shashṭh$  "sixth" is pronounced *khashṭh*. This pronunciation is universal: the vulgar even write such a ष  $sh$ , phonetically ख  $kh$ . In the compound consonant र्ष  $rsh$ , ष  $sh$  is also always pronounced as ख  $kh$ ; e.g. आकर्षण *ákarshan* is pronounced *ákarkhan*. A similar pronunciation is optional in the compound ल्ष  $lsh$ ; e.g. the word सुवल्षु (Sams. loc. plur of सुवल्) is pronounced either *suvalshu* or *suvalkhu*. By some this ख  $kh$  sound of ष  $sh$  is pronounced as a guttural breathing, and not as a guttural check,—something, but not quite, like the Persian  $\dot{c}$   $kh$ , or the  $ch$  in *loch*. This pronunciation is, however, condemned by the best paṇḍits. The compound letter क्ष  $ksh$  is pronounced like च्छ  $chchh$ , which is occasionally written for it by the vulgar; e.g. लक्ष्मी is so written, and is pronounced as *Lakshmi* by purists, but is commonly written and pronounced लच्छ्मी *Lachchh'mi*. The compound षष्प  $shp$  is peculiar. It is pronounced something like ह्ष  $hsp$ ; e.g. पुष्प *pushp* "a flower" is pronounced *puhsp*.

§ 14. The letter ह *h*, when compound with य *y*, becomes ह्य *hy*, which is pronounced in a peculiar way. If *zh* be taken to represent the Persian *zh*, the pronunciation of this compound can best be represented by *zhjy*; e.g. ग्रह, *fit to be accepted*, is pronounced *grázhjya*, the final अ being retained in pronunciation, though usually inert, for the sake of euphony.

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## PART II.

### NOUNS, ADJECTIVES AND PRONOUNS.

#### CHAPTER II.

#### GENDER, NUMBER AND CASE.

§ 15. The noun has two Genders,—Masculine and Feminine. Words derived direct from the Samskrit, which were originally neuter, become masculine in Maithilí.

There are two numbers, the Singular, and the Plural.

§ 16. There are (counting the vocative) eight cases,—*viz.*, Nominative, Accusative, Instrumental, Dative, Ablative, Genitive, Locative and Vocative.

§ 17. The NOMINATIVE has one invariable form, which is the same before all kinds and before all tenses of verbs. The vulgar, however, capriciously add the termination उआ *uá* or आ *á* to all nominatives, especially to those of proper names. E.g. घर *ghar* or घरआ *gharuá*, a house; रघू *Raghú* or रघुआ *Raghuá*, a proper name: नैनी *není* or नैनिआ *neniá*, a girl.

§ 18. The ACCUSATIVE is formed by adding the postposition केँ *kē* to the nominative. This postposition is however commonly dropped in writing and conversation, when no ambiguity is likely to arise. It is forbidden, however, to drop this postposition in this way, in the case of the pronouns of the first and second persons, for which special forms are provided. Throughout the ensuing paradigms, the termination is always given, but it must be understood, that, except in the cases above mentioned, it can optionally be discarded. In different parts of Mithilá the postposition is written केँ *ke*, केँ *kē*, केँ *kāi*, and काँ *kā'*. The oldest form, which is met with most frequently in poetry, is केँ *kāi*, but the one most commonly used nowadays is केँ *kē*.

§ 19. The INSTRUMENTAL denotes the instrument, means, cause, or agent by which a thing is done. It in no way corresponds to the so-called agent in Hindí, which is used before the past tenses of transitive words. It

is usually formed by adding सँ *sā*, of which सौँ *sō* is an occasional variety. सौँ *sō* is the poetical and older form. There is another form of the instrumental made by the addition of the syllable एँ *ē*. This is formed in two ways.

A. by the substitution of एँ *ē* for the final vowel in,—

(1) all nouns ending in अ *a*, which is not pronounced; e.g. फल *phal*, *fruit*, has for one of the forms of its instrumental फलें *phalē*.

(2) All nouns ending in आ *á*, whether directly borrowed from Sanskrit, or from Prákrític sources. E.g. कथा *kathá*, a saying, makes one of its instrumental forms कथें *kathē*, and नैना *nená*, a boy, similarly makes नैनें *nenē*.

B. In all other nouns by the simple addition of एँ *ē*, before which a final long vowel is shortened. Thus पानि *páni*, water, becomes in one form of the instrumental singular पानिएँ *paniē*, and बेटी *betí*, a daughter, similarly becomes बेटिएँ *betiē*.

§ 20. The DATIVE “is the case of the recipient or that form of the noun which indicates that in which the object of an action rests.” It is similar in form to the Accusative, but the postposition के *ke*, कें *kē*, कौँ *kāi* or काँ *kā'* is not liable to be dropped.

§ 21. The ABLATIVE indicates separation or removal from. It is formed by adding the postposition सँ *sā*, of which सौँ *sō* is an occasional variety. सौँ *sō* is the poetical and older form.

§ 22. The GENITIVE “denotes connection generally, whether arising from origin or possession.” Its sign is क *k*. An older form, but still in occasional use, is केर *ker*. In the pronouns, too, the distinguishing termination of the genitive is the letter र *r*. None of these three postpositions, क *k*, केर *ker* or र *r*, shows any symptom of being influenced by gender, as is the case with the corresponding Hindí postpositions का *ká*, के *ke* and की *kí*. Although really ending in an inherent short अ *a*, this final vowel is not pronounced in prose or in conversation, so that क *k*, केर *ker* and र *r* are usually pronounced as if they were क् *k*, केर् *ker* and र् *r*. In order to prevent mispronunciation, throughout the following paradigms, the postpositions क and र are written as part of the qualifying word. Thus नैनाक *nenák*, हमर *hamar*, and not नैना क *nená k*, हम र *ham r*, which would be the more logical way of writing them. But it must never be forgotten that क and र are postpositions and have not yet been so amalgamated with the principal word, that the whole forms one inflected base.

§ 23. The LOCATIVE indicates the place in, or the time at which a thing is done. It is formed usually by the postposition में *mē*, of which मँ *mā* and मौँ *mō* are optional forms. Of these three forms, मौँ *mō* is the oldest and is usually found in poetry. An old form of the Locative ended, like the Sanskrit, in ए *e*. It now, however, appears in only a few adverbial sentences, such as घरे घरे *ghare ghare*, in every house.

§ 24. The VOCATIVE usually takes the same form as the Nominative. In speaking to a person of lower rank or age, the termination वा *vá* or आ *á* is used as follows. नैना *nená*, a boy, becomes रौ नैनवा *rau nen'vá*. नैनी *není*, a girl, becomes गै नैनिआ *gai neniá*. रघू *Raghú*, a proper name, becomes रौ रघुआ *rau Raghúá*.

The following interjections are used with the vocative.

- (a.) With masculine inferiors,—or familiarly, रौ *rau*, रे *re*.
- (b.) With masculine equals or superiors, औ *au*, हौ *hau*, हे *he*.
- (c.) With feminine inferiors,—or familiarly, गै *gai*.
- (d.) With feminine equals or superiors, है *hai*.

### CHAPTER III.

#### PLURAL NUMBER.

§ 25. The plural number of nouns in Maithilí is simply formed by the addition of a noun signifying multitude. Those most commonly used are सभ *sabh* and सर्वहि *sabah* meaning *all*, and लोकनि *lokani*\* meaning *people*. The last is only used with animate objects. सभ *sabh* and सर्वहि *sabah*' can be used indifferently either before or after the qualified noun. Thus नैना सभक *nená sabhak*, नैना सर्वहिक *nená sab'hik*, सभ नैनाक *sabh nenák*, सर्वहि नैनाक *sabah nenák* and नैना लोकनिक *nená lokanik* are all possible forms of the genitive plural of नैना *nená*, a boy. लोकनि *lokani* be it observed, can only be used after the qualified noun. In all cases, whatever be the order of the words, the postposition deciding the case comes last.

§ 26. The same rules partially apply to pronouns: but, in addition to the word signifying plurality, many of them have entirely new bases for their plural forms.

§ 27. Throughout the following Paradigms, I shall generally only use the word सभ to designate the plural; but it must always be understood that unless specially forbidden, सर्वहि *sabah*' and लोकनि *lokani* can also be used.

### CHAPTER IV.

#### DECLENSION OF NOUNS.

§ 28. There is in Maithilí really only one declension, but as the forms of some classes of nouns vary slightly from each other before some of the postpositions, it will be convenient to consider nouns in three classes.

§ 29. I. The first class will consist of all nouns ending in आ *á*.

II. The second class will consist of all nouns ending in inherent अ *a*, when it is not pronounced.

III. The third class will consist of all other nouns.

The difference between these three classes will be noticed on comparison of the Instrumental and Vocative singular.

\* The final *i* in this word is pronounced.

## CLASS I.

## ALL NOUNS ENDING IN आ á.

§ 30. (1) Example of a Masculine noun ending in आ á.

नेना *nená*, a boy.SINGULAR एकवचन *Ek'vachan*.

|       |                                                                               |
|-------|-------------------------------------------------------------------------------|
| Nom.  | नेना <i>nená</i> , a boy.                                                     |
| Acc.  | { नेना <i>nená</i> ,<br>नेना केँ <i>nená kē</i> , } a boy.                    |
| Inst. | { नेनेँ <i>nenē</i> ,<br>नेना सँ <i>nená sā</i> , } by a boy.                 |
| Dat.  | नेना केँ <i>nená kē</i> , to a boy.                                           |
| Abl.  | नेना सँ <i>nená sā</i> , from a boy.                                          |
| Gen.  | { नेनाक <i>nenák</i> ,<br>नेनाकेर <i>nenáker</i> , } of a boy.                |
| Loc.  | नेना में <i>nená mē</i> , in a boy.                                           |
| Voc.  | रौ नेनवा <i>rau nen'vá</i> , O boy, (or respectfully) औ नेना <i>au nená</i> . |

PLURAL बहुवचन *Bahuvachan*.

|       |                                                                                                   |
|-------|---------------------------------------------------------------------------------------------------|
| Nom.  | नेना सभ <sup>1</sup> <i>nená sabh</i> , boys.                                                     |
| Acc.  | { नेना सभ <sup>1</sup> <i>nená sabh</i> ,<br>नेना सभकेँ <sup>2</sup> <i>nená sabh kē</i> , } boys |
| Inst. | { नेना सभेँ <sup>3</sup> <i>nená sabhē</i> ,<br>नेना सभ सँ <i>nená sabh sā</i> , } by boys.       |
| Dat.  | नेना सभ केँ <sup>4</sup> <i>nená sabh kē</i> , to boys.                                           |
| Abl.  | नेना सभ सँ <sup>5</sup> <i>nená sabh sā</i> , from boys.                                          |
| Gen.  | { नेना सभक <sup>6</sup> <i>nená sabhak</i> ,<br>नेना सभकेर <i>nená sabh'ker</i> , } of boys.      |
| Loc.  | नेना सभ में <sup>7</sup> <i>nená sabh mē</i> , in boys.                                           |
| Voc.  | { रौ नेनवा सभ <sup>8</sup> <i>rau nen'vá sabh</i> ,<br>औ नेना सभ <i>au nená sabh</i> , } O boys.  |

- [1.] Other forms are सभ नैना *sabh nená*, नैना सबहि *nená sabah'*, सबहि नैना *sabah' nená* and नैना लोकनि *nená lokani*.
- [2.] Other forms are नैना सबहिकेँ *nená sabah' kē*, and नैना लोकनि केँ *nená lokani kē*.
- [3.] Other forms are नैना सबहिएँ *nená sab'hiē*, नैना सबहि सँ *nená sabah' sã*, नैना लोकनिएँ *nená lok'niē* and नैना लोकनि सँ *nená lokani sã*.
- [4.] Other forms are नैना सबहि केँ *nená sabah' kē* and नैना लोकनि केँ *nená lokani kē*.
- [5.] Other forms are नैना सबहि सँ *nená sabah' sã* and नैना लोकनि सँ *nená lokani sã*.
- [6.] Other forms are नैना सबहिक *nená sab'hik*, नैना लोकनिक *nená lokanik*.
- [7.] Other forms are नैना सबहि में *nená sabah' mē* and नैना लोकनि में *nená lokani mē*.
- [8.] रै नैना सबहि *rau nená sabah'*, औ नैना लोकनि *au nená lokani*.

§ 31. (2) Example of a feminine noun, ending in आ *á*.

कथा *kathá*, a story.

SINGULAR एकवचन *Ek'vachan*.

Nom. कथा *kathá*, a story.

Acc. { कथा *kathá*,  
कथा केँ *kathá kē*, } a story.

Inst. { कथेँ *kathē*,  
कथा सँ *kathá sã*, } by a story.

Dat. कथा केँ *kathá kē*, to a story.

Abl. कथा सँ *kathá sã*, from a story.

Gen. { कथाक *kathák*,  
कथाकेर *katháker*, } of a story.

Loc. कथा में *kathá mē*, on a story.

Voc. हे कथा *he kathá*, O story.

PLURAL बहुवचन *Bahuvachan.*

|       |                                                                                    |
|-------|------------------------------------------------------------------------------------|
| Nom.  | कथा सभ <i>kathá sabh</i> , stories.                                                |
| Acc.  | { कथा सभ <i>kathá sabh</i> ,<br>कथा सभ केँ <i>kathá sabh kē</i> , } stories.       |
| Inst. | { कथा सभेँ <i>kathá sabhē</i> ,<br>कथा सभ सँ <i>kathá sabh sā</i> , } by stories.  |
| Dat.  | कथा सभ केँ <i>kathá sabh kē</i> , to stories.                                      |
| Abl.  | कथा सभ सँ <i>kathá sabh sā</i> , from stories.                                     |
| Gen.  | { कथा सभक <i>kathá sabhak</i> ,<br>कथा सभकेर <i>kathá sabh'ker</i> , } of stories. |
| Loc.  | कथा सभ मेँ <i>kathá sabh mē</i> , in stories.                                      |
| Voc.  | हे कथा सभ <i>he kathá sabh</i> , O stories.                                        |

## CLASS II.

ALL NOUNS ENDING IN INHERENT अ *a*, WHEN THIS LETTER IS NOT PRONOUNCED.

§ 32. (1) Example of a masculine noun, ending in अ *a*.

फल *phal*, a fruit.

SINGULAR एकवचन *Ek'vachan.*

|       |                                                                |
|-------|----------------------------------------------------------------|
| Nom.  | फल <i>phal</i> , a fruit.                                      |
| Acc.  | { फल <i>phal</i> ,<br>फल केँ <i>phal kē</i> , } a fruit.       |
| Inst. | { फलेँ <i>phalē</i> ,<br>फल सँ <i>phal sā</i> , } by a fruit.  |
| Dat.  | फल केँ <i>phal kē</i> , to a fruit.                            |
| Abl.  | फल सँ <i>phal sā</i> , from a fruit.                           |
| Gen.  | { फलक <i>phalak</i> ,<br>फलकेर <i>phal'ker</i> , } of a fruit. |
| Loc.  | फल मेँ <i>phal mē</i> , in a fruit.                            |
| Voc.  | हे फल <i>he phal</i> , O fruit.                                |

PLURAL बहुवचन *Bahuvachan.*

|       |                                                                              |
|-------|------------------------------------------------------------------------------|
| Nom.  | फल सभ <i>phal sabh</i> , fruit.                                              |
| Acc.  | { फल सभ <i>phal sabh</i> ,<br>फल सभ केँ <i>phal sabh kē</i> , } fruit        |
| Inst. | { फल सभेँ <i>phal sabhē</i> ,<br>फल सभ सँ <i>phal sabh sā</i> , } by fruit.  |
| Dat.  | फल सभ केँ <i>phal sabh kē</i> , to fruit.                                    |
| Abl.  | फल सभ सँ <i>phal sabh sā</i> , from fruit.                                   |
| Gen.  | { फल सभक <i>phal sabhak</i> ,<br>फल सभकेर <i>phal sabh'ker</i> , } of fruit. |
| Loc.  | फल सभ मेँ <i>phal sabh mē</i> , in fruit.                                    |
| Voc.  | हे फल सभ <i>he phal sabh</i> , O fruit.                                      |

## CLASS III.

ALL NOUNS NOT ENDING IN आ *á*, OR SILENT अ *a*,

§ 33. (1) Example of a masculine noun, ending in इ *i*

पानि *páni*,\* water.

SINGULAR एकवचन *Ek'vachan.*

|       |                                                                   |
|-------|-------------------------------------------------------------------|
| Nom.  | पानि <i>páni</i> , water.                                         |
| Acc.  | { पानि <i>páni</i> , water,<br>पानि केँ <i>páni kē</i> , } water. |
| Inst. | { पानिएँ <i>pániē</i> ,<br>पानि सँ <i>páni sā</i> , } by water.   |
| Dat.  | पानि केँ <i>páni kē</i> , to water.                               |
| Abl.  | पानि सँ <i>páni sā</i> , from water.                              |
| Gen.  | { पानिक <i>pánik</i> ,<br>पानिकेर <i>pániker</i> , } of water.    |
| Loc.  | पानि मेँ <i>páni mē</i> , in water.                               |
| Voc.  | हे पानि <i>he páni</i> , O water.                                 |

\* The *i* in the termination of this word is pronounced.

PLURAL बहुवचन *Bahuvachan.*

|       |                                                                                   |
|-------|-----------------------------------------------------------------------------------|
| Nom.  | पानि सभ <i>páni sabh</i> , waters.                                                |
| Acc.  | { पानि सभ <i>páni sabh</i> ,<br>पानि सभ केँ <i>páni sabh kē</i> , } waters.       |
| Inst. | { पानि सभेँ <i>páni sabhē</i> ,<br>पानि सभ सँ <i>páni sabh sā</i> , } by waters.  |
| Dat.  | पानि सभ केँ <i>páni sabh kē</i> , to waters.                                      |
| Abl.  | पानि सभ सँ <i>páni sabh sā</i> , from waters.                                     |
| Gen.  | { पानि सभक <i>páni sabhak</i> ,<br>पानि सभकेर <i>páni sabh'ker</i> , } of waters. |
| Loc.  | पानि सभ मेँ <i>páni sabh mē</i> , in waters.                                      |
| Voc.  | हे पानि सभ <i>he pání sabh</i> , O waters.                                        |

§ 34. (2) Example of a feminine noun ending in इ i.

नेनी *není*, a girl.

SINGULAR एकवचन *Ek'vachan.*

|       |                                                                  |
|-------|------------------------------------------------------------------|
| Nom.  | नेनी <i>není</i> , a girl.                                       |
| Acc.  | { नेनी <i>není</i> ,<br>नेनी केँ <i>není kē</i> , } a girl.      |
| Inst. | { नेनिएँ <i>neniē</i> ,<br>नेनी सँ <i>není sā</i> , } by a girl. |
| Dat.  | नेनी केँ <i>není kē</i> , to a girl.                             |
| Abl.  | नेनी सँ <i>není sā</i> , from a girl.                            |
| Gen.  | { नेनीक <i>neník</i> ,<br>नेनीकेर <i>neniker</i> , } of a girl.  |
| Loc.  | नेनी मेँ <i>není mē</i> , in a girl.                             |
| Voc.  | गै नेनिआ <i>gai neniá</i> , O girl.                              |

PLURAL बहुवचन *Bahuvachan.*

|       |                                                                        |             |
|-------|------------------------------------------------------------------------|-------------|
| Nom.  | नेनी सभ <i>není sabh</i> ,                                             | girls.      |
| Acc.  | { नेनी सभ <i>není sabh</i> ,<br>नेनी सभ केँ <i>není sabh kē</i> , }    | girls.      |
| Inst. | { नेनी सभेँ <i>není sabhē</i> ,<br>नेनी सभ सँ <i>není sabh sâ</i> , }  | by girls.   |
| Dat.  | नेनी सभ केँ <i>není sabh kē</i> ,                                      | to girls.   |
| Abl.  | नेनी सभ सँ <i>není sabh sâ</i> ,                                       | from girls. |
| Gen.  | { नेनी सभक <i>není sabhak</i> ,<br>नेनी सभकेर <i>není sabh'ker</i> , } | of girls.   |
| Loc.  | नेनी सभ में <i>není sabh mē</i> ,                                      | in girls.   |
| Voc.  | गै नेनिआ सभ <i>gai neniâ sabh</i> ,                                    | O girls.    |

§ 35. (3) Example of ३ masculine proper noun ending in ऊँ.

रघू\* *Raghú* a proper noun.

|       |                                                       |                                                               |
|-------|-------------------------------------------------------|---------------------------------------------------------------|
| Nom.  | रघू <i>Raghú</i> ,                                    | <i>Raghú</i> .                                                |
| Acc.  | रघू केँ <i>Raghú kē</i> ,                             | <i>Raghú</i> .                                                |
| Inst. | { रघुएँ <i>Raghuē</i> ,<br>रघू सँ <i>Raghú sâ</i> , } | by <i>Raghú</i> .                                             |
| Dat.  | रघू केँ <i>Raghú kē</i> ,                             | to <i>Raghú</i> .                                             |
| Abl.  | रघू सँ <i>Raghú sâ</i> ,                              | from <i>Raghú</i> .                                           |
| Gen.  | रघूक <i>Raghúk</i> ,                                  | of <i>Raghú</i> .                                             |
| Loc.  | रघू में <i>Raghú mē</i> ,                             | in <i>Raghú</i>                                               |
| Voc.  | रौ रघुआ <i>rau Raghúâ</i> ,                           | O <i>Raghú</i> (or respectfully) हा रघू<br><i>hau Raghú</i> . |

\* Usually spelt thus in Maithilí.

## CHAPTER V.

ADJECTIVES गुणवाचक *Gunavāchak.*

§ 36. The Maithil adjective is not declined. It sometimes is liable however to a change on account of gender.

§ 37. As the rules for the formation of the feminine of adjectives are the same as those for the formation of the feminine of substantives, it will be convenient to treat the whole subject of gender at the present opportunity.

I must, however, preface my remarks by confessing that this will be found, I fear, to be the most incomplete part of this grammar. As a matter of fact the distinction of gender is observed but loosely: except to paṇḍits grammatical gender, as distinct from natural gender, is almost unknown; that is to say, adjectives only become feminine when applied to female living creatures, and hence I have found considerable difficulty in collecting sufficient examples to warrant me in forming general rules.

§ 38. It is a well known fact that in High Hindī the adjectives which are derived from the *prākṛit* stock of the language, and which end in आ *á* are in reality the only ones in that language which are affected by gender. Adjectives imported direct from the Saṃskṛit, and forming their feminines after the model of that language, do not form part of the living spoken stock of the Hindī dialect, but belong rather to the dead language of the books. The same is only partly true in Maithilī. In this language we find not only *prākṛit* but even some Saṃskṛit adjectives forming feminines distinctly the property of the language in which they have been adopted.

§ 39. The genitival terminations of High Hindī, का *ká*, के *ke*, and कौ *kí* evidently correspond to the *prākṛit* derived adjectives ending in ०आ-*á*, ०ए-*e*, and ०ई-*í*. In fact the genitive of a substantive may be considered as, and is liable to the same changes as, a *prākṛit* derived adjective in ०आ-*á*, ०इ-*e*, and ०ई-*í*.

§ 40. Without wishing it to be supposed that Maithilī is in any way whatever *derived* from High Hindī, it may be taken as a general rule that wherever a *prākṛit* derived word occurs both in High Hindī and in Maithilī, if that word ends in a long vowel in High Hindī, the *usus loquendi* of Maithilī tends to shorten that vowel. Thus we have

*High Hindī.*

पानी *pání.*

पानी का *pání ká.*

बड़ा *bará.*

*Maithilī.*

पानि *páni,* water.

पानिक *páni k(a)* of water.

बड़ *bar (a)* great.

The above rule is not universal, for we have in Maithilī words like नैना *nená* a boy, नैनी *není* a girl, बेटा *betá* a son, and बेटौ *betí* a daughter; but it is nearly so, and may be taken as general.

§ 41. It may be therefore remembered that what corresponds to the *prākṛit* derived termination °आ-á in High Hindí, is the *prākṛit* derived termination °अ-a in Maithilí; both corresponding to the *prākṛit* nominative in °आ-o, and both apparently derived from it.

§ 42. Similarly *prākṛit* derived nouns, adjectives, and genitives in High Hindí ending in °आ-á, form their feminines by changing this °आ-á into °ई-í, while *prākṛit* derived nouns and adjectives in Maithilí ending in °अ-a, form their feminines by changing the °अ-a into °इ-i. This rule does not, be it observed, apply to the genitive in Maithilí, which has lost all trace of its former adjectival form. That the termination of the genitive °क-k (a) was originally an adjective, and derived from the Samskrít कृत *kríta*, through the *prākṛit* करक *keraka* or केलक *kelaka* as suggested by Mr. Hoernle cannot I think admit of a doubt; for we have even at the present day the form °केर-*ker* used alongside of °क-ka, and a study of the older Maithilí poems, shows that the former termination is the more ancient, and has only been supplanted by, or contracted into the latter in comparatively modern times.

§ 43. To return, however to the subject of gender, the first rule to be observed is that in Maithilí, *Prākṛit-derived words ending in short °अ-a, form their feminine in short °इ-i.*

Examples :

| <i>Masc.</i>               | <i>Fem.</i>             |
|----------------------------|-------------------------|
| गोर <i>gor</i> fair        | गेरि <i>gor'</i> .      |
| बड़ <i>bar</i> great       | बड़ि <i>bar'</i> .      |
| बुधिआर <i>budhiár</i> wise | बुधिआरि <i>budhiár'</i> |

*Note.*—गोर *gor* also has an irregular feminine गेरिआ *goriá*.

§ 44. The second rule is peculiar to Maithilí, and is as follows. *Many pure Samskrít words ending in °अ-a, adopted unaltered in Maithilí, form their feminines in short °इ-i; and that, whether in Samskrít these words form their feminines in long °ई-í or not.*

Examples :

|                                                                            | <i>Masc.</i> | <i>Fem.</i>                |
|----------------------------------------------------------------------------|--------------|----------------------------|
| Samskrít } सुन्दर <i>sundar</i> beautiful                                  |              | { सुन्दरी <i>sundari</i> . |
| Maithilí } सुन्दर <i>sundar</i> beautiful                                  |              | { सुन्दरि <i>sundar'</i> . |
| S. } धूसर <i>dhúsar</i> { धूसरा <i>dhúsará</i> , or धूसरी <i>dhúsari</i> . |              |                            |
| M. } dusty { धूसरि <i>dhusar'</i> .                                        |              |                            |
| S. } अत्यन्त <i>atyant</i> excessive { अत्यन्ता <i>atyantá</i> .           |              |                            |
| M. } अत्यन्त <i>atyant</i> excessive { अत्यन्ति <i>atyant'</i> .           |              |                            |

The following may here be noted as irregular :

|    | <i>Masc.</i>               |   | <i>Fem.</i>            |
|----|----------------------------|---|------------------------|
| S. | } सुबोध <i>subodh</i> wise | { | सुबोधा <i>subodhá.</i> |
| M. |                            |   | सुबुधि <i>subudh'.</i> |

§ 45. RULE III. *A few prákrit-derived words ending in ०आ-á, form their feminines in ०ई-í.*

Examples :

|  | <i>Masc.</i>           |  | <i>Fem.</i>                  |
|--|------------------------|--|------------------------------|
|  | बेटा <i>betá</i> a son |  | बेटी <i>betí</i> a daughter. |
|  | बेना <i>nená</i> a boy |  | बेनी <i>není</i> a girl.     |

§ 46. RULE IV. *Prákrit-derived words signifying colour form their feminines as follows :*

|    | <i>Masc.</i>             |          | <i>Fem.</i>                                     |
|----|--------------------------|----------|-------------------------------------------------|
| or | उजर <i>ujar</i>          | } white  | { उजरी <i>uj'ri</i><br>or उजरकी <i>ujar'ki.</i> |
| or | उजरा <i>uj'rá</i>        |          |                                                 |
| or | उजरका <i>ujar'ká</i>     |          |                                                 |
| or | कारी <i>kári</i>         | } black  | करिकी <i>karikkí.</i>                           |
| or | करिआ <i>kariá</i>        |          |                                                 |
| or | करिका <i>karikká</i>     |          |                                                 |
| or | पीरा <i>pírá</i>         | } yellow | पिअरकी <i>piar'ki.</i>                          |
| or | पीअर <i>piar</i>         |          |                                                 |
| or | पिअरका <i>piar'ká</i>    |          |                                                 |
| or | हरिअर <i>hariar</i>      | } green  | हरिअरकी <i>hariar'ki.</i>                       |
| or | हरिअरका <i>hariar'ká</i> |          |                                                 |

| <i>Masc.</i> |               |   | <i>Fem.</i>    |
|--------------|---------------|---|----------------|
| लाल          | <i>lál</i>    | } | red            |
| OR ललका      | <i>lal'ká</i> |   |                |
|              |               |   | ललकी           |
|              |               |   | <i>lal'kí.</i> |

EXCEPTION.—गोर *gor* fair, which makes गोरि *gor'*, or गोरिआ *goriá.*

Note also that नील *níl*, dark blue, which is adopted direct from the Samskrít and which in that language forms its feminine नीला *níla*, or नीली *níli*, in Maithili adopts नीली *níli* as its feminine form.

§ 47. RULE V. The following classes of words, adopted directly from Samskrít, form their feminines generally as in that language.

a. Verbal adjectives in °इ-*i*, and °ई-*í*, corresponding to Samskrít adjectives in इन् *in*.

Examples :

|    | <i>Masc.</i>                   |   | <i>Fem.</i>                          |
|----|--------------------------------|---|--------------------------------------|
| S. | मानिन् <i>mánin</i>            | } | proud                                |
| M. | मानि <i>máni</i>               |   |                                      |
|    |                                |   | { or मानिनी <i>mániní</i>            |
|    |                                |   | { or मानिनि <i>mánin'</i> .          |
| S. | भाविन् <i>bhávín</i>           | } | future                               |
| M. | भावी <i>bhavi</i>              |   |                                      |
|    |                                |   | { or भाविनी <i>bhávini</i>           |
|    |                                |   | { or भाविनि <i>bhávín'</i> .         |
| S. | हारिन् <i>hárin</i>            | } | seizing                              |
| M. | हारी <i>hári</i>               |   |                                      |
|    |                                |   | { or हारिणी <i>hárini</i>            |
|    |                                |   | { or हारिनि <i>harin'</i> .          |
| S. | धारिन् <i>dhárin</i>           | } | bearing                              |
| M. | धारी <i>dhári</i>              |   |                                      |
|    |                                |   | { or धारिणी <i>dháriní</i>           |
|    |                                |   | { or धारिनि <i>dhárin'</i> .         |
| S. | कारिन् <i>kárin</i>            | } | doing                                |
| M. | कारी <i>kári</i>               |   |                                      |
|    |                                |   | { or कारिणी <i>káriní</i>            |
|    |                                |   | { or कारिनि <i>kárin'</i> .          |
| S. | चिरञ्जीविन् <i>chirañjivin</i> | } | long-lived                           |
| M. | चिरञ्जीवी <i>chirañjibí</i>    |   |                                      |
| OR | चिरञ्जिव <i>chirañjib</i>      |   |                                      |
|    |                                |   | चिरञ्जीवि <i>chirañjib'</i> or       |
|    |                                |   | चिरञ्जीविनी <i>chirañjibiní.</i>     |
|    |                                |   | OR चिरञ्जीविनि <i>chirañjibin'</i> , |

As an irregular under this head falls,—

*Masc.*

*Fem.*

|    |                           |            |                                                            |
|----|---------------------------|------------|------------------------------------------------------------|
| S. | सुधर्मन् <i>sudharman</i> | } virtuous | { सुधर्मा <i>sudharmá.</i><br>सुधर्मिणी <i>sudharminí.</i> |
| M. | सुधर्मा <i>sudharmá</i>   |            |                                                            |

§ 48. (b) Participles of the Reduplicated perfect in °वस्-*vas*, and comparatives in °इयस्-*íyas*.

Examples :

*Masc.*

*Fem.*

|    |                                            |        |                        |
|----|--------------------------------------------|--------|------------------------|
| S. | विद्वस् (विद्वान्) <i>vidvas, (vidván)</i> | } wise | विदुषी <i>vidushí.</i> |
| M. | विद्वान् <i>vidván</i>                     |        |                        |

|    |                         |           |                         |
|----|-------------------------|-----------|-------------------------|
| S. | गरीयस् <i>garíyas'</i>  | } heavier | गरीयसी <i>garíyasi.</i> |
| M. | गरीञ्चान् <i>garíán</i> |           |                         |

|    |                          |           |                          |
|----|--------------------------|-----------|--------------------------|
| S. | लघीयस् <i>laghíyas</i>   | } lighter | लघीयसी <i>laghíyasi.</i> |
| M. | लघीञ्चान् <i>laghíáú</i> |           |                          |

§ 49. (c) *Nomina agentis* terminating in °अक *ak(a)*.

Examples :

*Masc.*

*Fem.*

|                      |             |                          |
|----------------------|-------------|--------------------------|
| कारक <i>káruk</i>    | a doer      | कारिका <i>káriká.</i>    |
| पालक <i>pálak</i>    | a protector | पालिका <i>páliká.</i>    |
| रक्षक <i>rakshak</i> | a guardian  | रक्षिका <i>rakshiká.</i> |
| पाचक <i>páchak</i>   | a cook      | पाचिका <i>páchiká.</i>   |
| सहायक <i>saháyak</i> | a helper    | सहायका <i>saháyaká.</i>  |

§ 50. (d) Gerundials and past participles passive.

Examples :

*Masc.*

*Fem.*

|                        |                |                           |
|------------------------|----------------|---------------------------|
| मंतव्य <i>mantaby</i>  | to be remarked | मंतव्या <i>mantabyá.</i>  |
| बंदनीय <i>bandaníy</i> | praiseworthy   | बंदनीया <i>bandaníyá.</i> |
| योग्य <i>jogy</i>      | worthy         | योग्या <i>jogyá.</i>      |
| मान्य <i>mány</i>      | reverend       | मान्या <i>máná.</i>       |
| साध्य <i>sádhy</i>     | easy           | साध्या <i>sádhyá.</i>     |

| <i>Masc.</i>                       |        | <i>Fem.</i>           |
|------------------------------------|--------|-----------------------|
| युक्त <i>jukt</i>                  | joined | युक्ता <i>juktá.</i>  |
| सुद्ध (शुद्ध) <i>suddh (suddh)</i> | pure   | सुद्धा <i>suddhá.</i> |
| आर्त <i>árt</i>                    | pained | आर्ता <i>ártá.</i>    |
| खिन्न <i>khinn</i>                 | broken | खिन्ना <i>khinná.</i> |

§ 51. (e) Other nouns and adjectives as,—

| <i>Masc.</i>           |                      | <i>Fem.</i>               |
|------------------------|----------------------|---------------------------|
| धूर्त <i>dhúrt</i>     | a knave              | धूर्ता <i>dhúrtá.</i>     |
| श्याम <i>śyám</i>      | dark                 | श्यामा <i>śyámá.</i>      |
| गरिष्ठ <i>garishth</i> | heaviest (venerable) | गरिष्ठा <i>garishthá.</i> |
| श्रेष्ठ <i>śreshth</i> | excellent.           | श्रेष्ठा <i>śreshthá.</i> |
| वृन्द <i>vrind</i>     | numerous             | वृन्दा <i>vrindá.</i>     |
| आर्य <i>árjy</i>       | respectable          | आर्या <i>árjyá.</i>       |

§ 52. RULE VI. The following anomalous forms should be noticed.

(a) राजा *rájá*, a king, makes रानी *rání* a queen.

(b) Forms borrowed from Samskrít *nomina agentis* in °तृ *tri* present some curious anomalies.

Examples.

| <i>Masc.</i>           |             | <i>Fem.</i>              |
|------------------------|-------------|--------------------------|
| S. धातृ <i>dhátri</i>  | } creator   | { धात्री <i>dhátri.</i>  |
| M. धाता <i>dhátá</i>   |             |                          |
| S. ज्ञातृ <i>ñátri</i> | } knower    | { ज्ञात्री <i>ñátri.</i> |
| M. ज्ञाता <i>ñátá</i>  |             |                          |
| S. पातृ <i>pátri</i>   | } protector | { पात्री <i>pátri.</i>   |
| M. पाता <i>pátá</i>    |             |                          |

#### COMPARISON OF ADJECTIVES.

§ 53. (a) *Comparative.* As in High Hindí, the comparative is formed, not by any change in the adjective, but by putting the word for the thing

with which the comparison is made in the ablative case. Example, इ गाछी  
आइि गाछी सँ सुंदर छैक *i gáchhí oh' gáchhí sã sundar chhaik*. "This grove  
is more beautiful than that."

§ 54. (b) *Superlative*. This is formed either by prefixing सभ सँ *sabh sã*, the ablative case of सभ *sabh all*, or the adjective बड़ *bar* (which is liable to inflection according to gender) to the principal adjective. Examples; इ गाछी सभ सँ सुंदर छैक *i gáchhí sabh sã sundar chhaik* "this is the most beautiful grove;" or इ गाछी बड़ सुंदर छैक *i gáchhí bar sundar chhaik* "this grove is very beautiful."

§ 55. Certain comparatives and superlatives are also borrowed direct from the Sanskrit, which need not be noted here.

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## CHAPTER VI.

### PRONOUNS सर्वनाम *Sarvanám*.

§ 56. The declension of Pronouns presents some important points of difference from that of nouns, which must be carefully noticed.

§ 57. While nouns remain unchanged before postpositions, pronouns always change to some other form. They have an inflected base which is different from the nominative, and which is used before all postpositions.

§ 58. The accusative singular of pronouns is never the same as the nominative. The pronoun of the second person अपन *ap'ne* or अहाँ *aháñ*, and the interrogative adjectival pronoun की *kí*, *what?* are the only exceptions to this rule. In circumstances corresponding to those in which the accusative of a noun takes the nominative form, the accusative of a pronoun takes the form of the inflected base without any postposition.

The genitive form of pronouns in र *r* is also to be noticed.

In pronouns not only the accusative, but also the dative, is allowed to drop the postposition के *kê*.

§ 59. Pronouns have the same form whether referring to masculine or feminine nouns. They are declined throughout in the singular and plural numbers.

§ 60. With the exception of the pronouns of the second person, they all want the vocative case.

## PERSONAL PRONOUNS.

पुरुषवाचक सर्वनाम *purush'vāchak sarvanām.*

§ 61. There are three sets of personal pronouns, the first set referring to the first person, the second to the second person, and the third to the third. Each of the two last sets consists of two divisions—an honorific, and a non-honorific division. In other words, the pronouns of the second and third persons have each two forms, an honorific and a non-honorific form.

§ 62. To people accustomed to deal with eastern languages, I need do no more than point out the fact, except to notice *en passant*, that in no Indian language which I have studied, is this distinction carried to a greater length\* than in Maithili.

§ 63. The following are the personal pronouns in use at the present day:—

|            | <i>Direct Form.</i>                                                                      | <i>Oblique Form.</i>                                            |
|------------|------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| 1st Person | { Honorific हम <i>ham</i><br>Non-honorific हम <i>ham</i>                                 | हमरा <i>ham'rá</i><br>हमरा <i>ham'rá</i>                        |
| 2nd Person | { Honorific { अपने <i>ap'ne</i><br>{ or अहाँ <i>ahā'</i><br>Non-honorific तौँ <i>tōh</i> | अपने <i>ap'ne</i><br>or अहाँ <i>ahā'</i><br>तोहरा <i>tohará</i> |
| 3rd Person | { Honorific ओ <i>o</i><br>Non-honorific ओ <i>o</i>                                       | ऊनका <i>hun'ká</i><br>ओकरा <i>okará</i>                         |

I now proceed without further premise to give their declension.

FIRST PERSON, उत्तम पुरुष *uttam purush.*

§ 64. हम *ham*, I.  
SINGULAR.

|       |                                                     |          |
|-------|-----------------------------------------------------|----------|
| Nom.  | हम <i>ham</i> , I.                                  |          |
| Acc.  | { हमरा <i>ham'rá.</i><br>हमरा केँ <i>ham'rá kē.</i> | } me.    |
| Inst. | { हमरें <i>ham'rē,</i><br>हमरा सँ <i>ham'rá sā,</i> | } by me. |

\* It will be seen further on, that some verbs have not only a honorific and a non-honorific form depending on the subject, but have also another pair of honorific and non-honorific forms depending on the object.

## SINGULAR.

|      |                                                         |            |
|------|---------------------------------------------------------|------------|
| Dat. | { हमरा <i>ham'rá</i> ,<br>हमरा केँ <i>ham'rá kē</i> , } | to me.     |
| Abl. | हमरा सँ <i>ham'rá sā</i> ,                              | from me.   |
| Gen. | हमर <i>hamar</i> , or हमार <i>hamár</i> ,               | of me, my. |
| Loc. | हमरा में <i>ham'rá mē</i> ,                             | in me.     |

## PLURAL.

|       |                                                                                                                                                                                                             |                  |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| Nom.  | { हम सभ <i>ham sabh</i> ,*<br>हमरा सभ, सबहि, लोकनि <i>ham'rá sàbh</i> , or<br><i>sabah'</i> , or <i>lokani</i> ,                                                                                            | } we.            |
| Acc.  | { हमरा सभ केँ, सबहि केँ, लोकनि केँ <i>ham'rá sabh kē</i> ,<br>or <i>sabah' kē</i> , or <i>lokani kē</i> ,                                                                                                   | } us.            |
| Inst. | { हमरा सभें, सबहिँ, लोकनिँ, <i>ham'rá sabhē</i> , or<br><i>sab'hiē</i> , or <i>lok'niē</i> ,<br>हमरा सभ सँ, सबहि सँ, लोकनि सँ <i>ham'rá sabh</i><br><i>sā</i> , or <i>sabah' sā</i> , or <i>lokani sā</i> , | } by us.         |
| Dat.  | { हमरा सभ केँ, सबहि केँ, लोकनि केँ <i>ham'rá sabh kē</i> ,<br>or <i>sabah' kē</i> , or <i>lokani kē</i> ,                                                                                                   | } to us.         |
| Abl.  | { हमरा सभ सँ, सबहि सँ, लोकनि सँ <i>ham'rá sabh sā</i> ,<br>or <i>sabah' sā</i> , or <i>lokani sā</i> ,                                                                                                      | } from us.       |
| Gen.  | { हमरा सभक, सबहिक, लोकनिक <i>ham'rá sabhak</i> , or<br><i>sab'hik</i> , or <i>lokanik</i> ,                                                                                                                 | } of us,<br>our. |
| Loc.  | { हमरा सभ में, सबहि में, लोकनि में <i>ham'rá sabh</i><br><i>mē</i> , or <i>sabah' mē</i> , or <i>lokani mē</i> ,                                                                                            | } in us.         |

\*हम सबहि *ham sabah'*, and हम लोकनि *ham lokani* are not used.

§ 65.

मैं *mē*, I.

The following forms are used in poetry :—

SINGULAR.

Nom. मैं *mē*, I.Acc. मोहि *moh'*, me.Inst. मोहि सौं *moh' sō*, by me.Dat. मोहि *moh'*, to me.Abl. मोहि सौं *moh' sō*, from me.Gen. मोर, मोरा *mor*, or *morá*, of me, my.Loc. मोहि में *moh' mō*, in me.

The plural forms are not used. When necessary, the plural forms of हम *ham* are substituted. This, however, occurs but seldom.

SECOND PERSON मध्यम पुरुष *madhyam purush*.

§ 66.

तौह *tōh*, thou.

SINGULAR.

Nom. { तौह *tōh*,  
तौ *tō*, } thou.Acc. { तोहरा *tohará*,  
तोहरा केँ *tohará kē*, } thee.Inst. { तोहरेँ *toharē*,  
तोहरा सँ *tohará sã*, } by thee.Dat. { तोहरा *tohará*,  
तोहरा केँ *tohará kē*, } to thee.Abl. तोहरा सँ *tohará sã*, from thee.Gen. तोहर *tohar*, of thee, thy.Loc. तोहरा में *tohará mē*, in thee.Voc. हौ तौह *hau tōh*, O thou.

## PLURAL.

|       |                                                                                                                                                                                                |                    |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Nom.  | { *तोँह सभ, तोँ सभ <i>tôh sabh</i> , or <i>tô sabh</i> ,<br>तोहरा सभ, सबहि, लोकनि <i>tohará sabh</i> , <i>sabah'</i> ,<br>or <i>lokani</i> ,                                                   | } you,<br>ye.      |
| Acc.  | { तोहरा सभ केँ, सबहि केँ, लोकनि केँ <i>tohará sabh kē</i> ,<br><i>sabah' kē</i> or <i>lokani kē</i> ,                                                                                          | } you, ye.         |
| Inst. | { तोहरा सभेँ, सबहिँ, लोकनिँ <i>tohará sabhē</i> or<br><i>sab'hiē</i> or <i>lokaniē</i> ,<br>तोहरा सभ सँ, सबहि सँ, लोकनि सँ <i>tohará sabh sã</i> ,<br><i>sabah' sã</i> , or <i>lokani sã</i> , | } by you.          |
| Dat.  | { तोहरा सभ केँ, सबहि केँ, लोकनि केँ <i>tohará sabh</i><br><i>kē</i> , <i>sabah' kē</i> or <i>lokani kē</i> ,                                                                                   | } to you.          |
| Abl.  | { तोहरा सभ सँ, सबहि सँ, लोकनि सँ <i>tohará sabh sã</i> ,<br><i>sabah' sã</i> , or <i>lokani sã</i> ,                                                                                           | } from<br>you.     |
| Gen.  | { तोहरा सभक, सबहिक, लोकनिक <i>tohará sabhak</i> ,<br><i>sab'hik</i> , or <i>lokanik</i> ,                                                                                                      | } of you,<br>your. |
| Loc.  | { तोहरा सभ मेँ, सबहि मेँ, लोकनि मेँ <i>tohará sabh</i><br><i>mē</i> , <i>sabah' mē</i> , <i>lokani mē</i> ,                                                                                    | } in you.          |
| Voc.  | { हौ तोँह सभ <i>hau tôh sabh</i> ,<br>हौ तोहरा सभ, सबहि, लोकनि <i>hau tohará sabh</i> ,<br><i>sabah'</i> or <i>lokani</i> ,                                                                    | } O ye.            |

*N.B.*—For तोहरा *tohará*, तोहरेँ *toharē*, and तोहर *tohar*, तोरा *torá*, तोरेँ *torē*, and तोर *tor* are used by the vulgar.

\* तोँह सबहि *tôh sabah'*, and तोँह लोकनि *tôh lokani* are not used.

§ 67.

तौ<sup>०</sup> *tō*, thou.

The following are used in poetry :—

## SINGULAR.

Nom. तौ<sup>०</sup> *tō*, thou.Acc. तेहि<sup>०</sup> *toh'*, *thee*.Inst. तेहि सौ<sup>०</sup> *toh' sō*, by thee.Dat. तेहि<sup>०</sup> *toh'*, to thee.Abl. तेहि सौ<sup>०</sup> *toh' sō*, from thee.Gen. तुअ, तेर, तेहर, तेहार *tua, tor, tohar*, or *tohár*, of thee, thy.Loc. तेहि मौ<sup>०</sup> *toh' mō*, in thee.

The plural forms are not used. When necessary, the plural forms of तेह *tōh* are substituted. This, however, occurs but seldom.

## SECOND PERSON RESPECTFUL.

§ 68.

अहँ<sup>०</sup> *ahā'*, thou.

## SINGULAR.

Nom. अहँ<sup>०</sup>, अपने *ahā'*, or *ap'ne*, thou.Acc. अहँ के<sup>०</sup>, अपने के<sup>०</sup> *ahā' kē*, or *ap'ne kē*, thee.Inst. अहँ<sup>०</sup>, अहँ सँ, अपने सँ *ahāi, ahā' sā*, or *ap'ne sā*, by thee.Dat. अहँ के<sup>०</sup>, अपने के<sup>०</sup> *ahā' kē*, or *ap'ne kē*, to thee, thy.Abl. अहँ सँ, अपने सँ *ahā' sā*, or *ap'ne sā*, from thee.Gen. अहँक, अपनेक *ahā'k, ap'nek*, of thee.Loc. अहँ में, अपने में *ahā' mē, ap'ne mē*, in thee.Voc. औ अहँ *au ahā'*, O thou.

## PLURAL.

Nom. { अहाँ सभ, सबहि, लोकनि *ahā' sabh, sabah', or lokani,* } you,  
 { अपने सभ, सबहि, लोकनि *ap'ne sabh, sabah', or lokani,* } ye.

Acc. { अहाँ सभ केँ, सबहि केँ, लोकनि केँ *ahā' sabh kē,*  
*sabah' kē, or lokani kē,* } you,  
 { अपने सभकेँ, सबहि केँ, लोकनि केँ *ap'ne sabh kē,*  
*sabah' kē, or lokani kē,* } ye.

Inst. { अहाँ सभ सँ, अहाँ सभ सँ, अपने सभ सँ, सबहि सँ,  
 लोकनि सँ *ahā' sabh sā, ahāi sabh sā, ap'ne* } by  
*sabh sā, sabah' sā, or lokani sā,* } you

Dat. { अहाँ सभ केँ, अपने सभ केँ, सबहि केँ, लोकनि केँ *ahā'* } to  
*sabh kē, ap'ne sabh kē, sabah' kē, lokani kē,* } you.

Abl. { अहाँ सभ सँ, अपने सभ सँ, सबहि सँ, लोकनि सँ *ahā'* } from  
*sabh sā, ap'ne sabh sā, sabah' sā, or* } you.  
*lokani sā,*

Gen. { अहाँ सभक, अपने सभक, सबहिक, लोकनिक *ahā' sab-* } of  
*hak, ap'ne sabhak, sab'hik, or lokanik,* } you.

Loc. { अहाँ सभ में, अपने सभ में, सबहि में, लोकनि में *ahā'* } in  
*sabh mē, ap'ne sabh mē, sabah' mē or lokani mē,* } you.

*N.B.*—अपने *ap'ne* can be used throughout for अहाँ *ahā'*. It is the more honorific term of the two. अहाँ *ahā'* is sometimes even used when talking to inferiors. अहाँ *ahā'*, in fact, is *polite*, and तौह *tōh* is *vulgar*.

## REFLEXIVE PRONOUN.

अपनहिँ *ap'nah'ñ*, self.

§ 69.

SINGULAR.

- Nom. अपनहिँ *ap'nah'ñ*, self.  
 Acc. अपना केँ *ap'ná kē*, self.  
 Inst. अपना सँ, अपनहिँ सँ *ap'ná sā*, or *ap'nah'ñ sā*, by self.  
 Dat. अपना केँ *ap'ná kē*, to self.  
 Abl. अपना सँ, अपनहिँ सँ *ap'ná sā*, or *ap'nah'ñ sā*, from self.  
 Gen. { अपन *apan*,  
 अप्पन *appan*, } of self.  
 Loc. अपना में *ap'ná mē*, in self.

PLURAL.

- Nom. { अपनहिँ सभ, सबहिँ, लोकनि *ap'nah'ñ sabh*,  
*sabah'*, or *lokani*, } selves.  
 Acc. { अपना सभ केँ, सबहिँ केँ, लोकनि केँ *ap'ná*  
*sabh kē, sabah' kē, or lokani kē*, } selves.  
 Inst. { अपना सभ सँ, सबहिँ सँ, लोकनि सँ *ap'ná*  
*sabh sā, sabah' sā, or lokani sā*, } by selves.  
 Dat. { अपना सभ केँ, सबहिँ केँ, लोकनि केँ *ap'ná*  
*sabh kē, sabah' kē, or lokani kē*, } to selves.  
 Abl. { अपना सभ सँ, सबहिँ सँ, लोकनि सँ *ap'ná sabh*  
*sā, sabah' sā or lokani sā*, } from selves.  
 Gen. { अपना सभक, सबहिँक, लोकनिक *ap'ná sab-*  
*hak, sabahik, or lokanik*, } of selves.  
 Loc. { अपना सभ में, सबहिँ में, लोकनि में *ap'ná*  
*sabh mē, sabah' mē, or lokani mē*, } in selves.

THIRD PERSON अन्यपुरुष *anya purnsh.*

## PROXIMATE DEMONSTRATIVE NON-HONORIFIC.

§ 70. इ *i* or ई *í*, this ; not used as an adjective, and only used when referring to animate objects.

## SINGULAR.

|       |                                                                |
|-------|----------------------------------------------------------------|
| Nom.  | इ <i>i</i> or ई <i>í</i> , this.                               |
| Acc.  | एकरा, एकरा केँ <i>ekará</i> , or <i>ekará kē</i> , this.       |
| Inst. | { एकरेँ <i>ekarē</i> ,<br>एकरा सँ <i>ekará sã</i> , } by this. |
| Dat.  | एकरा, एकरा केँ <i>ekará</i> , <i>ekará kē</i> , to this.       |
| Abl.  | एकरा सँ <i>ekará sã</i> , from this.                           |
| Gen.  | एकर <i>ekar</i> , of this.                                     |
| Loc.  | एकरा में <i>ekará mē</i> , in this.                            |

## PLURAL.

|       |                                                                                                                                                                                       |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Nom.  | { इ or ई सभ, सबहि, लोकनि <i>i</i> or <i>í sabh, sabah'</i> ,<br>or <i>lokani</i> , } these.                                                                                           |
| Acc.  | { एकरा सभ केँ, सबहि केँ लोकनि केँ, <i>ekará sabh</i><br><i>kē, sabah' kē, or lokani kē</i> , } these.                                                                                 |
| Inst. | { एकरा सभेँ, सबहिँ, लोकनिँ <i>ekará sabhē</i> ,<br><i>sab'hiē, or lok'niē</i> ,<br>एकरा सभ सँ, सबहि सँ, लोकनि सँ <i>ekará sabh</i><br><i>sã, sabah' sã or lokani sã</i> , } by these. |
| Dat.  | { एकरा सभ केँ, सबहि केँ, लोकनि केँ <i>ekará sabh</i><br><i>kē, sabah' kē, or lokani kē</i> , } to these.                                                                              |

## PLURAL.

- Abl. { एकरा सभ सँ, सबहि सँ, लोकनि सँ *ekará sabh* } from these.  
           *sā, sabah' sā, or lokani sā,*
- Gen. { एकरा सभक, सबहिक, लोकनिक *ekará sabhak,* } of these.  
           *sab'hik, or lokanik,*
- Loc. { एकरा सभ में, सबहि में, लोकनि में *ekará sabh* } in these.  
           *mē, sabah' mē, or lokani mē,*

## PROXIMATE DEMONSTRATIVE HONORIFIC.

## SINGULAR.

## § 71.

- Nom. इ or ई, *i* or *ī*, this.
- Acc. हिनका, हिनका केँ *hin'ká*, or *hin'ká kē*, this.
- Inst. हिनका सँ *hin'ká sā*, by this.
- Dat. हिनका, हिनका केँ *hin'ká*, or *hin'ká kē*, to this.
- Abl. हिनका सँ *hin'ká sā*, from this.
- Gen. { हिनक *hinak,* } of this.  
       { हिनकार *hin'kar,* }
- Loc. हिनका में *hinká mē*, in this.

## PLURAL.

- Nom. { इ or ई सभ, सबहि, लोकनि *i* or *ī sabh,* } these.  
           *sabah', or lokani,*
- Acc. { हिनका सभ केँ, सबहि केँ, लोकनि केँ *hin'ka* } these.  
           *sabh kē, sabah' kē, or lokani kē.*

## PLURAL.

|       |   |                                                 |   |             |
|-------|---|-------------------------------------------------|---|-------------|
| Inst. | { | हिनका सभ सँ, सबहि सँ, लोकनि सँ <i>hin'ká</i>    | } | by these.   |
|       |   | <i>sabh sā, sabah' sā, or lokani sā,</i>        |   |             |
| Dat.  | { | हिनका सभ केँ, सबहि केँ, लोकनि केँ <i>hin'ká</i> | } | to these.   |
|       |   | <i>sabh kē, sabah' kē, or lokani kē,</i>        |   |             |
| Abl.  | { | हिनका सभ सँ, सबहि सँ, लोकनि सँ <i>hin'ká</i>    | } | from these. |
|       |   | <i>sabh sā, sabah' sā, or lokani sā,</i>        |   |             |
| Gen.  | { | हिनका सभक, सबहिक, लोकनिक <i>hin'ká sabh-</i>    | } | of these.   |
|       |   | <i>ak, sab'hik, or lokanik,</i>                 |   |             |
| Loc.  | { | हिनका सभ में, सबहि में, लोकनि में <i>hin'ká</i> | } | in these.   |
|       |   | <i>sabh mē, sabah' mē, or lokani mē,</i>        |   |             |

THIRD PERSON अन्यपुरुष *anya purush.*

## REMOTE DEMONSTRATIVE NON-HONORIFIC.

§ 72. ओ *o*, he, she, it, that, not used as an adjective, and only used when referring to animate objects.

## SINGULAR.

|       |                                                                 |
|-------|-----------------------------------------------------------------|
| Nom.  | ओ <i>o</i> , he, she, it, that.                                 |
| Acc.  | ओकरा, ओकरा केँ <i>okará</i> , or <i>okará kē</i> , him, etc.    |
| Inst. | ओकरा सँ* <i>okará sā</i> , by him, etc.                         |
| Dat.  | ओकरा, ओकरा केँ <i>okará</i> , or <i>okará kē</i> , to him, etc. |
| Abl.  | ओकरा सँ <i>okará sā</i> , from him, etc.                        |
| Gen.  | ओकर <i>okar</i> , of him, etc.                                  |
| Loc.  | ओकरा में <i>okará mē</i> , in him, etc.                         |

\* The form ओकरें *okarē*, is wanting.

## PLURAL.

|       |                                                                   |
|-------|-------------------------------------------------------------------|
| Nom.  | ओ सभ, सबहि, लोकनि <i>o sabh, sabah', or lokani</i> , they, those. |
| Acc.  | ओकरा सभ केँ, <i>etc. okará sabh kē</i> , etc., them, etc.         |
| Inst. | ओकरा सभ सँ, <i>etc. okará sabh sã</i> , etc., by them, etc.       |
| Dat.  | ओकरा सभ केँ, <i>etc. okará sabh kē</i> , etc., to them, etc.      |
| Abl.  | ओकरा सभ सँ, <i>etc. okará sabh sã</i> , etc., from them, etc.     |
| Gen.  | ओकरा सभक, <i>etc. okará sabhak</i> , etc., of them, their, etc.   |
| Loc.  | ओकरा सभ में, <i>etc. okará sabh mē</i> , etc., in them, etc.      |

## REMOTE DEMONSTRATIVE HONORIFIC.

## SINGULAR.

## § 73.

|       |                                                                   |
|-------|-------------------------------------------------------------------|
| Nom.  | ओ <i>o</i> , he, she, it, that.                                   |
| Acc.  | ऊनका, ऊनका केँ <i>hun'ká</i> , or <i>hun'ká kē</i> , him, etc.    |
| Inst. | ऊनका सँ <i>hun'ká sã</i> , by him, etc.                           |
| Dat.  | ऊनका, ऊनका केँ <i>hun'ká</i> , or <i>hun'ká kē</i> , to him, etc. |
| Abl.  | ऊनका सँ <i>hun'ká sã</i> , from him, etc.                         |
| Gen.  | ऊनक, ऊनकर <i>hunak, hun'kar</i> , of him, his, etc.               |
| Loc.  | ऊनका में <i>hun'ká mē</i> , in him, etc.                          |

## PLURAL.

|       |                                                                   |
|-------|-------------------------------------------------------------------|
| Nom.  | ओ सभ, सबहि, लोकनि <i>o sabh, sabah', or lokani</i> , they, those. |
| Acc.  | ऊनका सभ केँ, <i>etc. hun'ká sabh kē</i> , etc., them, etc.        |
| Inst. | ऊनका सभ सँ, <i>etc. hun'ká sabh sã</i> , etc., by them, etc.      |
| Dat.  | ऊनका सभ केँ, <i>etc. hun'ká sabh kē</i> , etc., to them, etc.     |
| Abl.  | ऊनका सभ सँ, <i>etc. hun'ká sabh sã</i> , etc., from them, etc.    |
| Gen.  | ऊनका सभक, <i>etc. hun'ká sabhak</i> , etc., of them, their, etc.  |
| Loc.  | ऊनका सभ में, <i>etc. hun'ká sabh mē</i> , etc., in them, etc.     |



## PLURAL.

|       |                                                            |            |
|-------|------------------------------------------------------------|------------|
| Inst. | { जकरा or जाहि सभ सँ, etc. <i>jakarā</i> or <i>jáh'</i> }  | by whom,   |
|       | { <i>sabh sā</i> , etc., }                                 | etc.       |
| Dat.  | { जकरा or जाहि सभ केँ, etc. <i>jakarā</i> or <i>jáh'</i> } | to whom,   |
|       | { <i>sabh kē</i> , etc., }                                 | etc.       |
| Abl.  | { जकरा or जाहि सभ सँ, etc. <i>jakarā</i> or <i>jáh'</i> }  | from whom, |
|       | { <i>sabh sā</i> , etc., }                                 | etc.       |
| Gen.  | { जकरा or जाहि सभक, etc. <i>jakarā</i> or <i>jáh'</i> }    | whom, etc. |
|       | { <i>sabhak</i> , etc., }                                  |            |
| Loc.  | { जकरा or जाहि सभ में, etc. <i>jakarā</i> or <i>jáh'</i> } | in whom,   |
|       | { <i>sabh mē</i> , etc., }                                 | etc.       |

## THE RELATIVE PRONOUN HONORIFIC.

## § 76.

## SINGULAR.

|       |                                                                      |
|-------|----------------------------------------------------------------------|
| Nom.  | जे <i>je</i> , who, which, that.                                     |
| Acc.  | जनिका, जनिका केँ <i>janiká</i> , or <i>janiká kē</i> , whom, etc.    |
| Inst. | जनिका सँ <i>janiká sã</i> , by whom, etc.                            |
| Dat.  | जनिका, जनिका केँ <i>janika</i> , or <i>janiká kē</i> , to whom, etc. |
| Abl.  | जनिका सँ <i>janiká sã</i> , from whom, etc.                          |
| Gen.  | जनिक, जनिकर <i>janik</i> , <i>janikar</i> , of whom, whose, etc.     |
| Loc.  | जनिका में <i>janiká mē</i> , in whom, etc.                           |



|      |                                                                                                               |
|------|---------------------------------------------------------------------------------------------------------------|
| Dat. | { तकरा or ताहि सभकेँ, etc. <i>takará</i> or <i>táh'</i> } to them,<br>{ sabh <i>kē</i> , etc., } to those.    |
| Abl. | { तकरा or ताहि सभ सँ etc. <i>takará</i> or <i>táh'</i> } from them,<br>{ sabh <i>sā</i> , etc., } from those. |
| Gen. | { तकरा or ताहि सभक, etc. <i>takará</i> or <i>táh'</i> } their,<br>{ sabh <i>ak</i> , etc., } of those.        |
| Loc. | { तकरा or ताहि सभ में, etc. <i>takará</i> or <i>táh'</i> } in them,<br>{ sabh <i>mē</i> , etc., } in those.   |

## THE CORRELATIVE PRONOUN HONORIFIC.

§ 78.

## SINGULAR.

|       |                                                                     |
|-------|---------------------------------------------------------------------|
| Nom.  | से <i>se</i> , he or that.                                          |
| Acc.  | तनिका, तनिका केँ <i>taniká</i> , or <i>taniká kē</i> , him, etc.    |
| Inst. | तनिका सँ <i>taniká sā</i> , by him, etc.                            |
| Dat.  | तनिका, तनिका केँ <i>taniká</i> , or <i>taniká kē</i> , to him, etc. |
| Abl.  | तनिका सँ <i>taniká sā</i> , from him, etc.                          |
| Gen.  | तनिक, तनिकर <i>tanik</i> , <i>tanikar</i> , of him, his, etc.       |
| Loc.  | तनिका में <i>taniká mē</i> , in him, etc.                           |

## PLURAL.

|       |                                                                     |
|-------|---------------------------------------------------------------------|
| Nom.  | से सभ, सबहि, etc. <i>se sabh</i> , <i>sabáh'</i> etc., they, those. |
| Acc.  | तनिका सभ केँ, etc. <i>taniká sabh kē</i> , etc., them, etc.         |
| Inst. | तनिका सभ सँ, etc. <i>taniká sabh sā</i> , etc., by them, etc.       |
| Dat.  | तनिका सभ केँ, etc. <i>taniká sabh kē</i> , etc., to them, etc.      |
| Abl.  | तनिका सभ सँ, etc. <i>taniká sabh sā</i> , etc., from them, etc.     |
| Gen.  | तनिका सभक, etc. <i>taniká sabhak</i> , etc., of them, their, etc.   |
| Loc.  | तनिका सभ में, etc. <i>taniká sabh mē</i> , etc., in them, etc.      |

## INTERROGATIVE PRONOUN NON-HONORIFIC.

प्रश्नवाचक सर्वनाम *praśnavāchak sarvanām*.

§ 79.

SINGULAR.

- Nom. के *ke*, who? which?  
 Acc. ककरा, ककरा केँ *kakarā, kakarā kē*, whom? which?  
 Inst. ककरा सँ *kakarā sā*, by whom? by which?  
 Dat. ककरा, ककरा केँ *kakarā, or kakarā kē*, to whom? to which?  
 Abl. ककरा सँ *kakarā sā*, from whom? from which?  
 Gen. ककर *kakar*, whose?  
 Loc. ककरा में *kakarā mē*, in whom? in which?

PLURAL.

- Nom. के सभ, सबहि, लोकनि *ke sabh, sabhī, or lokani*, who? which?  
 Acc. ककरा सभ केँ *etc. kakarā sabh kē*, etc., whom? etc.  
 Inst. ककरा सभ सँ, *etc. kakarā sabh sā*, etc., by whom? etc.  
 Dat. ककरा सभ केँ *etc. kakarā sabh kē*, etc., to whom? etc.  
 Abl. ककरा सभ सँ *etc. kakarā sabh sā*, etc., from whom? etc.  
 Gen. ककरा सभक *etc. kakarā sabhak*, etc., whose? etc.  
 Loc. ककरा सभ में *etc. kakarā sabh mē*, etc., in whom? etc.

The form काहि *kāhī* which might be expected, is not used so far as my experience goes.

## INTERROGATIVE PRONOUN HONORIFIC.

§ 80.

SINGULAR.

- Nom. के *ke*, who? which?  
 Acc. कनिका, कनिका केँ *kanikā, or kanikā kē*, whom? etc.  
 Inst. कनिका सँ *kanika sā*, by whom? etc.







PLURAL.

|       |                                                 |                         |
|-------|-------------------------------------------------|-------------------------|
| Nom.  | { इ or ई सभ (नेना) <i>i or í sabh (nená)</i> ,  | } these (boys).         |
|       | { इ or ई (नेना) सभ <i>i or í (nená) sabh</i> ,  |                         |
| Acc.  | { एहि सभ (नेना) केँ <i>eh' sabh (nená) kē</i> , | } these (boys).         |
|       | { एहि (नेना) सभ केँ <i>eh' (nená) sabh kē</i> , |                         |
| Inst. | { एहि सभ (नेनेँ) <i>eh' sabh (nenē)</i> ,       | } by these<br>(boys).   |
|       | { एहि सभ (नेना) सँ <i>eh' sabh (nená) sã</i> ,  |                         |
| Dat.  | { एहि सभ (नेना) केँ <i>eh' sabh (nená) kē</i> , | } to these<br>(boys).   |
|       | { एहि (नेना) सभ केँ <i>eh' (nená) sabh kē</i> , |                         |
| Abl.  | { एहि सभ (नेना) सं <i>eh' sabh (nená) sã</i> ,  | } from these<br>(boys). |
|       | { एहि (नेना) सभ सं <i>eh' (nená) saah sã</i> ,  |                         |
| Gen.  | { एहि सभ (नेनाक) <i>eh' sabh (nenák)</i> ,      | } of these<br>(boys).   |
|       | { एहि (नेना) सभक <i>eh' (nená) sabhak</i> ,     |                         |
| Loc.  | { एहि सभ (नेना) में <i>eh' sabh (nená) mē</i> , | } in these<br>(boys).   |
|       | { एहि (नेना) सभ में <i>eh' (nená) sabh mē</i> , |                         |

§ 86. Similarly is declined the adjectival remote Demonstrative Pronoun ओ *o*, that, (oblique form ओहि *oh'*), used only as an adjective when referring to animate objects, and either as an adjective or substantive when referring to inanimate objects.

§ 87. Note with regard to जे *je*, who, which, that, से *se*, he, she, के *ke*, who, ? which? की *kí*? what, केओ *kco*, any one, some one, किछु *kichh'*, any thing and किछु *kichh'*, something. These words are only used, when declined as above, as pronouns, and not as pronominal adjectives, agreeing with any immediately succeeding noun.

When used as adjectives they discard inflections, and, if agreeing with a noun in the direct form, they (except के *ke*, who? and की *kí*, what?) retain

the forms of their respective nominatives. If, however, agreeing with a noun in the oblique form, they themselves change as follows:—

जे *je*, who, which, that, becomes जाहि *jáh'*.

से *se*, he, she, becomes ताहि *táh'*.

केओ *keo*, any one, some one, becomes कोनो *kono*.

किहु *kichh'*, any thing, remains किहु *kichh'*.

किहु *kichh'*, something, remains किहु *kichh'*.

But के *ke*, who? which? and की *ki*, what? when used adjectivally always become कोन *kon*.

§ 88.

Examples.

1. जे आएल छल, से गेल *je áel chhal, se gel*;—he who came, went.
2. जे लोक आएल छल, से लोक गेल *je lok áel chhal, se lok gel*;—the man who came, went.
3. जकर खेत, तकर धान *jakar khet, takar dhán*;—he who owns the field owns the rice crop.
4. जाहि लोकक खेत, ताहि लोकक धान *jáh' lokak khet, táh' lokak dhán*;—the man who owns the field, owns the rice crop.
5. के छल ? *ke chhal ?*;—who was he ?
6. ओ कोन लोक थिक ? *o kon lok thik ?*—what caste is he ?
7. ककर घोड़ हैक *kakar ghor chhaik*;—whose horse is it ?
8. कोन लोकक घोड़ हैक ? *kon lokak ghor chhaik ?*—what person is the owner of the horse ?

6. की छैक ? *ki chhaik* ?—what is it ?
10. कोन वृक्ष छैक ? *kon briksh chhaik* ?—what tree is it ?
11. कथी में पानि लाएल छह ? *kathí mē páni lál chhah* ?—n  
what have you brought the water ?
12. कोन लोटा में पानि लाएल छह ? *kon lotá mē páni lál chhah* ?—in what *lotá* have you brought the water ?
13. केओ नहिँ आएल ? *keo nah'ñ áel* ;—no one came.
14. कोनो नेना नहिँ आएल *kono nená nah'ñ áel* ;— no boy  
came.
15. ओहि ग्राम में ककरो किछु नहिँ छैक *oh' grám mē kakaro kichh' nah'ñ chhaik* ;—in that village no one has any  
property.
16. ओहि ग्रामक कोनो बनिआँ सँ किछु नहिँ भेटल *oh' grámak kono baniá sã kichh' nah'ñ bhētat* ;—he will get  
nothing from any shopkeeper of that village.
17. किछु अमोट पठबिह *kichh' amot pathabiha* ;—send me  
some mango conserve.
18. ओ औषध कथू में धैल होतैक *o aukhadh kathú mē dhail ho-taik* ;—that medicine must be kept in something.

## DERIVATIVE PRONOMINAL FORMS.

§ 89. The following table gives in a succinct form the various derivative pronominal forms.

It explains itself, and further comment is unnecessary.

|                           | Near<br>Demonstrative. | Remote<br>Demonstrative. | Interrogative.  | Relative.      | Correlative.        |
|---------------------------|------------------------|--------------------------|-----------------|----------------|---------------------|
| Time.                     | इ this.                | ओ that.                  | को or कौन who?  | जे who, which. | से that.            |
|                           | एबन now.               | तखन then.                | कखन when?       | जखन when.      | तखन then.           |
| Place.                    | एतय here.              | ओतय there.               | कतय where?      | जतय wherever.  | ततय there.          |
|                           | एहर hither.            | ओहर thither.             | कौहर whither?   | जौहर whether.  | तौहर thither.       |
| Manner.                   | एना thus.              | ओना in that way.         | कौना how?       | जैना as        | तैना so.            |
| Likenses.                 | एहन like this.         | ओहन like that.           | कौहन like what. | जौहन like as.  | तौहन like the same. |
|                           | अतिक this much.        | ओतिक that much.          | कतिक how much.  | जतिक as much.  | ततिक so much.       |
| Quantity<br>or<br>Number. |                        |                          |                 |                |                     |

## CHAPTER VII.

## NUMERALS.

## CARDINALS.

§ 90. The following are the Cardinals up to 100. It will be observed that they differ from those in use in Hindí. It has not been thought necessary to transliterate them.

|                  |                        |
|------------------|------------------------|
| १ एक             | २१ एकैस                |
| २ दुइ            | २२ वाइस                |
| ३ तीनि           | २३ तैस                 |
| ४ चारि           | २४ चौवीस               |
| ५ पाँच           | २५ पचीस                |
| ६ छै             | २६ छव्वीस              |
| ७ सात            | २७ सत्ताइस             |
| ८ आठ             | २८ अठाइस               |
| ९ नौ             | २९ उनतीस               |
| १० दश            | ३० तीस                 |
| ११ एगारह         | ३१ एकतीस               |
| १२ बारह          | ३२ वत्तीस              |
| १३ तेरह          | ३३ तेँ तीस             |
| १४ चौदह          | ३४ चौँ तीस             |
| १५ पन्द्रह       | ३५ पैँ तीस             |
| १६ सोलह or सोड़ह | ३६ छत्तीस              |
| १७ सत्रह         | ३७ सैँ तीस             |
| १८ अठारह         | ३८ अठतीस               |
| १९ उनैस          | ३९ उनचालीस or उननचालीस |
| २० वीस           | ४० चालीस               |

|                     |                             |
|---------------------|-----------------------------|
| ४१ एकतालीस          | ६७ सतसठि OR सतसठि           |
| ४२ वेआलीस           | ६८ अठसठि OR अड़सठि OR अठसठि |
| ४३ तैँ तालीस        | ६९ उनहत्तरि                 |
| ४४ चौआलीस           | ७० सत्तरि                   |
| ४५ पैँ तालीस        | ७१ अकहत्तरि                 |
| ४६ केआलीस           | ७२ वहत्तरि                  |
| ४७ सैँ तालीस        | ७३ तेहत्तरि                 |
| ४८ अठतालीस          | ७४ चौहत्तरि                 |
| ४९ उनचास OR उननचास  | ७५ पचहत्तरि                 |
| ५० पचास             | ७६ केहत्तरि                 |
| ५१ एकावन            | ७७ सतहत्तरि                 |
| ५२ बावन             | ७८ अठहत्तरि                 |
| ५३ तिरपन            | ७९ उनासी                    |
| ५४ चौवन             | ८० अस्सी                    |
| ५५ पचपन             | ८१ एकासी                    |
| ५६ छपन              | ८२ बेरासी OR बेआसी          |
| ५७ सतावन            | ८३ तेरासी                   |
| ५८ अठावन            | ८४ चौरासी                   |
| ५९ उनसठि            | ८५ पचासी                    |
| ६० साठि             | ८६ केआसी                    |
| ६१ एकसठि OR एकसठि   | ८७ सतासी                    |
| ६२ बासठि OR बासठि   | ८८ अठासी                    |
| ६३ तिरसठि OR तिरसठि | ८९ नवासी                    |
| ६४ चौँसठि OR चौँसठि | ९० नब्बै                    |
| ६५ पैँसठि OR पौँसठि | ९१ एकानब                    |
| ६६ केआसठि OR केआसठि | ९२ वरानब OR वेआनब           |

६३ तेरानवे  
 ६४ चौथानवे  
 ६५ पंचानवे  
 ६६ षष्ठानवे

६७ सप्तानवे  
 ६८ अठानवे  
 ६९ निनानवे  
 १०० सै

## ORDINALS.

§ 91. Ordinals are simple in their formation and run as follows:—

|                      |                  |
|----------------------|------------------|
| पहिल first.          | सातम seventh.    |
| दोसर second.         | आठम eighth.      |
| तेसर third           | नौम ninth.       |
| चौठ or चारिम fourth. | दशम tenth.       |
| पाँचम fifth.         | एगारहम eleventh. |
| छठम sixth.           |                  |

Etcetera; the ordinals of the remaining numbers being formed by adding न as a termination.

## FRACTIONAL NUMBERS.

§ 92. The following are useful:—

पाचो a quarter.  
 आध a half.  
 पौन three quarters; or, less by a quarter.  
 सवैयां one and a quarter; or, plus a quarter.  
 डेअोदा one and a half; or, plus a half.

## AGGREGATE NUMBERS.

§ 93. Note the form दुनु both.

## PART III.

## THE VERB.

## CHAPTER VIII.

## PRELIMINARY.

§ 94. The *Maithil* verb delights in a redundancy of forms. Like all partially cultivated languages, it has few parts of which there are not two or three optional forms. These optional forms are not local peculiarities, but are all used by the same speaker as his fancy or as the rhythm of the sentence dictates. I cannot find out that they represent any different shades of meaning. I shall throughout the following paradigms give first the forms most commonly used, and shall then note after each tense, the optional forms which I have been able to collect.

§ 95. The Maithil verb is of three kinds—active, neuter, and passive. I shall not deal with the passive verb now but shall treat of its peculiarities in another section. The difference between active (or transitive) and neuter (or intransitive) verbs will be treated of further on in this section.

§ 96. The verb has no moods, in the sense of those which we find in Greek or Latin,—that is to say two or more moods, each with its own array of tenses. It has, it is true, a conditional, an imperative, and an infinitive form, but these have few tense forms, and it is more convenient to consider them as tenses, like the *kálas* (*tempora*) or tenses of Sanskrit.

§ 97. Taking them in this sense, there are nine commonly used tenses in Maithili, corresponding to the nine tenses, mentioned by Mr. Etherington, as being commonly used in Hindí;—*viz.* 1. the Present, 2. the Imperfect, 3. the Past, 4. the Perfect, 5. the Pluperfect, 6. the Future, 7. the Retrospective Conditional, 8. the Prospective Conditional, 9. the Imperative.

§ 98. These tenses have no number, but they make up for this by having in transitive verbs each no less than twenty four personal forms, each of which has many varieties. Intransitive verbs have half that number of forms.

§ 99. In the first place, it has two genders, and hence there are twelve pairs of forms, one member of each pair being used when the subject of the verb is masculine, and the other when it is feminine.

§ 100. Again, there are three persons, the first person, the second person, and the third person, each of which is determined also by the subject of the verb. There are thus in transitive verbs four masculine and four

feminine forms, and in intransitive verbs two masculine and two feminine forms (each with its varieties), for each person, and it now remains to consider these personal forms.

§ 101. I shall first deal with the four personal forms of the transitive verb. These four forms exhibit to a wonderful degree the luxuriance of the language. They depend not only on the subject, but on the object of the verb. We are accustomed, in languages like Bangáli, to meet with so called Respectful and Disrespectful forms of the verb, which are used according to the social position in the kingdom of ideas of the subject of the verb, but in Maithili this distinction of rank is carried to a much greater length, for the form of the word is not only governed by the social position of the subject, but by that of the object. We thus have four forms of each person—

1. When the subject and object are both superior.
2. When the subject is superior, and the object inferior.
3. When the subject and object are both inferior.
4. When the subject is inferior, and the object superior.

Examples in order would be,—

1. He (a king) sees him (a king).
2. He (a king) sees him (a slave).
3. He (a slave) sees him (a king).
4. He (a slave) sees him (a slave).

In each of these sentences the word “ sees ” would be rendered by a different form of the verb.

§ 102. These different forms I have called as follows:—

1. Double Honorific.
2. Honorific-non-Honorific.
3. Double non-Honorific.\*
4. Non-Honorific-Honorific.

The first is that form in which the subject and the object are both superior. The second is that in which the subject is superior and the object inferior. The third, that in which subject and object are both inferior; and the fourth that in which the subject is inferior, and the object superior.

§ 103. The intransitive verb has no object, and hence its form cannot be determined by the object. It has hence for each gender and person only two forms, depending only on the subject.—It prefers (but by no means universally) forms corresponding to the Honorific-non-honorific and Double non-honorific of the transitive verb. That is to say it prefers the forms which, in a transitive verb, show the object to be inferior. The Honorific form

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\* This is the general rule. Practically, however, we often find the 1st and 3rd forms used, when no special respect is attributed to the object.

of the intransitive verb, corresponds to the Honorific non-honorific of the transitive and similarly the non-honorific, to the double non-honorific. Besides the above distinction there are some important differences of conjugation between the transitive and intransitive verb, which will be noted further on.

§ 104. I shall commence by describing the formation of the transitive verb, as being the fuller of the two, and shall then proceed to note the points in which the intransitive verb differs from it.

§ 105. The infinitive of the verb ends in °अब *ab*, or °एब *eb*, and the conjugational base or root of the verb may be found by cutting off this अब *ab*, or एब *eb*, from the infinitive. Thus देखब *dekhāb* is the infinitive mood, and means "to see." Cutting off अब *ab* we obtain देख् *dekh*, which is the root.

§ 106. By adding, the termination ऐत *ait* to the root we obtain the present participle. Example, देखैत *dekhait*, "seeing".

§ 107. By adding the termination °अल *al* to the root we obtain the past participle. Example, देखल *dekhāl*, "seen".

§ 108. From these four forms, the root, the present participle, and the past participle, all the tenses of a verb are formed. *viz.*—

Four from the root,

1. The Prospective Conditional or Simple Present.
2. The Future.
3. The Imperative, and
4. The Retrospective Conditional.

Two from the present participle.

1. The Present (Periphrastic), and
2. The Imperfect.

Three from the past participle,

1. The Past.
2. The Perfect.
3. The Pluperfect.

Note that in the High Hindī the Retrospective Conditional is said to be formed from the Present Participle. In Maithilī it is apparently formed from the root but the point is very doubtful.

§ 109. Before proceeding further, it is necessary to learn the conjugation of the verb personal, which is as follows.

§ 110. The verb personal is irregular in many respects, different parts being derived from three different roots, of which the infinitives are or are supposed to be.

1. क्ख *chhab*, to be.
2. थिक्ख *thikab*, to stand (?)
3. रहव *rahav*, to remain.

It is also defective, only the present and imperfect forms existing. A past participle is also borrowed from the irregular verb ह्यएव *hoeb*, to be.

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### CHAPTER VIII.

#### THE AUXILIARY VERB.

क्ख *chhab* &c., to be (not used in this form.)

§ 111.

PRESENT TENSE.

“I am” &c.

FORM I.

*Used when no special respect is attributed to the object.*

MASCULINE.

*a. Honorific.*

1st P. हम, or हमरा सभ की *ham*, or *ham'rá sabh khí*,<sup>(1)</sup> I am, or we are.

2nd P. आहँ, or आहँ सभ की *ahá*, or *ahā' sabh khí*,<sup>(1)</sup> you are.

3rd P. ओ, or ओ सभ क्यि *o*, or *o sabh chhath'*,<sup>(3)</sup> he is, or they are.

(1) Optional forms of की are किए *chhiái*, and किएक *chhiaik*. The forms किएौ *chhiáu*, किएौक *chhiauk* and किएहु *chhiáh'*, are also used, but only in the first person.

*b. Non-Honorific.*

1st P. हम, or हमरा सभ की *ham*, or *ham'rá sabh chhi*,<sup>(1)</sup> I am, or we are,

2nd P. तौह, or तौहरा सभ कह *tōh*, or *tohará sabh chah*,<sup>(2)</sup> you are.

3rd P. ओ, or ओ सभ अछि *o*, or *o sabh achh*,<sup>(4)</sup> he is or they are.

(1) Optional forms for की are किये *chhiyi*, कियेक *chhiyik*, कियौ *chhiyu*, कियौक *chhiyuk*, and कियहु *chhiyah*'.

(2) Optional forms of कह *chah* are कॅ *chhē*, कॅँ *chhāi*, कहक *chhahak* and कहिक *chhahik*.

(4) Optional forms of अछि *achh*' are कै *chhai*, कैक *chhaik*, कैौ *chhau*, and कैौक *chhauk*.

## FEMININE.

The feminine is the same as the masculine, except that in the 2nd Person non-Honorific, the form कहँ *chhah'ñ* is substituted for कह *chhah*.

## FORM. II.

*Used when special respect is attributed to the object.*

## MASCULINE.

*Honorific.*

1st P. हम, or हमरा सभ कियेन्हि, *ham*, or *ham'rá sabh chhiainh*', I am or we are.

2nd P. अहाँ, or अहाँ सभ कियेन्हि *ahā*', or *ahā' sabh chhiainh*', You are.

3rd P. ओ, or ओ सभ क्युन्हि *o*, or *o sabh chhathúnh*', he is, or they are.

(3) An optional form of क्युन्हि *chhathúnh*', is क्यौन्हि *chhathínk*'.

*Non-Honorific.*

1st P. हम or हमरा सभ कियेन्हि, *ham* or *ham'rá sabh chhiainh*', I am, or we are.

2nd P. तोँह or तोहरा सभ छहूँन्हि *tôh*, or *tohará sabh chha-háinh'*, you are.

3rd P. ओ, or ओ सभ छैन्हहि *o*, or *o sabh chhainh'*, he is, or they are.

## FEMININE.

The Feminine is the same as the Masculine.

§ 112. Another form of the verb substantive present is derived from the root थिक् *thik*. It is conjugated as follows, personal pronouns and meaning being omitted for the sake of brevity.

## FORM I.

*Used when no special respect is attributed to the object.*

## MASCULINE.

*Honorific.**Non-Honorific.*

1st P. थिक्हुँ *thikah'ñ*,<sup>1</sup>

थिक्हुँ *thikah'ñ*<sup>1</sup>

2nd P. थिक्हुँ *thikah'ñ*,<sup>1</sup>

थिकाह *thikáh*,<sup>2</sup>

3rd P. थिकाह *thikáh*,<sup>3</sup>

थिक् *thik*.<sup>4</sup>

(1) Optional forms for थिक्हुँ *thikah'ñ* are थिकिएँ *thikiaí*, and थिकिएँक *thikiaik*. The forms थिकिओ *thikiau*, थिकिओक *thikiau*k, and थिकियहुँ *thikiah'* are also used but only in the first person.

(2) Optional forms for थिकाह *thikáh* (2nd Person non-Honorific) are थिकेँ *thikē*, थिकेँ *thikaiñ*, थिकहक *thikahak*, and थिकहैक *thikahík*.

(4) Optional forms for थिक् *thik* are थोक *thík*, थिकेँ *thikai*, थिकेँक *thikaik*, थिकौ *thikau*, and थिकौक *thikau*k.

## FEMININE.

*Honorific.**Non-Honorific.*

1st P. थिक्हुँ *thikah'ñ*,<sup>1</sup>

थिक्हुँ *thikah'ñ*,<sup>1</sup>

2nd P. थिक्हुँ *thikah'ñ*,<sup>1</sup>

थिकीह *thikih*,<sup>2</sup>

3rd P. थिकीह *thikih*,<sup>3</sup>

थीकि *thík*.<sup>4</sup>

(1) Optional forms of चिकहुँ *thikah'ñ* are already given under the masculine.

(2 & 3) An optional form of चिकीह *thikíh* is चिकीहि *thikíh'*.

(4) Optional forms of चीकि *thík'* are given under the masculine, as optional forms of चिक *thik*.

#### FORM II.

*Used when special respect is attributed to the object.*

#### MASCULINE.

##### *Honorific.*

##### *Non-Honorific.*

|        |                                             |                                             |
|--------|---------------------------------------------|---------------------------------------------|
| 1st P. | चिकियेन्हि <i>thikciinh'</i> , <sup>1</sup> | चिकियेन्हि <i>thikciinh'</i> , <sup>1</sup> |
| 2nd P. | चिकियेन्हि <i>thikciinh'</i> , <sup>1</sup> | चिकहून्हि <i>thik'húnh'</i> , <sup>2</sup>  |
| 3rd P. | चिकथून्हि <i>thik'thúnh'</i> , <sup>3</sup> | चिकैन्हि <i>thikcainh'</i> . <sup>4</sup>   |

(3) An optional form is चिकथीन्हि *thik'thính'*.

#### FEMININE.

The Feminine is the same as the Masculine.

§ 113. NOTE. Wherever the persons of छी *chhí* can be used, the corresponding forms of चिकहुँ *thikah'n* can also be used. This rule is universal, and must be noted. छी *chhí* is used as an auxiliary in forming the present and perfect tenses of other verbs, and in those cases चिकहुँ *thikah'ñ* can always be substituted for it. In the verbal paradigms, I shall only give छी *chhí* as an auxiliary, but it must never be forgotten that चिकहुँ can also be used.

#### IMPERFECT TENSE.

§ 114. “I was” etc.

#### FORM I.

*Used when no special respect is attributed to the object.*

##### *a. Honorific.*

1st P. हम, or हमरा सभ छलहुँ *ham*, or *ham'rá sabh chhalah'ñ*,<sup>1</sup>  
I was or we were.

2nd P. अहाँ, or अहाँ सभ कलहुँ *ahā'*, or *ahā' sabh chhalah'ñ*,<sup>1</sup>  
you were.

3rd P. ओ, or ओ सभ कलाह *o*, or *o sabh chhaláh*<sup>3</sup>, he was or  
they were.

(1) Optional forms of कलहुँ are कल्लिए *chhaliai*, and कल्लिएक *chhaliaik*.  
The forms कल्लिओ *chhaliau*, कल्लिओक *chhaliauk* and कल्लिओहु *chhaliauk'* are also  
used, but only in the 1st Person.

*b. Non-Honorific.*

1st P. हम, or हमरा सभ कलहुँ *ham*, or *ham'rá sabh chhalah'ñ*,<sup>1</sup>  
I was, or we were.

2nd P. तौह, or तोहरा सभ कलाह *tōh*, or *tohará sabh chhaláh*,<sup>2</sup>  
you were.

3rd P. ओ, or ओ सभ कल *o*, or *o sabh chhal*,<sup>4</sup> he was, or they  
were.

(1) Optional forms of कलहुँ *chhalah'ñ* are given above.

(2) Optional forms of कलाह *chhaláh* are कल्ले *chhalē*, कल्ले *chhalāi*, कल्लक  
*chhal'hak*, and कल्लीक *chhal'hík*.

(3) Optional forms of कल *chhal* are कल्ले *chhalai*, कल्लेक *chhalaik*, कल्लौ  
*chhalau*, and कल्लौक *chhalauk*.

FEMININE.

(*Personal pronouns, and meanings are omitted to save space.*)

*Honorific.*

*Non-Honorific.*

1st P. कलहुँ *chhalah'ñ*,<sup>1</sup>

कलहुँ *chhalah'ñ*,<sup>1</sup>

2nd P. कलहुँ *chhalah'ñ*,<sup>1</sup>

कल्लीह *chhaláh*,<sup>2</sup>

3rd P. कल्लीह *chhaláh*,<sup>3</sup>

कल्लि *chhal'*.<sup>4</sup>

(1) Optional forms of कलहुँ are given above.

(2&3) An optional form of कल्लीह *chhaláh* is कल्लीहि *chhaláh'*.

(4) Optional forms of कल्लि *chhal'*, are given under the masculine as  
optional forms of कल *chhal*.

## FORM II.

*Used when special respect is attributed to the object.*

## MASCULINE.

*a. Honorific.*

- 1st P. हम, or हमरा सभ छलियेन्हि *ham*, or *ham'rá sabh chhaliainh'*, I am or we were.  
 2nd P. अहाँ or अहाँ सभ छलियेन्हि *ahā'*, or *ahā' sabh chhaliainh'*, you were.  
 3rd P. ओ or ओ सभ छलयून्हि *o*, or *o sabh chhal'thúnh'*.<sup>3</sup> He was or they were.

(3) An optional form of छलयून्हि *chhal'thúnh'*, is छलथीन्हि *chhal'thính'*.

*b. Non-Honorific.*

- 1st P. हम or हमरा सभ छलियेन्हि<sup>1</sup> *ham*, or *ham'rá sabh chhaliainh'*, I was, or we were.  
 2nd P. तौह, or तौहरा सभ छलहून्हि<sup>2</sup> *tôh*, or *tohará sabh chhal'húnh'*, You were.  
 3rd P. ओ, or ओ सभ छलैन्हि<sup>1</sup> *o*, or *o sabh chhalainh'*. He was, or they were.

## FEMININE.

The Feminine is the same as the Masculine.

§ 115. Another form of the imperfect of the verb substantive is formed from the root रह *rah*. It is conjugated as follows, Personal Pronouns and meaning being omitted for the sake of brevity.

## FORM I.

*Used when no special respect is attributed to the object.*

## MASCULINE

*Honorific.**Non-Honorific.*

- |        |                                  |                                 |
|--------|----------------------------------|---------------------------------|
| 1st P. | रही <i>rahí'</i>                 | रही <i>rahí'</i> <sup>1</sup>   |
| 2nd P. | रही <i>rahí'</i>                 | रहह <i>rahaḥ</i> , <sup>2</sup> |
| 3rd P. | रहथि <i>rahath'</i> <sup>3</sup> | रहौ <i>rahaú</i> . <sup>4</sup> |

(1) Other forms are रहिए *rahiai*, रहिएक *rahiaik*. The forms रहिऔ *rahiau*, रहिऔक *rahiauk* and रहिअहु *rahiah'*, are also used, but only in the first person:

(2) Other forms are रह *rah*, रहहक *rahahak*, and रहहौक *rahahik*.

The Feminine is the same as the Masculine, except that the form रहँहिँ *rahāh'ñ* is substituted for रहह *rahah* of the 2nd Person non-Honorific.

## FORM II.

*Used when special respect is attributed to the object.*

## MASCULINE.

*Honorific.**Non-Honorific.*

1st P. रहियेन्हि *rahiainh'*,<sup>1</sup>

रहियेन्हि *rahiainh'*,<sup>1</sup>

2nd P. रहियेन्हि *rahiainh'*,<sup>1</sup>

रहहून्हि *rah'húinh'*,<sup>2</sup>

3rd P. रहथून्हि *rah'thúinh'*,<sup>3</sup>

रहैन्हि *rahainh'*.<sup>4</sup>

(3) Another form is रहथीन्हि *rah'thính'*.

## FEMININE.

The Feminine is the same as the Masculine.

§ 116. NOTE. Wherever the persons of छलहुँ *chhalah'n* can be used, the corresponding forms of रही *rahí* can also be used. This rule is universal, and must be noted. छलहुँ *chhalah'ñ* is used as an auxiliary in forming the imperfect and pluperfect tenses of other verbs, and in those cases रही *rahí* can always be substituted for it. In the verbal paradigms I shall only give छलहुँ *chhalah'ñ* as an auxiliary, but it must never be forgotten that रही *rahí* can also be used.

§ 117. The only remaining form in use is as follows :—

## PAST PARTICIPLE.

Masculine, भेल *bhel*.

Feminine, भेलि *bhel'*.

## CHAPTER IX.

## THE TRANSITIVE VERB.

§ 118. I now proceed to give the conjugation in full of the transitive verb देख् देखाव *dekhhab* to see. I shall not discuss the numerous personal terminations, for they are too many, and their origin is too obscure for me to attempt any satisfactory explanation concerning many of them. I shall first, however, as briefly as possible describe the formation of the Tense stems to which the personal terminations are attached.

§ 119. (1) Tenses formed from the Root.

a. The stem of the Prospective Conditional is the root itself unaltered, to which the personal terminations are added directly.

§ 120. b. The Future has two distinct stems, one formed by adding °अब-*ab* directly to the root, and the second by adding °अत-*at* either directly to the root, or with an intermediate °इ-*i* (in the latter case the initial °अ-*a* of the stem termination being omitted). We thus get देख् देखाव *dekhhab*, and देख् देखत *dekhhat*, or देखित *dekhhit*. To either of these stems the termination °ग-*ga*, can optionally be suffixed. It seems to me that one of these forms is derived from the infinitive. That the future is frequently formed from infinitives is well known to students of comparative philology. Familiar examples are the Sanskrit भवितास्मि *bhavitāsmi* "I am to be"\* or "I shall be" and the French *j'aimer-ai* "I have to love", or "I shall love". In the same way we have देख् देखाव *dekhhab-ga* "I go to see", that is "I shall see." In ordinary conversation the final termination °ग-*ga* may be left out, but the above is the full form, and it is that to which we must look for a derivation.

§ 121. With respect to the stem देखित *dekhhit* or देखत *dekhhat*, I have no distinct suggestion to make as to its formation. It seems to be connected in some way with the present participle, but how I do not know.

§ 122. I venture to suggest one derivation of this form, which I only put forward to invite discussion, and not with any persuasion as to its truth. Is it possible that देखित *dekhhit* may be connected with a low Sanskrit form of दर्शिता *darśita*, the less common form of the periphrastic future of दृश् *drīś* "to see"? The derivation does not seem to me to be very violent, but I have no proof to offer of it, and only put it forward as a suggestion and nothing more.

---

\* भविता "a be-er" is evidently closely connected with the infinitive भवितुं "to be".

§ 123. The stem of the Imperative is the root itself, to which the personal terminations are added direct.

§ 124. *d.* I have been in some doubt as to whether I ought to class the Retrospective Conditional as derived from the root, or from the present participle. In the cognate modern languages the corresponding tense is usually said to be derived from the latter, but I hesitate in following suit in this case, the characteristic diphthong ऐ *ai*, of the present participle being absent from the tense, except in one form of the 3rd person non-Honorific (देखैत *dekhait*). As the stem of this tense is similar in form to the second stem of the future (viz. देखित *dekhit*) I have classed it as a tense derived from the root.

§ 125. Tenses formed from the Present Participle.

*a & b.* Both Present and Imperfect are periphrastic; and are formed by subjoining the conjugated Present and Imperfect tenses of the auxiliary verb directly to the Present Participle.

§ 126. (3) Tenses formed from the Past Participle.

*a.* The stem of the past tense is formed by adding the personal terminations to the Past Participle direct.

§ 127. *b.* There are two conjugational forms of the Perfect.

The first is formed by subjoining the word अस्ति *asthi* " he is " to the conjugated Past tense. How any meaning is arrived at out of this queer compound I do not pretend to say.

§ 128. The second conjugational form of the Perfect is obtained by subjoining the conjugated Present tense of the verb substantive to a slightly modified form of the Past Participle.

§ 129 *c.* The Pluperfect is formed by subjoining the Imperfect tense of the verb substantive to the same modified form of the Past Participle which we observed in the Perfect.

§ 130. It will be convenient, as an aid to memory, to give the tenses in the order given in § 108, and not in order of time.

## CONJUGATION OF A TRANSITIVE VERB.

## ACTIVE VOICE.

Model Verb देखव *dekhav*, “to see”.

## PRINCIPAL PARTS.

§ 131.

|                    |     |                                  |
|--------------------|-----|----------------------------------|
| Root               | ... | देख् <i>dekh</i> , “see.”        |
| Present participle | ... | देखैत <i>dekhait</i> , “seeing”. |
| Past participle    | ... | देखल <i>dekhāl</i> , “seen”.     |

1. Four tenses are formed from the root देख् *dekh*.

§ 132. a. THE PROSPECTIVE CONDITIONAL or SIMPLE PRESENT.

“(If) I see,” (If) I should see,” etc.\*

## FORM I.

*Used when no special respect is attributed to the object.*

## MASCULINE.

*Honorific.**Non-Honorific.*

|        |                                      |                                   |
|--------|--------------------------------------|-----------------------------------|
| 1st P. | देखी <i>dekhī</i> , <sup>1</sup>     | देखी <i>dekhī</i> . <sup>1</sup>  |
| 2nd P. | देखी <i>dekhī</i> , <sup>1</sup>     | देखह <i>dekhah</i> , <sup>2</sup> |
| 3rd P. | देखथि <i>dekhathi</i> , <sup>3</sup> | देखौ <i>dekhau</i> . <sup>4</sup> |

(1) Other forms are देखिए *dekhiai*, देखिएक *dekhiaik*. The forms देखिऔ *dekhiau*, देखिऔक *dekhiauk*, and देखिअहु *dekhiah*,<sup>1</sup> are also used, but only in the first person.

(2) Other forms are देख *dekh*, देखहक *dekhahak*, देखहीक *dekhahīk*.

The FEMININE is conjugated like the masculine; except that in the 2nd person non-Honorific the form देखह *dekhah* is not used, the form देखहिं *dekhāh'ñ* being used instead.

\* In poetry this tense is frequently used in the sense of the Present. It is then called the SIMPLE PRESENT in contradistinction to the PERIPHRASTIC PRESENT formed from the Present Participle.

## FORM. II.

*Used when special respect is attributed to the object.*

## MASCULINE.

*Honorific.*

*Non-Honorific.*

|        |                                            |                                            |
|--------|--------------------------------------------|--------------------------------------------|
| 1st P. | देखियेन्ह <i>dekhiainh'</i> , <sup>1</sup> | देखियेन्ह <i>dekhiainh'</i> , <sup>1</sup> |
| 2nd P. | देखियेन्ह <i>dekhiainh'</i> , <sup>1</sup> | देखहुन्ह <i>dekh'húnh'</i> , <sup>2</sup>  |
| 3rd P. | देखयुन्ह <i>dekh'thúnh'</i> , <sup>3</sup> | देखौन्ह <i>dekhaunh'</i> . <sup>4</sup>    |

(1) Another form is देखिऔन्ह *dekhiaunh'*, which, however, is only used in the first person.

The FEMININE is the same as the masculine.

## § 133.

## b. THE FUTURE.

“I shall or will see,” etc.

## FORM I.

*Used when no special respect is attributed to the object.*

## MASCULINE.

*Honorific.*

*Non-Honorific.*

|        |                                        |                                       |
|--------|----------------------------------------|---------------------------------------|
| 1st P. | देखब <i>dekháb'</i> , <sup>1</sup>     | देखब <i>dekháb'</i> , <sup>1</sup>    |
| 2nd P. | देखब <i>dekháb'</i> , <sup>1</sup>     | देखबह <i>dekh'bah'</i> , <sup>2</sup> |
| 3rd P. | देखताह <i>dekh'táh'</i> , <sup>3</sup> | देखत <i>dekhát'</i> . <sup>4</sup>    |

(1) Other forms are देखबै *dekh'bai*, देखबैक *dekh'baik*, देखतिऐ *dekh'tiai*, देखतिऐक *dekh'tiaik*, देखितहुं *dekhitāh'n*, and देखिअहु *dekhiah'*. The forms देखबौ *dekh'bau*, देखबौक *dekh'bauk*, देखतिऔ *dekh'tiau*, देखतिऔक *dekh'tiauk*, देखिऔ *dekhiau*, देखिऔक *dekhiauk*, and देखीग *dekhíga*, are also used, but only in the first person.

(2) Other forms are देखबैँ *dekh'bē*, देखबहक *dekh'bahak*, and देखबहीक *dekh'bahík*.

(4) Other forms are देखते *dekh'tai*, देखतेक *dekh'taik*, देखती *dekh'tau*, देखतीक *dekh'tauk*.

In the FEMININE the following forms are substituted.

For 2, देखतेहिँ *dekh'bāh'ñ*.

For 3, देखतीह *dekh'tih*, or देखतिह *dekh'tih'*.

For 4, देखति *dekhat'* instead of देखत *dekhat*. The remaining forms are common to both genders.

#### FORM II.

*Used when special respect is attributed to the object.*

##### MASCULINE.

###### *Honorific.*

###### *Non-Honorific.*

|        |                                               |                                                |
|--------|-----------------------------------------------|------------------------------------------------|
| 1st P. | देखतेन्हि <i>dekh'bainh'</i> , <sup>1</sup>   | देखतेन्हि <i>dekh'bainh'</i> , <sup>1</sup>    |
| 2nd P. | देखतेन्हि <i>dekh'bainh'</i> , <sup>1</sup>   | देखतेहून्हि <i>dekh'bahúnh'</i> , <sup>2</sup> |
| 3rd P. | देखतेहून्हि <i>dekh'thúnh'</i> , <sup>3</sup> | देखतेन्हि <i>dekh'tainh'</i> . <sup>4</sup>    |

(3) Another form is देखतीन्हि *dekh'thính'*.

The FEMININE the same as the masculine.

NOTE. That to all the above forms, with the exception of देखीग *dekhíga*, the termination °ग-*ga*, can optionally be added. In this syllable the inherent °अ-*a*, is pronounced. E. g. देखत *dekhah*, or देखतग *dekhah'ga*.

#### § 134.

##### THE IMPERATIVE.

“Let me see,” “See thou,” etc.

##### FORM I.

*Used when no special respect is attributed to the object.*

##### MASCULINE.

###### *Honorific.*

###### *Non-Honorific.*

|        |                                      |                                   |
|--------|--------------------------------------|-----------------------------------|
| 1st P. | देखू <i>dekhú'</i> , <sup>1</sup>    | देखू <i>dekhú'</i> , <sup>1</sup> |
| 2nd P. | देखू <i>dekhú'</i> , <sup>1</sup>    | देखह <i>dekhah</i> , <sup>2</sup> |
| 3rd P. | देखयु <i>dekhath'</i> , <sup>3</sup> | देखौ <i>dekhau</i> . <sup>4</sup> |

\* NOTE. The final °अ-*a* in this form is pronounced.

(1) Other forms are देखिए *dekhiāi*, देखिएक *dekhiāik*, and देखियऊ *dekhiāh'*. The forms देखिऔ *dekhiāu*, and देखिऔक *dekhiāuk*, are also used, but only in the first person.

(2) Other forms are देख *dekh*, देखहक *dekhahak*, and देखहीक *dekhahīk*.

The FEMININE is conjugated like the masculine, except that in the 2nd person non-Honorific the form देखह *dekhah*, is not used, the form देखहिँ *dekhah'ñ* or देखहिँ *dekhāh'ñ* being used instead.

### FORM II.

*Used when special respect is attributed to the object.*

#### MASCULINE.

##### *Honorific.*

##### *Non-Honorific.*

|        |                                             |                                             |
|--------|---------------------------------------------|---------------------------------------------|
| 1st P. | देखियेन्हि <i>dekhiāinh'</i> , <sup>1</sup> | देखियेन्हि <i>dekhiāinh'</i> , <sup>1</sup> |
| 2nd P. | देखियेन्हि <i>dekhiāinh'</i> , <sup>1</sup> | देखहुन्हि <i>dekh'húnh'</i> , <sup>2</sup>  |
| 3rd P. | देखयून्हि <i>dekh'thúnh'</i> , <sup>3</sup> | देखौन्हि <i>dekhaunh'</i> . <sup>4</sup>    |

(1) Another form is देखिऔन्हि *dekhiāunh'*

The FEMININE is the same as the masculine.

### § 135. d. THE RETROSPECTIVE CONDITIONAL.

“If I had seen,” etc.

#### FORM I.

*Used when no special respect is attributed to the object.*

#### MASCULINE.

##### *Honorific.*

##### *Non-Honorific.*

|        |                                          |                                          |
|--------|------------------------------------------|------------------------------------------|
| 1st P. | देखितऊँ <i>dekhītah'ñ</i> , <sup>1</sup> | देखितऊँ <i>dekhītah'ñ</i> , <sup>1</sup> |
| 2nd P. | देखितऊँ <i>dekhītah'ñ</i> , <sup>1</sup> | देखितह <i>dekhītah</i> , <sup>2</sup>    |
| 3rd P. | देखितथि <i>dekhītath'</i> , <sup>3</sup> | देखैत <i>dekhait</i> . <sup>4</sup>      |

(1) Other forms are देखितिए *dekhitiai*, and देखितिएक *dekhitiaik*. The forms देखितिआ *dekhitiau*, देखितिआक *dekhitiauk*, and देखितइ *dekhitah*, are also used, but only in the 1st Person.

(2) Other forms are देखितै *dekhitē*, देखितहक *dekhitahak*, and देखितहीक *dekhitahīk*.

(4) Other forms are देखितै *dekhitai*, देखितैक *dekhitaik*, देखितौ *dekhitau* and देखितौक *dekhitauk*.

The FEMININE is conjugated like the masculine, except that, in the 2nd person non-Honorific, the form देखितह *dekhitah* is not used; the form देखितहिँ *dekhitah'ñ* or देखितैहिँ *dekhitāh'ñ* being used instead.

#### FORM II.

*Used when special respect is attributed to the object.*

#### MASCULINE.

##### *Honorific.*

##### *Non-Honorific.*

1st P. देखितियेन्हि *dekhitiainh'*,<sup>1</sup>

देखितियेन्हि *dekhitiainh'*,<sup>1</sup>

2nd P. देखितियेन्हि *dekhitiainh'*,<sup>1</sup>

देखितहून्हि *dekhitahūnh'*,<sup>2</sup>

3rd P. देखितथून्हि *dekhit' thūnh'*,<sup>3</sup>

देखितैन्हि *dekhitainh'*.<sup>4</sup>

(3) Another form is देखितथीहिँ *dekhit' thīnh'*.

The FEMININE is the same as the masculine.

§ 136.

2. Two tenses are formed from the Present Participle देखित *dekhait*.

#### a. THE PRESENT.

“ I see or am seeing,” etc.

#### FORM I.

*Used when no special respect is attributed to the object.*

#### MASCULINE.

##### *Honorific.*

##### *Non-Honorific.*

1st P. देखैत छी *dekhait chhī*.<sup>1</sup>

देखैत छी *dekhait chhī*,<sup>1</sup>

2nd P. देखैत छी *dekhait chhī*,<sup>1</sup>

देखैत छह *dekhait chhah*,<sup>2</sup>

3rd P. देखैत छथि *dekhait chhathī*,<sup>3</sup>

देखैत अछि *dekhait achh'*.<sup>4</sup>

(1) For the auxiliary *की* *chhī* may be used *किए* *chhiai*, and *किएक* *chhiaiik*. The forms *किया* *chhiau*, *कियाक* *chhiaiuk*, and *कियाऊ* *chhiah'*, are also used, but only in the first person.

(2) Other forms of the auxiliary are *कें* *chhē*, *कें* *chhāi*, *कहाक* *chhahak*, and *कहीक* *chhahīk*.

(4) Other forms of the auxiliary are *कै* *chhai*, *कैक* *chhāik*, *कौ* *chhau*, and *कौक* *chhauk*.

## FEMININE.

The FEMININE is conjugated like the masculine, except that the feminine form of the Present Participle, *देखैत* *dekhait'*, is used instead of the masculine form *देखैत* *dekhait*. E. g. *देखैत* *की* *dekhait' chhī*, instead of *देखैत* *की* *dekhait chhī*. The form *देखैत* *कह* *dekhait' chhah* (which might be expected as the 2nd person non-Honorific) is not used, *देखैत* *कहिँ* *dekhait' chhah'ñ* or *देखैत* *कहिँ* *dekhait' chhāh'ñ* being substituted.

## FORM II.

*Used when special respect is attributed to the object.*

## MASCULINE.

*Honorific.*

1st P. देखैत कियेन्हि *dekhait chhiaiñh'*,<sup>1</sup>

2nd P. देखैत कियेन्हि *dekhait chhiaiñh'*,<sup>1</sup>

3rd P. देखैत क्युन्हि *dekhait chhathúnh'*,<sup>3</sup>

*Non-Honorific.*

1st P. देखैत कियेन्हि *dekhait chhiaiñh'*,<sup>1</sup>

2nd P. देखैत कहून्हि *dekhait chhahúnh'*,<sup>2</sup>

3rd P. देखैत कैन्हि *dekhait chhāiñh'*.<sup>4</sup>

(3) Another form of the Auxiliary is *क्यौन्हि* *chhathúnh'*.

The FEMININE is conjugated like the masculine, except that the feminine form of the Present Participle is used as explained above.

OBSERVE.—In all the above forms, when masculine, the final °त-*t*, of the Present Participle may be, and usually is, omitted. The Participle and auxiliary then form one word. E. g. देखैत ह्यी *dekhait chhí*, or देखैह्यी *dekhaitchhí*. Similarly, when feminine, the final °ति-*t'* of the participle may be omitted. E. g. देखैति ह्यी *dekhait' chhí*, or देखैह्यी *dekhaitchhí*.

## § 137.

## b. THE IMPERFECT.

“ I was seeing,” etc.

## FORM I.

*Used when no special respect is attributed to the object.*

## MASCULINE.

*Honorific.*

1st P. देखैत कलज्झं *dekhait chhalah'ñ*,<sup>1</sup>

2nd P. देखैत कलज्झं *dekhait chhalah'ñ*,<sup>1</sup>

3rd P. देखैत कलाह *dekhait chhaláh*,<sup>3</sup>

*Non-Honorific.*

1st P. देखैत कलज्झं *dekhait chhalah'ñ*,<sup>1</sup>

2nd P. देखैत कलाह *dekhait chhaláh*,<sup>2</sup>

3rd P. देखैत कल *dekhait chhal*.<sup>4</sup>

(1) Other forms of the auxiliary कलज्झं *chhalah'ñ*, are कल्लिए *chhaliai*, and कल्लिएक *chhaliaik*. The forms कल्लिऔ *chhaliau*, कल्लिऔक *chhaliauk*, and कलज्झ *chhalah'* are also used, but only in the first person.

(2) Other forms of the auxiliary are कल्ले *chhalē*, कल्लै *chhalāi*, कल्लहक *chhal'hak*, कल्लहक *chhal'hík*.

(4) Other forms of the auxiliary are कल्लै *chhalai*, कल्लैक *chhalaik*, कल्लौ *chhalau*, and कल्लौक *chhalauk*,

## FEMININE.

As explained under the head of the present tense, the Present Participle takes the form देखैति *dekhait'* in the feminine. Also, in the feminine, the form क्लीह *chhalih*, or क्लीहि *chhalih'* is substituted for क्लाह *chhalah*, of the 3rd person Honorific, and 2nd person non-Honorific, and the form क्लि *chhal'* is substituted for क्ल *chhal* of the 3rd person non-Honorific.

## FORM II.

*Used when special respect is attributed to the object.*

## MASCULINE.

*Honorific.*

- 1st P. देखैत क्लियेन्हि *dekhait chhaliainh'*,<sup>1</sup>  
 2nd P. देखैत क्लियेन्हि *dekhait chhaliainh'*,<sup>1</sup>  
 3rd P. देखैत क्लयून्हि *dekhait chhal'thúnh'*,<sup>3</sup>

*Non-Honorific.*

- 1st P. देखैत क्लियेन्हि *dekhait chhaliainh'*,<sup>1</sup>  
 2nd P. देखैत क्लहून्हि *dekhait chhal'húnh'*,<sup>2</sup>  
 3rd P. देखत क्लैन्हि *dekhait chhalainh'*.<sup>4</sup>

(3) Another form of the auxiliary is क्लयीन्हि *chhal'thính'*.

## FEMININE.

As in the Present Tense, the present participle takes the feminine termination °ति-*t'*. In other respects the feminine of this form is the same as the masculine.

Observe.—As in the present tense, the masculine termination °त-*t*, and the feminine termination °ति-*t'* of the present participle may optionally be omitted. E. g. देखैत क्लहूँ *dekhait chhalah'ñ* or देखैक्लहूँ *dekhai-chhalah'ñ*. The latter is the more usual form.

## § 138.

3. Three tenses are formed from the Past Participle देखल *dekh'al*.

## a. THE PAST.

"I saw," etc.

## FORM I.

*Used when no special respect is attributed to the object.*

## MASCULINE.

*Honorific.**Non-Honorific.*

|                                                 |                                          |
|-------------------------------------------------|------------------------------------------|
| 1st P. देखलङ्ग <i>dekh'lah'ñ</i> , <sup>1</sup> | देखलङ्ग <i>dekh'lah'ñ</i> , <sup>1</sup> |
| 2nd P. देखलङ्ग <i>dekh'lah'ñ</i> , <sup>1</sup> | देखलह <i>dekh'lah</i> , <sup>2</sup>     |
| 3rd P. देखलन्ह <i>dekh'lanh</i> , <sup>3</sup>  | देखलक <i>dekh'alak</i> <sup>4</sup>      |

(1) Other forms are देखल *dekh'al*, देखलिपे *dekh'liai*, देखलिपेक *dekh'liaiak*, देखले *dekh'lai* देखलेक *dekh'laik*, and देखली *dekh'li*. The forms देखलिऔ *dekh'liau*, देखलिऔक *dekh'liauk*, देखली *dekh'liu*, देखलीक *dekh'liuk*, and देखलिअङ्ग *dekh'liakh* are also used, but only in the first person.

(2) Other forms are देखले *dekh'lē*, देखलेँ *dekh'lēi*, देखलहक *dekh'lahak*, and देखलहीक *dekh'lahik*.

(4) Other forms are देखलकै *deh'al'kai*, देखलकैक *dekh'al'kaik*, देखलकौ *dekh'al'kau*, and देखलकौक *dekh'al'kauk*.

## FEMININE.

The following forms are substituted :—

In (1). For देखल *dekh'al*; देखलि *dekh'al*.'

In (2). For देखलह *dekh'lah*; देखलिँहि *dekh'lih*', or देखलीँहि *dekh'lih*'.

## FORM II.

*Used when special respect is attributed to the object.*

## MASCULINE.

*Honorific.**Non-Honorific.*

|                                                      |                                               |
|------------------------------------------------------|-----------------------------------------------|
| 1st P. देखलैन्ह <i>dekh'lainh</i> , <sup>1</sup>     | देखलैन्ह <i>dekh'lainh</i> , <sup>1</sup>     |
| 2nd P. देखलैन्ह <i>dekh'lainh</i> , <sup>1</sup>     | देखलहून्ह <i>dekh'lahúnh</i> , <sup>2</sup>   |
| 3rd P. देखलयून्ह <i>dekh'al'thúnh</i> , <sup>3</sup> | देखलकौन्ह <i>dekh'al'kainh</i> . <sup>4</sup> |

- (1) Another form is देखलियेन्हि *dekh'liainh'*.  
 (2) Another form is देखलथीन्हि *dekhalthính'*.

## FEMININE.

The FEMININE is the same as the Masculine.

§139.                    b.    THE PERFECT.

“ I have seen”, etc.

## FIRST CONJUGATIONAL FORM.

*Formed by adding the third person present non-honorific of the auxiliary verb, as a suffix to the various forms of the past.*

## FORM I.

*Used when no special respect is attributed to the object.*

## MASCULINE.

*Honorific.*

- 1st P. देखलहुँ अछि *dekh'lah'ñ achh'*,<sup>1</sup>  
 2nd P. देखलहुँ अछि *dekh'lah'ñ achh'*,<sup>1</sup>  
 3rd P. देखलन्हि अछि *dekh'lanh' achh'*,<sup>3</sup>

*Non-Honorific.*

- 1st P. देखलहुँ अछि *dekh'lah'ñ achh'*,<sup>1</sup>  
 2nd P. देखलहुँ अछि *dekh'lah achh'*,<sup>2</sup>  
 3rd P. देखलक अछि *dekh'lak achh'*.<sup>4</sup>

(1) Other forms are देखल अछि *dekhah achh'*, देखलिये अछि *dekh'liai achh'*, देखलियेक अछि *dekh'liaik achh'*, देखलै अछि *dekh'lai achh'*, देखलैक अछि *dekh'laik achh'*, and देखली अछि *dekh'li achh'*. The forms देखलियाँ अछि *dekh'liau achh'*, देखलियाँक अछि *dekh'liauk achh'*, देखलौ अछि *dekh'lau achh'*, देखलौक अछि *dekh-lauk achh'*, and देखलियाँहुँ अछि *dekh'liah' achh'*, are also used but only in the first person.

(2) Other forms are देखलैँ अछि *dekh'lē achh'*, देखलैँ अछि *dekh'lāi achh'*, देखलहक अछि *dekh'lahak achh'*, देखलहीक अछि *dekh'lahík achh'*.

(4) Other forms are देखलकैँ अछि *dekhal'kai achh'*, देखलकैँक अछि *dekhal'kai achh'*, देखलकौँ अछि *dekhal'kau achh'*, and देखलकौँक अछि *dekhal'kau achh'*.

#### FEMININE.

The following forms are substituted :—

In (1) For देखल *dekh'al*; देखलि *dekh'al'*.

In (2) For देखलह *dekh'lah*; देखलिँहि *dekh'lih'*, or देखलीँहि *dekh'li'h'*.

#### FORM II.

*Used when special respect is attributed to the object.*

#### MASCULINE.

##### *Honorific.*

1st P. देखलैँहि अछि *dekh'lainh' achh'*,

2nd P. देखलैँहि अछि *dekh'lainh' achh'*,

3rd P. देखलधूँहि अछि *dekhal'thūnh' achh'*.

##### *Non-Honorific.*

1st P. देखलैँहि अछि *dekh'lainh' achh'*,

2nd P. देखलधूँहि अछि *dekhal'thūnh' achh'*,

3rd P. देखलकौँहि अछि *dekhal'kainh' achh'*.

(1) Another form is देखलिँहि अछि *dekh'liainh' achh'*.

(3) Another form is देखखयीँहि अछि *dekhal'thūih' achh'*.

#### FEMININE.

The FEMININE is the same as the Masculine,

## § 140. SECOND CONJUGATIONAL FORM.

*Formed by adding the present tense of the auxiliary verb to an inflected form of the Past Participle.*

## FORM I.

*Used when no special respect is attributed to the object.*

## MASCULINE.

*Honorific.**Non-Honorific.*

|        |             |                                     |              |                                    |
|--------|-------------|-------------------------------------|--------------|------------------------------------|
| 1st P. | देखलेँ की   | <i>dekh'lē chhī,</i> <sup>1</sup>   | देखलेँ की    | <i>dekh'lē chhī,</i> <sup>1</sup>  |
| 2nd P. | देखलेँ की   | <i>dekh'lē chhī,</i> <sup>1</sup>   | देखलेँ कह    | <i>dekh'lē chhah,</i> <sup>2</sup> |
| 3rd P. | देखलेँ क्यि | <i>dekh'lē chhath,</i> <sup>3</sup> | देखलेँ अक्कि | <i>dekh'lē achh.</i> <sup>4</sup>  |

(1) Other forms of the auxiliary may be substituted, as in the Present Tense. *q. v.*

(2) Other forms of the auxiliary may be substituted, as in the Present Tense. *q. v.*

(4) Other forms of the auxiliary may be substituted, as in the Present Tense. *q. v.*

## FEMININE.

The FEMININE is the same as the masculine, except that in the 2nd Person Non-Honorific the form देखलेँ कह *dekh'lē chhah* is not used; the form देखलेँ कहिँ *dekh'lē chhah'ñ* or देखलेँ कहिँ *dekh'lē chhāh'ñ* being substituted.

## FORM II.

*Used when special respect is attributed to the object.*

## MASCULINE.

*Honorific.*

|        |                 |                                        |
|--------|-----------------|----------------------------------------|
| 1st P. | देखलेँ कियेन्हि | <i>dekh'lē chhiainh,</i> <sup>1</sup>  |
| 2nd P. | देखलेँ कियेन्हि | <i>dekh'lē chhiainh,</i> <sup>1</sup>  |
| 3rd P. | देखलेँ क्युन्हि | <i>dekh'lē chhathānh,</i> <sup>3</sup> |

*Non-Honorific.*1st P. देखलेँ क्रियेन्हि *dekh'lē chhiainh'*,<sup>1</sup>2nd P. देखलेँ कइन्हि *dekh'lē chhahúnh'*,<sup>2</sup>3rd P. देखलेँ कैन्हि *dekh'lē chhainh'*.<sup>4</sup>

(3) As in the Present, another form of the auxiliary is कथिन्हि *chhatháinh'*.

## FEMININE.

The FEMININE is the same as the masculine.

§ 141. c. THE PLUPERFECT.

“I had seen,” etc.

## FORM I.

*Used when no special respect is attributed to the object.*

## MASCULINE.

*Honorific.*1st P. देखलेँ कलजँ *dekh'lē chhalak'ñ*,<sup>1</sup>2nd P. देखलेँ कलजँ *dekh'lē chhalak'ñ*,<sup>1</sup>3rd P. देखलेँ कलाह *dekh'lē chhaláh'*,<sup>3</sup>*Non-Honorific.*1st P. देखलेँ कलजँ *dekh'lē chhalak'ñ*,<sup>1</sup>2nd P. देखलेँ कलाह *dekh'lē chhaláh'*,<sup>2</sup>3rd P. देखलेँ कल *dekh'lē chhal*.<sup>4</sup>

(1) Other forms of the auxiliary may be substituted as in the Imperfect Tense. *q. v.*

(2) Other forms of the auxiliary may be substituted as in the Imperfect Tense. *q. v.*

(4) Other forms of the auxiliary may be substituted as in the Imperfect Tense. *q. v.*

#### FEMININE.

In the FEMININE the following forms are substituted.—

In (2 & 3). For देखलेँ क्वाह *dekh'lē chhaláh*; देखलेँ क्वाहि *dekh'lē chhaláh*, or देखलेँ क्वाहिहि *dekh'lē chhaláh*. The remaining forms are common to both genders.

In (4). For देखलेँ क्वा *dekh'lē chhal*; देखलेँ क्वाहि *dekh'lē chhal*.

#### FORM II.

*Used when special respect is attributed to the object.*

#### MASCULINE.

##### *Honorific.*

1st P. देखलेँ क्वाहिनेहि *dekh'lē chhaliaính'*,<sup>1</sup>

2nd P. देखलेँ क्वाहिनेहि *dekh'lē chhaliaính'*,<sup>1</sup>

3rd P. देखलेँ क्वाथुनेहि *dekh'lē chhal'thúnh'*,<sup>3</sup>

##### *Non-Honorific.*

1st P. देखलेँ क्वाहिनेहि *dekh'lē chhaliaính'*,<sup>1</sup>

2nd P. देखलेँ क्वाहनेहि *dekh'lē chhal'háneh'*,<sup>2</sup>

3rd P. देखलेँ क्वाहिनेहि *dekh'lē chhaliaính'*.<sup>4</sup>

(3) Another form is देखलेँ क्वाथीनेहि *dekh'lē chhal'thính'*.

#### FEMININE.

The FEMININE is the same as the masculine.

§ 142. *Participles—Declinable.*

## ADJECTIVE PARTICIPLES.

Present, 'seeing'.

MASCULINE.

देखैत *dekhait*.

FEMININE.

देखैति *dekhait'*.

Past, 'seen'.

MASCULINE.

देखल, देखल भेल, *dekhāl*, OR *dekhāl bhel*.

FEMININE.

देखलि, देखल भेलि, *dekhāl'*, OR *dekhāl bhel'*.§ 143. *Participles—Indeclinable.*

## CONJUNCTIVE PARTICIPLES.

'seeing', 'having seen'.

देखिकँ *dekhikā*, देखिकैँ *dekhikāi*, देखिकैँकँ *dekhikaikā*,

## ADVERBIAL PARTICIPLES.

देखितहिँ *dekhital'hñ*, 'on seeing', 'in the act of seeing'.§ 144. *Precative or Respectful Forms.*

1. RESPECTFUL IMPERATIVE.

देखल जाय *dekhāl jāy* and देखल जाओ *dekhāl jāo*, 'be you,' or 'ye pleased to see'.

## 2. RESPECTFUL FUTURE.

देखल जायत *dekhāl jāet*, OR देखल जायतग *dekhāl jāet'ga*, 'you will see,' or 'will be pleased to see'.

## 3. MILD IMPERATIVE.

देखिह *dekhīha*, 'see you', or 'see ye'.

## INFINITIVE or VERBAL NOUN.

§ 145. देखब *dekhāb*, 'to see'.

## CHAPTER X.

## THE INTRANSITIVE VERB.

§ 146. Theoretically speaking, as already pointed out, the Neuter Verb should be wanting in all those tense-forms, which in the Transitive Verb fall under Form II ; i. e. those in which special respect is attributed to the object. Such, however, is not altogether the case, for the Neuter Verb, while affecting most of the tense-forms of Form I, also indulges pretty freely in those of Form II. What tense forms it uses and what it discards will be learned from the following paradigms.

§ 147. The conjugation of the Past Tense, in the Neuter Verb, differs in many respects from that of the same tense in the Verb Transitive, and should be noted.

In the Transitive Verb there are two conjugational forms of the Perfect Tense. In the Neuter Verb there is only one. It is formed by subjoining the word अह्नि *achh'*, to the conjugated Past Tense. Only one or two inflexions of the second conjugational form are used in the 2nd person non-honorific.

§ 148. The verb सूतव *sūtab* 'to sleep', is an example of a verb whose

root-vowel (ऊ *ú*) is long. When such a vowel is आ *á* \* ई *í* or *ú*, it is liable to be shortened in certain cases.

viz. It is shortened

(1) If it is followed in the same word by another long vowel or diphthong. Example, सुतौ *sutau*. The only exceptions to this are certain forms of the first and second persons of the Prospective Conditional and the Imperative, and the anomalous Future form सूतीग *sutíga*.

(2) If it is followed in the same word by three syllables, any of which contains either the vowel इ *i*, or the vowel उ *u*. Example, सुतिअङ्ग *sutiah'*. If neither of these vowels follows, the root-vowel may be long or short. Example, सूतहक *sútahak*, or सुतहक *sutahak*.

(3) If it be followed in the same word by any number of syllables more than three. Example, सुतबहक *sutabahak* : but सूतहक *sútahak*, where only three syllables, none of which contains either इ *i* or उ *u*, follow the root-vowel ऊ *ú*.

(4) Also in the Mild Imperative, the vowel is shortened in spite of the foregoing rules. Thus:—

सुतिह *sutiha*, 'be pleased to sleep'.

Model verb सूतब *sútab*, 'to sleep'.

§ 149. Root ... .. सूत् *sút*, 'sleep'.

Present Participle ... सूतैत *sutait*, 'sleeping'.

Past Participle ... .. सूतल *sútal*, 'slept'.

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\* There is a considerable diversity of custom with regard to the shortening of आ *á*. Some speakers shorten it as often as ई *í* or ऊ *ú* are shortened. Others always keep it lengthened ; and others again only keep it lengthened when आ *á* is the root-vowel of an Active or Causal Verb, which has been lengthened from the radical अ *a* of a Neuter Verb, as will be seen later on. An example of the last case is the आ in मारव *márab*, 'to kill', which is the Active form of the Neuter Verb मरव *marab*, 'to die'. This last custom is probably the most correct of the three.

§ 150. 1. Four tenses are formed from the root, स्त *sút*.

a. THE PROSPECTIVE CONDITIONAL or SIMPLE PRESENT.

'(If) I see', 'I see', etc.

*Honorific.*

*Non-Honorific.*

1st P. स्तुती *súti*,<sup>1</sup>

स्तुती *súti*,<sup>1</sup>

2nd P. स्तुती *súti*,<sup>1</sup>

स्तुतह *sútah*,<sup>2</sup>

3rd P. स्तुतथि *sútath*,<sup>3</sup>

स्तुतौ *sutau*.<sup>4</sup>

(1) Other forms are स्तुतिरे *sutiai*, and स्तुतिके *sutiaik*. The forms स्तुतिञ्चौ *sutiau*, स्तुतिञ्चौक *sutiauk*, and स्तुतिञ्च *sutiah*' are also used, but only in the first person. The form स्तुतिरेहि *sutiaih*' is also used, but only in the first and second persons Honorific.

(2) Other forms are स्तुतञ्चिहि *sut'háñh*', स्तुतहक *sútahak*, and स्तुतहीक *sutahík*.

(3) Another form is स्तुतथूहि *sut'thúñh*'.

(4) Another form is स्तुतैहि *sutainh*'.

The FEMININE is as the masculine, except that in the second person Non-Honorific the form स्तुतह *sútah*, is not used, the form स्तुतहिँ *sútah'ñ* or स्तुतैहिँ *sutāh'ñ* being used instead.

§ 151.

b. THE FUTURE.

'I shall or will sleep', etc.

MASCULINE.

*Honorific.*

*Non-Honorific.*

1st P. स्तुतव *sútab*,<sup>1</sup>

स्तुतव *sútab*,<sup>1</sup>

2nd P. स्तुतव *sútab*,<sup>1</sup>

स्तुतवह *sút'bah*,<sup>2</sup>

3rd P. स्तुतवाह *sut'táh*,<sup>3</sup>

स्तुतत *sútat* <sup>4</sup>

(1) Other forms are स्तुतवै *sut'bai*, स्तुतवैक *sut'baik*, स्तुततिरे *sut'tiai*, स्तुततिके *sut'tiaik*, स्तुतितैञ्च *sutitāh'ñ*. The form स्तुतवैहि *sut'bainh*' is used only in

the first and second person Honorific. The forms सुतवौ *sut'bau*, सुतवौक *sut'bauk*, सुततिश्री *sut'tiau*, सुततिश्रीक *sut'tiauk*, सुतिश्री *sutiau*, सुतिश्रीक *sutiauk*, सुतिश्रद्ध *sutiaḥ*, and सूतीग *sūtīga*, are also used, but only in the first person.

(2) Other forms are सुतवेँ *sut'bē*, सुतवहक *sut'bahak*, and सुतवहीक *sut'bahák*.

(3) Other forms are सुतथीन्हि *sut'thínk'*, and सुतथून्हि *sut'thúnk'*.

(4) Other forms are सुततैन्हि *sut'taink'*, सुततौ *sut'tau*, सुततौक *sut'tauk*, सुततै *sut'tai*, सुततैक *sut'taik*.

In the FEMININE the following forms are substituted.

For (2), सुतवैँहिँ *sut'bāh'ñ*.

For (3), सुततीह *sut'tih*, or सुततिहि *sut'tih'*.

For (4), सुतति *sutat'*.

NOTE. That to all the above forms, with the exception of सूतीग *sūtīga*, the termination ग *ga*, can optionally be added. In this syllable the inherent अ *a*, is pronounced. E. g. सुतव *sutab*, or सुतवग *sutab'ga*.

§ 152. c. THE IMPERATIVE.

'Let me sleep,' 'Sleep thou,' etc.

MASCULINE.

*Honorific.*

*Non-Honorific.*

1st P. सुतू *sútú*,<sup>1</sup>

सुतू *sútú*,<sup>1</sup>

2nd P. सुतू *sútú*,<sup>1</sup>

सुतह *sútah*,<sup>2</sup>

3rd P. सुतथु *sútath*,<sup>3</sup>

सुतौ *sutau*.<sup>4</sup>

(1) Other forms सुतिऐ *sutiai*, सुतिऐक *sutiaik*, सुतिश्री *sutiau*, सुतिश्रीक *sutiauk*, and सुतिश्रद्ध *sutiaḥ*. The forms सुतिऐन्हि *sutiainh'*; and सुतिश्रीन्हि *sutiaunh'*, are also used but only in the first person and second person Honorific.

(2) Other forms are सुतहून्हि *sut'húnk'*, सुत *sút*, सुतहक *sútahak*, and सुतहीक *sutahák*.

(3) Another form is सुतथून्हि *sut'thúnk'*.

The FEMININE is as the masculine, except that in the<sup>7</sup> feminine of the second person Non-Honorific the form सूतह *sútah*, is not used; the form सूतहिँ *sútah'ñ* or सूतहिँह *sútāh'ñ* being used instead.

§ 153. d. THE RETROSPECTIVE CONDITIONAL.

'If I had slept,' etc.

MASCULINE.

*Honorific.*

*Non-Honorific.*

|                                                              |                                                       |
|--------------------------------------------------------------|-------------------------------------------------------|
| 1st P. सूतितङ्ग <sup>ॐ</sup> <i>sutitah'ñ</i> , <sup>1</sup> | सूतितङ्ग <sup>ॐ</sup> <i>sutitah'ñ</i> , <sup>1</sup> |
| 2nd P. सूतितङ्ग <sup>ॐ</sup> <i>sutitah'ñ</i> , <sup>1</sup> | सूतितह <i>sutitah</i> , <sup>2</sup>                  |
| 3rd P. सूतितथि <i>sutitath</i> , <sup>3</sup>                | सूतितै <i>sutitait</i> . <sup>4</sup>                 |

(1) Other forms are सूतितिए *sutitai*, सूतितिएक *sutitaiik*. The forms सूतितिऔ *sutitaiu*, सूतितिऔक *sutitaiuk*, and सूतितङ्ग *sutitah*, are also used but only in the first person. The form सूतितिएन्हि *sutitaiinh*' is used in the first person and second person Honorific.

(2) Other forms are सूतितै *sutitē*, सूतितहन्हि *sutitahānh*', सूतितहक *sutitahak*, सूतितहीक *sutitahīk*.

(3) Other forms are सूतितथीन्हि *sutitathīnh*', and सूतितथून्हि *sutitathūnh*'.

(4) Other forms are सूतितै *sutitai*, सूतितैक *sutitaiik*, सूतितौ *sutitau*, सूतितौक *sutitauk*, and सूतितैन्हि *sutitainh*'.

The FEMININE is as the masculine, except that in the second person Non-Honorific the form सूतितह *sutitah* is not used; the form सूतितहिँ *sutitah'ñ* or सूतितहिँह *sútāh'ñ* being used instead.

§ 154. 2. Two tenses are formed from the present participle सुतैत *sutait*.

a. THE PRESENT.

'I sleep', or 'am sleeping', etc.

MASCULINE.

*Honorific.*

*Non-Honorific.*

1st P. सुतैत की *sutait chhí*,<sup>1</sup>

सुतैत की *sutait chhí*,<sup>2</sup>

2nd P. सुतैत की *sutait chhí*,<sup>1</sup>

सुतैत क्क *sutait chhah*,<sup>2</sup>

3rd P. सुतैत क्कथि *sutait chhath*,<sup>3</sup>

सुतैत अक्कि *sutait achh*.<sup>4</sup>

(1) Other forms are सुतैत क्किए *sutait chhiai*, and सुतैत क्किएक *sutait chhiaiik*. The forms सुतैत क्किया *sutait chhiau*, सुतैत क्कियाक *sutait chhiauik*, and सुतैत क्कियाह *sutait chhiah* are also used, but only in the first person. The form सुतैत क्किएन्हि *sutait chhiaiinh* is used in the first person and second person Honorific.

(2) Other forms are सुतैत क्कै *sutait chhē*, सुतैत क्कैँ *sutait chhāi*, सुतैत क्कहक *sutait chhahak*, सुतैत क्कहक *sutait chhahik*, and सुतैत क्कहन्हि *sutait chhahinh*.

(3) Other forms are सुतैत क्कथीन्हि *sutait chhathinh*, and सुतैत क्कथून्हि *sutait chhathūnh*.

(4) Other forms are सुतैत क्कै *sutait chhai*, सुतैत क्कैक *sutait chhaiik*, सुतैत क्कौ *sutait chhau*, सुतैत क्कौक *sutait chhauik*, and सुतैत क्कैन्हि *sutait chhainh*.

FEMININE.

The FEMININE is the same as the masculine, except that the feminine form of the Present Participle, सुतैति *sutait*, is used instead of the masculine सुतैत *sutait*. E. g. सुतैति की *sutait chhí*, instead of सुतैत की *sutait chhí*. The form सुतैति क्क *sutait chhah* (which might be expected as the 2nd person Non-Honorific) is not used, and in its place is used सुतैति क्कहिँ *sutait chhak'ñ* or सुतैति क्कहिँ *sutait chhāh'ñ*.

NOTE. In the above forms, when masculine, the final °त -*t* of the present participle may be, and usually is omitted. The Participle and auxiliary then form one word. E. g. सुतैत की *sutait chhí*, or सुतैकी *sutaichhí*. Similarly, when feminine the final °ति -*t* of the participle may be omitted. E. g. सुतैति की *sutait chhí*, or सुतैकी *sutaichhi*.

§ 155.

b. THE IMPERFECT.

*Honorific.**Non-Honorific.*1st P. सुतैत क्खञ्जं *sutait chhalah'ñ*,<sup>1</sup> सुतैत क्खञ्जं *sutait chhalah'ñ*,<sup>2</sup>2nd P. सुतैत क्खञ्जं *sutait chhalah'ñ*,<sup>1</sup> सुतैत क्खञ्जं *sutait chhaláh*,<sup>2</sup>3rd P. सुतैत क्खञ्जं *sutait chhaláh*,<sup>3</sup> सुतैत क्खञ्जं *sutait chhal*.<sup>4</sup>

(1) Other forms are सुतैत क्खल्लि *sutait chhalai*, and सुतैत क्खल्लिक्क *sutait chhalaiik*. The forms सुतैत क्खल्लिअ *sutait chhaliau*, सुतैत क्खल्लिअक्क *sutait chhaliauk*, and सुतैत क्खल्लिअह *sutait chhaliah* are also used, but only in the first person. The form सुतैत क्खल्लिअह्नि *sutait chhaliainh* is used in the first person and second person Honorific.

(2) Other forms are सुतैत क्खल्ले *sutait chhalē*, सुतैत क्खल्ले *sutait chhalēi*, सुतैत क्खल्लेह *sutait chhal'hak*, सुतैत क्खल्लेह *sutait chhal'hik*, and सुतैत क्खल्लेह्नि *sutait chhal'háinh*.

(3) Other forms are सुतैत क्खल्लेथीह्नि *sutait chhal'thính*, and सुतैत क्खल्लेथीह्नि *sutait chhal'thúnh*.

(4) Other forms are सुतैत क्खल्ले *sutait chhalai*, सुतैत क्खल्लेक्क *sutait chhalaiik*, सुतैत क्खल्ले *sutait chhalau*, सुतैत क्खल्लेक्क *sutait chhalauk*, and सुतैत क्खल्लेह्नि *sutait chhalainh*.

## FEMININE.

The FEMININE is the same as the masculine, except that the feminine form of the Present Participle सुतैति *sutait'* is used. E. g. सुतैति क्खञ्जं *sutait' chhalah'ñ*. The forms for the 3rd Person Honorific and the 2nd Person Non-Honorific, are सुतैति क्खल्लेह *sutait' chhaláh*, and सुतैति क्खल्लेह *sutait' chhaláh* instead of सुतैत क्खञ्जं *sutait chhaláh*. The form सुतैति क्खल्ले *sutait' chhal'* is substituted for सुतैत क्खञ्जं *sutait chhal*, in the 3rd Person Non-Honorific.

NOTE. As in the present tense the masculine termination °त-*t*, and the feminine termination °ति-*t'* of the present participle may optionally be omitted. E. g. सुतैत क्खञ्जं *sutait chhalah'ñ*, or सुतैत्तञ्जं *sutaichhalah'ñ*. The latter is the more usual form.

§156. 3. Three tenses are formed from the Past Participle सूतल *sútal*.

a. THE PAST.

MASCULINE.

*Honorific.*

*Non-Honorific.*

1st P. सुतलञ्जं *sut'lah'ñ*,<sup>1</sup>

सुतलञ्जं *sut'lah'ñ*,<sup>1</sup>

2nd P. सुतलञ्जं *sut'lah'ñ*,<sup>1</sup>

सुतलाह *sut'láh*,<sup>2</sup>

3rd P. सुतलाह *sut'láh*,<sup>3</sup>

सूतल *sútal*.<sup>4</sup>

(1) Other forms are सुतलिऐ *sut'liai*, and सुतलिऐक *sut'liaik*. The form सुतलिअञ्जं *sut'liakh'* is also used, but only in the first person. सुतलिऐन्दि *sut'liainh'* is used in the first person and second person Honorific.

(2) Other forms are सुतलैँ *sut'lē*, सुतलैँ *sut'lāi*, सुतलहक *sut'lahak*, सुतलहक *sut'lahák*, and सुतलहन्दि *sut'lahánh'*.

(3) Other forms are सुतलन्दि *sut'lanh'*, सुतलधीन्दि *sutal'thính'*, and सुतलथून्दि *sutal'thánh'*.

(4) Other forms are सुतलै *sut'lai*, सुतलैक *sut'laiik*, सुतलौ *sut'lau*, सुतलौक *sut'lauk*, and सुतलैन्दि *sut'lainh'*.

In the FEMININE the following forms are substituted.

For 2 & 3, सुतलीह *sut'líh*, or सुतलीहि *sut'líh*.

For 4, सूतलि *sútal*.

§ 157.

b. THE PERFECT.

'I have slept', etc.

MASCULINE.

*Honorific.*

1st P. सुतलञ्जं अछि *sut'lah'ñ achh'*,<sup>1</sup>

2nd P. सुतलञ्जं अछि *sut'lah'ñ achh'*,<sup>1</sup>

3rd P. सुतलाह अछि *sut'láh achh'*,<sup>3</sup>

*Non-Honorific,*

1st P. सुतलञ्जं अछि *sut'lah'ñ achh'*,<sup>1</sup>

2nd P. सुतलाह अछि *sut'láh achh'*,<sup>2</sup>

3rd P. सुतलक अछि *sut'lak achh'*.<sup>4</sup>

1. Other forms are सुतल्लिए अछि *sut'liai achh'*, सुतल्लिएक अछि *sut'liaik achh'*. The form सुतल्लिअछ अछि *sut'liakh' achh'* is also used, but only in the first person. सुतल्लिएन्हि अछि *sut'liainh' achh'* is used in the first person and second person Honorific.

2. Other forms are सुतल्ले कह *sut'lē chhak*, सुतल्ले कहक *sut'lē chhakak*, सुतल्ले कह्नीक *sut'lē chhakīk*; सुतल्ले कहन्हि *sut'lē chhakūnh'*, सुतल्लहक अछि *sut'lahak achh'*, सुतल्लहीक अछि *sut'lahīk achh'*, and सुतल्लहन्हि अछि *sut'lahūnh' achh'*.

3. Other forms are सुतल्लन्हि अछि *sut'lanh' achh'*, सुतल्लथीन्हि अछि *sutal'thīnh' achh'*, and सुतल्लथून्हि अछि *sutal'thūnh' achh'*.

4. Other forms are सुतल्ले अछि *sut'lai achh'*, सुतल्लेक अछि *sut'laik achh'*, सुतल्लौ अछि *sut'lau achh'*, सुतल्लौक अछि *sut'lauk achh'* and सुतल्लेन्हि अछि *sut'lainh' achh'*.

In the FEMININE the following forms are substituted.

For 2 & 3, सुतल्लीह अछि *sut'lih achh'* or सुतल्लीहि अछि *sut'lih' achh'*.

### § 158. c. THE PLUPERFECT.

'I had slept,' etc.

#### MASCULINE.

*Honorific.*

*Non-Honorific.*

1st P. सुतल्लेँ कलज्जँ *sut'lē chhalah'ñ*,<sup>1</sup> सुतल्लेँ कलज्जँ *sut'lē chhalah'ñ*,<sup>1</sup>

2nd P. सुतल्लेँ कलज्जँ *sut'lē chhalah'ñ*,<sup>1</sup> सुतल्लेँ कलाह *sut'lē chhaláh*,<sup>2</sup>

3rd P. सुतल्लेँ कलाह *sut'lē chhaláh*,<sup>3</sup> सुतल्लेँ कल *sut'lē chhal*.<sup>4</sup>

(1) Other forms are सुतल्लेँ कल्लिए *sut'lē chhaliai*, and सुतल्लेँ कल्लिएक *sut'lē chhaliaik*.

(2) Other forms are सुतल्लेँ कल्ले *sut'lē chhalē*, सुतल्लेँ कल्लेँ *sut'lē chhalāi*, सुतल्लेँ कल्लहक *sut'lē chhal'hak*, सुतल्लेँ कल्लहीक *sut'lē chhal'hīk*.

(3) Other forms are सुतल्लेँ कल्लथीन्हि *sut'lē chhal'thīnh'* and सुतल्लेँ कल्लथून्हि *sut'lē chhal'thūnh'*.

(4) Other forms are सुतल्लेँ कल्ले *sut'lē chhalai*, सुतल्लेँ कल्लेक *sut'lē chhalaik*, सुतल्लेँ कल्लौ *sut'lē chhalau*, and सुतल्लेँ कल्लौक *sut'lē chhalauk*.

In the FEMININE the following forms are substituted.

For 2 & 3, सुतलें क्लीह *sut'lē chhalih*, or सुतलें क्लीहि *sut'lē chhalih*.'

For 4, सुतलें क्लि *sut'lē chhal*'.

§ 159. 1. *Participles—Declinable.*

ADJECTIVE PARTICIPLES.

Present, 'sleeping'.

MASCULINE.

FEMININE.

सुतैत *sutait*.

सुतैति *sutait*'.

Past, 'slept'.

MASCULINE.

FEMININE.

सूतल *sútal*.

सूतलि *sútal*'.

§ 160. *Participles—Indeclinable.*

CONJUNCTIVE PARTICIPLES.

'sleeping', 'having slept'.

सूतिकँ *sút' kã*, सूतिकैँ *sút' kãi*, सूतिकैकँ *sút' kaikã*.

ADVERBIAL PARTICIPLES.

सूतितहिँ *sutitah'ñ*, 'on sleeping,' 'in the act of sleeping'.

§ 161. *Precautive or Respectful Forms.*

1. RESPECTFUL IMPERATIVE.

सूतल जाय *sútal jáy*, and सूतल जाओ *sútal jáo*, 'be you', or 'ye pleased to sleep'.

2. RESPECTFUL FUTURE.

सूतल जायत *sútal jáet*, or सूतल जायतग *sútal jáet'ga*, 'you will sleep', or 'will be pleased to sleep'.

## MILD IMPERATIVE.

सुतिह *sutiha*, 'sleep you' or 'sleep ye'.

§ 162. *Infinitive or Verbal Noun.*

सुतव *sútab*.

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 CHAPTER XI.

## OBSERVATIONS ON THE FOREGOING.

§163. Attentive consideration of the foregoing shews that the conjugational forms range themselves under one of two great classes according as the object of the verb is Honorific or Non-Honorific. It may indeed be said that there are two distinct conjugations,—one in which the object is Non-Honorific, and another in which it is Honorific.

§164. In order to make this plain, I here give the more usual masculine terminations of each conjugation, separately in a tabular form.

FIRST CONJUGATION.

*Viz.* That in which the object is Non-Honorific (including the conjugation of Intransitive Verbs).  
 (1) Tenses formed from the root देव् *dekh*.

|            | Prospective Conditional. |                        | Future.           |                        | Imperative.        |                        | Retrospective Conditional. |                        |
|------------|--------------------------|------------------------|-------------------|------------------------|--------------------|------------------------|----------------------------|------------------------|
|            | Subject Honorific.       | Subject Non-Honorific. | Subject Honorific | Subject Non-Honorific. | Subject Honorific. | Subject Non-Honorific. | Subject Honorific          | Subject Non-Honorific. |
| 1st Person | दे                       |                        | अव                |                        | उ                  |                        | इत ऊँ                      |                        |
| 2nd Person | Do                       | अह                     | Do                | अवह                    | Do                 | अह                     | Do                         | इतह                    |
| 3rd Person | अयि                      | औ                      | अताह              | अत                     | अयु                | औ                      | इतयि                       | इत                     |

(2) Tenses formed from the present participle देखित *dekhait*.

|            | Present            |                        | Imperfect.         |                        |
|------------|--------------------|------------------------|--------------------|------------------------|
|            | Subject Honorific. | Subject Non-Honorific. | Subject Honorific. | Subject Non-Honorific. |
| 1st Person |                    |                        |                    | कलऊँ                   |
| 2nd Person | Do.                | कह                     | Do.                | कलाह                   |
| 3rd Person | अयि                | अकि                    | कलाह               | कल                     |

(3) Tenses formed from the past participle देखल *dekhāl*.

|            | Transitive Past.   |                        | Intransitive Past. |                        | Transitive Perfect, (2nd Form). |                        | Pluperfect.        |                        |
|------------|--------------------|------------------------|--------------------|------------------------|---------------------------------|------------------------|--------------------|------------------------|
|            | Subject Honorific. | Subject Non-Honorific. | Subject Honorific. | Subject Non-Honorific. | Subject Honorific.              | Subject Non-Honorific. | Subject Honorific. | Subject Non-Honorific. |
| 1st Person | अऊँ                |                        | अऊँ                |                        | अँ क्यी                         |                        | अँ कलऊँ            |                        |
| 2nd Person | Do.                | अह                     | Do.                | आह                     | Do.                             | अँ कह                  | Do.                | अँ कलाह                |
| 3rd Person | अनिह               | अक                     | अँ आह              |                        | अँ कयि                          | अँ अकि                 | अँ कलाह            | अँ कल                  |

The sign अँ signifies that the final vowel is omitted before the termination.

SECOND CONJUGATION.  
A LUGU III WHICH THE OBJECT IS HONORIFIC.

(1) Tenses formed from the root देष् *dekh*.

|            | Prospective Conditional. |                        | Future.            |                        | Imperative.        |                        | Retrospective Conditional. |                        |
|------------|--------------------------|------------------------|--------------------|------------------------|--------------------|------------------------|----------------------------|------------------------|
|            | Subject Honorific.       | Subject Non-Honorific. | Subject Honorific. | Subject Non-Honorific. | Subject Honorific. | Subject Non-Honorific. | Subject Honorific.         | Subject Non-Honorific. |
| 1st Person | इरीन्हि                  |                        | अवेन्हि            |                        | इरीन्हि            |                        | इतिरीन्हि                  |                        |
| 2nd Person | Do                       | अरुन्हि                | Do                 | अवुरुन्हि              | Do                 | अरुन्हि                | Do                         | इतरुन्हि               |
| 3rd Person | अयून्हि                  | अतैन्हि                | अयून्हि            | अतैन्हि                | अयून्हि            | अतैन्हि                | इतयून्हि                   | इतैन्हि                |

(2) Tenses formed from the present participle देखैत *dekhait*.

|            | Present.           |                        | Imperfect.         |                        |
|------------|--------------------|------------------------|--------------------|------------------------|
|            | Subject Honorific. | Subject Non-Honorific. | Subject Honorific. | Subject Non-Honorific. |
| 1st Person | खिरीन्हि           |                        | खलिरीन्हि          |                        |
| 2nd Person | Do.                | करुन्हि                | Do.                | खलरुन्हि               |
| 3rd Person | कयून्हि            | कैन्हि                 | कयून्हि            | कलैन्हि                |

(3) Tenses formed from the past participle देखल *dekhāl*.

|            | Transitive Past.   |                        | Transitive Perfect, (2nd Form). |                        | Pluperfect.        |                        |
|------------|--------------------|------------------------|---------------------------------|------------------------|--------------------|------------------------|
|            | Subject Honorific. | Subject Non-Honorific. | Subject Honorific.              | Subject Non-Honorific. | Subject Honorific. | Subject Non-Honorific. |
| 1st Person | रेन्हि             |                        | रें खिरीन्हि                    |                        | रें खलिरीन्हि      |                        |
| 2nd Person | Do.                | अरुन्हि                | Do.                             | रें अरुन्हि            | Do.                | रें अरुन्हि            |
| 3rd Person | अयून्हि            | अकैन्हि                | रें अयून्हि                     | रें अकैन्हि            | रें अयून्हि        | रें अकैन्हि            |

The sign ◦ signifies that the final vowel is omitted before the termination.

## CHAPTER XII.

## VERBS WITH ROOTS ENDING IN VOWELS.

§ 165. The roots of both the verbs just conjugated end in consonants. When the root ends in a vowel some slight difficulties occur, which require to be noted. I therefore give two examples of such verbs, not conjugating them fully, but giving, of one the first and third persons singular of the non-honorific first form, and of the other a fuller conjugation: noting at the same time any irregularities which may occur in the other forms.

I shall first give an example of a root ending in a vowel other than आ *á*. These verbs are nearly regular.

§ 166. EXAMPLE OF A ROOT ENDING IN A VOWEL OTHER THAN आ *á*.

MODEL VERB सिञ्च *siab* "to sew".

Principal Parts.

|                     |                                                         |
|---------------------|---------------------------------------------------------|
| Root,               | सि <i>si</i> , "sew,"                                   |
| Present Participle, | सिञ्चते <i>siat</i> , or सिञ्चत <i>siut</i> , "sewing", |
| Past Participle,    | सिञ्चल <i>sial</i> , or सिञ्चल <i>siul</i> , "sewn."    |

FIRST FORM. NON-HONORIFIC.

|              |              |
|--------------|--------------|
| 1st. Person. | 3rd. Person. |
|--------------|--------------|

PROSPECTIVE CONDITIONAL.

|                  |                      |
|------------------|----------------------|
| सिई <i>sii</i> , | सिञ्चौ <i>siau</i> . |
|------------------|----------------------|

NOTE.—In the optional forms the letter च *b* is inserted as follows. Some writers use च् *v* instead of च् *b*. In pronunciation, however, the sound is something between *b* and *v*.

1st PERSON. सिञ्चि(क) *sibiai(k)*, सिञ्चिऔ(क) *sibiau(k)*, सिञ्चिञ्च *sibiah'*.

2nd PERSON. *Non-Honorific*. सिञ्चह *sibah*, सिञ्चहक *sib'hak*, सिञ्चहीक *sib'hík*, सिञ्चहन्दि *sib'hánh'*.

3RD PERSON. *Honorific*, सिवधि *sibath'*, or सिअधि *siath'*, सिवयून्दि *sib'-tháuk'*. *Non-Honorific*, सिवैन्दि *sibaink'*.

## FUTURE.

सिअब *siab*,सिअत *siat* or सिउत *siut*.

NOTE. In the 1ST PERSON instead of the forms सिअवै(क) *siabai(k)*, the forms सिवै(क) *sibai(k)* may optionally be used. The form सिअइ *siak'* is seldom used.

## IMPERATIVE.

सिऊ *siú*.सिअौ *siau*.

Optional forms of the 1ST PERSON are, सितिए(क) *sitiai(k)*, सितिअौ(क) *sitiau(k)*, सितिअइ *sitiah'*, and सितिएन्दि *sitiaink'*, in all of which the letter *t* has been inserted.

2ND PERSON. *Non-Honorific*, Optional forms are सित *sit*, सितहक *sit'-hak*, सितहीक *sit'hík*, and सितह्न्दि *sit'húnk'*.

3RD PERSON. *Honorific*, The form for this person is सिअयून्दि *siatháuk'*.

## RETROSPECTIVE CONDITIONAL.

I conjugate this tense in full.

*Honorific.**Non-Honorific.*

1st P. { सिइतज् *siitah'ñ*, or  
सितज् *sitah'ñ*,

*As in the Honorific.*

2nd P. *As in the 1st P.*,

सिइतह *siitah*, or सितह *sitah*,

3rd P. { सिइतथि *siitath'* or  
सितथि *sitath'*,

सिएत *siait*.

## PAST.

1st P. सिअलज् *sialah'ñ*, or सिउलज् *siulah'ñ*.

3rd P. सिअल *sial*, or सिउल *siul*.

The other tenses do not require explanation, being perfectly regular, and presenting no difficulty.\*

§ 167. EXAMPLE OF A ROOT ENDING IN LONG आ á.

MODEL VERB. पायब *páyb* "to obtain."

Principal Parts.

Root, ... .. पा *pá*, "obtain."

Present Participle, पवैत *pavait*, or पाइत *páit*, "obtaining".

Past Participle, पाओल *páöl*, or पाएल *páel*, "obtained."

In order to show the conjugation of this class of verbs clearly, I decline it throughout in the first conjugational form. I omit the first Person non-Honorific, and the 2nd Person Honorific, as they are the same in form as the 1st Person Honorific. Note, however, that as usual, certain optional forms are wanting in the 2nd Person Honorific.

PROSPECTIVE CONDITIONAL.

*Honorific.*

*Non-Honorific.*

1st P. पाई *pái*,<sup>†</sup>

—

2nd P. —

पाबह *pábah*<sup>2†</sup>

3rd P. पाबधि *pá bathi*,<sup>3†</sup>

पतौ *patau*.<sup>4</sup>

Optional forms.

(1) पैऐ(क) *paiai(k)*, पैओ(क) *paiau(k)*, पैअइ *paiah*'.

\* Other examples are चूअब *chúab*, "to drip". 1. Imperative चूबू *chúbú*; 2. Fut. चूइब *chúib* or चूअब *chúab*; 3. Do. चूइत *chúit* or चूअत *chúat*; Past Part. चूइल *chúil*, or चूअल *chúal*. धीएध *dhoëb*, "to wash". 1. Imperative धीवू *dhobú*; 1. Fut. धीएब *dhoëb* or धीअब *dhoab*; 3. do. धीएत *dhoët*, or धीअत *dhoat*; Past Part. धीएल *dhoël*, or धीअल *dhoal*. Generally speaking *b* or *v* may optionally be inserted between concurrent vowels.

† In this and all similar cases, *v* is written by some for *b*. See § 166.

(2) पैह् *paih*, पैअहक *paiahak*, पैअहीक *paiahík*.

The second conjugational forms are

- (1) पैऐन्हि *paiaink'*, (2) पैअहन्हि *paiahánk'*, (3) पैअून्हि *paithánk'*.  
 (4) पबौन्हि *pabaunk'*.

#### FUTURE.

1st P. पाएब *páčb*,<sup>1</sup>

2nd P. ———

पैबह *paibah*,<sup>2</sup>

3rd P. पैताह *paitih*, or पैताह *pautáh*,<sup>3</sup> पाएत *páét*, or पाओत *páót*.<sup>4</sup>

Optional forms.

(1) पैवै(क) *paibai(k)*, पैवौ(क) *paibau(k)*, पैतिऐ(क) *paitiai(k)* पैतिऔ(क) *paitiau(k)*, पैऔक *paiau(k)*, पैअङ्ग *paiah'ñ*, पैतङ्ग *paitah'n*, पाईग *páíga*.

(2) पैबै *paibē*, पैबहक *paib'hak*, पैबहीक *paib'hík*.

(4) पैतै(क) *pitai(k)*, पैतौ(क) *pitau(k)*,

The second conjugational forms are

(1) पैवैन्हि *paibaink'*, (2) पैबहन्हि *paib'hánk'*, (3) पैअून्हि *paithánk'*, पैतैन्हि *pitaink'*.

In all the above forms औत *aut* may be substituted for ऐत *ait* throughout; as पौतिऐ *pautiai*, पौतैन्हि *pautaink'*, &c.

#### IMPERATIVE.

1st. P. पाऊ *páú*<sup>1</sup>

2nd. P. ———

पाबह *pábah*,<sup>2\*</sup>

3rd. P. पाबथ *pá bath*,<sup>3\*</sup>

पतौ *patau*,<sup>4</sup>

Optional forms, as in the Prospective Conditional.

#### RETROSPECTIVE CONDITIONAL.

1st P. पैतङ्ग *paitah'ñ*,<sup>1</sup>

2nd P. ———

पैतह *paitah*,<sup>2</sup>

3rd P. पैतथि *paitath*,<sup>3</sup>

पवैत *parait*.<sup>4</sup>

\*In this and all similar cases, व v is written by some for ब b. See § 166.

Optional forms.

(1) पैतिऐ(क) *paitiai(k)*, पैतिऔ(क) *paitiau(k)*, पैतङ्क *paitak'*.

(2) पैतै *paitē*, पैतहक *pait'hak*, पैतहीक *pait'hík*.

(4) पैतै(क) *paitai(k)*, पैतौक *paitau(k)*.

The 2nd. conjugational forms are,

(1) पैतिऐन्हि *paitiainh'*, (2) पैतहन्हि *pait'hánh'*, (3) पैतथून्हि *pait'thánh'*, पैतैन्हि *paitainh'*.

For पैत *pait*, पौत *paut* or पवित *pavit* may be used throughout; thus पौतङ्क *pautak'ñ*, पवितङ्क *pavitak'ñ*, &c.

The *Present* and *Imperfect* are regular and do not require comment.

PAST.

1st P. पौलङ्क *paulak'hñ*,<sup>1</sup>

2nd P. ———

पौलह *paulah'*,<sup>2</sup>

3rd P. पौलन्हि *paulanh'*,<sup>3</sup>

पौलक *paulak*.<sup>4</sup>

OPTIONAL FORMS

(1) पाञ्चोल *páöl*, पौलिए (क) *pauliai(k)*, पौलै(क) *paulai(k)*, पौली *paulí*, &c.

(2) पौलै *paulē*, पौलैँ *paulāi*, पौलहक *paul'hak*, &c.

(4) पौलकै(क) *paul'kai(k)*, पौलकौ(क) *paul'kau(k)*.

In older Maithilí poetry we sometimes find पैल *pail* instead of पौल *paul*, but this never occurs nowadays: thus पैलङ्क *pailak'ñ*, &c. The verb आएब *áëb*, "to come," however, still makes its 3rd P. Non-Hon. आएल *áël* instead of आञ्चोल *áöl*.

PERFECT.

पौलैँ की *paulē chhí*. OR पौलङ्क अक्कि *paulak'hñ achh'*.

PLUPERFECT.

पौलैँ क्कलङ्क *paulē chhalak'hñ*

NOTE. It is important to note the conjugation of पाएब *páëb* carefully; as it is the model of a large class of verbs, principally actives and causals.

The explanation of the seeming irregularities in the conjugation of पाएब *páëb* is this. As explained in § 166, the letter व *v* (or व *b*) may be inserted after the final vowel of the root, before all vowel terminations. In the case of पा *pá* this is generally done, and hence we get a root पाव *páv* which forms the real conjugational base. The rules in § 148 for the shortening of the long

vowel of the root apply in this conjugation. Before त *t* and ल *l*, immediately following, this व is liable to be changed to औ *õ*, which ò it may be stated here is pronounced short, which accounts for the forms पाऔल *páól* and पाऔत *páõt*, in which the *á* remains long in spite of § 148. 1, according to which if *o* was a long vowel we should expect पाऔल *paól*, and पाऔत *paot*. When, however, the आ *á* is shortened to अ *a* under § 148.2 or 3, this latter coalesces with a following औ *õ*, and the two together become the diphthong औ *au*. Thus we get, in order, for the 1st. sing. Past पवलङ्ङ, *pav'lah'u*, पाऔलङ्ङ *paõlah'ñ* and finally पौलङ्ङ.

The forms containing पै *pai*, are those in which the euphonic letter व *v* (or ब *b*) has not been inserted. In these the आ *á* of the root is first shortened under § 148.2 or 3, and then, combining with a following इ *i*, forms ऐ *ai*. Thus 1st Retro. Conditional is पा + इतङ्ङ *pá + itah'ñ*; then (§ 148) पा + इतङ्ङ *pa + itah'ñ*, then finally पैतङ्ङ *paitah'ñ*. In the Future and Past an इ *i* has been inserted first for the sake of euphony. In the Retrospective Conditional this has not been necessary.

Here it must be noted that the ए *ẽ* and औ *õ*, which we find in the conjugation of verbs with vocalic roots, are always pronounced short, and do not affect a preceding long vowel. They will, hence, always hereafter be marked short; thus *ẽ, õ*.

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 CHAPTER XIII.

## THE PASSIVE VOICE.

§ 168. As in other Neo-Aryan languages the Passive voice is formed by subjoining the conjugated verb जाएव *jáëb* "to go", to the past participle. This participle is liable to inflection as to gender, in which respect it agrees with the subject of the verb, but in other respects it remains unaltered. Thus देखल जाएव *dekhah jáëb* means "to be seen."

§ 169. It is needless therefore to conjugate the passive verb throughout. As however जाएव *jáëb* is irregular in some of its forms, I here conjugate it in its more usual tenses.

§ 170. जाएव *jáëb* "to go".

|                     |                    |
|---------------------|--------------------|
| Root,               | जा <i>já</i> .     |
| Present Participle, | जाइत <i>jáit</i> . |
| Past Participle,    | गेल <i>gel</i> .   |

## PROSPECTIVE CONDITIONAL.

*Honorific.**Non-Honorific.*1st. P. जाई *jái*,

—

2nd. P. —

जाह *jáh*,3rd. P. जाथि *játh'*,जतौ *jatau*,

## FUTURE.

1st. P. जाएब *jaíb*,

—

2nd. P. —

जैबह *jaibah*,3rd. P. जैताह *jaitáh*,जाएत *jaét*.

## IMPERATIVE.

1st. P. जाऊ *jáú*,

—

2nd. P. —

जाह *jáh*,3rd. P. जाथु *játh'*,जतौ *jatau*.

## RETROSPECTIVE CONDITIONAL.

1st. P. जैतऊँ *jaitak'ñ*,

—

2nd. P. —

जैतह *jaitah'*,3rd. P. जैथि *jaitath'*,जाइत *jaít*.PRESENT. जाइत ही *jaít chhi*, &c.IMPERFECT. जाइत छलऊँ *jaít chhalak'ñ*, &c.

## PAST.

1st. P. गेलऊँ *gèlah'ñ*,

—

2nd. P. —

गैलाह *gèláh*,3rd. P. गैलाह *gèláh*,गेल *gel*.PERFECT. गेलऊँ अछि *gèlah'ñ achi*, &c.PLUPERFECT. गेल छलऊँ *gel chhalak'ñ*, &c.

## CHAPTER XIV.

## IRREGULAR VERBS.

§ 171. Besides जाएब *jāēb*, already conjugated, I have noted the following important verbs as irregular.

- करब *karab*, “to do”,  
 धरब *dharab*, “to seize”, “place”.  
 आएब *āēb*, “to come”,  
 देब *deb*, “to give”,  
 लेब *leb*, “to take”,  
 होएब *hoēb*, “to become”,  
 मरब *marab*, “to die”.

It is not necessary to conjugate them throughout, and the following tables, showing their principal parts, must suffice.

§ 172. a. करब *karab*, “to do”.

Present Participle, करैत *karait*,

Past Participle, कैल *kail*,

1st. P. Honorific Past, हम कैलजँ *ham kailah'ñ*,

3rd. P. Non-Honorific Past, ओ कैलक *o kailak*.

Note also the conjunctive participle कैकजँ *kai kah'ñ*, or कय कजँ *kay kah'ñ*, “having done”.

b. धरब *dharab* “to seize”, “place”, is conjugated exactly like करब *karab*, “to do”, only substituting घ *dh* for क *k* throughout.

§ 173. आएब *āēb*, “to come”.

Present Participle, आवैत *avait*,

Past Participle, आएल *āēl*,

3rd. P. Non-Honorific Past, ओ आएल *o āēl*.

§ 174. a. देव *deb*, “to give”.

Present Participle, दैत *dait*,

Past Participle, देल *del*,

1st. P. Honorific Past, हम देल *ham del*.

(देलज्ज *dēlah'ñ* is seldom used)

3rd. P. Non-Honorific Past, ओ देलक *o delak*.

Note, that the 2nd person Non-Honorific Imperative, is दह *dah*, and not देअह *deah*; also दहक *dahak*, दहीक *dahík*.

b. लेव *leb* “to take”, is conjugated exactly like देव *deb*, “to give”, only substituting ल *l* for द *d* throughout.

Note that the 2nd Person Non-Honorific Imperative is लह *lah*, and not लेअह *leah*; also लहक *lahak*, and लहीक *lahík*.

§ 175. मरव *marab*, “to die”.

Present Part., मुइत *muít*, or मरैत *marait*.

Past Part., मुइल *muil*, or मरल *maral*.

1st P. Hon. Pros. Cond., मरी *marí*.

„ Future, मरव *marab*.

„ Imperative, मरु *marú*.

„ Retrosp. Cond., मुइतज्ज *muítah'ñ*, or मरितज्ज *maritah'ñ*.

„ Present, मरैत की *marait chhí*.

„ Past, मुइलज्ज *muilah'ñ*, or मरलज्ज *mar'lah'ñ*.

Adverbial Participle, मुइतहिँ *muítah'ñ*.

§ 176. होएव *hoëb*, or हैव *haib*, “to become,”

Present Part., होएत *hōait*, or होइत *hoit*.

Past Part., भेल *bhel*.

- 1st . Hon. Pros. Cond., होई *hoi*.  
 ,, Future, हैब *haib*, (N. B. The form होईग *hoiga* is not used.)  
 ,, Imperative, होऊ *hoú*  
 ,, Retrospect Cond., होइतऊँ *hōitah'ñ*.  
 ,, Present, होयेत की *hōait chhi*, or होइत की *hoit chhi*.  
 ,, Past, भेलऊँ *bhēlah'ñ*.  
 ,, Perfect, भेल की *bhel chhi*, or भेलऊँ अछि *bhēlah'ñ achh'*.  
 Conjunctive participle, भै कँ *bhai kā*, भै कैँ *bhai kái*.  
 Adverbial participle, होइतहिँ *hōitah'ñ*.

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CHAPTER XV.

THE FORMATION OF ACTIVE AND CAUSAL VERBS.

§ 177. As in other *Gaudian* languages the neuter verb in Maitihili can be made active, and the active verb, causal.

§ 178. The active verb is generally formed by adding °आव *áv* to the root, and the causal °वाव *váv*, but there are many exceptions. The roots thus formed are then conjugated like the root पाव *páv*, the optional form of the root पा *pá*, 'obtain'. See § 167. Note.

The following are examples of the regular adoption of the rule.

| NEUTER.                     | ACTIVE.                         | CAUSAL.                                       |
|-----------------------------|---------------------------------|-----------------------------------------------|
| उठब <i>uthab</i> , to rise, | उठाएब <i>utháëb</i> , to raise, | उठवाएब <i>uth'váëb</i> ,<br>to cause to rise. |

|                                        |                                 |                                                |
|----------------------------------------|---------------------------------|------------------------------------------------|
| गिरब <i>girab</i> , to fall,           | गिराएब <i>giráëb</i> , to fell, | गिरवाएब <i>gir'váëb</i> ,<br>to cause to fell. |
| चढ़ब <i>charhab</i> , to ascend,       | चढ़ाएब <i>charháëb</i> ,        | चढ़वाएब <i>charh'váëb</i> .                    |
| पकब <i>pakab</i> to ripen,             | पकाएब <i>pakáëb</i> ,           | पकवाएब <i>pak'váëb</i> .                       |
| बजब <i>bajab</i> , to sound, to speak, | बजाएब <i>bajāëb</i> ,           | बजवाएब <i>baj'váëb</i> .                       |
| लगब <i>lagab</i> , to be applied,      | लगाएब <i>lagaëb</i> ,           | लगवाएब <i>lag'váëb</i> .                       |
| पिघलब <i>pigh'lab</i> , to melt,       | पिघलाएब <i>pigh'láëb</i> ,      | पिघलवाएब <i>pighal'váëb</i>                    |
| लटकब <i>laṭ'kab</i> , to hang,         | लटकाएब <i>laṭ'káëb</i> ,        | लटकवाएब <i>laṭak'váëb</i> .                    |

§ 179. Monosyllabic roots containing a long vowel, generally shorten it in the active and causal forms ; but unlike Hindī, the *guṇa* diphthongs ° ए-*e*, and ° औ-*o*, are not shortened to their simple vowels ° इ-*i*, and ° उ-*u* respectively ; they are, instead pronounced short, like *ě*, & *ǒ*: thus :—

| NEUTER.                           | ACTIVE.                 | CAUSAL.                    |
|-----------------------------------|-------------------------|----------------------------|
| जागब <i>jágab</i> , to be awake,  | जगाएब <i>jagáëb</i> ,   | जगवाएब <i>jag'váëb</i> .   |
| बजब <i>bájab</i> , to speak,      | बजाएब <i>bájaëb</i> ,   | बजवाएब <i>baj'váëb</i> .   |
| भीजब <i>bhíjab</i> , to be wet,   | भिजाएब <i>bhijáëb</i> , | भिजवाएब <i>bhij'váëb</i> . |
| घूमब <i>ghúmab</i> , to go round, | घुमाएब <i>ghumáëb</i> , | घुमवाएब <i>ghum'váëb</i> . |

But

|                                   |                        |                           |
|-----------------------------------|------------------------|---------------------------|
| डोलब <i>dolab</i> , to be shaken, | डोलाएब <i>dóláëb</i> , | डोलवाएब <i>dól'váëb</i> . |
| लेटब <i>leṭab</i> , to lie down,  | लेटाएब <i>létáëb</i> , | लेटवाएब <i>lét'váëb</i> . |

NOTE, that, unlike Hindī, monosyllabic roots, consisting of a consonant and a long vowel, do not form actives in ° ला *lá*, or causals in ° लवा-*l'vá*.

§ 180. The following are examples of monosyllabic roots of active verbs, which become doubly active and causal.

## ACTIVE.

## DOUBLY ACTIVE.

## CAUSAL.

देब *deb*, to give,दिआएब *diáëb*,दिआवाएब *diaváëb*.धोअब *dhoab*, to wash,{ धोआएब *dhöáëb* or  
धोबाएब *dhöbáëb* }धोआवाएब *dhöaváëb*.पिअब *piab*, to drink,{ पिआएब *piáëb* or  
पिबाएब *pibáëb* }पिआवाएब *piaváëb*.सीखब *sikhab*, to learn,सिखाएब *sikháëb*,सिखावाएब *sikh'váëb*.

Note also here,

जिअब *jiab*, to live,जिआएब *jiáëb*,जिआवाएब *jiaváëb*.

§ 181. Many neuter verbs with a short vowel in the root simply lengthen it to form the active, and form the causal regularly with ° वा-*vá* ; thus,

## NEUTER.

## ACTIVE.

## CAUSAL.

कटब *katáb*, to be cut,काटब *kátáb*,कटवाएब *kat'váëb*.गड़ब *garáb*, to be buried,गाड़ब *gáráb*,गड़वाएब *gar'váëb*.मरब *maráb*, to die,मारब *máráb*,मरवाएब *mar'váëb*.

Wanting

पालब *pálab*, to rear, पलवाएब *pal'váëb*.

Wanting

लादब *ládab*, to load, लदवाएब *lad'váëb*.

BUT,

खुलब *khuláb*, to be open,खोलब *kholab*,खोलवाएब *khöl'váëb*.

§ 182. The following are irregular.

## NEUTER.

## ACTIVE.

## CAUSAL.

कूटब *chhútab*, to go off,क़ोड़ब *chhoráb*,क़ोड़वाएब *chhōr'váëb*.टूटब *tútab*, to be broken,तोड़ब *toráb*,तोड़वाएब *tōr'váëb*.फटब *phatab*, to be rent,फाड़ब *pháráb*,फाड़वाएब *phar'váëb*.अटब *atab*, to be stopped,अड़ाएब *aráëb*,अड़वाएब *ar'váëb*.

बिक्रब *bikab*, or }  
 बिक्राएब *bikáēb*, } to be sold, बेचब *bechab*, बेचवाएब *bēch'váēb*.

रहब *rahab*, to remain, राखब *rākhab*, रखवाएब *rakh'váēb*.

§ 183. Amongst others, the following verb takes the causal form, but does not use it in a causal, but only in an active sense; the Causal form thus becomes an optional form of the Active.

SIMPLE VERB,

ACTIVE.

कहब *kahab*, to say,

{ कहाएब *kaháēb*, or  
 { कहवाएब *kah'váēb*.

#### CHAPTER XVI.

#### COMPOUND VERBS.

§ 184. The compound verbs in Maithilí, do not range themselves under such a simple classification as we find in Hindí. We find the root appearing not only in its simple form, but in other modified forms, for the use of which it is difficult to give any definite rule. I shall adopt as far as possible the classification of Hindí grammars, and hence commence with

A. *Compound Verbs formed from the root, whether simple or modified.*

I. INTENSIVES. Examples are,

§ 185. (a) From the simple root;

खा जाएब *khá jáēb*, to eat up.

पि जाएब *pi jáēb* }  
 पि लेब *pi leb*, } to drink up.

हो जाएब *ho jáēb*, to become.

हो रहब *ho rahab*, to be.

हेड़ा देब *herá deb*, to lose

Note here a kind of passive formed with पड़ब *parab*, to fall. Example, मार पड़ब *már parab*, to be beaten.

§ 186. (b) *From the modified root.*

युकारि उठब *pukár' uṭhab*, to call out.

बनि जायब *ban' jáëb*, to be made.

काटि डारब *kát' dārab*, to cut off.

राखि लेब *rākh' leb*, to lay by.

सूति रहब *sút' rahab*, to sleep on.

चलि जायब *chal' jáëb*, to depart.

§ 187. II. POTENTIALS. Always formed from the modified root. Examples are,

चलि सकब *chal' sakab*, to be able to move.

बाजि सकब *bāj' sakab*, to be able to speak.

लिखि सकब *likh' sakab*, to be able to write.

देि सकब *dai sakab*, to be able to give.

लेि सकब *lai sakab*, to be able to take.

जाय सकब *jāë sakab*, to be able to go.

§ 188. III. COMPLETIVES. Sometimes formed from the simple, and sometimes from the modified root. Examples are,—

खा चुकब *khá chukab*, to have done eating.

देि चुकब *dai chukab*, to have done giving.

मारि चुकब *már' chukab*, to have done beating.

The foregoing modified form of the root, is really an additional form of the conjunctive participle, corresponding to the *Bangálí* conjunctive participle in ० इया. Thus काटि *kát'* appears to correspond to the *Bangálí* काटिया *kátiyá*.

B. *Compound verbs formed with the Verbal Noun.*

§ 189. The following observations have been inserted here, although they might, perhaps, be more logically placed in the Chapter on Simple Verbs.

There are three forms of the Verbal noun. All these can be regularly declined like nouns, but, unlike nouns, they have an oblique form, differing from the nominative, to which the case terminations are attached.

(1.) The first form is that already given in this grammar, ending in व *b*; as देखव *dekhav*, "seeing." Its oblique form ends in वा *bá*, as देखवा में *dēkh'vá\** *sā* "from seeing," देखवाक *dēkh'vák*, "of seeing," &c.

(2.) The Second form is made by substituting ल *l* for व *b* in the first form, as देखल *dekhál*, oblique form देखला *dēkh'lá*. Its nominative or direct therefore generally, but not always (e. g. not in the case of जाएव *jáēb* "to go") is the same as that of the Past Participle. Sometimes, however, in the case of irregular verbs, the form of the Past Participle is used by the ignorant instead of the real form of the verbal noun. Thus, the proper form of this variety of the verbal noun of the verb जाएव *jáēb* "to go" is जाएल *jáēl*, but the vulgar sometimes say गेल *gel*, which is the form of the Past Participle. In the case of verbs whose roots end in आ *á*, the observations in § 168 (note) apply; so that we find forms like पावल *pával*, and पैला में *pailá mē*, beside forms like पाएल *páēl* and पैला *pailá*.

(3.) The third form of the verbal noun does not occur in the direct form at all. It is only found in the oblique form, which is made by adding अ *a* or ऐ *ai* to the root. Thus Acc. Sing. देख केँ *dekhá* (not *dekh*) *kē*, or देखै *dēkhāi* *kē*: and so on. The final ऐ *ai* is pronounced short thus *dēkhāi* and does not affect a previous long vowel; cf. § 148. and § 167 (note). Thus we have the verbal noun पठावै *paṭhāvāi*, while the Present Participle in the Present tense is पठवै (छी) *paṭhavai* (*chhí*) of पठाएव *paṭháēb*, "to send". When the root of the verb ends in आ *á*, this form of the verbal nouns ends either in आवै *āvāi* as above, or in ऐ, as जाए *jáē*, पाए *páē*. In irregular verbs, as in the second variety, the vulgar use forms connected with the past participle, instead of the regular ones, as मुरै *muāi*, instead of मरै *marāi* from मरव *marav*, "to die."

\* See addenda.

§ 190. I. DESIDERATIVES, which are formed in two ways.

(a) By the phrase इच्छा अस्ति *icchhá aśhī* meaning "there is a desire" following the genitive of the first form of the verbal noun in व ब.

(b) By the accusative, genitive, or simple oblique third form of the verbal noun with the verb चाहव *chāhāv*, to wish :— Examples—

(a) देखनाक इच्छा अस्ति *dēkhabāk icchhá aśhī*, there is a desire of seeing, *i e.* I wish to see.

With this phrase, compare the Bangálí, देखिबार इच्छा अस्ति *dekhībār icchhá áśhī*.

(b) हम देख केँ चहैकी *ham dekha kē chahaichhī*, I wish to see.

ओ बाज चहैअस्ति *o bāja chahaiachhī*, he wishes to speak.

घड़ी बाजै चहैअस्ति *gharī bājā chahaichhal*, the clock was about to strike.

ओ जाय चहैअस्ति *o jāé chahaichhathī*, he wishes to go.

ओ मरै (vulgarly मुरै) चहैत अस्ति *o marā (vulgarly murā) chahait aśhī*, he is at the point of death.

रहि पोथी केँ पढ़क चाही *eh' pothī kē parhak chāhī*, one should read this book.

तोहरा ओतय जायक (or जाय or जाय केँ) चाही *tōh'rá otay jāék (or jāé or jāé kē) chāhī*, you should go there.

§ 191. II. PERMISSIVES are also formed from the third form of the verbal noun. Examples are ;—

जाय देव *jāé deb*, to allow to go.

कहै देव *kahāé deb*, or

कह देव *kaha (not kah) deb*

} to allow to speak.

ओ ओकरा खाय देलकैक *o ok'rá khāé dēl'kaik*, he allowed him to eat.

§ 192. III. ACQUISITIVES, are also formed from the same form. Example.

ओ उठै नहिँ पाबधि *o uṭhāi' nahi'ṅ pābath'*, do not let him rise.

§ 193. III. FREQUENTATIVES, are formed with the direct form of the second variety of the verbal noun in ल *l*. Examples.

आएल करब *āēl karab*, to come frequently.

कैल करब *kāil karab*, to do frequently,

ओ कहल करैअछि *o kahal karaiachh'*, he speaks frequently

ओ जाएल करैअछि *o jāēl karaiachh'*, he goes frequently.

§ 194. IV. INCEPTIVES. In Maithilī these are formed with the oblique form of the third variety of the verbal noun. Examples are

कह लागब *kaha* (not pronounced *kah*) *lāgab*, to begin to speak.

दीअ लागब *dīa lāgab*, to begin to give.

मारै लागल *mārāi lāgal*, he began to beat.

बाघ खाय लागल *bāgh khāi lāgal*, the tiger began to eat.

C. *Compound verbs formed from the present participle.*

These are, as in Hindī, Continuatives and Staticals. Examples are ;—

§ 195. I. CONTINUATIVES.

लिखैत जाएब *likhait jāēb*, to continue writing.

पढ़ैत जाएब *parhait jāēb*, to continue reading.

बोलैत जाएब *bōlait jāēb*, to continue speaking.

जाइत रहब *jáit rahab*, to continue going.

पवैत आब *pavait áëb*, to go on finding.

पानि बहैत जाइअक्कि *páni bahait jáiachh'*, the water keeps flowing away.

नदी केर धार बहैत रहैअक्कि *nadi ker dhár bahait rahaiachh'*, the stream of the river keeps flowing on.

§ 196. II. STATICALS.

कनैत चलब *kanait chalab*, to go along crying.

गबैत आब *gabait áëb*, to come singing.

एक स्त्री गवैत अवैक्कलि, *ek strí gavait avaiçchal'*, a woman was coming singing.

§ 197. D. *Other compound verbs.*

I. The following idiom with the Past Participle, making quasi statical verbs may be noted,

पानि बहल जाइत अक्कि *páni bahal jáit achh'*, the water keeps flowing away.

एक बाघ पड़ल फिरैक्कल *ek bágh paral phiraichhal*, a tiger was prowling about.

In connection with this note that the phrase चला जाना *chalá jáná*, "to go away", so common in Hindí, has no counterpart in Maithilí, the Intensive compound being used instead.

II. The Maithilí equivalent to the Hindí ले आना *le áná*, to bring, is आनब *ánab*, and to the Hindí ले जाना *le jáná*, to take away, is the anomalous लेनें जाएब *lenē jáëb*.

## PART IV.

## INDECLINABLES.

## CHAPTER XVII.

## ADVERBS, PREPOSITIONS, AND CONJUNCTIONS.

§ 198, Henceforth I shall not transliterate. It was necessary to do so in the case of verbs, but Indeclinable words, as a rule, show their own pronunciation.

The following lists of ADVERBS have been collected.

## § 199. I. ADVERBS OF TIME.

|          |                                                                        |           |                                    |
|----------|------------------------------------------------------------------------|-----------|------------------------------------|
| एखन      | <i>Now.</i>                                                            | सबेर      | } <i>Early, at dawn.</i>           |
| तखन      | } <i>Then.</i>                                                         | प्रातःकाल |                                    |
| तहिआ     |                                                                        | अत्युख    |                                    |
| कखन      | } <i>When?</i>                                                         | भोर       | } <i>Perhaps, some-<br/>times.</i> |
| कहिआ     |                                                                        | कदाचित    |                                    |
| जखन      | } <i>When.</i>                                                         | कदापि     |                                    |
| जहिआ     |                                                                        | कहिओ      |                                    |
| आइ       | <i>Today.</i>                                                          | निदान     | } <i>At last.</i>                  |
| काहिह    | <i>Yesterday, tomorrow.</i>                                            | अन्त      |                                    |
| आइ काहिह | <i>Now-a-days.</i>                                                     | अन्तकाल   | } <i>Often.</i>                    |
| परसू     | <i>The day before yester-<br/>day, or the day after-<br/>tomorrow.</i> | बेरिबेरि  |                                    |
|          |                                                                        | बारंबार   |                                    |
|          |                                                                        | शीघ्र     | <i>Quickly.</i>                    |
| प्रतिदिन | } <i>Every day.</i>                                                    | तात्काल   | } <i>Instantly.</i>                |
| अनुदिन   |                                                                        | तत्क्षण   |                                    |
| सभदिन    |                                                                        |           | पश्चात्                            |
| सदा      | } <i>Always.</i>                                                       | पाछा      |                                    |
| सर्वदा   |                                                                        | फेरि      | <i>Again.</i>                      |
| नित्य    | <i>Continually.</i>                                                    | एकबेरि    | <i>Once.</i>                       |

## § 200. II. ADVERBS OF PLACE.

|           |                  |          |                      |
|-----------|------------------|----------|----------------------|
| एतय       | <i>Here.</i>     | तेन्हर   | <i>Thither.</i>      |
| ओतय       | <i>There.</i>    | लगपास    | <i>On all sides.</i> |
| कतय, कहाँ | <i>Where ?</i>   | समीप     | <i>Near.</i>         |
| जतय, जहाँ | <i>Where.</i>    | एहिक्कात | <i>On this side.</i> |
| ततय, तहाँ | <i>There.</i>    | ओहिक्कात | <i>On that side.</i> |
| एन्हर     | <i>Hither.</i>   | सबत्र    | } <i>Everywhere</i>  |
| ओन्हर     | <i>Thither.</i>  | सभठाम    |                      |
| केन्हर    | <i>Whither ?</i> | पार      | <i>Across.</i>       |
| जेन्हर    | <i>Whither.</i>  | निकट     | <i>Near.</i>         |

## § 201. III. ADVERBS OF MANNER.

|          |                        |                 |                   |
|----------|------------------------|-----------------|-------------------|
| अकस्मात् | } <i>Accidentally.</i> | वृथा            | } <i>In vain.</i> |
| अचक में  |                        | ब्यर्थ          |                   |
| अति      | <i>Very.</i>           | नाहक            |                   |
| एथक      | } <i>Separately.</i>   | एना             | <i>Thus.</i>      |
| फाराक    |                        | कोना, कोन तरहें | <i>How ?</i>      |
| भटपट     | } <i>At once.</i>      | जेना, जैँ तरहें | <i>As.</i>        |
| भटद      |                        | तेना, तैँ तरहें | <i>So.</i>        |
| तथापि    | } <i>Nevertheless</i>  | सत्य            | <i>Truly.</i>     |
| तैओ      |                        | सहज, सहजें,     | } <i>Gratis.</i>  |
| यद्यपि   | } <i>Although.</i>     | सहज में         |                   |
| जैओ      |                        | इत्यादि, इआदि,  | <i>Etcetera.</i>  |

## § 202. IV. ADVERBS OF AFFIRMATION AND NEGATION.

हँ *Yes.*निश्चय *Certainly.*निस्सन्देह *Doubtlessly.*अवश्य *Necessarily.*नहिँ } *No, not.*

न

जनु *No, do not.*

## § 203. The following are examples of COMPOUND ADVERBS.

कहिँओ कहिँओ *Sometimes.*नऊँ नऊँ } *Gently.*

सुस्ते सुस्ते

एखन धरि *Till now, yet.*कहिँआ धरि } *Till when ?*कखन धरि } *How long ?*कहिँओ नहिँ *Never.*दुनुदिश *On both sides, all  
round.*एहन ओहन *Indifferently.*जौँ कहिँओ *Whenever.*और कतऊ *Elsewhere.*कतहु नहिँ *Nowhere.*एतय धरि *Hitherto.*नहिँ तँ *If not, else.*कहिँओ न कहिँओ *Sometime  
or other.*कतहु न कतहु *Somewhere  
another.*जखन न तखन *now and then.*एना नेँ एना *Somehow or  
other.*

§ 204. The following are examples in which adverbs take the signs of cases after them.

एखनुक बेरि नीक क़ैक *Now is the best time. (Lit. The time of now is good).*

तहिँआ सँ आइ भेट भेल अक्कि *I have not seen you since then till today. (Lit. From that time today a (first) meeting has occurred.)*

निदान कँ एलाह *At last he came.*

अन्तकाल में ज्ञान भेलेन्ह *At length he came to his senses.*

ओ आइ के काबिह कहैत क्यि *He puts off from today to tomorrow. (Lit. He calls tomorrow today.)*

#### PARTICLES OF EMPHASIS.

§ 205. These are ई and ही or हीँ, *only, even*, and ओ and ऊ or ऊँ, *also, even*. They are always used enclitically, and when any of them is added to a word ending in आ, that आ is omitted. Examples, हमरी *mine only* (हमर + ई), or *me only* (हमरा + ई); हमरी or हमरऊँ *mine also*, or *me also*. उतर, *a reply*, उतरी, *even a reply*. अपनऊँ, *even one's own*.

#### PREPOSITIONS.

§ 206. The following is a list of the more usual Prepositions.

आगाँ *Before.*

साक्षात् *Before.*

पाछाँ *Behind.*

लेख *For, on account of.*

ऊपर *Above.*

बिनु, बिनाँ *Without, Except.*

नीचाँ *Beneath.*

बाहर *Out.*

भीतर *Within.*

संग *With.*

संमुख }  
सोभाँ } *Facing.*

The above all govern the genitive case.

#### CONJUNCTIONS.

§ 207. The following are the more useful.

आओर or ओ *And.*

की...की *Either...or.*

कि *That.*

परंतु *But.*

ओ *Else, even.*

वोँ *If.*

तँ *Then.*

§ 208. INTERJECTIONS, see § 24. Others as in Hindi.

## ADDENDA ET CORRIGENDA.

### INTRODUCTION.

I withdraw the remarks on Page 2 concerning the tract over which Maithilī is spoken. In Champāran a form of Bhojpūrī is spoken, with a strong Maithilī tendency, but not sufficiently strong to entitle me to class the language as a sub-dialect of the latter. We must therefore deduct the figures for Champāran from the foot note, but at the same time we must add the figures for the whole of South Munger and South Bhāgalpūr, for the Barh Subdivision of Patna, and for part of Pūrniyā, where subsequent investigations have shown me that Maithilī in greater or less purity is spoken.

The corrected figures, therefore, for the foot note will run as follows.

|                                |           |       |     |           |
|--------------------------------|-----------|-------|-----|-----------|
| Muzaffarpūr                    | ...       | ...   | ... | 23,15,267 |
| Darbhanga                      | ...       | ...   | ... | 21,03,337 |
| Munger                         | ...       | ...   | ... | 18,16,894 |
| Bhāgalpūr                      | ... about | ...   | ... | 20,00,000 |
| Arariā Sub-division of Pūrniya | ...       | ...   | ... | 3,05,040  |
| Barh                           | ,,        | Patna | ... | 2,47,076  |
| TOTAL,                         |           |       |     | 87,87,614 |

§ 5. This Grammar went to the Printer more than a year and a half ago. When the manuscript was despatched, with the exception of Mr. Beames' notes on the Bhojpūrī dialect there was no other philological work from which I could obtain any help regarding the Bihār dialects. Under the circumstances, I purposely avoided mentioning certain facts which I had noticed, but which, mistrusting my own uncorroborated ear, I thought demanded consideration and reflection before stating. One of these, thanks to Dr. Hærnle's Gauḍian Grammar, has since become one of the commonplaces of Eastern Hindī Grammar. I allude to the existence of the short vowels *ē*, *ō*, *āi*, and *āū*. These vowels have no symbol in the alphabets of Bihār, being represented like their long congeners as follows; ए *e* or *ē*, औ *o* or *ō*, ऐ *ai* or *āi*, औ *au* or *āū*. The fact is, that just as the simple

vowels have each a short and a long form viz: *a* and *á*, *i* and *í* &c, so also the diphthongs have each a short and a long form, viz: *ě* and *e*, *ǒ* and *o*, *ǎi* and *ai* and *ǎu* and *au*. Instances of these short diphthongs will be found in § 167 (note); and as diphthongs are liable to exactly the same rules as regards shortening as the simple vowels, the rules in § 148 apply to them also. Hence, subsequently to § 167, I have marked short diphthongs wherever they occur. Note that the words एहि, this, and ओहि, that, (§§ 85 & 86) are pronounced *ěh'* and *ǒh'*.

The rules as regards shortening of vowels and diphthongs in verbal inflections have been given by me in § 148; but another important rule, first given by Dr Hærnle, for the shortening of vowels and diphthongs in words other than verbs, must be given here. As adapted to this Maithilí Grammar it is as follows:

(1) As regards आ *á*, this vowel is always shortened if it comes in the antepenultimate syllable or earlier in a word. Thus in the word चाउर *cháur*, rice, the *á* is long, because *á* is only in the penultimate syllable; but the longer form (see § 17) is चउरुआ *chaurúá* (or contracted चौरुआ *chaurúá*) in which the *a* is short, as it is in a syllable earlier than the antepenultimate. Again there is रामा *Rámá* a proper name, in which the first *á* is long, but in the vocative it is रमवा *ram'vá*, in which the first *a* is shortened, it being in the antepenultimate syllable.

(2) As regards other vowels and diphthongs they are liable to be shortened in the antepenultimate only if a consonant, which is not euphonic य *ya* or व *va*, follow. If, however, in a syllable earlier than the antepenultimate, they are liable to be shortened no matter whether a consonant or a vowel follow. Thus ओ *o*, this, makes its genitive ओकर *okar*, with a long *o*, but its accusative is ओकरा *ǒk'rá* with a short *ǒ*, as this *ǒ* falls in the antepenultimate and is followed by a consonant. So also the *ě* in नेनिआ (see § 34) *něniá* is short.

In counting syllables for applying this rule, it must be remembered that a final silent consonant (see § 7) must not be counted a syllable, as it is counted in § 148. Thus ओकर *okar* is only two syllables, while ओकरा *ǒk'rá* is three syllables.

There is only one exception to this rule,—it is that the final syllable *ě* of the instrumental case is not considered as part of the word, but as a separate word. Hence we have पानिँ *pániě*, and not पनिँ *paniě* with the *a* short. The word, however, though written *pániě* is pronounced *paniě* with the *a* short.

§ 70. An optional form of the instrumental singular of ई ई, "this", is एँ *ē*. I have not met any corresponding form for ओ *o*, "that".

§ 85. For एहि *ēh'*, एह *ēh* and एह *āh* are sometimes used.

§ 86. Similarly for ओहि *ōh'*, we find ओह *ōh*, and ओह *āh*.

§ 104. NOTE, as to spelling, that verbal forms containing ऐ *ai*, are frequently written with अइ *ai*. Similarly verbal forms in औ *au* are frequently written with अउ *au*. So that देखैत *dēkhait* is sometimes written देखइत *dēkhait*, and देखिऔ *dēkhiau*, sometimes देखिअउ *dēkhiau*.

In poetry ऐ *ai* when final is frequently written अय *ay*: e.g. देखिऐ *dēkhiai* is written sometimes देखिअय *dēkhiai*.

§ 111. I have omitted a common form for "he is", अहि *ah'*. No other forms from this root are, so far as my experience goes, in use.

§ 117. Add present participle अचैत *achhait* "existing"

§ 132. The forms of the prospective conditional may also be used for the imperative, and *vice versa*.

In poetry the prospective conditional is very commonly used as a simple present. When this is the case, the third singular non-honorific may have also the following additional forms, देख *dekh*, देखे *dekhe*, देख *dekh'*, देखै *dekhai* (or देखय *dekhay*), and देखऐ *dēkhaai*. So also in intransitive verbs.

§ 133. 3rd Future Hon.—An optional form for this person is देखथु *dēkhat'h'*, frequently, however, written देखतङ्क *dēkhat'h'*.

§ 167. *Past Tense*.—The use of the diphthongs *ai* and *au* in this tense is regulated by the following rules.

(1) Transitive verbs (including causals) generally take *au*, and so also does गाएव *gāēb*, "to sing". Hence we have in the first person पैलङ्क *paulah'ñ*, "I obtained", गौलङ्क *gaulah'ñ*, "I sang", चढौलङ्क *charhaulah'ñ*, "I caused to ascend". The past participles of these verbs are पाञ्चाल *pāōl*, गाञ्चाल *gāōl*, and चढाञ्चाल *charhāōl*. The principal exception which I have met is the verb खाएव *khāēb*, "to eat", which makes its past tense खैलङ्क *khailah'ñ*, and its past participle खाल *khāōl*: the form खाञ्चाल *khāōl*, I have, however, met, once or twice, though said to be incorrect.

(2) Intransitive verbs as a rule use the diphthong *ai*. Thus अघाएव *aghāēb*, "to be satiated", *past part.* अघाएल *aghāēl*, and its 1st pers. past, अघैलङ्क *aghailah'ñ*, "I was satiated", so also घबड़ाएल *ghab'ráēl*, "confused," आएल *āēl*, "come", and हड़बड़ाएल *har'barāēl*, "agitated", from the intransitive verbs घबड़ाएव *ghab'ráēb*, आएव *āēb*, and हड़बड़ाएव *har'barāēb* respectively.

§ 189-3. The verbal noun (oblique form in ऐ *āi*) of the verbs देव *deb*, to give, and लेव *leb*, to take, inserts an म् *m*, thus, देमै *demāi*, लेमै *lemāi*, *gen.* देमैक *demāik* &c. Verbs whose root ends in इ *i*, insert a व *b* in this form: E.g. पिबै *pibāi* from पिबव *piab*, to drink.

See § 4. APPENDIX N<sup>o</sup>.1.

Table shewing the various alphabets used in Mithila.

| Deva<br>Nāgri. | Kayasthi. | Maithili. | English<br>Transli-<br>-teration. | Deva<br>Nāgri. | Kayasthi. | Maithili. | English<br>Transli-<br>-teration. |
|----------------|-----------|-----------|-----------------------------------|----------------|-----------|-----------|-----------------------------------|
| अ              | शा        | शु        | a                                 | अ              | ॐ         | शु        | n                                 |
| आ              | शा।       | शा        | a                                 | उ              | ॐ।        | शु।       | t                                 |
| इ              | ४         | उ         | i                                 | उ              | ४         | उ         | th                                |
| ई              | ५         | ५         | i                                 | उ              | ५         | उ         | d                                 |
| उ              | ६         | ६         | u                                 | उ              | ६         | उ         | dh                                |
| ऊ              | ७         | ७         | u                                 | आ              | ७         | अ         | n                                 |
| ऋ              |           | ८         | ri                                | न              | ८         | त         | l                                 |
| ॠ              |           | ९         | ri                                | य              | ९         | थ         | th                                |
| ऌ              |           | १०        | lr                                | द              | १०        | द         | d                                 |
| ॡ              | १०        | १०        | e                                 | ध              | १०        | ध         | dh                                |
| ए              | ११        | ११        | ai                                | न              | ११        | न         | n                                 |
| ऐ              | १२        | १२        | o                                 | प              | १२        | प         | p                                 |
| ओ              | १३        | १३        | aw                                | फ              | १३        | फ         | ph                                |
| ऋऌ             | १४        | १४        | ri                                | ब              | १४        | ब         | b                                 |
| ॠॡ             | १५        | १५        | k                                 | भ              | १५        | भ         | bh                                |
| ऌॢ             | १६        | १६        | k                                 | म              | १६        | म         | m                                 |
| ॡॣ             | १७        | १७        | kh                                | प              | १७        | प         | y                                 |
| ऋऌऌ            | १८        | १८        | g                                 | र              | १८        | र         | r                                 |
| ॠॡॢ            | १९        | १९        | gh                                | ल              | १९        | ल         | l                                 |
| ऌॣ             | २०        | २०        | ch                                | व              | २०        | व         | voru                              |
| ॡ।             | २१        | २१        | chk                               | श              | २१        | श         | s                                 |
| ऌ॥             | २२        | २२        | J                                 | स              | २२        | स         | sk                                |
| ॡ०             | २३        | २३        | jh                                | ह              | २३        | ह         | s                                 |
|                |           |           |                                   |                | २४        |           | k                                 |

The semi-vowel ष is not used by Kayasths in writing Maithili, the vowel इ being substituted for it.



*See § 4 APPENDIX N<sup>o</sup>.1.*

*A Sanskrit Sloka written in the three characters  
of Mithilā.*

उद्रस्मास्वात्मीयताविहृमिदमेवास्मदृश्यते . ॥  
दयानुरपियक्त्रुशोनास्मद्दुःखंजिहीषति ॥१॥

अस्मास्वात्मीयतादीहृमीदमेवासीमदीशीमते .  
दयानुरपियक्त्रुशोनास्मद्दुःखंजिहीषति . ॥१॥

*The Kayathī character is not adapted for writing  
Sanskrit. It has no form for short medial i and  
has no semivowel ya.*

अस्मास्वात्मीयताविहृमिदमेवास्मदृश्यते . ॥  
दयानुरपियक्त्रुशोनास्मद्दुःखंजिहीषति . ॥१॥





*Hindi.*

फिर उसने कहा किसी मनुष्यके दो पुत्र थे। उनमेंसे एकने पितासे कहा हे पिता सम्पत्तिमेंसे जो मेरा बंश होय सो मुझे दीजिये, तब उसने उनकी अपनी सम्पत्ति बाँट दिई। बहुत दिन नहीं बीते कि कुछका पुत्र सब शूण एकठा करके दूर देश चला गया और वहाँ लुचपनमें दिन पिताने हुए अपनी सम्पत्ति उड़ा दिई। जय वह सब शूण उठा चुका तब उस देशमें बड़ा भकाल पड़ा और वह कंगाल हो गया। और वह जाके उस देशके निवासियोंसे एकके यहाँ रहने लगा जिसने उसे अपने खेतोंमें सूअर चरानेकी भेजा।

और वह उन कीमियोंसे जिन्हें सूअर खाते थे अपना पेट भरने चाहता था और कीड़े नहीं लसकी कुछ देता था। तब उसे चेत हुआ और उसने कहा मेरे पिताके कितने मजूरोंकी भोजन से अधिक रीटी होती है और मैं भूखसे मरता हूँ। मैं उठके अपने पिता पास जाऊँगा और उस से कहूँगा हे पिता मैंने स्वर्गके विरुद्ध और आप-के सान्ने पाप किया है। मैं फिर आपका पुत्र कहवानेके योग्य नहीं हूँ मुझे अपने मजूरोंमेंसे एकके समान कीजिये। तब वह उठके अपने पिता पास चला पर वह दूरही था कि उसके पिताने उसे देखके दया किई और दौड़के उसके गलेमें लिपटके उसे चूमा। पुत्र ने

उससे कहा हे पिता मैंने स्वर्गके विरुद्ध और आपके सान्ने पाप किया है और फिर आपका पुत्र कहवानेके योग्य नहीं हूँ। परन्तु पिताने अपने दासोंसे कहा सबसे उत्तम बस्त्र निकालके उसे पहनाओ और उसके हाथमें अंगूठी और पाँवोंमें जूते पहनाओ। और मीठा बखडू लाके सारो और हम खावें और आनन्द करें। क्योंकि यह सेरा पुत्र सूआ था फिर जीआ है खी गया था फिर मिला है, तब वे आनन्द करने लगे। उसका जेठा पुत्र खेतमें

था और जब वह आते हुए घरके निकट पहुँचा तब राजा और नाचका शब्द सुना। और उसने अपने संबन्धियोंसे एककी अपने पास बुलाके पूछा यह क्या है। उसने उससे कहा आपका भाई आया है और आपके पिताने मीठा बखडू सारा है इसलिये कि उसे भला चंगा पाया है। परन्तु उसने कीध किआ और भीतर जानि न चाहा इसलिये उसका पिता बाहर आ उसे मनाने लगा। उसने

पिताकी उत्तर दिआ कि देखिये मैं इतने बरसोंसे आपकी सेवा करता हूँ और कभी आपकी आज्ञाकी उल्लंघन न किआ और आपने मुझे कभी एक मेला भी न दिया कि मैं अपने मित्रोंके संग आनन्द करता। परन्तु

आपका यह पुत्र जो वेश्याओंके संग आपकी सम्पत्ति खा गया है ज्योंही आया योंही आपने उसके लिये मीठा बखडू सारा है। पिताने उससे कहा हे पुत्र तू सदा मेरे संग है और जो कुछ मेरा है सो सब तेरा है। परन्तु आनन्द करना और हर्षित होना उचित था क्योंकि यह तेरा भाई सूआ था फिर जीआ है खी गया था फिर मिला है।

*Maithili.*

फिर ओ कहलथीन्हि कीनो मनुष्य के दुइ बेटा रहैन्हि। ओहिमेंसे छोटका बापसँ कहलक ओ बाबू सम्पत्तिमेंसे जे हमर भाग होी से हमरा दिअ। तखन ओ हुनका अपन सम्पत्ति बाँटि देलथीन्हि। बहुत दिन नहिँ धितल की छोटका बेटा मभकिहु एकठा के कहूँ दूर देश चललैल आओर ओते लुचपनोमें दिन धितवैत अपन सम्पत्ति उड़ा देलक। जखन ओ सब किहु उड़ा चुकल तखन ओहि देशमें बहुत भकाल पड़लैक आओर ओ दुखित भैगेल। आओर ओ जाके ओहि देशके निवासी सबमेंसँ एक गोठा कौते रहैलागल जे ओकरा अपना खेतसभमें मगर चरावै निमित्त पठीलके।

आओर ओ ओहि कीमड़ि सभसँ जे मगर खाइत छलै अपन पेट भरै चाहैत छल आओर केओ नहिँ ओकरा किहु देखलै। तखन ओकरा चैतय भेलै आओर कहलक हमरा बापक कतेक बनिहार सभकेँ खाएक सँ अधिक रीटी होइहै आओर हम भूखसँ मरेछी। हम उपटिके अपना बापक लग जाएब आओर हुनका सँ कहवैन्हि ओ बाबू हम स्वर्गक विरुद्ध आओर अपनेक अथक पाप कौल अछि। हम फेरि अपनेक बेटा कहवैक योग्य नहिँ होी हमरा अपन बनिहार सबहिमेंसँ एकक बराबर कौलजाओ। तखन ओ उपटिके अपना बापक समीप चलल परन्तु ओ फराकहिँ छल की ओकर बाप ओकरा देखिके दया कौलथीन्हि आओर दौड़के ओकरा गरामें लपटिके ओकरा चुम्बा लैलथीन्हि। बेटा

हुनका कहलथीन्हि ओ बाबू हम स्वर्गक विरुद्ध आओर अपनेक अथक पाप कौल अछि आओर फेरि अपनेक पुत्र कहवैक योग्य नहिँ होी। परन्तु बाप अपना बहिआ सभसँ कहलन्हि जे सभसँ उत्तम बस्त्र बहारके हिनका पहिरावह आओर हिनका हाथमें अंगूठी आओर पाएमें पनही पहिरावह। आओर मीठ वाका आनि मारह आओर हम खाई आओर आनन्द करी। किएफ तँ ई हमर बेटा सुइल छल फेरि जीउल अछि हेइएल छल फेरि भेटल अछि, तखन ओ लोकानि आनन्द करै लगलाह। ओकर जेठ बेटा खेतमें

छलै आओर जखन ओ अवैत अवैत घरक समीप पहुचल तखन राजा आओर नाचक शब्द सुनलक। आओर अपना सेवक सबहिमेंसँ एकके अपना लग वजाके पुछलकेक ई की थिके। ओ हुनका सँ कहलकैन्हि अपनेक भाए आएल अछि आओर अपनेक बाप मीठ वाका मारलन्हि अछि ऐ हेतु की हुनका बेश निरीग पाओर अछि। परन्तु ओ क्राध कौलन्हि आओर भितरौ जैवाक इच्छा नहिँ कौलन्हि ऐ हेतु हुनक बाप बाहर आवि हुनका मनावै लगलाह। ओ

बापकेँ उत्तर देलन्हि की देखू हम एतेक बरष सँ अपनेक सेवा करैछी आओर कहिओ अपनेक आज्ञाकेर उल्लंघन नहिँ कौल आओर अपने हमरा कहिओ पाठिओ नहिँ देल की हम अपना मिल सभक संग आनन्द करितइँ। परन्तु

अपनेक ई बेटा जे वेश्या सबहिक संग अपनेक सम्पत्ति खाए गेल अछि जेहिँ आएल तेहिँ अपने ओकरा निमित्त मीठ वाका मारल अछि। बाप हुनका कहलथीन्हि हे बालक तौह सदा हमरा संग छह आओर जे-किहु हमर अछि से तोहर थिक। परन्तु आनन्द करव हर्षित हैब उचित छल किएक तँ ई तीहर भाई सुइल छल फेरि जीउल अछि हेइए गेल छल फेरि भेटल अछि।

*Bangali.*

तिनि आरओ कइमिन, एक व्यक्तिर दुइ पुत्र छिल; ताहादिर मध्ये कनिष्ठ पुत्र पिताके कहिल, हे पित, सब्ध पितर

ये अंग्य आमि पाइय, ताहा देखी; ताहाते पिता ताहादिर जन्मे निज सम्पत्ति विभाग करिल। अल्प दिन परे सेइ कनिष्ठ पुत्र समस्त धन एकत्र करिया लइया दूरदेशे प्रस्थान करिल; आर तथाय नछेर मत आचरण करल

निज सम्पत्ति उड़ाइआ दिल। ताहार सकलदुख्य हइले पर सेइ देशे प्रवल दुर्मित्र हइल, ताहाते से कष्ट पाइते लागिल। तखन से जाइया तद-देशीय कीन पीरर अनुजीवी हइल;

से ताहाके गृकरपाल चराइते आपन तालुके पाटाइआ दिल;

तथाय से गृकरेर खाद्य गुठीहारा उदर पूर्ण करिते आकांक्षा करित, किन्तु केइ ताहाके दित ना। अग्रश्रेणि से मने मने चेतना पाइया कहिल, आमार पितार कत बेतनयाहो दास खाओर बाहुल्य पाइतेहै किन्तु आमि एस्थाने सुधाय मरितेहै। आमि उठिया आपन पितार निकटे गिया यलब, हे पित, खगैर विरुडे एवं तीमार साचते आमि पाप करियाछि, तीमार पुत्र बलिया विख्यात हइवार जीग्य आर नहि, तीमार बेतनयाहो दासिर मत आमाके राख। परे से उठिया आपन पितार निकटे गमन करिल; ताहाते दूरे थाकिते ताहार पिता ताहाके देखिते पाइया करुणाविष्ट हइल, एवं दौड़िया गिया ताहार गला धरिया ताहाके चुम्बन करिल। तखन पुत्र

ताहाके कहिल, हे पित, खगैर विरुडे ओ तीमार साचते आमि पाप करियाछि, तीमार पुत्र बलिया विख्यात हइवार जीग्य आर नहि। किन्तु ताहार पित

दासदियके आज्ञा दिल, सर्वोत्तम परिच्छेद आनिया इहके पराओ, एवं इहार हसे अंगुरीय ओ पावे पादुका देखी। आर हष्ट पुष्ट बाकुट्टी आनिया मार; आमरा भीजन करिआ आमीद प्रमीद करि। जेहेतुक आमार एइ पुत्र मृत हइया पुनर्जीवित हइल, एवं हाराण हइया पुनर्लब्ध हइल। ताहाते ताहारा आमीद प्रमीद करिते लागिल। तत्काले ताहार व्यष्ट पुत्र चैव

छिल, परे आसिते आसिते वाटीर निकटे उपस्थित हइया बाब ओ वृत्तेर शब्द युनिते पाइया दासदेर एक जनके डकिया जिज्ञासा करिल, इहार भाव कि? से ताहाके बलिब, तीमार भाता आसियाछे, एवं तीमार पिता ताहाके सुख्य शरीरे प्राप्त होवाते हष्ट पुष्ट बाकुट्टी मारियाछे। ताहाते से क्रुद्ध हइया भितरै जाइते असमत्त हइल; तखन ताहार पिता बाहिरै आसिया ताहाके साध्यसाधना करिते लागिल।

किन्तु से पिताने उत्तर करिल, देख, एत बत्सरावधि आमि तीमार दास आछि, कखनी तीमार आज्ञा लंघन करि नाइ, तथापि आमि जेन निज मित्रगणेर सहित आमीद प्रमीद करि पारि,

एइ जन्मे एक बारओ एकटौ क्वागवत्स आमाके दिओ नाइ, किन्तु

तीमार ऐ जे पुत्र वेश्यादेर संगे तीमार सम्पत्ति खाइया फेलियाछि, से आसिबामात्र ताहारइ निमित्तने हष्ट पुष्ट बाकुट्टी मारिला। तखन पिता कहिल, बत्स, तुमि सतत आमार संगे आछ, आर आमार सर्वस्वइ तीमार। किन्तु आमादेर आमीद प्रमीद करा ओ आहादिल होवा उचित नटे,

कारण तीमार ऐ भाता मृत हइया पुनर्जीवित हइल, एवं हाराण हइया पुनर्लब्ध हइल।

## E R R A T A.

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In spite of great care, the following errors of the press, which are owing to the difficulty experienced by the printer in printing an entirely foreign language, have been detected. The necessary corrections should be made, as some are important. They are printed on one side only of the paper so that each correction can be cut out and pasted in the proper place in the body of the work.

|                                     | FOR                       | READ.                                                               |
|-------------------------------------|---------------------------|---------------------------------------------------------------------|
| P. 5 L. 2 from bottom               | Bengálí                   | Bangálí.                                                            |
| „ 7 „ 3 from top                    | ई                         | ईं                                                                  |
| „ 16 „ 3 from bottom                | ह्रा                      | ह्रै                                                                |
| „ „ Foot Note                       | Usualy                    | Usually                                                             |
| „ 20 The last three lines should be |                           |                                                                     |
| S. चिरंजीविन् <i>chirañjivin</i>    | } long-<br>lived. }       | चिरंजीविनी <i>chirañjibiní.</i>                                     |
| M. चिरंजीबी <i>chirañjibí</i>       |                           | चिरंजीबिन <i>chirañjibin'.</i>                                      |
| or चिरंजिब <i>chirañjib</i>         |                           | or चिरंजीबि <i>chirañjib'.</i>                                      |
| P. 21 L. 2 from bottom              | <i>mána</i>               | <i>mányá</i>                                                        |
| „ 22 „ 2 from top                   | ( <i>suddh</i> )          | ( <i>s'uddh</i> )                                                   |
| „ 23 „ 5 „                          | which is                  | which is not                                                        |
| „ 24 „ 19 „                         | तौंइ                      | तौंह                                                                |
| „ „ „ 23 „                          | गुरुष                     | गुरुष                                                               |
| „ 27 Foot Note                      | तौंह                      | तौंह                                                                |
| „ 32 1                              | लीकनि                     | लोकनि                                                               |
| „ 36 4 from bottom                  | <i>janika</i>             | <i>janiká</i>                                                       |
| „ 43 11 from top                    | <i>saah</i>               | <i>sabh</i>                                                         |
| „ „ 6 from bottom                   | <i>kí</i> ? what,         | <i>kí</i> , what ?                                                  |
| „ „ Last line                       | and की <i>kí</i> , what ? | की <i>kí</i> , what ? and केओ<br><i>keo</i> , any one, some<br>one. |



P. 44 L. 5 from top omit **केओ keo**, any one, some one, becomes **कोनो kono**.

„ „ „ 9 after “**कोन kon**” insert “and **केओ keo**, any one, some one, under similar circumstances always becomes **कोनो kono**.”

|                      | FOR           | READ.       |
|----------------------|---------------|-------------|
| „ 45 „ 5 from top    | <i>lotá</i>   | <i>lotá</i> |
| „ „ „ 16 „           | <i>amot</i>   | <i>amot</i> |
| „ 46 „ 2 from bottom | Likenses      | Likeness.   |
| „ „ „ „              | like what     | like what ? |
| „ „ „ „              | like the same | like that.  |
| „ „ Last line        | how much      | how much ?  |

Numerals. pp. 47—49.

|            |           |
|------------|-----------|
| २० वीस     | २० बीस    |
| २४ चौबीस   | २४ चौबीस  |
| २६ ष्ठीस   | २६ ष्ठीस  |
| ६४ चौँसठि  | ६४ चौँसठि |
| ६५ पौँसठि  | ६५ पैँसठि |
| ६५ पँचानवे | पँचानवे   |
| ६८ अँठानवे | अँठानवे   |

|                           |                        |                                                     |
|---------------------------|------------------------|-----------------------------------------------------|
| P. 50 L. 15 & 16 from top | section                | chapter                                             |
| „ „ „ 6 from bottom       | it has                 | the verb has                                        |
| „ 52 „ 11 from top        | अव                     | अव                                                  |
| „ „ „ 12 „                | ऐत <i>ait</i>          | ○ ऐत <i>-ait</i>                                    |
| „ „ „ 14 „                | ○ अल <i>al</i>         | ○ अल <i>-al</i>                                     |
| „ 53 „ 9 „                | CHAPTER VIII.          | <i>omit.</i>                                        |
| „ 54 „ 4 „                | <i>chah</i>            | <i>chhah</i>                                        |
| „ „ „ 6 from bottom       | ओ                      | ओ                                                   |
| „ 55 „ 3 from top         | कैन्हि                 | कैन्हि                                              |
| „ „ „ 8 from bottom       | थिकैँ <i>thikaiñ</i>   | थिकैँ <i>thikai</i>                                 |
| „ 62 „ 2 & 1 from bottom  | देखहिँ <i>dekhāh'ñ</i> | देखहिँ <i>dekhah'ñ</i> or<br>देखहिँ <i>dekhāh'ñ</i> |



|                           | FOR                                                    | READ.                         |
|---------------------------|--------------------------------------------------------|-------------------------------|
| P. 63 L. 6 from bottom    | देखितंहुं                                              | देखितंङ्                      |
| „ 66 „ 4 from top         | देखितं                                                 | देखिते                        |
| „ 70 „ 18 „               | <i>dehal'kai</i>                                       | <i>dekhāl'kai</i>             |
| „ 72 „ 3 from bottom      | देखखयीन्हि                                             | देखलयीन्हि                    |
| „ „ „ „ „                 | <i>dekhāl'thūik'</i>                                   | <i>dekhāl'thīnk'</i>          |
| „ 77 „ 2 from top         | देखल                                                   | देखल                          |
| „ 85 „ 1 „                | <i>sut liaik</i>                                       | <i>sut'liaik</i>              |
| „ 89 „ 4 from bottom      | एँ                                                     | ० एँ                          |
| „ 92 2nd line of footnote | 2. Fut.                                                | 1. Fut.                       |
| „ „ „ 8 from top          | or पाएल <i>pāēl</i> ,                                  | <i>omit, but see addenda.</i> |
| „ 95 „ 10 „               | <i>euphonic</i>                                        | <i>omit.</i>                  |
| „ 99 „ 5 „                | हीस्तङ्                                                | होस्तङ्                       |
| „ 100 „ 10 from bottom    | <i>bājāēb</i>                                          | <i>bajāēb</i>                 |
| „ 101 „ 4 „               | <i>after chhorab, insert</i> or छाड़ब <i>chhārab</i>   |                               |
| „ „ „ 1 „                 | <i>after arāēb insert, or</i> आड़ब <i>ārāb</i>         |                               |
| „ 107 „ 1 „               | <i>after jāēb insert or</i> लेले जाएब <i>lelē jāēb</i> |                               |
| „ 109 „ 3 from top for    | ओतय <i>read</i>                                        | ओतय                           |
| „ „ „ 6 „                 | ओहि „                                                  | ओहि                           |
| „ 110 „ 15 „              | ओहन „                                                  | ओहन                           |



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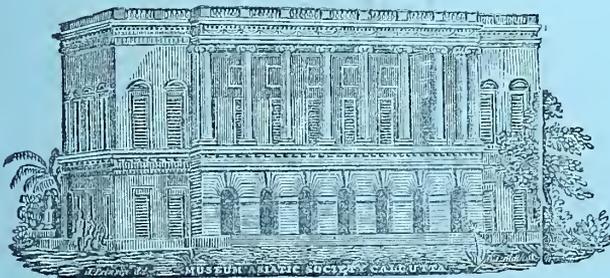
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The bounds of its investigation will be the geographical limits of Asia : and within these limits its inquiries will be extended to whatever is performed by man or produced by nature."—SIR WILLIAM JONES.

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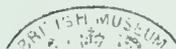
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## INTRODUCTION.

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1. The Balochí language belongs to the Iranian branch of the Aryan family. It is found in two distinct forms; the Northern dialect which is here treated of, and the Southern or Makráni dialect which has been lately dealt with in Major Mockler's Grammar. The Northern dialect is spoken among the Rind Baloches living in the neighbourhood of the Bolán Pass in Kachi, and on the Upper Sindh and South Panjáb frontiers. The tribes speaking this dialect are the Rinds, Dombkís, Maghasís, Jakránís, Marrís, Bugtís, Mazárís, Drishaks, Gorchánís, Lashárís, Durkánís, Leghárís, Hadyánís, Lunds, Khosas, Bozdárs, and Kaisaránís. These tribes come into contact with populations speaking Sindhí, Panjábí, Brahói, and Pashto. The Indian languages, Sindhí and Panjábí, have affected the Balochí Vocabulary considerably, Pashto very slightly if at all, while Brahói has probably borrowed considerably from Balochí. The Brahóis commonly understand Balochí, and it is the commonest medium of communication between them and the Balochí speaking tribes. The best Baloch is probably spoken among the Dombkís and Bugtís, the most corrupt perhaps among the Bozdárs. But the differences in dialect between one tribe and another are very slight, while between the Northern and Southern dialects the difference is so great that the one is almost unintelligible to the tribes speaking the other. The Sarawán and Jahlawán tribes of Brahóis occupy a broad belt of country dividing one dialect from the other.

2. This dialect was first dealt with by Leech in the Journal of the Bengal Asiatic Society for 1840. His sketeh was commented on by Lassen in the "Zeitschrift für die Kunde des Morgenlandes" for 1841. Leech gives a small Vocabulary. Gladstone's Bilúchí Manual (Lahore, 1873) and Bruee's Manual (Lahore, 1869) both include Vocabularies, but no attempt has hitherto been made to compile a full or systematical vocabulary. There is a scanty vocabulary of Southern Balochí in Masson's travels, but this dialect is fully dealt with by Major Mockler, and a vocabulary is also promised. The difference between the dialects is so

great however that Major Mockler's works are of small value to the student of Northern Balochí, which is of most importance politically speaking. Partly to supply this want, and partly as a contribution to the study of an interesting group of languages, I have compiled this vocabulary, for which I have been collecting words for four years on the Southern Deráját Frontier, and in the Sulaiman Hills, and for a short time in Sibi and Kachí.

3. Balochí is as regards vocabulary a mixed language. The original old Persian stock has formed the nucleus round which the alien elements have gathered. The principal borrowings have been from Sindhí or the South Panjábí dialect which is nearly akin to it. Correspondences are pointed out in the vocabulary, Indian words being generally marked as Sindhí, as that is the source from which they are immediately derived. But by pointing out the correspondence I do not mean to assert that in every case Balochí has borrowed from Sindhí. Sometimes Sindhí may be the borrowing language, and in many cases both languages are indebted to modern Persian or Arabic. Though the numerical proportion of Sindhí words as shown in the vocabulary may seem very large it is not so in actual practice, as many of these words are of rare occurrence, and others only locally used. Nearly all the words in commonest use, especially the verbs, are pure Balochí.

4. I prefix an outline of the grammar of Balochí. Lassen has already treated of the sounds, but the materials furnished him by Leech were too imperfect, and too full of misprints to be a safe foundation to build on in every case. Although, however, he was led astray in individual cases, the true character of the language did not escape him, and the remarks that follow are based on his.

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# BALUCHI GRAMMAR.

TABLE OF BALUCHI SOUNDS.

|              | SURD.   |           |          | SONANT.    |           |           | Nasal. | Sibilant.          | Semi-vowels.     | Aspirate. |
|--------------|---------|-----------|----------|------------|-----------|-----------|--------|--------------------|------------------|-----------|
|              | Mute.   | Aspirate. |          | Mute.      | Aspirate. |           |        |                    |                  |           |
| Guttural ... | ڪ<br>k  | ڪھ<br>kh  | ڪھ<br>kh | گ<br>g     | گھ<br>gh  | گھ<br>gh  | ن<br>n | ...                | ...              | ح<br>h    |
| Palatal ...  | چ<br>ch | چھ<br>chh | ...      | ج<br>j     | جھ<br>jh  | ...       | ...    | ش<br>sh<br>ز<br>zh | ي<br>y           | ...       |
| Cerebral ... | ٺ<br>t  | ٺھ<br>th  | ...      | ڍ ڙ<br>d r | ڍ<br>dh   | ...       | ...    | ...                | ...              | ...       |
| Dental ...   | ٺ<br>t  | ٺھ<br>th  | ٺ<br>t   | ڍ<br>d     | ڍھ<br>dh  | ڍ<br>dh   | ن<br>n | س<br>s<br>ز<br>z   | ل<br>l<br>ر<br>r | ...       |
| Labial ...   | پ<br>p  | پھ<br>ph  | ف<br>f   | ب<br>b     | بھ<br>bh  | و<br>v, w | م<br>m | ...                | ...              | ...       |

## THE ALPHABET.

Balochí can hardly be called a written language. It is only within the last few years that Balochís have begun to write it, Persian being the ordinary medium of written communication and the Balochís considering their language to be merely a colloquial form of Persian. In writing, uniformity of spelling is little attended to. As the Persian character is the only one current in the countries where Balochí is spoken, I have employed it in the Vocabulary, giving a transliteration of all words in the Roman character. Short vowels are not marked in the Persian character, as the transliteration renders it unnecessary. The Arabic letters ث and ذ are retained to represent certain Balochí sounds corresponding, or nearly so, with their Arabic values, the representation of these sounds by س and ز being insufficient and misleading. The other Arabic letters ط, ص, ح, ع, and ق are omitted as unnecessary having no distinct value in Balochí. In the borrowed Arabic words phonetic correctness is all that is aimed at. Aspirates are represented by هه or *h* following the aspirated consonant. The cerebrals are marked as in Urdú.

*The Persian Alphabet as applied to Balochí.*

| Persian. | Roman.       | Value.                                                                                                                                                                                                                                                                                                     |
|----------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ا        | a, i, u, á,  | As in Persian, an initial introducing all vowels.                                                                                                                                                                                                                                                          |
|          | e, ai, o, au | With the short vowel marks $\overset{1}{\text{—}}$ $\overset{2}{\text{—}}$ $\overset{3}{\text{—}}$ it forms a, i, u. With <i>madda</i> $\overset{4}{\text{ا}}$ it forms á. With $\text{ي}$ following it forms í, e, ai. With $\text{و}$ following it forms ú, o, au. As a medial and final it is always á. |
| ب        | b            | As in English and Persian.                                                                                                                                                                                                                                                                                 |
| بھ       | bh           | Aspirated <i>b</i> .                                                                                                                                                                                                                                                                                       |
| پ        | p            | As in Persian and English.                                                                                                                                                                                                                                                                                 |
| پھ       | ph           | Aspirated <i>p</i> .                                                                                                                                                                                                                                                                                       |
| ت        | t            | Dental <i>t</i> as in Persian.                                                                                                                                                                                                                                                                             |
| تھ       | th           | Aspirated <i>t</i> .                                                                                                                                                                                                                                                                                       |
| تھ       | th           | As in Arabic, English <i>th</i> in <i>breath</i> , <i>health</i> .                                                                                                                                                                                                                                         |
| تھ       | t̤           | Cerebral <i>t̤</i> pronounced as in Hindústání.                                                                                                                                                                                                                                                            |
| تھ       | t̤h          | Aspirated <i>t̤</i> .                                                                                                                                                                                                                                                                                      |
| ج        | j            | <i>J</i> as in English.                                                                                                                                                                                                                                                                                    |
| جھ       | jh           | Aspirated <i>j</i> .                                                                                                                                                                                                                                                                                       |
| چ        | ch           | As in English <i>church</i> .                                                                                                                                                                                                                                                                              |

| Persian. | Roman. | Value.                                                                                                                         |
|----------|--------|--------------------------------------------------------------------------------------------------------------------------------|
| چھ       | chh    | Aspirated <i>ch</i> .                                                                                                          |
| خ        | kh     | An aspirate guttural as in Persian, pronounced without harshness as in Pashto.                                                 |
| د        | d      | Dental <i>d</i> as in Persian.                                                                                                 |
| دھ       | dh     | Aspirated <i>d</i> .                                                                                                           |
| ذ        | ḏ      | Cerebral <i>ḏ</i> as in Hindústání.                                                                                            |
| ذھ       | ḏh     | Aspirated <i>ḏ</i> .                                                                                                           |
| ذ        | dh     | As in Arabic, or English <i>th</i> in <i>brother, breathe</i> .                                                                |
| ر        | r      | A clearly trilled <i>r</i> , as in Persian.                                                                                    |
| ر        | ṛ      | Cerebral <i>ṛ</i> as in Hindústání, and like it nearly connected in sound with <i>ḏ ḏ</i> .                                    |
| ز        | z      | As English <i>z</i> .                                                                                                          |
| ژ        | zh     | As in Persian, or <i>s</i> in English <i>measure</i> .                                                                         |
| س        | s      | As in Persian. English <i>s</i> .                                                                                              |
| ش        | sh     | As in Persian, the palatal sibilant. English <i>sh</i> .                                                                       |
| غ        | gh     | As in Persian. A slightly pronounced guttural, not so harsh as in Arabic or Pashto.                                            |
| ف        | f      | A pure labial <i>f</i> , not partly dental as English <i>f</i> .                                                               |
| ک        | k      | As English <i>k</i> without any palatalization as in Persian.                                                                  |
| گ        | g      | <i>G</i> hard as in English and Persian without palatalization.                                                                |
| م        | m      | As English <i>m</i> .                                                                                                          |
| ن        | n      | As English <i>n</i> . Also as a slightly pronounced guttural nasal, as in the final <i>n</i> of Persian or Hindústání plurals. |
| و        | w, v   | Either as English <i>w</i> or as a purely labial <i>v</i> , not as English <i>v</i> .                                          |
| ه        | h      | As English <i>h</i> . Occasionally mute as a final. When so mute it is not represented in transliterations.                    |
| ی        | y      | As English <i>y</i> . Sometimes pronounced with a slight tendency to become <i>zh</i> .                                        |

## BALOCHI SOUNDS.\*

## 1.—CONSONANTS.

ك k corresponds with Persian k, which however more usually appears in Balochi as كھ kh or كھ kh.

كھ kh as an initial represents Persian ك k or كھ kh; e. g.,

|                   |                  |
|-------------------|------------------|
| Balochi khush-agh | Persian kush-tan |
| B. khar           | P. khar          |
| B. khan-agh       | P. kun           |

As a final it sometimes represents گ g; e. g.,

|           |         |
|-----------|---------|
| B. gwánkh | P. báng |
| B. gurkh  | P. gurg |

خ kh seldom occurs initially, its place being taken by kh. As a final it corresponds with Persian k or g; e. g.,

|          |         |
|----------|---------|
| B. hákh  | P. khák |
| B. rehkh | P. reg  |

گ g corresponds either with Persian g or b. As an initial gw answers to b (original v); e. g.,

|             |           |
|-------------|-----------|
| B. gandím   | P. gandum |
| B. gíst     | P. bíst   |
| B. gwátth   | P. bád    |
| B. gwaf-agh | P. báftan |
| B. geth     | P. bed    |

گھ gh does not seem to occur in true Balochi words, but to be confined to words of Indian origin.

غ gh hardly ever appears as an initial. As a medial it corresponds with Persian g and h; as a final usually with h (whether pronounced or mute in modern Persian, also occasionally with g; e. g.,

|            |          |
|------------|----------|
| B. jaghar  | P. jigar |
| B. nigháh  | P. nigáh |
| B. dighár  | P. díbár |
| B. jíggh   | P. zih   |
| B. roshagh | P. rozah |
| B. ragh    | P. rag   |

In the words saghar 'head,' P. sar, and naghan 'bread,' P. nán, the gh has no consonant corresponding to it in the Persian.

\* These explanations follow the order of sounds in the Table, p. 3.

The *gh* appears to be inherent in past particples, answering to the final *h* of the Persian, but it is not heard except in eompound forms when followed by a vowel. Thus *khutka*, p. p. of *khanagħ* means 'done,' but *khutka-gh-ant* 'they have done.'

و *n* frequently occurs as a final, in the place of *n* or *nt*; e. g.,  
*khanagħen* — *khanagħant*.

Occasionally owing to a nasal style of pronuneiation, *nw* stands for *m*, and *n* is interpolated as a final; e. g.,  
*nyánwán* — *nyámá*

چ *ch* generally corresponds with the same letter in Persian.

چھ *chh* also represents Persian *ch*; e.g.,

|                  |                  |
|------------------|------------------|
| B. <i>ehhátħ</i> | P. <i>cháħ</i>   |
| B. <i>ehham</i>  | P. <i>ehashm</i> |

ج *j* corresponds either with original Persian *j* or *z*; e.g.,

|                 |                 |
|-----------------|-----------------|
| B. <i>jihán</i> | P. <i>jahán</i> |
| B. <i>jan</i>   | P. <i>zan</i>   |
| B. <i>jígħ</i>  | P. <i>zih</i>   |

چھج *jh* is only found in words of Indian origin.

The cerebral consonants are found almost entirely in words of Indian origin. Before a dental, *r* is occasionally pronounced *ṛ*, as *maṛd* for *mard*, *garṭha* for *gartha*; but this is not universal and has not been marked in the Vocabulary. Leech represents this by *d*, but I have never heard it so pronounced.

ت *t* represents an original *t*, which however more usually becomes *th*.

تھ *th* as an initial commonly represents an original *t*. As a final, and after a consonant medially, it often corresponds with Persian *d*; e.g.,

|                    |                  |
|--------------------|------------------|
| B. <i>tháħħtha</i> | P. <i>táħħta</i> |
| B. <i>thafar</i>   | P. <i>tabar</i>  |
| B. <i>árth</i>     | P. <i>árad</i>   |
| B. <i>khanth</i>   | P. <i>kunad</i>  |
| B. <i>burtha</i>   | P. <i>burda</i>  |

ث *th* (pronounced as in Arabie, like English *th* in *nothing*, *heath*), does not occur initially. As a medial and final it corresponds with Persian *d*. As a final it does not occur, unless preceded by a vowel; e. g.,

|                   |                   |
|-------------------|-------------------|
| B. <i>bráth</i>   | P. <i>birádar</i> |
| B. <i>gwátħ</i>   | P. <i>bád</i>     |
| B. <i>roth</i>    | P. <i>rúda</i>    |
| B. <i>roth</i>    | P. <i>ravad</i>   |
| B. <i>síth</i>    | P. <i>súd</i>     |
| B. <i>rasiłħa</i> | P. <i>rasúda</i>  |

د d corresponds with Persian d as an initial and occasionally after a consonant ; e.g.,

|             |               |
|-------------|---------------|
| B. dem      | P. adim       |
| B. khandagh | P. khand-údan |

دھ dh only occurs in words of Indian origin.

ذ dh (pronounced like English th in *mother*, *breathe*) never occurs initially. As a final and medial it corresponds with Persian d ; e. g.,

|           |          |
|-----------|----------|
| B. dídhar | P. dídár |
| B. sadh   | P. sad   |
| B. rodh   | P. rod   |

In some verbs dh as a characteristic represents a consonant which is lost in modern Persian ; e. g.,

|                          |                               |
|--------------------------|-------------------------------|
| B. rudh-agh, p.p. rustha | P. rustan, Imp. rú            |
| B. nyádth-agh            | P. nihádan, nih.              |
| B. shodth-agh            | P. shustan, shú, p.p. shustha |

In *malhakh* 'loest' dh corresponds with l in Persian *malakh*.

In *kághadh* کاغذ the Persian spelling is preserved, though ذ is pronounced dh not z.

In *nadhra* it represents Arabic ظ in نظر.

ن n corresponds with Persian n.

پ p corresponds with Persian p, also with f before a consonant ; e. g.,

|            |          |
|------------|----------|
| B. hapt    | P. haft  |
| B. gwaptha | P. báfta |

پھ ph as an initial represents Persian p and f ; e. g.,

|           |            |
|-----------|------------|
| B. phaneh | P. panj    |
| B. phusht | P. pusht   |
| B. phur   | P. pur     |
| B. phráh  | P. farákhl |

ف f seldom occurs initially, its place being taken by ph. As a medial and final it commonly represents Persian b ; e. g.,

|           |          |
|-----------|----------|
| B. thafar | P. tabar |
| B. shaf   | P. shab  |
| B. áf     | P. áb    |

ب b corresponds with Persian b as an initial and when not preceded by a vowel.

بھ bh is found only in words of Indian origin.

و w, v, has two sounds. The most usual is that of English w, which it receives generally when followed by a vowel, and the other that of a

labial v (bh in Ellis's palæotype), which it receives when followed by a consonant or as a final, and in borrowed words of Sindhí origin. With both pronunciations it often corresponds with Persian b; e. g.,

|          |                 |
|----------|-----------------|
| B. zawán | P. zabán        |
| B. warná | P. barná        |
| B. savz  | P. sabz         |
| B. wháv  | P. <i>khwáb</i> |

Combined with h, w is pronounced like English wh in *which*; wh and w alone often correspond with Persian *khw* خو or *kh* followed by a labial vowel (u, ú, o). The guttural is either preserved in the aspirate *kh* or more frequently lost altogether (see h); e. g.,

|            |                     |
|------------|---------------------|
| B. whán    | P. <i>khwán</i>     |
| B. whár    | P. <i>khwár</i>     |
| B. wash    | P. <i>khush</i>     |
| B. wán-agh | P. <i>khwán-dan</i> |
| B. war-agh | P. <i>khur-dan</i>  |

م m corresponds with Persian m.

س s corresponds with Persian s.

ش sh as an initial corresponds with Persian sh. As a final and medial it corresponds either with sh or z; e. g.,

|           |          |
|-----------|----------|
| B. shaf   | P. shab  |
| B. ash    | P. az    |
| B. namásh | P. namáz |
| B. seshin | P. sozan |
| B. rosh   | P. roz   |

Sher 'below' seems to correspond with Persian zer, but there is no other case of initial sh corresponding with z. Sher may be a contraction of ash-cr 'from below.'

ز z corresponds either with Persian s or z; e. g.,

|          |          |
|----------|----------|
| B. zuwár | P. suwár |
|----------|----------|

In the following words z corresponds with Persian d; *viz.*,

|            |              |
|------------|--------------|
| B. zí      | P. dí roz    |
| A. zán-agh | P. dán-istan |
| B. zámáth  | P. dámád     |

In zí 'yesterday,' mazáin 'great,' zánagh 'know,' and zirde, a poetical word meaning 'heart,' the original Zend z is preserved. In zámáth z represents an original j.

In *zik* and *zarágh* *z* corresponds with the *j* of *Sindhí jik* and *jaru*, but these words may have been borrowed by *Sindhí*. Cf. *Pashto zik*.

ژ *zh* corresponds with *Persian sh, z* and *j*; e. g.,

|                   |                   |
|-------------------|-------------------|
| B. <i>duzhman</i> | P. <i>dushman</i> |
| B. <i>azhmán</i>  | P. <i>ásmán</i>   |
| B. <i>drázh</i>   | P. <i>daráz</i>   |
| B. <i>wázhá</i>   | P. <i>khwájá</i>  |

ي *y*, و *w*, and ل *l* correspond with the same letters in *Persian*.

ه *h* generally represents an old *Persian h*, modern *Persian h* or *kh*; e. g.,

|                 |                  |
|-----------------|------------------|
| B. <i>hushk</i> | P. <i>khushk</i> |
| B. <i>hon</i>   | P. <i>khun</i>   |
| B. <i>hík</i>   | P. <i>khák</i>   |
| B. <i>phráh</i> | P. <i>farák</i>  |

Borrowed *Arabic* words beginning with ح undergo a similar change, as:—

|                 |                  |
|-----------------|------------------|
| B. <i>hair</i>  | A. <i>khair</i>  |
| B. <i>hatar</i> | A. <i>khatar</i> |

The above noted correspondences may be tabulated as follows :

| Persian.  |               | Balochi.             |
|-----------|---------------|----------------------|
| k         | as an initial | kh                   |
|           | medial }      | <i>kh</i>            |
|           | final }       |                      |
| <i>kh</i> | initial       | h, kh                |
|           | medial        | <i>kh</i>            |
|           | final         | h, <i>kh</i>         |
| g         | initial       | g                    |
|           | medial        | <i>gh</i>            |
|           | final         | <i>gh, kh</i>        |
| ch        | initial       | chh                  |
| t         | initial       | th                   |
| d         | medial }      | <i>th, dh, th</i>    |
|           | final }       |                      |
| p         | initial       | ph                   |
| f         | initial       | ph                   |
| b         | medial }      | f, v, w              |
|           | final }       |                      |
| sh        | medial        | zh (occasionally)    |
| s         | initial }     | z, zh (occasionally) |
|           | medial }      |                      |
| z         | initial       | j                    |

|          |                     |                      |
|----------|---------------------|----------------------|
| Persian. |                     | Balochi.             |
| z        | medial }<br>final } | sh, zh               |
| h        | medial }<br>final } | gh                   |
|          | initial             | occasionally omitted |

It will be noticed that the aspirates of the surd row (kh, chh, th) are very common, replacing the corresponding unaspirated Persian consonants, while those of the sonant row (gh, jh, dh, bh) seem to be entirely confined to words of Indian and Brahuí origin.

The letters *kh*, *gh*, *th*, *dh*, and *f* are usually medials or finals, representing the Persian letters, shown in the above table. *Th* and *dh* are never initials, and *kh*, *gh* and *f*, when they occur in borrowed words of modern introduction as initials, are usually pronounced kh, g and ph.

An initial h is occasionally lost altogether; e. g.,

|                 |                   |
|-----------------|-------------------|
| B. <i>astén</i> | P. <i>hastand</i> |
| B. <i>am</i>    | P. <i>ham</i>     |

## II. VOWELS.

The vowel sounds in Balochi generally agree with those of *Khurásání* Persian. They may be arranged as follows:—

|            |              |
|------------|--------------|
| Long       | á, í, ú      |
| Short      | a, i, u      |
| Diphthongs | e, ai, o, au |

The most noticeable point of difference from Persian is the frequent substitution of the palatal series í, i, e for the labial series ú, u, o; e.g.,

|                   |                  |
|-------------------|------------------|
| B. <i>sítth</i>   | P. <i>súd</i>    |
| B. <i>dír</i>     | P. <i>dúr</i>    |
| B. <i>seshin</i>  | P. <i>sozan</i>  |
| B. <i>gandím</i>  | P. <i>gandum</i> |
| B. <i>bíttha</i>  | P. <i>búda</i>   |
| B. <i>híkh</i>    | P. <i>khuík</i>  |
| B. <i>wasí</i>    | P. <i>khusú</i>  |
| B. <i>sírmugh</i> | P. <i>surma</i>  |

A similar change sometimes affects borrowed Arabic words; e. g.,

|                 |                 |
|-----------------|-----------------|
| B. <i>málím</i> | A. <i>málúm</i> |
| B. <i>hír</i>   | A. <i>húr</i>   |

In a few cases the change is reversed; e. g.,

|                    |                    |
|--------------------|--------------------|
| B. <i>osht-agh</i> | P. <i>ist-ádan</i> |
| B. <i>súf</i>      | P. <i>sev</i>      |

Other variations from the Persian vowel system are rare.

## THE NOUN.

## I—TERMINATIONS.

1. Balochi nouns in their formation correspond closely with Persián. The original terminal vowels have been lost, and the majority of nouns now terminate in consonants. There is no distinction of gender.

2. Vowel-endings.

á. The majority of nouns ending in á are borrowed from Sindhí or Arabic. In the former case á sometimes represents Sindhí o, therein corresponding more nearly with Panjábí; e. g.,

Ar. hayá, duá.

Si. bhá, jherá, thorá, trámá, velá.

The words wázhá, zá, chawá, pásná and begá are not borrowed. Of these wázhá (P. khwájah) and begá in inflected forms drop the á, and take the termination ah as a base of inflection; e. g.,

wázhá, pl. wázhahán, lords

begá: abl. begahá, in the evening.

The borrowed noun velá time, is similarly treated. Other nouns ending in á take no inflections. Some Sindhí nouns as jherá, thorá have an alternative form in o which can be inflected.

í. This is a common termination being commonly used as in Persian to form abstracts as duzí, 'theft' from duz 'thief,' sakí strength from sak 'strong' &c., also as the termination of other abstract nouns not directly formed from Balochí bases as shádhí 'rejoicing,' ziyání 'injury.' It occurs also in other nouns as godí 'lady,' druhání 'pistol,' mavárkí 'assembly,' pahlí 'rib' (P. pahlú). A as a termination of borrowed words í is also found as in chárí 'spy,' mehí 'buffalo,' phallí 'section of a tribe.'

O is of frequent occurrence both in pure Balochí and in borrowed words; e. g.,

|         |          |             |           |
|---------|----------|-------------|-----------|
| Balochi | dítlo,   | mist        | (P. dúd). |
|         | sháthlo, | dove        |           |
|         | bathlo,  | mortar      |           |
|         | nákho,   | uncle       |           |
|         | gokho,   | span        |           |
|         | mokho    | spider      |           |
|         | go       | race, prize |           |
|         | jo       | watercourse |           |
|         | gwando   | alligator   |           |
|         | duggo    | eagle       |           |
|         | jaddo    | cave        |           |
|         | phalo    | direction   |           |

|          |           |                 |              |
|----------|-----------|-----------------|--------------|
|          | surgo     | speech          |              |
|          | lero      | camel           |              |
| Borrowed |           |                 |              |
|          | dad̄do,   | pony            | Si. dad̄dro  |
|          | parad̄do, | echo            | Si. parad̄do |
|          | ghoro.    | a band of horse |              |
|          | shaddo    | a turban        |              |
|          | lekho     | reckoning.      |              |

This o nearly corresponds in sound to the close English o, and never has the open Italian sound. Most words ending in o change it to av when followed by a vowel, whether this vowel commences a following word or an inflectional suffix. The o of the first eight words in the above list (díhlo to jo inclusive) does not undergo this change. Go and jo are radical words, and the others end in the syllables lo and k̄ho which probably had originally a distinct force of their own; e. g.,

|           |                   |   |          |
|-----------|-------------------|---|----------|
| nákho     | } form the plural | { | nákhoán  |
| jo        |                   |   | joán     |
| but phale | } are inflected   | { | phalavá  |
| jaddo     |                   |   | jaddavá. |

Díhav 'leopard' may be elassed with words ending in o, though I have never heard the termination pronounced otherwise than av. This v is a purely labial sound, not the English v.

U. ú as a termination does not seem to occur in pure Balochi words. It is found in a few words of Sindhi origin and undergoes no change in inflections; e. g.,

|        |                 |
|--------|-----------------|
| ánú,   | an egg          |
| tilú,  | a bell          |
| varú,  | a beam          |
| límúa, | lemon (Arable). |

E has not been met with except in *kahne* 'pigeon,' also pronounced kahní.

Au is only found in *jau* 'barley.'

### 3. Special terminations.

#### (a). Verbal Nouns,

*Aḡh*. This is the termination of the infinitive, and verbal noun which corresponds with it in form. It apparently corresponds with the Pashto verbal noun in *ah*, as final *gh* in Balochí generally corresponds with Persian *h*. *Aḡh* as a termination corresponds with the Persian termination *ah* in many other nouns; e. g., *ramaḡh* "a floek of goats," *áhanjaḡh* "a sash" &c. Some are verbal nouns in form as *gwánzaḡh* "a swing." The termination *aḡh* also forms collective nouns as *murdánaḡh* "the fingers," from *murdán*, *phád̄haḡh* "legs," from *phád̄h*.

*Okh.* This termination forms the noun of agency from the Verbal base, and may be used with almost any verb; e.g., *thursokh* "a coward," from *thursagh* "to fear;" *warokh* "an eater," from *waragh*. These nouns of agency can be used and inflected as adjectives; e. g.,

*mirokh*, a fighter

*mirokhən* bing, fighting dog.

*Okh* is occasionally found in other nouns besides those of agency as in *gannokh* 'fool.'

(b) *Abstract Nouns.*

í. This is the commonest termination for abstract nouns, which may be formed from other nouns, or adjectives; e. g., *duzí* "theft," *sakmardí* "valour," *ghamí* "grief."

*Ádh.* Used in forming abstracts from adjectives of dimension; as,  
*gwandádh*, shortness  
*drázhádh*, length  
*phráhádh*, breadth.

*útá*; as *azmútá* 'examination' from *ázmainagh*.

*ár*; as *dídár* 'sight,' *raftár* 'paces.'

(c) *Collective Nouns.*

*Agh.* See above under verbal nouns.

*gal.* This is most usually employed to form collectives; e. g.,

*jangal*, a band of women from *jan*.

*zahgal*, a flock of kids from *zah*.

*pahar*, as *gwar-pahar*, a flock of lambs.

(d) *Diminutives.*

*Ak, akh, ikh.* This termination is frequently employed to form diminutives, sometimes modifying the base; e. g.,

*janikh* or *jinkh* girl, from *jan* woman

*gwarakh* lamb, from the base *gwar*—cf. *guránd* ram, and *gwar-papar* flock of lambs.

*kisánakh* very small, from *kisáin*.

This termination is occasionally used when all diminutive signification has been lost, as *wasarikh*, "father-in-law," (Persian *khusar*).

*Ro*, occasionally used, as in *kisánro*, a diminutive of *kisáin* 'small.' Possibly the termination *lo* in *dítlo*, *shátlo* had originally the force of a diminutive. Compare also the adverbs *khamro* "a very little," from *khan*, and *chíklo* "a little."

4. *Compound nouns and adjectives.*

Compounds are numerous, and may be classed under the Sanskrit

divisions of Dwandwa, Tatpurusha, Karmadháraya and Bahuvŕhi, or Copulative, Qualifying, Descriptive and Possessive.

*a.* Copulative. This class consists of nouns inseparably coupled together, only the latter being subject to inflection; e. g.,

phol-phurs, enquiry  
thaukh-tawár, conversation  
chukh-chorí, children.

*b.* Qualifying or dependent. In this class the latter member of the compound is qualified by the former. The latter member may be either a noun or a verbal root, the verbal noun in *o/h* being occasionally but not often used; e. g.,

- (1.) When both members are nouns.  
jogin-dár, a pestal (lit. mortar-stick).  
mazár-dumb, a plant (lit. tiger-tail).  
rosh-ásán, sunrise.  
chagá-hálwar, a matter of jest.  
chham-phusht, eyelid.  
máh-ghumá, eclipse of the moon.

- (2.) When the first member is a noun and the latter a verbal root.  
shírwar, milk-drinking  
rozh-gír, celipse of the sun (sun-seizing).  
godhán-din, udder-tearing (name of a plant).  
shav-khash, night-expeller (the planet Venus).  
mar-khusho/h, man-slayer.  
sangband, connected by marriage.

*c.* Descriptive. In this class the first member is an adjectives, numeral or other word simply describing or defining the second; e. g.,

syah-áf, perennial stream, (lit. blackwater).  
drázhdár, a beam (longwood).  
mádhgor, female wild ass.  
ergwáth, the leaside (lit. downwind).  
chyár-gíst, fourscore.

*d.* Possessive. These are formed in a similar manner to the last class, with the force of adjectives or descriptive epithets, the possession of the qualities described being implied; e. g.,

hor-dast, empty-handed.  
phásh-phádh, barefoot.  
sweth-rísh, greybeard  
syáb-gwar, black-breast (e. g. the black partridge).  
phodhán-demí, the name of a flower (lit. thither-faced).  
dí-ránagh, far-knowing.  
dast-basthagh, hands joined.

## 5. Inflection of nouns.

The suffixes used in forming the different cases are *á*, *ár*, *egh*, *án*, *ánrá* and *ání*, but these suffixes are put to a great variety of uses which will be considered under the different cases.

The most usual inflection is that in *á*. It may be used as an instrumental or nominative with verbs in a past tense, as an accusative, ablative, and locative, its place is to a certain extent taken in the plural by the suffix *ání*, the use of which is however more restricted.

(1) *The Nominative.* The nominative of all intransitive verbs, and of transitive verbs in the present and future is the simple uninflected noun. With transitive verbs in tenses derived from the past participle the instrumental construction is employed, the inflected form in *á* being used for the agent while the object is left uninflected.

(2) *Genitive.* In most cases the simple base is used with a genitive signification, but if greater precision is required the suffix *egh* is used, as *Án mard bachh*, that man's son; but *hawe bachh ánhí mardegh en*, he is the son of that man.

(3) *Dative.* The termination *ár* or *ar* is employed for the dative, as: *Mardumár naghaná dátha-í*, he gave the man bread.

(4) *Accusative.* The most usual ending of the accusative is *á*, but *ár* is frequently used, especially when emphasis is required or to distinguish a nearer object from a more remote; e. g., *má Balochiyá roṭí-ár naghan khanun*. In *Balochí* we call "*roṭí*" *naghan*.

The uninflected noun is also sometimes used for the accusative.

(5) *Ablative, Locative.* The inflected form in *á* is used with the prepositions *go* "with," *azh* "from," *pha* "on," *man* "in," *gwar* "in possession of," *dan* "into," and *avr* "in, upon," which alone precede the noun. It also expresses without a preposition position, motion to or from, time when. The meaning *from* is often implied without the use of the preposition *azh*; e. g.,

|                                     |                                             |
|-------------------------------------|---------------------------------------------|
| <i>Án ki khái chí kádhírá</i>       | Whatever thing comes from God               |
| <i>Bahr-khanání go hádhírá</i>      | That I will divide with my heart.           |
| <i>Har shákhá házár shákh bítha</i> | On every branch a thousand branches sprang. |
| <i>Har shákhá wathí gul bítha.</i>  | On every branch its own flower.             |

*Plural.*

(6). *Án.* The termination *án* is used for the nominative and accusative plural, but the singular forms are perhaps more frequently used. With numerals the singular is almost exclusively used.

*ánrá.* The plural dative in *ánrá* is also of rare occurrence, the singular being more frequently used.

*áni.* This is the most usual plural suffix, being always used for the genitive and ablative; e. g.,

*pakhtáni khund*, the vale of poplars.

(7). The suffix *e*.

*e* is used in the sense of an indefinite article; e. g., *mard* 'man'; *marde* 'a man.'

The indefinite base formed by the suffix *e* is used as a base of inflection, the case endings following the *e*. Thus from *mardo* we get *mardeá* and *mardeár*.

### ADJECTIVES.

1. Adjectives are formed by the terminations *í*, *en*, *ena*, *agh*, *o*, and *egh* from nouns and adverbs; e. g.,

|                         |                               |      |               |
|-------------------------|-------------------------------|------|---------------|
| <i>í.</i>               | <i>demí</i> , former          | from | <i>dem</i>    |
| .                       | <i>phadhí</i> , hinder        | ,,   | <i>phadhá</i> |
| <i>en</i> , <i>ena.</i> | <i>marden</i> , manly         | ,,   | <i>mard</i>   |
|                         | <i>nughraen</i> , } of silver | ,,   | <i>nughra</i> |
|                         | <i>nughraena</i> , }          |      |               |
| <i>agh.</i>             | <i>gandagh</i> , bad          | ,,   | <i>gand</i>   |
| <i>o.</i>               | <i>gwátho</i> , windy         | ,,   | <i>gwáth</i>  |
| <i>egh.</i>             | <i>daregh</i> , wooden        | ,,   | <i>dár</i>    |

2. Adjectives precede nouns and generally take the termination *en* when used with nouns, unless the original termination happens to be *en*; as,

*nughraen áden*, a silver mirror  
but

*gwáthoen halwar*, windy talk.

The adjectives *jowain*, good, *kisain*, small, and *mazain*, great, form respectively before nouns *jowánen*, *kisánen*, and *mazanen*.

3. Comparison. The comparative degree is formed by the suffix *thar*, *thir*, or *tar*; e. g.,

|               |       |                                     |
|---------------|-------|-------------------------------------|
| <i>kisain</i> | comp. | <i>kisánthar</i> and <i>kasthar</i> |
| <i>burz</i>   | ,,    | <i>burzáthir</i>                    |
| <i>mazain</i> | ,,    | <i>masthar</i>                      |
| <i>jowain</i> | ,,    | <i>jowánthar</i>                    |
| <i>sak</i>    | ,,    | <i>sakthar</i> ,                    |

the base being sometimes slightly modified. The word *bathir* (Pers. *bihitar*) is sometimes used with other adjectives to express comparison; as,

*bathir gandagh*, worse.

The word *geshtar* "more" corresponds to the Pers. *beshtar*, but the positive is wanting in Balochí.

“Than” in comparison is expressed by *azh*, whether the adjective is put in the comparative degree or not; e. g.,

*Azh tho nekħ en*, he is better than thou.

There is no special superlative form. The comparative form may be used, or the adverbs *sakía* “extremely”, *hudħái* “divinely” may be employed to give emphasis to the adjective. The phrase *azh thewagħen* or *azh kullán* “of all”, may also be used with the comparative to give a superlative sense; e. g.,

*Azh thewagħen mastħar*, the greatest of all.

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## NUMERALS.

### 1. CARDINAL NUMBERS.

|            |                                 |
|------------|---------------------------------|
| Yak }      | One                             |
| Ya }       |                                 |
| Do         | Two                             |
| Sai        | Three                           |
| Chyár      | Four                            |
| Phanch     | Five                            |
| Shash      | Six                             |
| Hapt       | Seven                           |
| Hasht }    |                                 |
| Hazhd }    | Eight                           |
| Nuh        | Nine                            |
| Dah        | Ten                             |
| Yázhdah }  |                                 |
| Yázdah }   | Eleven                          |
| Dwázhdah } |                                 |
| Dwázdah }  | Twelve                          |
| Senzdah    | Thirteen                        |
| Chyárdah   | Fourteen                        |
| Phánzdah   | Fifteen                         |
| Shánzdah   | Sixteen                         |
| Havdah     | Seventeen                       |
| Hazhdah    | Eighteen                        |
| Nozd       | Nineteen                        |
| Gíst       | Twenty                          |
| Gíst-u-yak | Twenty-one                      |
| Gíst-u-do  | Twenty-two, and so on regularly |
| Sí         | Thirty                          |
| Chhil      | Forty                           |

|                 |                               |
|-----------------|-------------------------------|
| Phanjáh         | Fifty                         |
| Sai-gíst        | Sixty                         |
| Saigíst-u-dah   | Seventy                       |
| Chyár-gíst      | Eighty                        |
| Chyárgíst-u-dah | Ninety                        |
| Sadh            | A hundred                     |
| Shazh-gíst      | A hundred and twenty          |
| Hapt-gíst       | A hundred and forty           |
| Hasht-gíst      | A hundred and sixty           |
| Nuh-gíst        | A hundred and eighty          |
| Dosadh          | Two hundred                   |
| Hazár           | } A thousand                  |
| Hadhár          |                               |
| Lak             | One hundred thousand          |
| Khor            | An indefinitely large number. |

The form *ya* "one" is used with nouns ; *ya* is used by itself.

Counting from sixty upwards is usually done in multiples of twenty, intermediate numbers being reckoned on or baek from the nearest multiple ; e. g.,

217 is sai kham yázhdah-gíst, *i. e.*, three less eleven-twenties.

223 is yázhdah-gíst-o-sai, *i. e.*, eleven-twenties and three.

## 2. ORDINAL NUMBERS.

|           |             |
|-----------|-------------|
| Pheshí    | First       |
| Duhmí     | Second      |
| Saimí     | Third       |
| Chyárumí  | Fourth      |
| Phanchumí | Fifth       |
| Shashumí  | Sixth       |
| Haptumí   | Seventh     |
| Hashtumí  | Eighth      |
| Nuhmí     | Ninth       |
| Dahmí     | Tenth       |
| Yázdamí   | Eleventh    |
| Dwázdámí  | Twelfth     |
| Senzdamí  | Thirteenth  |
| Chyárdamí | Fourteenth  |
| Phánzdamí | Fifteenth   |
| Shánzdamí | Sixteenth   |
| Havdamí   | Seventeenth |
| Hazhdamí  | Eighteenth  |

|          |            |
|----------|------------|
| Nozdamí  | Nineteenth |
| Gístumí  | Twentieth  |
| Síumí    | Thirtieth  |
| Chhilumí | Fortieth   |
| Sadhumí  | Hundredth  |
| Hazárumí | Thousandth |

Compound numbers are treated as single words in forming the ordinal; as,

|                |              |
|----------------|--------------|
| Gíst-yakumí    | Twenty-first |
| Gíst-phanchumí | Twenty-fifth |

### 3. FRACTIONAL NUMBERS.

|                                          |                 |
|------------------------------------------|-----------------|
| one-half ( $\frac{1}{2}$ )               | nem             |
| one-third ( $\frac{1}{3}$ )              | saiak           |
| one-quarter ( $\frac{1}{4}$ )            | páo, chyarak    |
| one-fifth ( $\frac{1}{5}$ )              | phanjak         |
| three-quarters ( $\frac{3}{4}$ )         | sai-páo         |
| one and a half ( $1\frac{1}{2}$ )        | yak nem or dedh |
| with one half more                       | sádhoán         |
| e. g. four and a half ( $4\frac{1}{2}$ ) | sádhoán chyár   |

With minuter fractions the word *bahr* is employed with the ordinal number, as *Gístumí bahr*, one-twentieth.

### 4. MULTIPLES.

- a.* Multiples of quantity, expressed in English by the word "fold."
- |             |           |
|-------------|-----------|
| dúrá        | double    |
| yake sai    | threefold |
| yake chyár  | fourfold  |
| yake phanch | fivefold  |
- and so on as required.

*b.* Multiples of time expressed generally by the word *bar* corresponding to the similar use of "times" in English. *Bar* is put in the plural except in *ya-bare* "once", where it receives the indefinite suffixes. *Thí-bare* "another time" is similarly constructed:

|             |            |
|-------------|------------|
| ya-bare     | once       |
| do-barán    | twice      |
| sai-barán   | thrice     |
| chyár-barán | four times |

and so on.

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## PRONOUNS.

## I.—PERSONAL PRONOUNS.

## a. First person.

| Singular.          |                                      |                           |
|--------------------|--------------------------------------|---------------------------|
| Nom.               | <i>man, mah</i>                      | I                         |
| Gen.               | <i>maní, maín</i><br><i>maígh</i>    | my<br>mine                |
| Dat. }<br>Acc. }   | <i>manán</i>                         | me, to me                 |
| Instr. }<br>Abl. } | <i>man</i><br><i>azh man, go man</i> | I, from me<br>with me &c. |
| Plural.            |                                      |                           |
| Nom.               | <i>má</i>                            | we                        |
| Gen.               | <i>maín</i><br><i>maígh</i>          | our<br>ours               |
| Dat. }<br>Acc. }   | <i>már, mára</i>                     | us, to us                 |
| Instr. }<br>Abl. } | <i>má</i>                            | we, us, &c.               |

The plural *má* is often used with a singular signification.

## b. Second person.

| Singular.          |                                         |               |
|--------------------|-----------------------------------------|---------------|
| Nom.               | <i>thau, tha</i>                        | thou          |
| Gen.               | <i>thaí</i><br><i>thaígh</i>            | thy<br>thine  |
| Dat. }<br>Acc. }   | <i>thará</i>                            | thee, to thee |
| Instr. }<br>Abl. } | <i>thau, tha</i>                        | thou, &c.     |
| Plural.            |                                         |               |
| Nom.               | <i>shawá, shá</i>                       | you           |
| Gen.               | <i>shawái, shái</i><br><i>shawáiigh</i> | your<br>yours |
| Dat. }<br>Acc. }   | <i>shawár, shár</i>                     | you           |
| Instr. }<br>Abl. } | <i>shawá, shá</i><br>&c.                | you           |

The singular and plural in the second personal pronoun are generally confined to their proper significations.

## II.—THIRD PERSONAL PRONOUN AND DEMONSTRATIVE PRONOUNS.

The demonstrative pronouns "this" and "that" take the place of the 3rd personal pronoun, which only exists independently in the form of the pronominal suffixes to be noticed hereafter.

## 1. Proximate demonstrative pronoun.

## Singular.

|        |                            |                         |
|--------|----------------------------|-------------------------|
| Nom.   | esh, e, í                  | this, he                |
| Gen.   | eshí, eshiyá               | of this, his            |
| Dat.   | eshiyar                    | to this, to him         |
| Ace.   | eshiyá, eshiyar            | this, him               |
| Instr. | eshiyá                     | he                      |
| Abl.   | 'sh eshiyá, go eshiyá, &c. | from this, from him &c. |

## Plural.

|        |                |                   |
|--------|----------------|-------------------|
| Nom.   | esh, eshán     | these, they       |
| Gen.   | eshání         | of these, their   |
| Dat.   | eshánrâ        | to these, to them |
| Ace.   | eshán, eshánrâ | these, them       |
| Instr. | eshání         | these, they       |
| Abl.   | 'sh eshání &c. | from them &c.     |

An intensive form is used with the prefix ham, sometimes corrupted to haw, as have, hamesh, hameshiyá, hameshání &c., "this very one, by this one."

## 2. Remote demonstrative pronoun.

## Singular.

|        |                 |              |
|--------|-----------------|--------------|
| Nom.   | án              | that, he     |
| Gen.   | ánhí, ánhiyá    | of that, his |
| Dat.   | ánhiyar         | to him, that |
| Ace.   | ánhiyar, ánhiyá | that, him    |
| Instr. | ánhiyá          | that, he     |
| Abl.   | 'sh ánhiyá &c.  | from him &c. |

## Plural.

|        |                |                  |
|--------|----------------|------------------|
| Nom.   | ánhán, án      | those, they      |
| Gen.   | ánhání         | of those, their. |
| Dat.   | ánhánrâ        | to those, them   |
| Ace.   | ánhán, ánhánrâ | those, them      |
| Instr. | ánhání         | those, they      |
| Abl.   | 'sh ánhání &c. | from them &c.    |

This pronoun has also an intensive form with the prefix ham or haw, meaning "that one", "that very one", as hawán, hawánhiyá &c.

The compound forms *imar* and *áumar* (for *í-mard* and *án-mard*) are frequently used in the sense of personal pronouns and are applied even to animals and inanimate objects.

### 3. Pronominal suffixes.

These are frequently employed with the verb when the regular pronouns are not expressed. Those of the 3rd person, *í* "he" and *ish* "they" are most frequently employed, the distinction between the singular and plural forms not being carefully observed. (For examples, see under the verb.) The suffix *án* is also sometimes used in the 3rd person as *khuthaghántán* "they did." The 1st person has also a suffix *ún*, which is not so frequently used. With this suffix the verb takes a peculiar form, a euphonic *t* being inserted to strengthen the weak final nasal of the 1st person singular or plural, as *khushthaghántán* or *khushthaghúntún* "I or we killed."

### III.—RELATIVE PRONOUNS.

The word *ki* performs most of the duties of a relative pronoun, as in Persian, and often merely has the meaning of a relative particle, being indeclinable, so that the meaning is not complete without the use of other pronouns; e. g.,

*E mard hameshen ki eshiyá biráthá má gipthaghún*, this is the man whose brother we have taken.

The following relative phrases are used :

|                    |                        |
|--------------------|------------------------|
| <i>har khas ki</i> | whoever                |
| <i>har ki</i>      | } whatever             |
| <i>har ehí ki</i>  |                        |
| <i>án ki</i>       | who, whoever, whatever |

e. g.,

*har khas ki khákh*, every one who comes

*har ki thau gush*, whatever you say

*an ki khái' ehí kádkirá*, whatsoever thing comes from God.

### IV.—REFLECTIVES.

*Wath*, self.

Singular.

|                  |               |                |
|------------------|---------------|----------------|
| Nom.             | <i>wath</i>   | self           |
| Gen.             | <i>wathí</i>  | own, one's own |
| Dat. }<br>Aee. } | <i>wathár</i> | self           |

Plural.

|                  |                  |        |
|------------------|------------------|--------|
| Nom.             | <i>wathán</i>    | selves |
| Gen.             | <i>wathání</i>   | own    |
| Dat. }<br>Aee. } | <i>watháurrá</i> | selves |

The words *jind* and *but* are also used in the sense of "self."  
 oneself, *wathí wath*  
 or *wathí jind*

e. g.,

*Ammar wathí jindár khushtha*, he killed himself.

*Jind* is especially used in referring to one's own private property, as the *Hindústání nij*; e. g.,

have *mádkhin maní jindeghen*, this mare is my own property.

The phrase *pha-wathán* is used for among themselves, ourselves, yourselves.

#### V.—INTERROGATIVES.

Who, *khái* ?

Sing. and Plur.

|           |                                 |                                                     |
|-----------|---------------------------------|-----------------------------------------------------|
| Nom.      | <i>khái</i>                     | who ?                                               |
| Gen.      | <i>kháigħ</i>                   | whose ?                                             |
| Dat. Acc. | <i>kháiár</i>                   | whom ?                                              |
|           | what ?                          | <i>chih</i>                                         |
|           | which, what (qualifying a noun) | <i>kithán thán</i>                                  |
|           | how much                        | } <i>chikhtar, chikar</i><br>(P. <i>chi qadr</i> ?) |
|           | how many ?                      |                                                     |

#### VI.—CORRELATIVES.

|                |   |                                           |
|----------------|---|-------------------------------------------|
| so much        | } | <i>ikhtar, ikar</i>                       |
| so many        |   | (P. <i>in qadr</i> ?)                     |
| just so much   |   | <i>hawikhtar</i> (P. <i>hamin qadr</i> ?) |
| that much      |   | <i>ánkhtar</i>                            |
| just that much |   | <i>hawánkhtar</i>                         |

#### VII.—INDEFINITE.

|                    |                   |         |
|--------------------|-------------------|---------|
| <i>khase</i>       | any one, some one |         |
| <i>har-khas</i>    | every one         |         |
| <i>khas nen</i>    | nobody            |         |
| <i>hech</i>        | }                 | any     |
| <i>hechí</i>       |                   |         |
| <i>'chí</i>        |                   |         |
| <i>har-chí</i>     | everything        |         |
| <i>'chíe</i>       | something         |         |
| <i>'chíc-'chíe</i> | a little          |         |
| <i>hechí-na</i>    | }                 | nothing |
| <i>'chí-na</i>     |                   |         |

|               |                  |
|---------------|------------------|
| báz           | many             |
| kham          | few              |
| geshtar       | more             |
| kharde        | some             |
| yak-áptiyá    | one another      |
| thí           | } other, another |
| phíthí        |                  |
| thí khase     | some one else    |
| thí 'chie     | something else   |
| thí 'chí-na   | nothing else     |
| theghí        | } all            |
| thewaghen     |                  |
| drust         | } the whole      |
| kull          |                  |
| las           |                  |
| kullán-phajyá | altogether       |
| hardo         | both             |

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#### STRUCTURE OF THE VERB.

The simplest form or base of every verb is with one or two exceptions identical in form with the 2nd pers. sing. imperative. From this base are formed immediately, by the addition of certain terminations, the imperative, aorist, infinitive and present participle. The termination of the infinitive is *agh*. From the base so obtained two more tenses, the present and imperfect, are formed. The past participle is formed from the base in a manner which will be described hereafter, and other past participles are formed from it as a base.

(a). Forms derived immediately from the base.

The imperative, as observed above, generally is the simplest form of the base. Verbs beginning with vowels take the prefix *ba* or *bi*, and the verbs *waragh* "to eat" and *ravagh* "to go" also form their imperatives *bawar* and *baro*. Verbs beginning with vowels take also the prefix *bi* or *kh* in the aorist. These prefixes are not used either in the imperative or aorist when a negative is expressed, the negative particles *na*, *ni* and *ma* taking their place; e. g.,

|         |                  |
|---------|------------------|
| riyár   | bring            |
| mayár   | do not bring     |
| bilán   | I will let       |
| nelán   | I will not let   |
| kháíth  | he will come     |
| nayáíth | he will not come |

The prefix *kh* is most usually taken in the aorist, but the verb *ilagh* "to let" always takes *b*.

The aorist has both indefinite, present, future and subjunctive significations. The terminations are as follows :—

| Singular.                | Plural.            |
|--------------------------|--------------------|
| 1. <i>án</i>             | <i>ún, om</i>      |
| 2. <i>e</i>              | <i>eth, edh, e</i> |
| 3. <i>th, th, íth, í</i> | <i>ant</i>         |

The most usual termination of the 3rd person singular is *íth*, which often becomes simply *í*. The following take *th* :—

| Infinitive                  | 3rd pers. sing. aorist. |
|-----------------------------|-------------------------|
| <i>khanagh, to do</i>       | <i>khanth</i>           |
| <i>janagh, to strike</i>    | <i>janth or jath</i>    |
| <i>giragh, to take</i>      | <i>gíρθ</i>             |
| <i>baragh, to take away</i> | <i>bárth</i>            |
| <i>waragh, to eat</i>       | <i>wárth</i>            |

In *giragh*, *gír* is the radical form of the verb. In *baragh* and *waragh* the radical vowel is lengthened. The following take *th* ;—

|                       |                 |
|-----------------------|-----------------|
| <i>biagh to be</i>    | <i>bíth, bí</i> |
| <i>ravagh to go</i>   | <i>roth, ro</i> |
| <i>deagh to give</i>  | <i>dáth, dá</i> |
| <i>siagh to swell</i> | <i>síth</i>     |

The present participle used of a continued or repeated action is formed from the base by the termination *ána* ; e. g.,

| Infinitive     | Present Participle. |
|----------------|---------------------|
| <i>biagh</i>   | <i>bíána</i>        |
| <i>khanagh</i> | <i>khanána</i>      |

The infinitive in *agh* is a noun and can be inflected. The inflected form has a gerundial signification ; e. g.,

*khanagh, to do, doing.*

*khanaghá khapta-í, he began to do (lit. he fell a-doing).*

The present and imperfect are formed from the infinitive by the following terminations :

| PRESENT.           |                    |
|--------------------|--------------------|
| Sing.              | Plur.              |
| 1. <i>án</i>       | <i>áún, áom</i>    |
| 2. <i>e</i>        | <i>e, eth</i>      |
| 3. <i>en</i>       | <i>ant, an, en</i> |
| IMPERFECT.         |                    |
| 1. <i>athán</i>    | <i>athún</i>       |
| 2. <i>athe</i>     | <i>athc</i>        |
| 3. <i>ath, eth</i> | <i>athaut</i>      |

The past participle is formed by the addition of the suffix *tha* or *thā* to the base which is liable to modifications to be noted below. For purposes of composition the past base ends in *gh*. (See sounds, *gh*.) From the base so formed the perfect and pluperfect are formed by the following terminations :

## PERFECT.

|    |           |               |
|----|-----------|---------------|
| 1. | <i>án</i> | <i>ún, om</i> |
| 2. | <i>e</i>  | <i>e, eth</i> |
| 3. | —         | <i>ant</i>    |

## PLUPERFECT:

|    |               |               |
|----|---------------|---------------|
| 1. | <i>athán</i>  | <i>athún</i>  |
| 2. | <i>athe</i>   | <i>athe</i>   |
| 3. | <i>ath, á</i> | <i>athant</i> |

The 3rd pers. singular of the perfect is the simple form of the past participle without the *gh*. In transitive verbs with an object and agent, this form expresses the perfect throughout, the agent being in the inflected or instrumental form, while the object is uninflected ; *e. g.*,

*mardumá naghan wártha*, the man ate bread,

where *mardumá* is the inflected form of *mardum*. But—

*mardum nagbanár wárth*, the man will eat bread.

Here *mardum* is uninflected and *naghan* receives the objective inflection.

The terminations of the present are nearly identical with those of the perfect, and those of the imperfect, with the pluperfect. Both seem to be formed by the addition of the present and past forms of the defective verb *to be* to the infinitive base and the past base respectively. The present with the infinitive base forms the present, with the past base the perfect. Similarly the past forms the imperfect and pluperfect. These forms are as follows :

## PRESENT.

|          | Sing.     |          | Plur.      |
|----------|-----------|----------|------------|
| I am     | <i>án</i> | we are   | <i>ún</i>  |
| thou art | <i>e</i>  | you are  | <i>e</i>   |
| he is    | <i>en</i> | they are | <i>ant</i> |

## PAST.

|           |              |           |               |
|-----------|--------------|-----------|---------------|
| I was     | <i>athán</i> | we were   | <i>athún</i>  |
| thou wast | <i>athe</i>  | you were  | <i>athe</i>   |
| he was    | <i>ath</i>   | they were | <i>athant</i> |

The plural forms *ún, e, athún, athe*, when used with a pronoun immediately preceding, take the prefix *kh* ; *e. g.*,

*má khún*

we are

*má khatún*

we were

But this prefix is never used when a noun or adjective immediately precedes.

From the simple past participle which has both an active and passive signification are formed two other participles; *viz.*, (1) the active past participle, used of a completed action and only found before a verb in a past tense. This is formed by changing the termination *tha*, *tha* into *tho*. (2) The present participle used of a continued but not repeated action. This is formed by changing *tha* or *tha* in *thíyá*, *thíyá* or sometimes *thíghá*, *thíghá*.

The use of the four participles may be shown as follows :

|         |                                                                                                                                |                                                                                                    |                                                            |
|---------|--------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| Past    | $\left\{ \begin{array}{l} \text{dáragh, to hold.} \\ \text{dáshtha, held.} \\ \text{dáshto, having held.} \end{array} \right.$ |                                                                                                    |                                                            |
| Present |                                                                                                                                | $\left\{ \begin{array}{l} \text{dáshthíyá} \\ \text{or} \\ \text{dásbthíghá,} \end{array} \right.$ | holding, continuing to hold.                               |
|         |                                                                                                                                |                                                                                                    | (dárána, holding (with intervals), keeping on taking hold. |

#### FORMATION OF THE PAST PARTICIPLE.

The termination is either *tha* or *tha* which is added to the base. *Tha* is the more usual. It is taken by all verbs whose bases end in a vowel. Verbs ending in mutes take *tha* as a rule, with a short vowel inserted after the characteristic; *e. g.*, *bashkagh* "to give," P. P. *bashkatha*. When a verb corresponds with a Persian verb in *ídan*, a short *i* is sometimes inserted; *e. g.*,

*rasagh*, to arrive P. P. *rasitha* (P. *rasidan*).

*thursagh*, to fear P. P. *thursitha* (P. *tursidan*).

When *tha* is used it is always attached to the base without an intervening vowel. This leads frequently to the modification of the characteristic of the base, the changes corresponding closely with those which take place in Persian. In some verbs the vowel of the base is also changed, and others are wholly irregular. Verbs whose characteristic is *n* (a class which includes all causals) take the termination *tha* without any modification of the base.

The most usual changes of characteristic letters are *sh* and *zh* to *kh*, *f* to *p*, *dh* and *z* to *s*. Many verbs in *sh* and *s*, take the termination without modifying the characteristic.

The following list gives the past participles of all the irregular verbs, also most of those which form their past participle by taking *tha* without modification of the base. The verbs beginning with vowels which take the prefixes *b*, *bi* and *kh* in the imperative and aorist are also given.

| Infinitive |          | Past Participle         |
|------------|----------|-------------------------|
| áragh      | to bring | ártha                   |
| ásagh      | to rise  | ástha                   |
| ashkhanagh | to hear  | ashkhu $\bar{t}$ ha     |
| ágh        | to come  | ákh $\bar{t}$ ha, átkha |

| Infinitive.                                                          |                      | Past Participle.               |
|----------------------------------------------------------------------|----------------------|--------------------------------|
| <i>aksagh</i>                                                        | to sleep             | <i>akastha</i>                 |
| <i>ilagh</i>                                                         | to let               | <i>ishtha</i>                  |
| <i>oshtagh</i>                                                       | to stand             | <i>oshtátha</i>                |
| <i>oshtalainagh</i> (causal of <i>oshtagh</i> )                      |                      | <i>oshtalaintha</i> .          |
| (The above take the prefixes <i>b</i> , <i>bi</i> , and <i>kh</i> .) |                      |                                |
| <i>básagh</i>                                                        | to low               | <i>bástha</i>                  |
| <i>bágh</i>                                                          | to be killed         | <i>báitha</i>                  |
| <i>baragh</i>                                                        | to take away         | <i>burtha</i>                  |
| <i>bresagh</i>                                                       | to spin              | <i>brestha</i>                 |
| <i>bushkagh</i>                                                      | to discharge (a gun) | <i>bukhtha</i>                 |
| <i>bozhagh</i>                                                       | to open              | <i>bokhtha</i>                 |
| <i>bandagh</i>                                                       | to shut, tie         | <i>bastha</i>                  |
| <i>bíagh</i>                                                         | to be                | <i>bítha</i>                   |
| <i>phadeagh</i>                                                      | to run               | <i>phadátha</i>                |
| <i>phrushagh</i>                                                     | to burst             | <i>phrushtha</i>               |
| <i>phashagh</i>                                                      | to cook              | <i>phakká</i>                  |
| <i>thusagh</i>                                                       | to faint             | <i>thustha</i>                 |
| <i>thosagh</i>                                                       | to extinguish        | <i>thostha</i>                 |
| <i>thashagh</i>                                                      | to run, gallop       | <i>thakhtha</i>                |
| <i>tháshagh</i>                                                      | to gallop (a horse)  | <i>thákhtha</i>                |
| <i>jágh</i>                                                          | to chew              | <i>jáitha</i>                  |
| <i>janagh</i>                                                        | to strike            | <i>jata</i>                    |
| <i>chinagh</i>                                                       | to pick up           | <i>chitha</i>                  |
| <i>dinagh</i>                                                        | to tear              | <i>dirtha</i>                  |
| <i>doshagh</i>                                                       | to milk              | <i>dushtha</i>                 |
| <i>doshagh</i>                                                       | to sew               | <i>dokhtha</i>                 |
| <i>dogh</i>                                                          | to fetch water       | <i>dotka</i>                   |
| <i>deagh</i>                                                         | to give              | <i>dátha</i>                   |
| <i>ravagh</i>                                                        | to go                | <i>shuttha, shudha, raptha</i> |
| <i>rudhagh</i>                                                       | to grow              | <i>rustha</i>                  |
| <i>radhagh</i>                                                       | to tear up           | <i>rastha</i>                  |
| <i>runagh</i>                                                        | to reap              | <i>rutha, runtha</i>           |
| <i>resinagh</i>                                                      | to pursue            | <i>resintha</i>                |
| <i>rishagh</i>                                                       | to scatter, pour     | <i>rikhtha</i>                 |
| <i>zágh</i>                                                          | to bring forth       | <i>zátha</i>                   |
| <i>zánagh</i>                                                        | to know              | <i>zántha</i>                  |
| <i>zinagh</i>                                                        | to snatch            | <i>zítha, zitha</i>            |
| <i>ziragh</i>                                                        | to raise             | <i>zurtha</i>                  |
| <i>sushagh</i>                                                       | to burn, be burnt    | <i>sukhtha</i>                 |
| <i>soshagh</i>                                                       | to burn (tr.)        | <i>sokhtha</i>                 |
| <i>sindagh</i>                                                       | to break             | <i>sistha</i>                  |

| Infinitive.        |                   | Past Participle.  |
|--------------------|-------------------|-------------------|
| <i>siagh</i>       | to swell          | <i>sītha</i>     |
| <i>shudhagh</i>    | to hunger         | <i>shustha</i>    |
| <i>shodhagh</i>    | to wash           | <i>shustha</i>    |
| <i>shastagh</i>    | to send           | <i>shastátha</i>  |
| <i>shamúshagh</i>  | to forget         | <i>shamushtha</i> |
| <i>shawashkagh</i> | to sell           | <i>shawakhtha</i> |
| <i>khashagh</i>    | to pull, turn out | <i>khashta</i>    |
| <i>khishagh</i>    | to cultivate      | <i>khishtha</i>   |
| <i>khushagh</i>    | to kill           | <i>khushtha</i>   |
| <i>khafagh</i>     | to fall           | <i>khaptha</i>    |
| <i>khanagh</i>     | to do             | <i>khutha</i>     |
| <i>kizagh</i>      | to allow          | <i>kishtha</i>    |
| <i>gáagh</i>       | to copulate       | <i>gátha</i>      |
| <i>grádhagh</i>    | to boil           | <i>grásthá</i>    |
| <i>gardagh</i>     | to return         | <i>gartha</i>     |
| <i>giragh</i>      | to take           | <i>giptha</i>     |
| <i>giregh</i>      | to weep           | <i>girenthá</i>   |
| <i>guzagh</i>      | to pass           | <i>gwasthá</i>    |
| <i>gushagh</i>     | to speak          | <i>gwashtá</i>    |
| <i>galáagh</i>     | to praise         | <i>galáithá</i>   |
| <i>gindagh</i>     | to see            | <i>dítha</i>      |
| <i>gwáfagh</i>     | to summon         | <i>gwáptha</i>    |
| <i>gwaragh</i>     | to rain           | <i>gwarthá</i>    |
| <i>gwafagh</i>     | to weave          | <i>gwapthá</i>    |
| <i>gezhagh</i>     | to bear abortion  | <i>gikhtha</i>    |
| <i>gieshagh</i>    | to pay, pick out  | <i>gieshtá</i>    |
| <i>láinagh</i>     | to touch          | <i>láithá</i>     |
| <i>laghushagh</i>  | to slip           | <i>laghushtá</i>  |
| <i>lawáshagh</i>   | to drink          | <i>lawáshthá</i>  |
| <i>madhagh</i>     | to freeze         | <i>masthá</i>     |
| <i>miragh</i>      | to die            | <i>murthá</i>     |
| <i>miragh</i>      | to fight          | <i>mirathá</i>    |
| <i>mizhagh</i>     | } to urine        | <i>mishthá</i>    |
| <i>mezagh</i>      |                   | <i>mishthá</i>    |
| <i>mishagh</i>     | to suck           | <i>mishthá</i>    |
| <i>mushagh</i>     | to rub            | <i>mushthá</i>    |
| <i>nigoshagh</i>   | to listen         | <i>nigoshtá</i>   |
| <i>nindagh</i>     | to sit            | <i>nishthá</i>    |
| <i>nyádhagh</i>    | to post           | <i>nyásthá</i>    |
| <i>wánagh</i>      | to read           | <i>wánthá</i>     |
| <i>wapsagh</i>     | to sleep          | <i>wapthá</i>     |

| Infinitive. |        | Past Participle. |
|-------------|--------|------------------|
| waragh      | to eat | wártha           |
| hushagh     | to dry | hushtha          |

*Causals.* The causal is commonly formed by adding the suffix ain to the root; e. g.,

tharagh, to return.

tharainagh, to cause to return, *i. e.*, to give back.

Oshtagh “to stand,” and nindagh “to sit,” form their causals thus:—

oshtagh—oshtalainagh.

nindagh—nistainagh (to lay, spread out.)

Some of the verbs given in the above list are causals, the intransitive verb becoming transitive by a change in the radical vowel resembling the Sanskrit guṇa or vṛiddhi, see—

sushagh, soshagh; thashagh, tháshagh; thusagh, thosagh.

*Compound Verbs.* Verbs are compounded with prepositions, with nouns and with other verbs. The most common of those compounded with prepositions will be found under the words پړ! er “down,” مان man “in;” در dar “out;” and وگ gon “with” in the vocabulary. In verbs which take the prefixes bi, b, and kh these are inserted after the prepositions, as are also the negative particles na and ma; e. g.,

phajjá together. Aragħ to bring.

phajjá áragħ, to recognize.

phajjá kháritħ, he will recognize.

phajjá nayártha, he did not recognize.

Compound phrases of a noun and a verb are common. The verb, khanagh “to do,” deagh “to give,” janagh “to strike,” and giragh “to take” are most commonly used in this way; e. g.,

sar giragh, to set out

dem deagh, to send

One verb frequently qualifies another, the two verbs being used in the same tense and person throughout. The active past participle is never used unless followed by another past tense; e. g.,

ilagh deagh, to let go

bilán deán, I will let go

ishtho dátħa, he let go

tharagh ágh, to come back

tharán khán, I will come back

thartħo ákhthagħathán, I had come back

*The particles i and ish.* These particles are appended to verbs and take the place of the pronouns of the 3rd person, when not expressed before the verb. The singular form is *í* and the plural *ish*, but in practice they are used almost indiscriminately. They express (1) the agent of the verb in the 3rd person; (2) the object of an action, or the instrument by which it was performed; e. g.,

(1) *khutha*, did or done

án *khutha* }  
or } he did  
*khutha-í*, }

*ravaghatkant-í*, they were going

*jatka-ish*, they struck

*hechí nestath-í*, there was none of it (lit. anything it was not).

(2) *wath gindíth-í*, he will see himself

*man kharán-í*, I will bring it

*harkhas phajyá-kharíth-í*, every one recognizes him.

*Verbal Noun.* From most verbs a verbal noun of agency can be formed by the suffix *okh* being added to the base; e. g.,

*giragh*, to take; *girokh*, taker, creditor

*khushagh*, to kill; *khushokh*, murderer.

## ADVERBS.

A great part of the Balochí adverbs are more properly adverbial phrases, only a few being original adverbs. Many are nouns in oblique cases, others phrases of several words.

### (1.)—ADVERBS OF TIME.

|                          |                                 |
|--------------------------|---------------------------------|
| now                      | <i>ní, nín</i>                  |
| then                     | <i>hadhen, án-vakhtá</i>        |
| when?                    | <i>khadhen</i>                  |
| to-day                   | <i>maroshí, mar'shí</i>         |
| yesterday                | <i>zí</i>                       |
| the day before yesterday | <i>phairí</i>                   |
| three days ago           | <i>phisphairí</i>               |
| last night               | <i>doshí</i>                    |
| night before last        | <i>pharandoshí</i>              |
| to-morrow                | <i>bánghá, bánghavá</i>         |
| the day after to-morrow  | <i>thí bánghá, phithí-roshe</i> |
| in the evening           | <i>begahá</i>                   |

|                         |                                            |
|-------------------------|--------------------------------------------|
| to-morrow evening       | báughá-begahá, nawáshí-begahá              |
| now-a-days              | nínava <i>khtá</i> , maroshí-nawáshí       |
| formerly                | olá                                        |
| first, before,          | pheshá                                     |
| afterwards              | phadhá                                     |
| hitherto                | shed <i>h</i> -pheshá                      |
| henceforward            | shed <i>h</i> -phadhá, shed <i>h</i> -demá |
| yet, till now, hitherto | dáín, dání, dánkoh, daníkará               |
| always, perpetually     | harro                                      |
| now and then            | } damdame, dame dame                       |
| at one time and another |                                            |
| once                    | yabare                                     |
| at once                 | yabará                                     |
| again                   | agh, aghdí, aghathán                       |
| then, again             | guḍá                                       |
| another time            | thíbare                                    |
| at last                 | áhirá                                      |
| early                   | phagen                                     |
| at daybreak             | rosh-tiká                                  |

## (2).—ADVERBS OF PLACE.

## a. Rest in a place.

|                      |                                              |
|----------------------|----------------------------------------------|
| here                 | ed <i>h</i> , edhá, hamed <i>h</i> , hamedhá |
| there                | od <i>h</i> , odhá, hamod <i>h</i> , hamodhá |
| before, in front of  | demá                                         |
| behind               | phadhá, díma, pha-díma                       |
| near                 | nazí, nazí <i>kh</i>                         |
| far                  | ḍír                                          |
| out                  | dar                                          |
| outside              | darrá                                        |
| above                | kharghá, burzá                               |
| below                | jahlá, sher, buná                            |
| down                 | er                                           |
| on, ahead            | sará                                         |
| where ?              | bakhú ?                                      |
| on this side         | inbará, shinbará                             |
| beyond, on that side | ánbará, shánbará                             |
| everywhere           | harhandá                                     |
| nowhere              | thíhandá                                     |
| elsewhere            | hizhgarnen                                   |
| anywhere             | hizhgar.                                     |
| in the middle        | nyámá                                        |

## b. Direction to or from.

|                      |                                                                                 |
|----------------------|---------------------------------------------------------------------------------|
| hither               | <i>phedh</i> , <i>phedhá</i> , <i>ingo</i> , <i>ingwar</i>                      |
| thither              | <i>phodh</i> , <i>phodhá</i> , <i>ángo</i> , <i>ángwar</i> ,<br><i>phawángo</i> |
| hence                | <i>shedh</i> , <i>shedhá</i> , <i>shamedhá</i> , <i>shingo</i>                  |
| thence               | <i>shodh</i> , <i>shodhá</i> , <i>shamodhá</i> , <i>shángo</i>                  |
| whither ?            | <i>thángo</i> ?                                                                 |
| whence ?             | <i>ashkho</i> ?                                                                 |
| in this direction    | <i>in-phalawá</i>                                                               |
| in that direction    | <i>an-phalawá</i>                                                               |
| from this direction  | ' <i>shín</i> <i>phalawá</i>                                                    |
| from that direction  | ' <i>shán</i> - <i>phalawá</i>                                                  |
| in every direction   | <i>har-phalawá</i>                                                              |
| in what direction ?  | <i>tbán-phalawá</i> ?                                                           |
| onwards, upwards     | <i>sará</i>                                                                     |
| downwards            | <i>erá</i> , <i>sherí</i> - <i>pahnádhá</i>                                     |
| from above downwards | <i>sará-erá</i>                                                                 |
| inwards              | <i>andará</i>                                                                   |
| outwards             | <i>darrá</i>                                                                    |

## (3).—ADVERBS OF QUANTITY.

|                          |                          |
|--------------------------|--------------------------|
| much, many               | <i>báz</i>               |
| few, little, less        | <i>kham</i>              |
| a little                 | <i>chíklo</i>            |
| very little              | <i>khamro</i>            |
| more                     | <i>geshtar</i>           |
| enough                   | <i>gwas</i> , <i>bas</i> |
| a great deal, any amount | <i>khoy</i>              |

## (4).—ADVERBS OF MANNER, &amp;c.

From most adjectives an adverb of quality or manner may be formed by the suffix *iyá*, the adjective being sometimes slightly modified ; e. g.,

|                      |                           |
|----------------------|---------------------------|
| <i>gandagh</i> , bad | <i>gandaghiyá</i> , badly |
| <i>jowain</i> , good | <i>jowániyá</i> , well    |

Other adverbs of manner are :

|          |                               |
|----------|-------------------------------|
| very     | <i>sakíá</i> , <i>sakíghá</i> |
| together | <i>phajíá</i>                 |
| quickly  | <i>zíthen</i>                 |

|                                  |                           |
|----------------------------------|---------------------------|
| perhaps                          | nawán, kaizán             |
| why?                             | pharche                   |
| altogether, certainly, doubtless | mundo, be-shak            |
| thus                             | hanehho, haehho           |
| how?                             | chaehho? ehon?            |
| in this way                      | e-ranga, e-r'gá           |
| in that way                      | úrangá, ár'gá             |
| every way                        | harrangá                  |
| in what way?                     | thúrangá                  |
| never                            | hehí-na, 'chína, mundo na |

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### PREPOSITIONS.

There are few prepositions, properly speaking, in Balochí, as most of the partíeles so used follow the noun and would be more correctly called postpositions.

The following are prepositions proper and precede the noun which is governed in the oblique form (ablative or locative).

|               |                                      |
|---------------|--------------------------------------|
| go            | with, together with, in company with |
| gwar          | with, near, in possession of         |
| pha           | on, for, among                       |
| man, mán      | in, into                             |
| dan           | into, to, up to                      |
| azh, ash, shi | from, than                           |
| avr           | on, into                             |

From the above, some prepositional phrases are formed, of which the first member precedes, and the last follows the governed noun.

|             |                 |
|-------------|-----------------|
| go—gon      | in company with |
| go—phajyá   | together        |
| azh—siwá    | except          |
| azh—darrá   | without         |
| pha—randá   | on the track of |
| azh—phalawá | away, from      |
| azh—phadhá  | behind          |

The postpositions do not put the noun governed in an oblique tense in the singular. The force is often that of the genitive, which has no distinct form in the singular, but as might be expected the genitive plural is often used. Pronouns also take the genitive in the singular.

|                      |                        |
|----------------------|------------------------|
| on                   | sará                   |
| on, upon             | ehakhá                 |
| towards              | nemghá, neghá, phalawá |
| on account of        | sángá                  |
| along with           | phajya                 |
| in                   | nyámá, nyáwán          |
| out of               | darrá                  |
| near                 | khund, gwará           |
| before, in front of  | demá                   |
| behind, after        | phadhá                 |
| before (in time)     | pheshá                 |
| over                 | sará, kharghá          |
| under                | buná                   |
| beyond               | 'shánbará              |
| on this side of      | 'shinbara              |
| for, on account of   | phar                   |
| in the presence of   | rúbarú                 |
| in, in the middle of | láfá                   |
| like                 | ḍaulá, wájh            |

*Examples.*

|                          |                                 |
|--------------------------|---------------------------------|
| khoh buná                | under the hill                  |
| khohání sará             | on the hills                    |
| go walí sardára          | with his own chief              |
| drogh pha ímánuá khátáen | falsehood is a blot upon honour |
| dast jant avr barziyá    | she puts her hand into the bag  |
| eshiyá phadhá            | after this                      |
| thái sángá               | on your account                 |
| bozhí láfá               | in the boat                     |

## CONJUNCTIONS.

|                                   |                                                                     |
|-----------------------------------|---------------------------------------------------------------------|
| also, too                         | dí                                                                  |
| both, and                         | dí, dí                                                              |
| and, then                         | guḍá                                                                |
| and (copulative between<br>nouns) | o                                                                   |
| when                              | va <sup>h</sup> tá-ki                                               |
| whenever                          | án-va <sup>h</sup> tá-ki, har-va <sup>h</sup> tá-ki,<br>har-velá-ki |
| wherever                          | har-handá-ki, handá-ki                                              |

|                        |                     |
|------------------------|---------------------|
| whithersoever          | har-phalawá-ki      |
| if                     | ki                  |
| that                   | ki                  |
| but                    | lekin (rare)        |
| or                     | ki, hai             |
| either, or             | hai, hai            |
| neither, nor           | na, na              |
| not                    | na                  |
| „ (with imperatives)   | ma                  |
| else, otherwise        | na                  |
| lest                   | eho-ma-ví-ki        |
| because, in order that | hawe-sangá-ki       |
| although               | agħarchi (rare)     |
| until                  | dáín ki             |
| as, like as            | chon-ki, ehaehon-ki |

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 INTERJECTIONS.

|                          |                              |
|--------------------------|------------------------------|
| yes                      | hau !                        |
| yes, certainly           | bale !                       |
| no                       | na, inná                     |
| see there                | gind                         |
| behold                   | marvehí                      |
| yes, sir                 | wázhá !                      |
| my lord                  | wázhá maní, sáín !           |
| welcome !                | biyá durr sh'ákhte, biyátħai |
| all's well               | mahairá                      |
| well done                | wáh                          |
| bismi'lláh               | in God's name                |
| salám alaik, alaik salám | greetings between Musalmáns  |
| phrr                     | fie !                        |
| O                        | halloa.                      |

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## LIST OF ABBREVIATIONS.

|        |     |                  |       |     |              |
|--------|-----|------------------|-------|-----|--------------|
| A. Ar. | ... | Arabic.          | Poet. | ... | Poetical.    |
| P.     | ... | Persian.         | Adj.  | ... | Adjective.   |
| Panj.  | ... | Panjabí.         | Adv.  | ... | Adverb.      |
| P.P.   | ... | Past Participle. | Prep. | ... | Preposition. |
| S.     | ... | Substantive.     | Br.   | ... | Brahoi.      |
| Si.    | ... | Sindhí.          | M.    | ... | Masculine.   |
| Skr.   | ... | Sanskrit.        | F.    | ... | Feminine.    |
| V.     | ... | Verb.            | Cf.   | ... | Compare.     |
|        |     |                  | H.    | ... | Hindí.       |

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*Note.*—The Arabic letters ق ع ظ ط غ س ح are not used in this vocabulary, having no distinct pronunciation. They are represented by *ç* *z* *s* *k* and *t* when they occur in borrowed words.

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## V O C A B U L A R Y .



۱۱

(Words beginning with vowels.)

- آب *Áb*, P. (metaphorically) honour, dignity. Not used in the meaning water. (*Áb er-kanagh*) to disgrace.
- آبا *Abbá*, A. Br. father, papa. (Used by children.)
- آبا *Ubbá*, Si. north.
- آبتار *Abtar*, *hyæna*, (P. *kaftár*.)
- آبریشم *Ábresham*, P. silk.
- آبناخ *Ábnákh*, P. honourable, worthy.
- آبهار *Ubhár*, Si. raising. (Poet. in the phrase ‘*uchál-ubhár*’ lowering and raising.)
- آپتیا *Áptiyá*. Only in the phrase ‘*yak áptiyá*,’ among themselves.
- آپورس *Apúrs*, (P. *ávran*, *árus*) the Juniper tree. (*Juniperus excelsa*.)
- آپهان *Aphán*, a leather bag for flour.
- آپهرغ *Áphiragh*, p.p. *áphirta*, (Si. *áphirjnu*) to swell.
- آث *Ath*, was. 3rd pers. singular of past indef. of the verb to be. The complete tense is *athán*, *atheí*, *ath*, *athún*, *atheí*, *athant* or *athan*.
- آچال *Úchál*. S. See *Ubhár*.
- آچا *Achá*, (Si. *achho*) clean.
- آحام *Ájám*, (P. *anjám*) settlement, arrangement.
- آجب *Ajab*, (A. *عجب*) wonderful. *Ajab-rang*, beautiful, purple-coloured.
- آخرا *Ákhírá*, A. utterly, extremcly.

- ادب Adab, A. good manners.  
 آدت Adít, }  
 آدتوار Adítwár, } Si. Panj, Sunday.  
 ادغ Adagh, v., to pitch a tent, encamp.  
 آدین Adén, }  
 آذینه Azína, } a mirror.  
 آد Ad, Si. a masonry watercourse.  
 آد دینغ Ad-deagh, v., to lean.  
 آدآ Addá, Si. Br. brother (familiarly).  
 آدرغ Udragh, (Si uđirǰu,) to fly.  
 آدوهی Udohí, Si. a white ant.  
 آدی Addí, S. Br. sister (familiarly).  
 آرام Áram, P. rest.  
 آرتهه Árth (P. árad) flour.  
 آرد Urd, an army. (P. urdú.)  
 آرزان Arzán, adj. P. cheap.  
 آرسی Ársí, adj. Si. idle.  
 آرغ Áragh, p.p. ártha; imp. bi-ár; fut. khárán. (P. ávardan, bi-ár) to bring. Kárá áragh, to use. Phajjá áragh, to recognize. Gír-áragh, to remember.  
 ارمان Armán, pity. P.  
 آروخ Árokh, bringer. Verbal noun from áragh.  
 آریخ Áríkh, gums.  
 آزاب دینغ Azáb-deagh, A. Bi. to offend.  
 آزاد Azád, free. P.  
 ازبوخت Izbozht, the ajwain seed.  
 ازمان Azmán, }  
 ازمان Azhmán, } the sky. (P. ásmán.)  
 آزماینغ Ázmáinagh, to examine. P.  
 آزمونا Ázmútá, examination.  
 از Azh, from. (P. az. Pázand ezh.)  
 ازگیز Azhgizh, flint and steel. (Cf. P. azkhash.)  
 ازمان Azhmán. See Azmán.

- اِزْوَركَ izhwark, }  
 اِزْرَك izhrak, } (Br. shark.) *Rhazya stricta*.  
 اِزْجَك izhg, }  
 اَسْ ás, fire. (P. átish).  
 اَسْ رُوخ ás-rokh, a platform erected where funeral ceremonies  
 have been performed.  
 اَسْ كِهْوَه ás-khoh, flint (lit. firestone).  
 اَسَان ásán, easy. P.  
 اَسْب asp, horse. (The generic term.) P.  
 اَسْبِسْت uspust, lucerne grass.  
 اِسْهَلِك isphulk, the spleen. Br.  
 اِسْتَا astá, }  
 اِسْتَاث astath, } was. } Parts of the defective verb to be,  
 اِسْتَيْن asten, } is, are. } to exist.  
 اِسْتَنْت astant, } (P. hastan. Sk. As.)  
 اِسْتَار astár, star. (P. sitára.)  
 اِسْتَرَاغ istaragh, razor.  
 اِسْتَاغ ástagh, slowly. (P. áhista.)  
 اِسْتُوْر istúr, coarse, thick.  
 اِسْتِيْن ástín, sleeve. P.  
 اِسْتِيْن istín, a light cloud, cirrus.  
 اِسْر asr (اِثْر), impression.  
 اِسْر asur, dawn, morning twilight. Si.  
 اِسْر ásur (اِصْر), mercy.  
 اِسْرَار isrár, mystery, secret. A.  
 اَسْرُوْخ ásrokh, the third day of mourning. A platform erected  
 to commemorate it.  
 اَسَاغ ásagh, p.p. ástha, fut. khásán, imp. biás, to rise. Ásán,  
 rising. Rosh-ásán, sunrise.  
 اَسْك ásk, a deer (f.) (P. áhú.)  
 اَسْك مَهِسْك ásk-mahisk, a kind of fly.  
 اَسْل asul (اِصْل), original.  
 اَسْلَا asulá, from the first. Asulá gannoKh, a born idiot.  
 اَسْن ásín, iron. (Cf. P. áhan.)

- اشا ashá, a. eight o'clock in the evening.
- اش ash, from. (P. az)
- اش كوه ash-koh, whence?
- اش مودا ash-modhá (for azh hamodhá), thence.
- اش ميدا ashmedhá (for azh hamedhá), hence.
- اشدافي ashtáfi, s. quickness. (P. shitábi.)
- اشكذغ ashkanagh, p.p. ashkutá, imp. bi ashkun, to hear, listen. Compounded of ash-kuanagh. (Ash = Skr. asru.)
- اشتهر ishtha, p.p. of ilagh. q. v.
- اشتغ ushtagh. See ارشتغ oshtagh.
- اغ agh, adv. conj. again, then.
- آع ágh, p.p. ákhtá, imp. biyá, fut. khán, (P. ámadan, biyá), to come.
- phedh ághen, } is coming.  
mana-ághen, }
- er-ágh, to come down.  
dar-ágh, come out.  
mán-ágh, be applied, suit, hit.  
Phádh-ágh, rise.  
dast-ágh, get, come to hand.  
kára-ágh, be of use.
- آغاهي ághábi, warning. (P. ágáh.)
- اغدي aghdí, again. Also اغ agh. q. v.
- اغر aghar, if. (P. agar.)
- اغرچه agharchi, although (rare).
- اغل aghl (a. عقل), intellect.
- اغما aghmá, effort, endeavour.
- آف áf, water. (P. áb, Z. áfs.)
- آف آردخ áf-áro kh, } water-bearer.  
آفي áfi, }
- آف بيئغ áf-biagh, to melt, thaw.
- آف داري áf dári, irrigation.
- آف ديئغ áf-dcagh, to irrigate.

- آف شيف *áf-shef*, slope, watershed.  
 آف لغر *áf-laghar*, rapid, waterfall.  
 آف مرغ *áf-murgh*, waterfowl.  
 آف درك *áf-drik*, a kind of grass. (Panj. *manihár*.)  
 آفسن *áfsin*, pregnant. (Cf. P. *ábista*.)  
 آفشك *áfshik*, s. soup. (Cf. P. *áb-zah*.)  
 آفكن *áfkin*, box for holding collyrium.  
 آفيم *áfím*, opium. (A. *afyún*.)  
 اِكْتَر *iktar*, }  
 اِكْر *ikar*, } so much, thus much. (? P. *ʾn qadr*.)  
 اَكس *akas*, envy.  
 اَكْسَغ *aksagh*, p.p. *akastha*, fut. *kaksí*, imp. *biakas*, to sleep.  
 اَكْسَرَا *aksará*, generally.  
 اَكْل *akul* (a. *عقل*), intellect, wits.  
 اَكْهَان *ákhán*, proverb, anecdote. Si.  
 اَكْهَر *ákhār*, buttermilk. Si.  
 اَكْهَرُو *ákhéro*, nest. Si.  
 اَكْيَا *ukaiyá*, in that way, of that sort.  
 اَكِيلَا *akíla* (a. *عقيله*), celebrated.  
 اَكْ *ag*, rate of sale.  
 اَلْاَج *iláj*, cure. (A. *علاج*)  
 اَلْاَهْدَا *aláhida*, separate. (A. *عليحده*)  
 اَلْسِي *álsi*, idle. Si.  
 اِلْغ *ilagh*, p.p. *ishtha*, fut. *kilf*. imp. *bil*. (P. *hishtan*, *hil*),  
 to leave, abandon. *ilagh-deagh*, p.p. *ishtho-dálha*, to  
 let go.  
 اَلْكَا *nlkah*, the world, the universe.  
 اَمْب *amb*, mango. P.  
 اَمْبَازِي *ambázi*, embrace. (P. *ham*, *bázú*.)  
 اَمْبُر *ambur*, forceps. P.  
 اَمْبُرَا *ambráh*, servant, companion. (? P. *hamráh*.)  
 اَمْبَل *ambal*, mistress, lover; companion.  
 اَمْدَان *ámdan*, income. (P. *ámdan*, to come.)

- اِمْرًا imar, he, this man, this. For *ín mard*.  
 اَمْرٌ umar, age. (Ar. *عمر*.)  
 اَمْوَرٌ ámur, slowly.  
 اَمْسَرُوْ اmsaro, equal in age or otherwise.  
 اَمْبَلٌ amul, mistress (see *ambal*).  
 اَمْسُوْدٌ amsodh, grief. (Cf. P. *afsos*).  
 اَمْنَامٌ annám, namesake. (P. *hamnám*.)  
 اَمِيْرٌ amír, chief.  
 اَنْ an, dem. pro. that, he.  
 اَنْهِيْ azhí. }  
 اَنْهِيْآ azhiyá. } Genitive of *án*.  
 اَنْهِيْآرٌ anhiyár. Objective and dative of *án*.  
 اَنْبَرٌ anbar, }  
 اَنْبَرَاْ anbará, } beyond, on that side.  
 اِنْبَارٌ inbará, on this side.  
 اَنْجِيْرٌ anjír, s. fig; *kho*hí anjír, wild fig. P. see *hinjír*.  
 اَنْدَرَاْ andará, adv. inside.  
 اَنْدَمَاْ ándemá, adv. thither, that side.  
 اِنْدَمَاْ indemá, adv. hither, this side.  
 اِنْصَافٌ insáf, s. justice. (A. *انصاف*.)  
 اَنْزِيْ anzí, s. a tear. P.  
 اَنْكْتَرٌ ánktar, }  
 اَنْكْرٌ ánkar, } so much, as much as that. (? P. *ánqadr*.)  
 اَنْكَارَاْ ángará, Tuesday. Si.  
 اَنْكَانِيْ angane, innumerable. Si.  
 اَنْكَوْ ángo, thither, in that direction.  
 اِنْكَوْ ingo, hither, in this direction.  
 اَنْمَآچَهْ annácha, an ammunition pouch. See *hambácha*.  
 اَنْمَرٌ ánmar, he, that man, that. (For *án mard*.)  
 اَنْوْ ánú, egg. Si.  
 اَنْهَالَاْ unbálá, hot weather. Si.  
 اَنْشَاغٌ aníshagh, s. (P. *anúsha*), forehead; fate, fortune.  
 اَوَارٌ áwár, spoil, plunder.

- آوار áwár, mixed. P. *Áwár bíagh*, to mix with, join.  
 آواز áwáz, voice. P.  
 اوباسی obásí, yawn.  
 اوبهار obhar, east. Si.  
 اوتک otak, s. a halt; otak *khanagh*, to halt, encamp.  
 اوتهر othar, s. a dust-storm.  
 اوتغ otigh, s. }  
 اوتی otí, s. } a tank.  
 اوچاغو ojággho, awake. Si.  
 اوجری ojrí, stomach. Si. Paj. See *saghindán*.  
 آوداری ávdári, s. irrigation.  
 اور avr, on, upon, into. (Pázand, awar, on, over.)  
 اودا odhá, adv. there.  
 اوزار auzár, tool.  
 اوزی iwazí, revenge, substitute. (A. عوضی.)  
 اوزرا awarzá, pleasing, agreeable.  
 اوشتاغ oshtagh, v. p.p. *oshtátla*: imp. *bosht*, to stand, stay. (P. *istádan*.)  
 اوشتالینغ oshतालainagh. Causal of *oshtagh*, to post, set up.  
 اوگال ogál, chewing the cud. (Si. Ogár.)  
 اولا olá, adv. formerly. (From A. اول.)  
 اولک olak, beasts of burden. (? Turkish *wulágh*.)  
 اولهه olah, west. Si.  
 اولی olí, adj. former.  
 اوندو ondo, overturned. Si. *Ondo khanagh*, to upset.  
 آوهسان کھتا auhsán-khatá, a puzzle.  
 اوھی ohí, }  
 اوھیل ohíl, } flame.  
 اویر aver, late. Si.  
 آہ áh, in, ah! alas!  
 اھار ahár, the hot weather, the month *Ásárlı* (Si. Panj. Ahar).  
 اھسان ahsán, mankind. (A. ahsán.)  
 آھنجغ áhanjagh, a sash, kamarband. P.

- ای e or í, prep, this.  
 ایرگا er'gá, }  
 ایرنگا erangá, } in this way.  
 ایند edh, }  
 ایندا edhá, } adv. here. (Cf. Zend. aétadha.)  
 ایر er, adv. down, below. شیر sh'er, from below. (Cf. P. zer, below.)  
 ایرغ er-ágh, to come down.  
 ایربرغ er-baragh, to swallow.  
 ایرجدغ er-janagh, to east down, abase.  
 ایرشغ er-shafagh, to go down, set (of the sun). p.p. er-shuttha.  
 ایروغ er-ravagh, to go down.  
 ایرشف er-shaf, s. going down. Rosh-er-shaf, sunset.  
 ایركهغ er-khafagh, v. to descend, alight.  
 ایركهغ er-khanagh, v. to lay down, place.  
 ایرگوات er-gwáth, the lee-side; er-gwáthá, to lee-ward.  
 ایرندغ er-nindagh, v. to sit down.  
 ایش esh, this. (Cf. Zend. aesha.)  
 ایمان ímán, honour.  
 این ín, pron. this.  
 ایو aiv, spot, bolt. (A. عیب.)  
 ایوکها ewakhá, alone. (Panj. hekwá.)

## ب B.

- بادشاه bádsháh, king. P.  
 بار bár, s. burden, load. P.  
 bár-bandagh, to load.  
 bár-er-khanagh, to unload.  
 بارغ báragh, adj. fine, thin, lean. (P. bárík.)  
 بارو báro, }  
 بارے báre, } turn. Si.  
 بارتهه bárth, 3rd pers. sing. fut. of baragh.

- باز *báz*, many, much.  
*bázen wájhá*, of many sorts.  
*bazen barán*, often.  
*bázen rangá*, many coloured.
- بازار *bázár*, bazaar. P.
- بازو *bázú*, limb. P.
- بازیگر *bázigar*, juggler.
- باسغ *básagh*, v. to low (of eattle).
- باغ *bágh*, s. a garden. P.
- باغ *bágh*, v. p.p. *báitka* بائته, to be killed.
- باغار *bághár*, s. a lizard.
- باقی *báqí*, adj. remaining. A.
- بال *bál*, s. flight.  
*bál-giragh*, to fly, take flight.  
*bál-deagh*, to let fly.
- بالان *báládh*, figure, shape, form.
- بالانیا *báládhíyá*, adv. from below, upwards.
- بانغ *bálagh*, of age. A.
- باددی *bándí*, s. a hostage.
- بانگ *báng*, a voice, sound; cock-erow. P.
- بانگا *bángá*, } s. the morning. *Bángawá*, in the morning
- بانگو *bángo*, } to-morrow. *Thí-bánga*, the day after to-morrow.
- بانگوھنا *bángoheiná*, in the early morning.
- باندن *bándan*, a rough table.
- باؤت *báut*, refugee.
- بازتی *báutí*, shelter, refuge.
- باشو *báhir*, s. a herd of donkeys.
- باھرو *báhrav*, s. male calves.
- بپھا *baphá*, seurf. Si. *bapho*.
- بت *but*, self, oneself. (Si. *butu*, the body).
- بتار *bitár*, the two stars (forming the tail of *Ursa major*).
- بتھر *bathir*, better, very good. (P. *bihtar*).
- بتھلو *bathlo*, wooden mortar.
- باتیرہ *baterá*, quail. Si.

- بیج bij, seed. Panj.  
 بیچہ bachh, son. P.  
 بخت ba $\dot{z}$ ht, fortune. P.  
 بخت والا ba $\dot{z}$ htwálá, fortunate, generous, (used in addressing superiors).  
 بختہ bu $\dot{z}$ hta, p.p. of bushka $\dot{g}$ h. q. v.  
 بختمل ba $\dot{z}$ hmal, velvet. (P. ma $\dot{z}$ hmal.)  
 بد bad, bad (only in Persian compounds).  
 بدخو bad-khú, ill-natured.  
 بددوا bad-duá, curse.  
 بدشکل bad-shakl, ugly,  
 بدرگا badragá, an escort.  
 بدی badí, enmity. P.  
 بدغ bu $\dot{d}$ a $\dot{g}$ h, v. p.p. بدتہ bu $\dot{d}$ at $\dot{h}$ a, to drown, be flooded.  
 (Si. bu $\dot{d}$ a $\dot{n}$ u.)  
 بد badh, s. enemy. Generally in the plural بذات badhán.  
 بذل badhal, s. a debt.  
 بر bar, a time, a season. P.  
 ya-bare, once.  
 thí-bare, again. Bázen-barán, often.  
 بر bar, s. fruit.  
 بر bar, s. a desert. A.  
 برات biráth, s. brother. Birá maní, my brother !  
 براخ barákh, coarse grass found in the lower Sulaiman Hills.  
 برادر barádhār, s. brother (poet). P.  
 برادری barádhārí, s. brotherhood.  
 برادرخت birázákh $\dot{t}$ , s. a nephew, (brother's son). P. birádarzáda.  
 برآور baráwar, adj. equal.  
 بردست bardast, s. shoulder-blade (used in augury).  
 برز burz,  
 برزا burzá, } adj. high, upper, lofty. P.  
 برزغ burzag $\dot{h}$  }  
 برزاتهر burzáthir, adj. very lofty, higher or highest. Comp. of burz.

- برزي barzí, s. a bag.  
 برغ baragh, v. p.p. bur̄tha برته, to carry away, bear off, remove.  
*P. burdan.*  
 Er-baragh, to swallow.  
 Dar-beragh, to defend, save.  
 برغ buragh, v. p.p. bur̄tha برته, to cut. *P. buridan.*  
 بوقه burqa, s. a veil. A.  
 برنج birinj, s. husked rice. P.  
 برو baro, } 2nd pers. sing. and plural Imperative of ravagh,  
 برويث baroeth, } go, go ye. P. burú. Skr. bhrú.  
 بروته baroth, s. moustaches. (Cf. Pashto bret.)  
 برسغ bresagh, v. pp. brestha برسته, to spin.  
 بري buzí, s. a spring.  
 بز baz, adj. thick, coarse.  
 بز buz, s. a goat. P.  
 بشام bashám, the rains, the month of Sáwan.  
 بشك bushk, s. a horse's mane.  
 بشكغ bashkagh, v. p.p. bashkatha, to give. *P. bakhshidan.*  
 بشكع bushkagh, v. p.p. bukhtha, to discharge a gun.  
 بغا baghá, s. coward, runaway.  
 بغل baghl, s. in the phrase baghl giragh, to embrace. Ar.  
 بغير baghair, except, without. Ar.  
 بكچي bukchí, horse's mane.  
 بکل bakkal, a Hindú, a trader. Ar. بقال.  
 بکهو bakhú, where?  
 بگ bag, a herd of camels. Panj. bag. Si. vagu.  
 بل bil, imperative of ilagh. Bil-dai! let go!  
 بل bal, spear.  
 بلا billá, s. medal.  
 بارو balrú, infant.  
 بلکو balgo, dirt.  
 بلوغت balúghat, puberty. Ar.

- بلی billí, eat. Hindi, Si., Panj.  
 بن ban, exposed surface of a stratum of rock, sandstone.  
 بن bun, root, bottom. P.  
 بنا buná, below, at the bottom.  
 بند band, an embankment. P.  
 بندر bundar, the buttocks. Si. bundaru.  
 بندع bandagh, v. p.p. bastha, to tie, bind. P. bastan.  
     Saren-bandagh, to help.  
     Drogh-bandagh, to lie.  
 بندیک bandíkh, thread.  
 بنغ bunagh, baggage.  
 بنو banú, an embankment round a field. Si. bano.  
 بنی binni, a donkey's pack-saddle.  
 بنیاد bunyád, foundation. P.  
 بو bo, s. smell. P.  
     Gand-bo, stink.  
     Náz-bo, pleasant smell.  
 بوت bot, vermin.  
 بوتغ bútagh, v. p.p. bútagha, to close (the eyes).  
 بوتغ búthagh, braeelet.  
 بوخته bokhta, p.p. of bozhagh. q. v.  
 بون bodh, a small tree producing Gúgal gum, *Balsamodendron mukul*.  
 بور bor, chestnut (of a horse); poetically a mare, horse Si. boru.  
 بۇر búr, a bud.  
 بورچی borehi, a cook. Turkish.  
 بوز boz, the Gúgal tree, also the drug obtained from it, *Balsamodendron mukul*. See bodh.  
 بوز búz, wild, savage.  
 بوژغ bozhagh, p.p. bokhta, to open, untie. (Cf. pázand, bozheshn, release.)

- بوڙي bozhí, a boat. A.  
 بوغ bogh, a joint in wood.  
 بوف bauf, a pillow, mattrass.  
 بوڳ بوکڱ bokagh, (1) to bleat as a goat; (2) to be proud, frisky.  
 بولاک bolak, a tribe.  
 بولي bulí, beestings.  
 بولي bolí, speech.  
 بوھاري bohári, sweeping. Si. buhári.  
 بوھتار bohtár, a host, entertainer.  
 بوھري boharí, in front.  
 بوھل bohal, a barren, salt mountain.  
 بوھره bohra, a vault, cellar.  
 بھا bhá, s. price. Si. bahá. bhá-giragh, to buy.  
 بھا bahá, v. the River Indus.  
 بھادر bahádkur, brave, a hero.  
 بھاڱيا bhágyá, rich, well off. Si. bhágyo.  
 بھان bihán, a filly.  
 بھانڌا bhándá, a fold, enclosure, pen. Si. bhándo.  
 بھائي bahái, sale.  
 بھت bhít, a wall. Si.  
 بھتي bhattí, a kiln. Si.  
 بھر bahar, a share. P. Bahar-khanagh, to deal, divide.  
 بھرکھا baharkhá, the month of Chait. P. bahár.  
 بھرڱ bhuragh, p.p. bhurítka, to be crushed, burst. Si. bhuraṇu  
 بھشٽ bihisht, heaven. P.  
 بھولو bholú, monkey. Si.  
 بھور بھنڱ bhorenagh, v. to break, burst (transitive). Causal of  
 bhuragh.  
 Chham bhorenagh, to wink.  
 Khond bhorenagh, to kneel.  
 بھيڌي bhedí, s. the ankle. Si. bhedí.  
 بے be, pr. without. P.

- بے ایمان be-ímán, faithless.  
 بے ادب be-adab, rude.  
 بے آرام be-árám, uneasy.  
 بے انصاف be-insáf, unjust.  
 بے اکل be-akul, senseless.  
 بے اکلی be-akulí, senselessness.  
 بے پہان be-phádĥ, a snake, (lit. without feet).  
 بے دہان be-dihán, thoughtless.  
 بے سدھاتی be-sanátí, useless.  
 بے سیک be-sek, weak.  
 بے شک be-shak, doubtless.  
 بے شمار be-shumár, innumerable.  
 بے فہما be-fahmá, unintelligible.  
 بے کار be-kár, unoccupied.  
 بے گناہ be-gunáh, innocent.  
 بے میار be-miyár, } shameless.  
 بے ہیبا be-hayá, }  
 بے وس be-was, helpless.  
 بی bai. Imperative.  
 بی bí, } 3rd pers. sing. fut. } of bíagh. Cf. Pashto ví.  
 بیڈھ bíĥ, } and subjunctive,  
 بیڈھ bíĥa. Past Part.  
 بیر bair, revenge. Bair-giragh, to take revenge.  
 بیرری bairí, revenge, enmity.  
 بیرانی berání, harm, damage.  
 بیر کھنځ ber-khanagh, to surround, encompass.  
 بیرو دینځ bero-deagh, to turn back.  
 بیرری berí, a boat. Si.  
 بیگاہ begáh, s. evening. Begahá, in the evening. P.  
 بیلان bílan, s. the small intestines.  
 بیل bel, (1) a friend; (2) a hoe. Si.  
 بینځ benagh, s. honey. Benagh-mahisk, a bee. (Cf. P. angubín.)  
 Pashto gabína.

بیدنگ bíng, dog. Bíng, the Dog, *i. e.*, the middle star of the three forming the tail of *Ursa Major*. See under Gu-ránd. Bíng-mahisk, a horsefly.

بیوان bewán, wilderness. P. bayábán.

بیوخ bíokh, possible. Bíokh-nen, impossible. Noun of agency from bíagh.

بیئغ bíagh v. to be, become, p.p. bítha.

Bíagh-ravagh, p.p. bítho-shutka, to become, to suffice.

## پ P.

پاتار pátár, a hole dug for roasting meat over.

پارا párá, hog-deer. Si.

پارت párat, charge, entrusting, confidence. Si.

پاره pára, quicksilver. Si.

پاد pád, root. Si.

پاسنا pásná, a night attack.

پاک pák, clean. P.

پاکرا pákrá, camel's riding-saddle. Si. pákhiro.

پالو pálo, frost. P.

پالینغ pálenagh, to strain, sift, winnow.

پانجالی pánjálí, yoke (of oxen). Si. panj.

پاینا páiná, lower, eastern. P.

پت paṭ, s. silk. Si.

پت paṭ, s. confidence, trust.

پت paṭ, s. a bare plain. Si.

پتافا patáfá, in the heat of the sun.

پتال pital, brass. Si.

پتنگ patang, s. a moth.

پتاکهه paṭsákh, oath. Si.

پچل pæhul, curtain or side walls of a Baloch hut.

پخت pukht, s. the Bhán tree (*Populus Euphratica*). See phukht.

- پارادو parādāv, s. } eeho. Si. parláu.  
 پارلا parlá, s. }  
 پاروتنا parútá, adj. stale.  
 پزادغ pazádagh, s. a step-son, (husband's son).  
 پشازنگ pasháng, s. a wild man, savage, idiot.  
 پشبي pashí, s. a berry.  
 پكار pakar, adj. neccessary.  
 پلان palán, eamel paek-saddle. Panj.  
 پلوتنا palútá, eurse.  
 پلینغ palíthagh, s. (p. falíta). The slow-match of a matchlock.  
 پندغ pindagh, to beg. Si. pinaṇu.  
 پندوگ pindoḡh, beggar. Noun of ageny from pindagh.  
 پنور panwar, (also mueh-panwar), the Pleiades.  
 پور por, s. a flood.  
 پوزغ púragh, v. to bury. Si. púranu.  
 پوریاہ poriyáh, wages. Si. porhyo.  
 پوست post, s. poppy. Post-dodá, poppy-heads.  
 پوشغ poshagh, to dress. P.  
 پوشینغ poshenagh, to clothe. (Causal of poshagh.)  
 پوگوخ pogokh, the gullet.  
 پوه poh, understanding. (Pashto poh.)  
 پوه کھنغ poh-khanagh, v. to explain.  
 پوه بیئغ poh-bíagh, v. to understand.  
 پھہ pha, prep. on, upon, among. P. ba. Pashto. pah. Pársi pa.  
     Pha-wathán, among themselves.  
 پھان phádh, s. foot, leg. Demí-phádh, forefoot.  
     Be-phádh, footless ; a snake.  
     P. páí. Z. pádha. Skr. páda.  
 پھان آغ phádh-ágh, to arise.  
 پھان پھشت phádh-phusht, instep.  
 پھان گوزار phádh-guzár, shoes.  
 پھان مچھہ phádh-muehh, ankle.  
 پھان مرنان phádh-murdán, toe.

- پهاندانغ *phádh-murdánagh*, toes.  
 پهاندنايي *phádh-nalí*, shin.  
 پهاندی *phádhí*, ring worn on a woman's toe.  
 پهاندغ *phádhagh*, wheel.  
 پهار *phár*, leisure.  
 پهارت *phárat*, charge. See *párat*. Si.  
 پهاريهنگ *phárphugh*, a tree, (*Tecoma undulata*).  
 پهاري *phárí*, last year. P. *pár-sál*.  
 پهاريز *phárez*, temperate. P. *parhíz*, safe.  
 پهاش *phásh*, bare; *phásh-phádh*, barefoot.  
 پهاشان *pháshan*, the male *márkhor*. P. *pázan*.  
 پهانغ *phágh*, turban. Met. The succession to a chiefship. Si. *pág*.  
 پهاندزده *phánzdah*, fifteen. P.  
 پهاهو *pháho*, hanging; a noose. Si.  
 پهههه *phiphar*, lungs, lights. Panj. Si. *phiphiru*.  
 پهت *phuṭ*, hair.  
 پهتگی *phiṭkí*, alum. Si.  
 پهت *phiṭ*, prickly-heat.  
 پهتتر *phuṭur*, original, genuine, thorough.  
 پهتغ *phiṭagh*, to turn sour. Si. *phiṭaṇu*.  
 پهتک *phuṭak*, short, stunted; a dwarf.  
 پهتوریک *phatrík*, a bush, (*Grewia populifolia*).  
 پهت *phith*, father. P. *pidar*. Pahl. *pid*.  
 پهتپهیر *phith-phírú*, forefathers.  
 پهتی *phiṭhí*, other, another. (In Kachí.)  
 پهخت *phukht*. See *pukht*, (*Populus euphratica*).  
 پهجی *phají*,  
 پهجیا *phajyá*, } with, in company with.  
 پهجیارغ *phajyá-aragh*, to recognize.  
 پهکو *phado*, pocket.  
 پهکدئغ *phadeagh*, v. p.p. *phadáttha*, to run.  
 پهکدما *phadímá*, adv. behind.

- پهدا phadhá, afterwards.  
 پهډي phadhí, hinder, coming after.  
 پهر phar, prep. for, on account of.  
 پهر phar, a wing, feather. P. par.  
 پهر phur, full. P. pur.  
 پهرا pahrá, watch, guard.  
 پهراف phuráf, a young female camel up to 3 years old.  
 پهرواغ pharámagh, to deceive, deceit.  
 پهراون pahráwan, long coat. Si.  
 پهراه phráh, broad. P. farák<sup>h</sup>.  
 پهراهان phráhád<sup>h</sup>, } breadth.  
 پهراهي phráhí, }  
 پهچهي pharchhe, why? on what account?  
 پهرز phurz, tinder. Si. purdu.  
 پهريشنگ phirishtagh, an angel. P. firishta.  
 پهروشنگ phrushagh, p.p. phrushtha, to break, burst (intr.).  
 Cf. P. fursúdan.  
 پهرومان pharmán, command. P. farmán.  
 پهروو phurú, a moth.  
 پهريي phurí, a mosquito or sand-fly.  
 پهروه phroh, grey.  
 پهريي phurí, a drop. Si.  
 پهروه phroh, a plant, (*Sagaretia Theesans?*).  
 پهريښنگ phirenagh, v. p.p. phirenthá, to throw, cast. Cf. P. pará-  
 nídán, to cause to fly.  
 پهژ phur, ashes.  
 پهژاك غز phizádagh, step-son, (husband's son).  
 پهژم phazhm, wool. P. pashm.  
 پهس phas, a sheep or goat. Pashto psah.  
 پهسو phaso, answer. Pahl. pasukho.  
 پهسپهريي phispairí, two days before yesterday. P. pas + phairí q. v.  
 پهسنگ phusagh, a son. P. pisar.  
 پهشت phusht, the back. P. pusht.

- پهشتی phushtí, a chaddar or sheet for wearing.
- پهشغ phashagh, v. p.p. phakká, to cook. P. pazídan and H. pakká.
- پهشك phaskk, a woman's garment, boddice.
- پهكا phakká, (1) ripe, cooked; (2) a boil. H. pakká.
- پهكي phakkí, anything reduced to powder, and taken down at a gulp with water.
- پهگرغ phagaragh, to melt, thaw.
- پهگین phagen, early in the morning. P. pagáh, dawn.
- پهل phul, a flower. Si. Panj.
- پهال puhál, a bridge. P. pul.
- پهلات phulát, steel. P. púlád.
- پهلمغ phullagh, to rob, plunder, p.p. phullitha. Si. phuraṇu.
- پهلكند phulkand, sugar.
- پهلو phalo, direction, way, side. Si. palau, edge, border. Pashto, dittó.
- پهلووا phalwá, in a direction.
- پهلووه phulúh, nose-ring. Si. búlo.
- پهلي phallí, section of a tribe.
- پهلي پاهلی pahlí, rib. P. pahlú.
- پهلي پهللی phullí, the cap of a gun.
- پهلي پهللیتغ phalíthagh, match of a matchlock. P. palíta or falíta.
- پهليت phalít, unclean. P. palíd or palíz.
- پهلمبلي phimblí, eyelash. Si. pimbiní.
- پهناد pahnád, side, direction.
- پهنال pahnál, flank.
- پهنج phanch, five. P. panj.
- پهنجك phanjak, one-fifth. (The share of plunder due to a chief.)
- پهنججاه phanjáh, fifty. P. panjáh.
- پهزوال pahzwál, shepherd.
- پهني phiní, calf of leg. Panj.
- پهنيذر phancer, curds, cheese. P. panír.
- پهنيذر پچ phanerpuch, rennet.

- پهواد phawád, a mountain, a peak.
- پهوپهوي phúphí, paternal aunt. Si. H.
- پهون phodh, }  
پهونان phodhán, } there, thither.
- پهونان ديممي phodhán-demí, the common white bindweed.
- پهور phor, a pipe made of clay, or a leaf of phísh, *Chamaerops ritchiana*, twisted spirally.
- پهوست phost, poppy. P. post.
- پهوغ phogh, s. chaff. (Cf. P. púk).
- پهوگ phog, s. a bush, *Calligonum polygonoides*. Si. panj.
- پهوگري phogrí, s. a goat given as wages to a goatherd.
- پهول phol, s. search, enquiry, demand. Si.
- پهول پهوس phol-phurs, s. questioning. Si. P.
- پهول كهڼع phol-khanagh, v. to ask, demand.
- پهولع pholagh, v. to search for. Si. pholaqu.
- پهولوخ pholokh, v. one who demands, a robber.
- پهونز phonz, s. nose. (Cf. Pashto, pazah. Brahoi, bámas.)
- پهيدارغ phedáragh, v. p.p. phedáshta, to show.
- پهيدن phídih, s. heel.
- پهيدن phedh, }  
پهيدان phedhán, } here, hither.
- پهيدانغ phedhág, visible. P. paidá.
- پهيدانغيدن phedhágghen, is coming. See ággh.
- پهيدنغ phídihagh, a plant. A small species of *Euphorbia* found in the southern Sulaiman hills.
- پهير phír, s. an old man; phírand, an old woman; adj. old.  
P. pír.
- پهير phír, s. the jál tree, *Salvadora oleoides*. Si.
- پهيراري phairárá, adv. the year before last. P. pírár-sál.
- پهيرك phíruk, s. grandfather.
- پهيري phírí, s. old age.
- پهيري phairí, adv. the day before yesterday. P. parí-roz.
- پهينغ phísagh, }  
پهيدنغ phídihagh, } a small plant. See پهينغ

- پهېدش phísh, the dwarf palm, *Chamærops ritcheiana*.  
 پهېش phesh, first, before. P. pesh.  
 پهېشې pheshí, adj. former, first.  
 پهېشا pheshá, formerly, first; pheshá, bundainagh, to forestall.  
 پهېغ phígh, fat, grease. P. píh.  
 پهېغل phífal, a bush, *Daphne mucronata*.  
 پهېلا phílá, complete, full, perfect.  
 پهېمار phímáz, onion. P. piyáz.  
 پهېهغ phehagh, to thrust; to enter forcibly. Si. pehañu.  
 پهېهې phehí, a scaffold (for watching crops). Si.  
 پېانغ piyádhagh, a footman. P. piyáda.  
 پېنډر píthar, a short grass found on the Sulaiman hills, growing  
 between the coarse tufts or gasht.  
 پېچ pech, a screw. P.  
 پېدائېش paidáish, produce. P.  
 پېغام paighám, a message. P.

## ت T.

- تابدار tábidár, obedient. A. P.  
 تاپهړغ táphuragh, v. p.p. táphuritha, to stumble. Si. thábirjanu.  
 تاج táj, a cock's comb.  
 تار tár, wire. H.  
 تاري tárí, clapping of hands. Si. tárí.  
 تازیم tazím, reverence. A.  
 تاس tás, cup. (Rare.)  
 تالك كهفغ ták-khafagh, to flinch, shy (of a horse).  
 تالابالا tálábálá, putting off, postponement. Si. tálo.  
 تالان tálan, a push. Tálan deagh, to push.  
 تالو tálo, the palate. Si. tárúu.  
 تاه táh, odd (in numbers, as opposed to even).  
 تاهه táha, inside.  
 تاهت táhat, true, right, correct.

- تَبِيَّت tabiyat, temper. A.  
 تَپَال tapál, post. Si. tapál.  
 تَرَاتِه tráth, a plant (called *maitr* in the Deraját), *Anabasis multiflora*.  
 تَرَان trán, counsel.  
 تَرْتِهه tirtha, mad.  
 تَرُش trush, harsh, sour. P. tursh.  
 تَرُغ taragh, v. p.p. tarathá, to swim. Si. taranu.  
 تَرُكُغ tarkagh, p p. tarkathá, to cackle.  
 تَرُزُد trund, cruel, fierce, passionate.  
 تَرِهَان tarhán, a young camel.  
 تَرِي trí, an aunt (paternal). Panj. Skr. strí, woman.  
 تَرِي زَاخْت trí-zákhht, a cousin (paternal aunt's son).  
 تَرِيَر trer, dew. Si.  
 تَرِيْت trít, s. bread steeped in milk or soup.  
 تَشْنَهه tushna, s. frog.  
 تَغَار taghár, a small watercourse on low hills.  
 تَك tak. } See ták and ták-khafagh.  
 تَك كَهْفَغ tap-khafagh. }  
 تِكَا tikká, swift, sharp. Si.  
 تَل tal, mole.  
 تَلَب talab, pay. A.  
 تَلُغ talagh, v. to fry. Si. taranu.  
 تَلِي tillí, palm of hand ; sole of foot. Panj. tarí.  
 تَمَاكُو tamákú, tobacco.  
 تَمْبِيَلَا tambelá, stable. A.  
 تَمُهَو tumho, a plant, *Crotalaria Burhia*.  
 تَنْد tund, maimed. Si. tundo.  
 تَنْكَهه tankh, narrow. P. tang.  
 تَنْكَهه tankh, a pass through a defile. P.  
 تَنْكُغ tang, girth of a horse. P.  
 تَنْكُغ دِيَنْغ ting-deagh, to drink up.  
 تَنْكُغ tung, a hole. See tong.  
 تَنْكُغ تَنْغ tangagh, to hang. Si. tangu.

- توار tawár, voice, call, speech. Si.  
 توان tawán, a vessel for baking bread. P. tábá.  
 توان tawán, battle, fight (poet).  
 توبا tobá, a spring. Panj.  
 توپ top, a cap. Si. topu.  
 توئا totá, parrot. P.  
 توخ tokh, a valley between two parallel ridges, a path through ditto.  
 توخ taukh, voice, speech; taukh-tawár, conversation.  
 توژ tauzh, adj. bitter, brackish.  
 توژ tauzh, s. a bush, *Salvadora Persica*.  
 توسغ tosagh, v. See thosağh.  
 توسینغ tosenagh, v. Causal of tosagh.  
 توف tof, cannon. P. T. top.  
 توفک túfak, gun, matchlock. P. tufang.  
 توکل tawakkul, dependence, confidence. A.  
 تونگ tong, hole. See ɬong.  
 تهاخ thákh, leaf.  
 تهار thár, dark. P. tár.  
 تهاف tháf, heat. P. táb.  
 تهاف tiháf, waterless. (P. tah, low and áb, water?).  
 تهافغ tháfagh, oven. P. tábah.  
 تهاشغ tháshagh, p.p. thákhtha, to gallop a horse. P. tákhthan, táz.  
 تهاشی tháshí, s. galloping; Galagh-thashí, horse-racing.  
 تهاله thála, s. a company.  
 تهان thán, which? thángo, whither? thán-rangá, how?  
 تهان thán, s. a pack-saddle.  
 تهانوان thánwán, s. damage.  
 تهاپ thap, wound.  
 تهر thar, moist. P. tar.  
 تهرس thurs, } fear. P. turs.  
 تهرس thars, }  
 تهرسغ thursagh, v. p.p. thursitha, to fear. P. tursídan.

- تهوسوخ thurso $\dot{k}h$ , a coward. Verbal noun from thursagh.  
 تهوسيندغ thursainagh. Causal of thursagh, to frighten.  
 تهروع tharagh, to return; p.p. thartha; tharagh- $\acute{a}gh$ , to come back.  
 تهروزنگل throngal, hail.  
 تهريندغ tharainagh. Causal of tharagh, to give back, send back.  
 تهسي thusí, a small bird.  
 تهغ thusagh, v. p.p. thustha, to faint; to go out (of a lamp).  
 تهش thash, an adze. P. tash.  
 تهشغ thashagh, v. p.p. thakhta, to run, gallop. Zend. tach.  
 تهغزار شور thaghárshoz, a plant.  
 تهغرد thaghard, matting made of the leaves of the phísh, (*Chamaerops ritchiana*). Cf. Pashto  $\dot{t}aghar$ , carpet.  
 تهف fever, heat. P. tap.  
 تهفر thafar, an axe. P. tabar.  
 تهفغ thafagh, to become hot.  
 تهل thal, a valley, an alluvial plain surrounded by hills.  
 تهل thul, a fort.  
 تهلانگ tahláng, face of an exposed rock-stratum.  
 تهلتغ thal $\dot{t}agh$ , v. to stammer.  
 تهلشك tahlíshk, broken edge of an exposed rock-stratum.  
 تههم tham, ambush. Si.  
 Tham-bíagh, to lie in wait.  
 تهامت tuhmat, slander. A.  
 تهين thun, thirst.  
 تهنج thanakh, thin, fine.  
 تهنگو thango, gold. P. tanka, tanga.  
 تهني thuní, thirsty.  
 تهو } thou, 2nd pers. pronoun sing. nom. P. tú. Pash-  
 تهه } to, tah.  
 تهورا thora, quarter (in fighting). Si.  
 تهوسغ thosagh, v. p.p. thosta (causal of thusagh), to extinguish,  
 put out.  
 تهولغ tholagh, jackal.

- تهواغ كدر tholagh-kunar, a bush, *Zizyphus oxyphylla*.  
 تھوم thom, garlic. Si. Panj. Ar. تھوم  
 تھی thí, other, another.  
     Thí-bare, another time, again.  
     Thí-roshe, another day.  
     Thí-kase, some one else.  
     Thí-bángá, day after to-morrow.  
     Thí-hande, somewhere else.  
     Thí-sál, next year.  
 تھیر thír, bullet, arrow; thír-janagh, to shoot. P. tír.  
 تھیردان thír-dán, a bullet-pouch.  
 تھیرغ thíragħ, horse's nose-bag.  
 تھیرغ thegh, sharp, swift.  
     Thegháf, "swift water," name of a stream.  
 تھیرغی theghí, all.  
 تھیل thíl, age (used of animals).  
 تھیلغ thelagħ, eyeball.  
 تھوغبین thewagħen, all, the whole.  
 تھیبہ thíb, a slave (male).  
 تیربند tírband, the constellation Orion.  
 تیز tez, sharp. P.  
 تیزغ tezhagħ, a melon.  
 تیزغی کہوہ tezhagħí-khoh, a hone, whetstone.  
 تیلان telán, a push, shove. Si. thelho.  
     Telán deagħ, to push.

## ت T.

- تہبی tubí, advice. Si.  
 تہر tapur, felt, namda. Si.  
 تراما trámá, copper. Si. trámo.  
 ترپغ trapagħ, to drop, drip.  
 ترصغ trimagħ, to drip. Si. trimanu.  
 ترمرؤف trimu-úf, dripping well, or small waterfall.

- ترڪڻ trakaḡh, to burst (used of boils).  
 تروريدار ṭroredár, a firelock.  
 ٿلو ṭlú, a bell.  
 ٿڻڍني ٿiṇḍiní, firefly. Si.  
 ٿوبِي ٿobí, dive. See ٿubí.  
     Ṭobí *deagh*, to dive.  
 ٿوپو ٿopú, hat. Si. ٿopu.  
 ٿوند ٿond, turban, *met.* a great man.  
 ٿونگ ٿong, a hole. Si. ٿungu.  
 ٿهاھنڱ ٿháhinagḡh, to make, construct. Si. ٿháhanu.  
 ٿهتر ٿheṭ, a mountain peak. Panj.  
 ٿهيدھل ٿhíthal, female ravine deer.  
 ٿهياغ ٿhílagḡh, eyeball.  
 ٿيتونا ٿítúná, the bulbul.  
 ٿيٿيھر ٿítíhar, the sand-piper, *Tringa goensis*.

## ج J.

- جابه jábah, quiver.  
 جار jár, net. Si. járu.  
 جار jár, twins. Si. járo.  
 جاسوس jásús, spy. A.  
 جاغ jágḡh, v. p.p. jáitḡha, to chew.  
 جاگرو jágrú, watch. Si. jágú.  
     Jágrú *dáragḡh*, to keep watch.  
 جام jám, chief. Si.  
 جان ján, body. P. ján, life.  
     ján-jebho, body armour.  
     ján-shodḡhagḡh, to bathe.  
     ján-khanagḡh, to dress.  
 جانگوه jángoh, arms and armour, when girt on the body.  
 جانور jánwar, domestic animals. P.  
 جاهل jáhil, lower, east. See jahl.  
 جائزو jáizo, promise, engagement. A. jáíz.

- جت *jat*, camel-driver. Si.  
 چټهر *jathir*, millstone. Si. *janḍru*.  
 چټه *jatha*, p.p. of *janagh*.  
 چټمت *juḥht*, scabbard of a sword.  
 چغت *juḥht*, adj. even (in numbers, as opposed to odd). Pashto  
*juḥht*.  
 چر *jar*, clothes, dress.  
 چریده *jarída*, a poor man, pauper.  
 چزغ *juzagh*, to go, move.  
     *gámá juzagh*, to walk (of a horse).  
 چزوخ *juzokh*. Verbal noun from *juzagh*, moving, the pulse.  
 چست *jist*, zinc. P.  
 چغدل *jaghdal*, s. a Jaṭ.  
 چغدلی *jaghdali*, s. the language of the Jaṭs, viz., Panjábí or Sindhí.  
 چغر *jaghar*, liver. P. *jigar*.  
 چفت *juft*, a pair.  
 چلاه *juláh*, } an attack. Si. *julah*.  
 چلوه *juloh*, }  
 چلگرو *julgav*, a crowd.  
 چما *jumá*, Friday. Ar. *jum'ah*.  
 چمارا *jamára*, everlastingly. Si. *jamár*.  
 چمب *jumb*, moving, shaking.  
 چمله *jumla*, collection, total, amount. Ar.  
 چن *jan*, s. woman. P. *zan*.  
     *jan-gal*, a band of women.  
 چنت *jannat*, } heaven. Ar. چنت.  
 چنتل *jantal*, }  
 چنټهر *janthir*, } a mill, millstone. Si. *janḍru*.  
 چندر *jandar*, }  
 چند *jind*, self, oneself. Si.  
     *wathí jindeghen*, one's own.  
 چنغ *janagh*, v. p.p. *jatha*, to strike. P. *zadan*, *zan*.  
     *tárí janagh*, to clap hands.  
     *chapol janagh*, to slap.

dápurá janagh, to stamp.  
 dighár janagh, to dig.  
 dafá janagh, to boast.  
 dak janagh, to solder.  
 dag janagh, to rob on the highway.  
 dil janagh, to vomit.  
 dang janagh, to sting.  
 túfak janagh, to shoot.  
 khátr janagh, to breach a wall.  
 ladhagh janagh, to kick.  
 síndá janagh, to whistle.  
 taukh janagh, to cry out.  
 goghrá janagh, to snore.  
 cháp janagh, to clap hands.  
 gwánkh janagh, to call out.

- جښکۀ jinkh, } s. a daughter. Dim. of jan. Cf. Pashto jinaí,  
 janikh, } jínakaí.
- جنگ jang, s. war. P. jung-bilá, a medal.
- جو jo, s. a stream, canal. Pehl. jóí. P. júí.  
 syáh jo, a perennial stream.
- جو jau, s. barley. P.
- جواب jawáb, s. answer. A.
- جوار jawár, s. a pair, yoke of oxen mate. Hind.
- جوابین jawáin, good.
- جوانیا jawániyá, adv. well.
- جود jodh, a man, warrior.
- جور jor, adj. well, strong, in health. Si. joru.
- جور jaur, poison.
- جور jaur, the oleander, *Nerium oderum*.
- جوژو jozho, a small fly.
- جورع joragh, } to make, construct. Si. joranu.  
 جورايج jorainagh, }
- جوغ jogh, yoke. Si. jog.
- جونا júfá, avarice, usury, A. Si. jyáfa.

- چوفاخور *júfákhor*, a usurer.
- جوگن *jogin*, a wooden mortar for cleaning corn.
- جوگن دار *jogindár*, stick or pestal for ditto.
- جول *júl*, a large bag.
- جوهان *jauhán*, a heap of corn at harvest. P.
- جهاتي *jhátí*, a peep. Si.
- جهار *jahár*, s. a flock of birds. Si. *jhári*.
- جهاز *jaház*, a ship. P.
- جهان *jihán*, the world.  
*dehá jiháná*, in the whole world.
- جه پښ *jhapagh*, to toss up. Si. *jhapanu*.
- جه پښکښ *jhakagh*, to sob. (Cf. Si. *jhakko*, a fit of passion.)
- جهر *jhur*, clouds. Si. *jhuru*.
- جهري *jhari*, of more than one colour.
- جهگ *jhag*, foam, scum, froth, bubbles. Si.
- جهل *jhul*, carpet. Si.
- جهل *juhul*, deep.
- جهل *jahl*, low.
- جهلا *jahlá*, below.
- جهل برز *jahl-burz*, ups and downs, inequalities.
- جهلي *jhali*, a pankha. Si.
- جهن *jhan*, small bird (snipe?)
- جهندا *jhandá*, a flag. Si.
- جهرا *jhera*, a quarrel. Si. *jhero*.
- جهبهو *jebho*, s. armour.
- جهيت *jait*, camel-saddle.
- جهدي *jedí* } (f.) a companion, associate.  
 جهديري *jedirí* }
- جهيد *jídh*, s. pasture.
- جهيڅ *jígh*, s. bowstring. P. *zih*. Pushto, *jái*. Si. *jihu*.

## چ Ch.

- چاب *chábar*, short grass.
- چاپ *cháp janagh*, to clap hands.

- چاپول *chápol janagh*, to slap.  
 چات *chátł*, a well. P. *cháh*.  
 چارغ *cháragh*, v. p.p. *cháritła*, to look out, spy.  
 چاری *chárí*, a guide, spy. Si.  
 چازی *chárí ascent*, Si. *charlí*.  
 چاک *chá-k-deagh*, to split, rip up. P.  
 چارت *cháút*, threshold. Si. *cháuzłhí*.  
 چابه *chabha*, sandals.  
 چپ کهنغ *chup khanagh*, to be quiet. Si.  
 چپ *chap*, left. P.  
 چپ دست *chap-dust*, left hand. P.  
 چپ چوت *chap-chot*, crooked.  
 چپ تاروی *chaprúi*, an English rupee.  
 چپی *chapí*, adj. left, sinister, unlucky.  
 چت *chit*, woman's petticoat.  
 چت *chat*, roof. H.  
 چتاکه نغ *chatá khanagh*, to grasp, catch hold of with the arms.  
 چتر *chitar*, matting.  
 چتغ *chaṭagh*, p.p. *chaṭłha*, to liek. Si. *Chaṭanu*. Lab *chaṭagh*,  
 to flash in the pan.  
 چتی *chaṭí*, s. a fine. Si.  
 چچهو *chachho*, how?  
 چر *char*, a path hemmed in by precipices on each side.  
 چر *chur*, a small hill torrent.  
 چرپ *charp*, adj. fat. P.  
 چرپی *charpí*, s. fat, grease.  
 چرز *charaz*, the houbara, (*otis houbara*). P.  
 چرغ *charagh*, to wander, go about. Si. *charanu*.  
 چرنگ *chiring*, s. a spark. Si. *chirig*.  
 چرو *charo*, merely, only.  
 چرخ *charokh*, wanderer, vagabond.  
 چرة *chirra*, shot.  
 چرینغ *charainagh*, to watch cattle, to graze. Causal of *charagh*.

- چاري charí, madman.  
 چارغ charagh, to ascend, climb. Si. charhanu.  
 چشمه chushma, a spring. P. chashma.  
 چشخ chishagh, p.p. chishatka, to sneeze.  
 چغون chighird, the bábul bush, (*Acacia Jacquemontii*).  
 چغل chughal, a spy.  
 چغل نينغ chaghal deagh, to throw away.  
 چكتر chiktar, } how much? How many? (Probably for chi  
 چكار chikar, } qadr).  
 چكغ chikagh, to pull, drag. Si. chhikanu.  
 چكغ chukagh, to kiss.  
 چكهه chukh, a child.  
 چوره چكهه chukhehorí, children.  
 چكهه chakha, on, upon.  
 چگا chagá, testing. Chagá-hálwar, a laughing matter.  
 چل chil, forty. P. chihal.  
 چانغ chillagh, to peel, scrape. P. chalídan.  
 چلر chillur, peel, bark, scales.  
 چلنگ chilkagh, to shine, glitter. Si. chilkanu.  
 چلنگه chalgudhagh, bat.  
 چامب chulumb, s. earring. (Cf. Si. chumbulu.)  
 چالو chalo, s. a ring. Si. chhalo.  
 چامب chamb, a spring.  
 چامبرغ chamberagh, v. p.p. chamberitha, to spring upon. Si. cham-  
 baranu.  
 چامبو chambo, ball of foot, claw. Si.  
 چامره chamra, bat. Si. chamıro.  
 چامغ chamagh, a spring, fountain. P. chashma. See chhamagh.  
 چانا chaná, opinion. (Cf. P. chanídan.) Maín chaná, in my  
 opinion.  
 چانجو chinjú, crowbar.  
 چند chund, }  
 چندرا chundra, } point of the compass.  
 چنغ chinagh, p.p. chitha, to pick up, gather, collect. P. chídan.

- چنگ chang, banjo or guitar. B.
- چوت chot, adj. crooked, bent.  
Chot *khanagh*, to bend, tr.  
Chot *biagh*, to bend, intr.  
Chot *chham*, squinting.
- چوتو choto, a horse-fly.
- چوا chawá, jest.
- چواگر chawágar, jester.
- چوچ chúch, little finger. Si. chích.
- چوپه‌په‌په‌په chaupher, round.
- چورو choro, boy. Panj.
- چوري chorí, orphan. Si. chhoro.
- چوري chúrí, chicken.
- چوفغ chofagh, v. p.p. *chofittha*, to pound, thump. (Cf. P. koftan).
- چهات chhath, a well. P. cháh. Z. chittha, pit.
- چهه chih, what?
- چهل chhil, forty. P. chihal.
- چهلو chhilav, cold weather (Jan. Feb.).
- چهه chham, the eye. P. chashm.  
chham *bhorainagh*, to wink.  
chham *phusht*, eyelid.
- چهتر chhatar, s. joke.
- چهی chí for چهیچی hechí, anything. P.
- چهی chí, s. a thing; chíe-chíe, somewhat.
- چهیار chyár, four; yake chyár, fourfold. P. chahár.  
chyár gíst, 80; chyár kund, four-cornered.  
chyár gíst dah, 90.  
chyár *phádth*, four-footed.
- چهیارده chyárdah, fourteen.
- چهیارمی chyáramí, fourth.
- چه‌بەر chebar, news.
- چیت آرغ chít áragh, to be crushed. Si. chitáranu.
- چیتغ chetagh, to repair, mend. Si. chetanu.

چیدغ *chedlagh*, a cairn erected to commemorate any notable event.

چیکلو *chiklo*, a little.

## خ Kh.

خازگ *kházg*, dirt.

خازگ بروخ *kházg-barokh*, sweeper.

خازگو *kházgo*, dirty.

خان *khán*, chief. See Hán.

خازدان *khándán*, family.

خدمت *khidmat* or *khizmat*, service.

خر *khár*, a donkey (female).

خرگوشک *khargoshk*, a hare.

خرچ *kharch*, expenses.

خمیس *khámis*, Thursday.

خندغ *khandagh*, p.p. *khandit̄ha*, to laugh. Su *khandagh*.

خوجا *khojá*, eunuch.

خوش *khush*, happy. See wash.

خوشی *khushí*, happiness.

## د D.

داپرا *dápurá janagh*, to stamp. Si. *dáphorá*.

دات گپت *dát̄hgipt*, dealings.

دار *dár*, wood.

دارغ *dáragh*, v. p.p. *dáshta*, to have, hold, hold in.

*dáshtiyá* quietly! P. *dáshtan*, *dár*.

داسن *dás*, a grass-knife; sickle.

داغ *dágh*,  
داغان *dághán*, } brand, spots, blemishes. P.

دالا *dálá*, thick.

دان *dán*, corn. P. *dána*.

- دانا *dána*,  
 دانکوه *dánkoh*,  
 دانی *dání*,  
 داهنتھی *dáhanthí*,  
 داین *dáin*,  
 دهن *dáhn*, complaint. Si. *dánh*.  
 دای *dái*, nurse. P.  
 دایمه *dáima*, for ever. A.  
 دواگر *dávágar*, s. champion.  
 دتهان *dathán*, s. tooth. P. *dandán*.  
                   *dathán-dor*, toothache.  
 دځ *diĥh*, s. spindle. P. *dúk*.  
 دځغ *didhagh*, p.p. *daĥhta*, to brand.  
 در *dar*, prep. out, outside. (P. *dar*, door.)  
 دربرغ *dar-baragh*, to defend.  
 درکھغ *dar-khagh*,  
 درآغ *dar-ágh*, } to come out.  
 دررغ *dar-ravagh*,  
 درشغ *dar-shagh*, } to escape.  
 درکھنغ *dar-khanagh*, to put out, expel.  
 درسرغ *dar-saragh*, to protect.  
 درگیژغ *dargezhagh*, to look out.  
 درآ *dará*, adv. outside.  
 درآخ *drákh*, s. vine. Si. *drákh*.  
 درآژ *drázh*, adj. long. P. *daráz*.  
 درآژان *drázhádh*,  
 درآژی *drázhí*, } s. length.  
 درآه *duráh*, well, in health.  
 درآهی *duráhí*, health.  
 درآهیا *daráhiyá*, a promise.  
 دurr *durr*, good, excellent.  
 در *durr*, an earring worn in the lobe of the ear (P. *durr*, pearl).  
 درجغ *dirjagh*, see *dinagh*, to burst.  
 درد *dard*, pain. P.

- درست drust, all, the whole. (Pashto drast.)  
 درشخ drishagh, p.p. drishtha, to bite.  
 درشخ drushagh, p.p. drushtha, to grind.  
 درشك darashk, tree. P. *dirakht*.  
 درغ diragh. See *dinagh*, to tear. P. *darídan*.  
 درمان darmán, s. medicine, spirits, gunpowder. P. *dárú*, *darmán*.  
 درنزغ dranzagh, to go swiftly (poet).  
 درنگ drang, precipice.  
 دروشم drosham, front, foremost part, shape, countenance.  
 دروغ drogh, false. P.  
     *drogh-bandagh*, to lie.  
     *drogh-bando'kh*, liar.  
 دروغ دند droghvand, lying, deceit.  
 دروه droh, false. Si.  
 دره druh, all.  
 درهاني dreháni, pistol.  
 دري darri, out, outwards.  
 دريس drís, a Baloch dance, at weddings, and also (called *jhamar*),  
     rejoicings, accompanied with shouting or groaning.  
 درين drín, rainbow.  
 دز duz, thief. P. *duzd*.  
 دزغ duzagh, to steal. P.  
 دزواگ daz-wág, bridle. (For *dast-wág*.)  
 دزواهي duzwáhi, friendship.  
 دزي duzi, theft. P.  
 دژك dazhak, s. a snipe.  
 دژمن duzghan, enemy. P. *dushman*.  
     Cf. Zend. *duzh*, in *duzhda*, evil, &c.  
 دژمني duzghaní, enmity. P.  
 دست dast, s. hand. P.  
     *dast-ágh*,  
     *dast-khafagh*, } to get, obtain, come to hand.  
     *dast-láinagh*, to touch.  
     *dast-lath*, walking-stick.  
     *dast-khatt*, signature.

- دستاغ *dastagh*, handle. P. *dasta*.  
 دستور *đastúr*, custom. P.  
 دشت *dasht*, a barren plain or tableland. P.  
 دعا *du'á*, prayer. A.  
     *neh-du'á*, blessing.  
     *bad-du'á*, curse.  
 دغار *dighár*, land, ground, level country. P. *dihár*.  
     *dighár-wázhá*, landlord.  
     *dighár-janagh*, to dig the ground.  
 دف *daf*, s. mouth.  
     *daf-janagh*, to boast.  
     *daf-dáragh*, to be silent.  
     *dafá-dár!* be silent!  
 دفار *dafár*, }  
 دوار *dawár*, } mouthful.  
 دفتر *daftar*, }  
 دوتر *davtar*, } bard. P.  
 دفسر *dafsar*, cover, lid.  
 دك *dak*, join, mending.  
 دك جنغ *dakjanagh*, to solder.  
 دكهه *dukh*, needle's eye.  
 دكهه *dukh*, trouble. Si.  
 دكهيا *dukhyá*, with difficulty.  
 دگ *dag*, road. Si. *dagu*.  
     *dag-janagh*, to rob on the highway.  
 دگو *duggav*, s. eagle.  
 دل *dil*, s. heart, zeal. P.  
     *dil-janagh*, to retch.  
     *dil-shut'hí*, retching.  
     *dil-gír*, sorrowful.  
 دليغ *dalagh*, s. boiled rice.  
 دلكود ئديغ *dalko-deagh*, to threaten.  
 دلو *dillo*, an earthenpot, *ghará*. Si. *dilo*.  
 دمب *dumb*, tail. P. *dum*.  
     *mazár-dumb*, tiger's-tail (a plant).

د مډيرو dambíro, a Baloeh banjo or guitar.

د مډبل dambul, a cairn erected in irony to commemorate a shameful action. P.

دن dan, a tax levied by Baloeh chiefs. See dan.

د نان كرا danánkará, till then.

د نغ dinagh, }  
د رغ diragh, } p.p. dirtha, to tear. P. darídan, din.  
د رچغ dirjagh, }

د نزر danz, dust. (Cf. Si. daj.)

د نيكمر daníkar, till now.

د نيا dunyá, the world, people. A.

دو do, two. P.

دو گيست do-gíst, forty. See ehil.

د وار dawár. See dafár.

د وازده dwázdah, twelve. P.

د وازدمي dwázdami, twelfth.

د وېر dobar, the chest.

د وېران dobarán, twice.

د وټر davtar, bard, reciter of genealogies. P. daftar.

د وړ dor, pain. { dathán-dor, tooth-ache.  
láf-dor, belly-ache.

د وړ daur, rieh.

د وړا dorá, double. Si. duhuro.

د وړوخ dorokh, ill, in trouble or pain.

د وړوخ dozakh, } hell. P. dozakh. Z. duzhanha. Pashto dozha<sup>kh</sup>.  
د وړوژي dozhí, }

د ووست dost, friend. P.

د وښغ doshagh, p.p. dokhtha, to sew. P.

د وښغ doshagh, p.p. dushtha, to milk. P.

د وښي doshí, last night. P.

د وښغ dogh, p.p. dotka, to feteh water.

د وښين doghín, pregnant.

د وښت daulat, wealth. A.

- دومذدیل dúmandíl, with two turbans, *i. e.*, a man of distinction.
- دوهون dúhon, smoke. Si.
- ده dah, ten. P.
- دهان dihán, thought, consideration. Si. dhyánu.
- دهك dhak, hurt, injury. Si. dhaku.
- دهغ dahagh, to get, touch.
- دهل dhul, drum. Panj. ḡhol.
- دهمی dahmí, tenth.
- دهنگ dhing, powerful.
- دهور dhúr, dust. Si. dhúri.
- دهوس dahús, bastard, a term of abuse.
- دهولیا dhúliyá, dust. Si.
- دی dí, also. Dí—dí. Both—and.
- دیب deb, thumb.
- دیلو díllo, mist. (P. dúd, smoke.)
- دیخ díkh, spindle. P. dúk.
- دین dedh, an earthen pot. See dez.
- دیند dídh, } sight. P. dídár, díd.
- دینار dídhár, }
- دیدرخ dídokh, eyeball.
- دیر dír, far, apart, separate. P. dúr.  
dír-zánagh, far-seeing, wise.
- دیر der, while, time. P. der.
- دیز dez, pot.
- دیغرا deghrá, large pot. P.
- دیم dem, face. P. adíma. Z. daema.
- دینکا demá, before, in front.
- دیم dím, back.
- دیمما díma, behind.
- ده deh, country, land, tract, territory. Si. ḡehu. P. ḡeh.  
Z. daḡha. Skr. deśa.
- دیدغ deagh, v. p.p. dátha, to give. P. dádan.  
dem-deagh, to send.  
drik-deagh, to leap.

ilagh-deagh, to let go.  
 sar-deagh, to send away.  
 gon-deagh, to accompany.  
 mán-deagh, to apply.  
 mokal-deagh, to dismiss.

### د D.

- دَآتو dáto, dust.  
 دَآچي dáchí, a female camel. Si.  
 دَآدي dádí, grandmother. Si.  
 دَآدي پوتري dádepotre, descendants of the same ancestor. Si.  
 دَآن dán, desert.  
 دَآندالي dándálí, a winnowing-sieve.  
 دَآني dání, time, a certain time. Si.  
 دَآه dáh, alarm, war news. Si.  
 دَآ did, } frog. Si. dëdaru.  
 دَآر dëdar, }  
 دَآدو daddav, pony, nag. Si. dëdro.  
 دَآرئغ drattagh, v., p.p. drattatha, to fall. Si. dërahanu, p.p. dëraþho.  
 دَآرك drik, jump, spring.  
 دَآرئغ drikagh, to jump.  
 دَآركان drakán, carpenter. Si. drakhanu.  
 دَآرئغ dragagh, to canter. (Si. drak).  
 دَآروه droh, falsehood, lie. Si.  
 دَآروه drohá, false, dishonest.  
 دَآسغ dasagh, v., p.p. dasatha, to show, point out. Si. dasanu.  
 دَآكال dukál, dearth, famine. Si. dukáru.  
 دَآگه digh, pice, copper coin.  
 دَآن dan, by force, violently. Si. danu.  
 دَآنډهور danphúr, a forcible contribution.  
 دَآندور dandwar, a tooth-brush.  
 دَآنگ dang, sting. Si. dangu.  
 دَآنگ-جانagh dang-janagh, to sting.  
 دَآدو dódá, poppy-heads.

- دَرَدَ ḍoḍ, framework, bones. Panj.  
                   hushken ḍoḍ, a dry skeleton.  
 دَرَدَرِ ḍor, a pond. Si. ḍhoro.  
 دَرَدَلِ ḍol, a bucket. Si. ḍolu.  
 دَرَدَلَا ḍaulá, the forearm. Si. ḍoro.  
 دَرَدَلُو ḍolo, cooked.  
                   ḍolo biagh, to be crooked.  
 دَرَدَمِ ḍom, }  
 دَرَدَمِبِ ḍomb, } bard, minstrel. Si.  
                   ḍombání-áf, } mirage (connected with a legend  
                   ḍomb-khushtagh, } of a minstrel's death).  
 دَرَدَنگِ ḍong, bottle.  
 دَرَدَنگَا ḍúngá, deep. Panj.  
 دَرَدَهَ ḍoh, sin, offence. Si. dohu.  
 دَرَدَوِي دَوِي ḍói, spoon. Si.  
 دَرَدَهَابُرَغِ دَهَابُرَغِ ḍháburagh, p p. ḍháburtha, to stumb.  
 دَرَدَالِ ḍhál, shield. Si. Panj.  
 دَرَدَهَكَنِ دَهَكَنِ ḍhakan, cover. Si.  
 دَرَدَهَكَنِ دَهَكَنِ ḍhakaní, knee-pan. Si. ḍhakiṗí.  
 دَرَدَهَوَنَدَ دَهَوَنَدَ ḍhúnd, skeleton. Si.  
 دَرَدَهِيَدَنگِ دَهِيَدَنگِ ḍhíng, crane.  
 دَرَدِيدَ دِيدَ ḍíḍar, muscles, biceps.  
 دَرَدِيرِ دِيرِ ḍer, husband's younger brother. Si. ḍeru.  
 دَرَدِيرَ دِيرَ ḍír, }  
 دَرَدِيلِ دِيلِ ḍíl, } body, form, shape. Si. ḍílu.  
 دَرَدِيلَهُو دِيلَهُو ḍelhú, fruit of the khalel (*capparis aphylla*). Si. ḍelho.  
 دَرَدِيمَبَهُو دِيمَبَهُو ḍembhú, wasp. Si.  
 دَرَدِيُو دِيُو ḍío, lamp. Si. ḍio.  
 دَرَدِيَهُو دِيَهُو ḍíhav, leopard.

## ر R.

- رَاچِي رَاچِي ráchí, camel-driver.  
 رَازَا رَازَا rázá, painter.

- راست *rást*, true. P.  
 راستی *rástí*, truth. P.  
 راک *rák*, cheek-bone.  
 ران *rán*, thigh. P.  
 راه *ráh*, road. P.  
 راهدی *ráhdí*, fate, death.  
 راهزن *ráhzan*, head of a band of robbers. P.  
 راهک *ráhak*, cultivator. Panj.  
 رب *rabb*, God. A.  
 رپته *rapta*, p p. of *ravagh*, used in the sense of began, begun ; its place in the meaning went, gone being supplied by *shutka*. P.  
 ریخته *rikhta*, p.p. of *ríshagh*. q. v.  
 ریذ *rið*, f. sheep (small-tailed). Si. *riðh*.  
 رذغ *radhagh*, p.p. *rastha*, to tear up the ground.  
 رذغ *radhagh*, to be beaten, to lose (in war or play).  
 رذغ *rudhagh*, v. p.p. *rustha*, to grow, germinate, spring up mount. P. *rustan*.  
 رزیناغ *razainagh*, p.p. *razaintha*, to make.  
 رس *ras*, juice, sap. Si. *rasu*.  
 رستار *rastar*, wild beasts, game.  
     *syáhen rastar*, wild swine.  
 رسغ *rasagh*, p.p. *rasitha*, to arrive. P. *rasídan*.  
 رسیناغ *rasainagh*. Causal of *rasagh*.  
 رشک *rashk*, liee.  
 ریغ *ragh*, pulse. P. *rag*, vein.  
 رغام *raghám*, collection of clouds, threatening weather.  
 رفتار *raftár*, paces. P.  
 رکبه *rakh*, s. lip.  
 رکیب *rikeb*, stirrup. P. *rikáb*.  
 رگ *rag*, vein, pulse. See *ragh*.  
 رگ *rug*, preeipice.  
 راغ *ralagh*, to mix, join. Si. *ralanu*.

- رومب rumb, a run.  
                     rumb zíragh, to run, hurry.  
 رومبغ rumbagh, to run away, gallop, race (on foot).  
 رومبه ramba, chisel. Si. rambo.  
 رومال rumál, towel. P.  
 رومغ ramagh, flock of goats. P. ramah.  
 روم ran, married woman. Panj. ranđ.  
 رومد rand, track, path. Si. randu.  
                     sar-rand, comb.  
 رومدغ randagh, to comb, part the hair.  
 رومغ runagh, p.p. rutha, to reap. Cf. Pashto, ravdal. Skr. lú.  
 روم ro, contracted from roth, 3rd per. aor. of ravagh, will go,  
                     goes, may go.  
 روم ro, contraction for rosh, day, sun.  
                     har-ro, every day, always.  
                     ro-táf, heat of sun, glare.  
 رومپهسك ropheesk, s. a fox (uncommon). P. rúbáh.  
 رومپهغ rophegh, a loud noise.  
 رومپورú rúbarú, in the presence of. P.  
 رومث roth, entrails. P. rúda.  
 رومدار rodár, bowstring, fiddlestring.  
 رومد rodh, high bank of a torrent or stream. P. rúd.  
 رومدغ rodhagh. See rudhagh.  
 رومدھن rodhin, madder.  
 رومدھنغ rodhainagh, to bring up, educate.  
 رومر roř, calf.  
                     roř-gal, herd of calves.  
 رومرگير rozgír, eclipse of the sun (from rosh and giragh).  
 رومش rosh, day, sun. P. roz.  
                     rosh-ásán, sunrise.  
                     rosh-er-shaf, sunset.  
                     rosh-tiká, daybreak.  
                     roshe-roshe, day by day.  
                     roshe-veláe, from time to time.

- روش roshagh, a fast. P. roza.  
 روغن roghan, clarified butter, ghí. P.  
 روع ravagh, p.p. shuṭha, to go. P. raftan, shuda.  
     dar-ravagh, to escape.  
     mán-ravagh, to enter.  
     bíagh-ravagh, to become.  
 روفر rofro, a fox. P. rúbáh.  
 روکھنغ rokhanagh, v., p.p. rokhuttha, to light, kindle.  
 رومست romast, chewing the cud.  
 رونگرá rúngrá, a narrow hill path.  
 روه ruh, soul. A. rúh.  
 ره rah, edge, edge of knife.  
 رهنغ rahnagh, edge or bank of river.  
 ریبده riband, fringe or horse's forehead.  
 ریت rít, custom. Si. ríti.  
 ریخ reh, sand. P. reg.  
     sar-reh, cold in the head.  
 ریر rer, }  
 ریل ril, } rags.  
 ریز rez, a rope (made of cotton thread).  
 ریزم rezam, blight (of corn).  
 ریسغ resagh, p.p. restha, to spin, twist. Pashto reshal.  
 ریسنغ resinagh, to pursue, chase; p.p. resintha.  
 ریش rísh, beard. P.  
 ریش resh, gall (on the back of a horse or beast of burden).  
 ریشغ ríshagh, p.p. ríkhtha, to pour, spill, scatter, sow (seed).  
     P. ríkhthan.  
 ریشینغ ríshainagh. Causal of ríshagh.  
 ریم rem, grass.  
 ریم rem, matter, pus. P. rím.  
 ریغ riagh, cacare.

## ز Z.

- زا zá, abuse, bad language.  
 زات zát, tribe, caste. A.  
 زات zát, coloured cloth.  
 زاخت zákht, son (in composition). P. záda. Skr. játa.  
     nákhózákht, nephew (son of paternal uncle).  
     trízákht, nephew (son of paternal aunt).  
     wasarzákht, brother-in-law.  
 زاد zád, many-coloured, variegated.  
 زاغ zágh, v. p.p. zátgha, to give birth, bring forth. P. zádan.  
 زال zál, woman. P.  
 زامات zámáth, son-in-law. P. dámád. Skr. jámátri. Pashto zúm.  
 زامر zámur, s. name of a tree.  
 زامن zámin, surty. A.  
 زامن گيري zámingírí, bail, security.  
 زان zán, thigh.  
 زانثو zántho, a., p.p. of zánagh, knowingly.  
 زانغ zánagh, p.p. zántha, to know. P. dánistan. Z. zná.  
     Skr. jná.  
 زانمر zánmur. See zámur.  
 زایفه záifa, a woman. A.  
 زخم zákhn, a wound. P.  
 زانغ zadhagh, wounded. (P. zada.)  
 زر zar, money. P.  
 زراغ zarágh, leech. (Si. jaru.)  
 زرتنه zurth, jowar. (Cf. Pehl. júrdák, corn.)  
 زرد zarđ, yellow. P.  
 زردو zardo, yolk of an egg.  
 زردوي zardoí, bile.  
 زردی zirde, heart (poet.) Skr. hridi. Zend. zaredhaya.  
     Pashto zřah.  
 زور zarúr, necessary. A.  
 زره zirih, armour. P.

- زره *zirih*, a well.  
 زغر *zaghar*, adj. fresh, quick.  
     *zagharen shír*, fresh milk.  
 زك *zik*, a bag or "maskína" for holding ghí. (Si. jik.  
     Pashto *zik*).  
 زمستان *zamistán*. See *zawistán*, winter. P.  
 زناخ *zanákh*, jaws. (P. *zanakh*, chin.)  
 زناور *zanáwar*, animal. P. *jánwār*.  
 زنجير *zanjír*, chain. P.  
 زندغ *zindagh*, living. P. *zinda*.  
 زنگ *zinagh*, v., p.p. *zitha*, *zinth* or *zítka*, to snatch, take away  
     forcibly.  
 زنگ *zang*, s. turnip.  
 زنگ *zang*, }  
 زنگال *zangál*, } rust.  
 زور *zor*, force, might, violence, wrong. P.  
 زور *zivir*, rough, not smooth. (Cf. Pashto *zig*.)  
 زوراخ *zorákh*, powerful, violent.  
 زوروالا *zorwálá*, oppressor, tyrant.  
 زوآډ *zawádh*, scent, smell. P. *zabád*.  
 زوار *zawár*, pebbles.  
 زوار *zawár*, rider, horseman. (P. *sawár*).  
 زوال *zawál*, s. injury.  
 زوان *zawán*, tongue. P. *zabán*.  
 زوستان *zawistán*, winter. P. *zamistán*.  
 زه *zah*, kid.  
     *zah-gal*, flock of kids.  
 زهر *zahr*, anger. P.  
     *zahr-giragh*, to be angry.  
 زهر *zahr*, bitter.  
 زهرلك *zahrak*, the gall-bladder. P. *zahra*.  
 زهم *zahm*, sword.  
     *zahm-band*, swordbelt.

zahm-jano $\dot{k}h$ , swordsman.

zahm-hand, scar of a sword wound.

زهیر zahír, lonely, a stranger. A.

زهی zí, yesterday. P. dí-rúz.

زیادی ziyání, harm, injury. Pehl. ziyán.

زیارت ziyárat, shrine, place of pilgrimage. A.

زیست zít $\dot{h}$ , quick. P. zúd.

زیئین zít $\dot{h}en$ , quickly.

زیخا zai $\dot{k}h$ á, s. ferns, moss, &c.

زیرغ zíragh, v. p.p. zurtha, to raise, lift.

zíragh-árag $\dot{h}$ , to fetch.

lashkar zíragh, to lead an army.

sáh zíragh, to draw breath.

rumb zíragh, to run, saughan zíragh, to swear.

زیم zím, scorpion.

زین zen, saddle. P. zín.

zen-kanagh, to saddle.

## ژ Zh.

ژانگه zhángagh, v. to bray.

ژالوخ zhalo $\dot{k}h$ , adj. yellow.

ژله دیئغ zhala deagh, v. to let go. (See ilagh.)

ژمارا zhamará, for ever. See jamará.

ژنگه کهنغ zHINGA khanagh, to erect the tail (of a horse).

ژنگه zHING, adj. erect, perpendicular. Also the name of a Baloch sub-tribe.

## س S.

سابون sábún, soap. Portuguese. Ar.

ساته sáth, a káfila. Si. sáthu.

ساد sád, honest. (P. sádá, plain (?)).

سان sád $\dot{h}$ , rope (of múnj or dwarf-palm leaves).

سارته sárth, cold. P. sard.

ساری sári, rice growing or in husk. P. shálí.

- ساز *sáz-kanagh*, to play (a musical instrument).  
 ساكه *sákh*, oath. Si.  
 ساگ *ság*, potherb. Si.  
 ساگی *sági*, that very one, the original. Si.  
 سال *sál*, a year. P.  
 سالغ *sálagħ*, parched corn.  
 سالوخ *sáloħ*, bridegroom.  
 سامبخ *sámbagh*, to favour, nourish. Si. *sámghanu*.  
 سان *sán*, stallion, bull. Si. *sánu*.  
 سانگ *sáng*, betrothal. Si. *sangu*.  
 سانگی *sángi*, spear. Si. *sángi*.  
 ساه *sáh*, shade. P. *sáya*.  
 ساه *sáh*, breath, life. P.  
     *sáh-zíragħ*, to breathe.  
 ساهددار *sáhdár*, domestic animals.  
 ساهي *sáhí*, a pause, breathing space, fallow.  
     *sáhí-deagh*, to let land lie fallow.  
 ساين *sáín*, sir, master. Si. Skr. *swámi*.  
 ساينغ *sáínagh*, v., p.p. *sáíntha*, to shave.  
     Imperative, *sá*, *sará sa*, shave the head.  
 سببي *subí*, autumn.  
 سڤي *sippí*, shell. Si.  
 سته *sath*, a deputation to ask pardon.  
 ستي *sutí*, a mosquito.  
 سجي *sijjí*, roast meat.  
 سخ *sikh*, barren land.  
 سدها *sidhá*, straight. Si. *sidho*.  
 سدكخ *suḍkagh*, to sob. Si. *suḍikanu*.  
 سده }  
 سن } *sudh*, } knowledge, understanding. Si. *sudhi*. Pashto *sud*.  
     *sudh*, }  
 سن *sadh*, a hundred. P. *sad*.  
 سر *sar*, a man. Pashto, *saṛai*.  
 سر *sar*, s. head, front. P.

sar-giragh, to set out.

sar-deagh, to send away.

سرډار sar-dar, bareheaded. (Pashto, saḍar.)

سرډار sar-dár, }  
سرډار sar-dar, } s. chief.

سرپوس sarposh, covering.

سررېځ sar-rekh, cold in the head.

سررند sar-rand, parting of hair.

سرناوځ sar-návagh, the morning star (poet.).

سرا sará, adv. and prep. above, upon, ahead, in front.

sará-bai, go in front.

سراريرا sará-era, adv. from above, downwards.

سربري sarbarí, upper.

sarbarí-pahnádhá, on the upper side.

سرپېدھ surphadh, }  
سرپھو surpho, } s. (Ar. سرفت), understanding.

surphadh bíagh, to understand.

سرجه sarjah, pillow.

سرساد sursád, provisions, forage. Si. sursát.

سرغ saragh, p.p. sarítha, to remember.

سرغ siragh, to leap, prance. Si. siranu.

سرغ suragh, to move. Si. suranu.

سرکپه sarakh, a kneading-trough.

سرگو surgo, speech, song.

سرل saral, a yearling colt. Si. sarlu.

سرم surum, hoof. P. sum.

سرنگ saring, a track. Si. suringh.

saring-janagh, to track.

سري sarí, a woman's chadar.

سرين saren, loins.

saren-bandagh, to gird up the loins, help.

saren-bandí, assistance.

سریندا saríndá, } s. a sort of fiddle with seven strings of sheep's

سریندو sarindo, } gut played with a horsehair bow. Si. surundo.

- سرینه sarína, upper; western. P.  
 سرود sarodh, music.  
 سروش sarosh, elbow.  
 سرک sarak, road. Hindí.  
 سزا sazá, punishment. P.  
 سستی sustí. See sutí.  
 سشع sushagh, p.p. su $\dot{h}$ ltha, to burn. (Intransitive.)  
 سخار saghár, adj. white-faced (of a horse).  
 سخداتا saghdattá, a small thorny plant.  
 سخر saghar, head.  
 سخركهه sagharkha, a wild species of sinapis.  
 سخرن saghan, dung of cattle.  
 سخندان saghindán, paunch, stomach.  
 سك sak, strong, stiff, hard. P. sakht.  
 سكاتر sakatar, a kind of partridge.  
 سكال sakal, beautiful.  
 سكمردى sakmardí, manliness, strength.  
 سكنى sakaní, Wednesday.  
 سخكغ sikhagh, to learn. Si. Sikhanu.  
 سخكغفغ sikhainagh, to teach. Causal of sikhagh.  
 سكي saki, extreme, excess.  
 سكييا sakyá, } very, extremely.  
 سكيغها sakíghá, }  
 سگ sag, skill, ability. Si. sagh.  
 سل sil, brick. Si. sir. Panj. sil.  
 سلبنده silband, brick-maker. Panj.  
 سلام salám, salutation.  
     salám-alaik, (Ar. سلام اَلعائِك), salutation on meeting.  
 سلهي silhe, arms. A. salah.  
     silhe-gal, arms and accoutrements.  
 سما samá, understanding. Si. samáu.  
 سمب samb, a hole, boring.  
     sumb-janagh, to bore.

- سمبرای sambaráí, preparation, readiness.  
 سمبرغ sambaragh, to prepare, be ready. Si. sambhiranu.  
 سمبغ sumbagh, stitch in the side.  
 سمندر samundar, sea.  
 سند sand, barren (of offspring). Pashto shand. Si. shandhi.  
 سندا sand, a joint. Si. sandhu.  
 سندا sund, a basket of matting. Si. sundu.  
 سندان sindán, anvil.  
 سندغ sindagh, v. p.p. sistha, to break.  
     P. shikastan, shikan.  
 سنج sanj, harness. Si. sanju.  
     sanj-khanagh, to saddle, harness.  
 سنگ sang, stone (uncommon). P.  
 سنگ بند sangband, related by marriage (used of two tribes).  
 سنگتی sangatí, companions, following. Si.  
 سنگد sangad, companions, escort.  
 سنی saní, hemp. Si. siní.  
 سنگهر sanghar, necklace. Si.  
 سوا sawá, except, without. P.  
 سوان sawád, sight, show.  
 سوارک sawarak, breakfast.  
 سواس sawás, Baloch sandals, made of the leaves of the dwarf palm.  
 سوال sawál, question. A.  
 سواه sawáh, morning. A. sabáh.  
 سوبه sobh, victory. A.  
 سود súd, interest. P.  
 سور sor, salt, brackish, saltpetre. P. shor.  
     soren-áf, brackish water.  
 سودا saudá, bargain. P.  
 سوره súrah, hero, warrior. Si. Súrihu. Z. súra, strong.  
 سوز savz, green. P. sabz.  
 سوشغ soshagh, v., p.p. sokhta, to burn. P. sokhtan, soz.  
 سوغن saughan, oath.

*sanghan-zíragħ*, to take an oath.

سوف súf, apple. A.

سوك sawakk, light (in weight).

سول sol, the kanda or jhand tree. (*Prosopis spicijera*.)

سومر somar, Monday. Si.

سونارو sonáro, goldsmith. Si.

سوهان sauhán, file.

سوهنا solná, beautiful. Panj.

سوهو sohav, guide, acquaintance.

سوو savav, account, reason. A. sabab.

savavá, on account of.

سويش sawetħ, white. P. safíd.

سهال saháral, skilful.

سهاك suhág, young unweaned camel up to six months old (f.)

سهبت suhbat, society. A.

سهاري sihári, an awl. Si. sírái.

سهش sahtħ, jewels.

سهر suhr, red. P. surħħ. Pashto súr.

سهر silr, magic. P.

síhr-khanoħħ, magician.

سهرا sahra, manifest, known, evident. A.

سهو suhv, morning. Ar. subħ.

suhv-astár, morning star.

سهيل suhel, autumn. The month Assú or Ásoj. A. (Sept. or Oct.)

سي sí, thirty. P.

ساي sai, three. P. sih.

sai-bará, thrice.

sai-kona, triangle.

sai-gíst, threescore.

سياد syád, relation.

سيال syál, relation, guest, enemy, equal. (Pashto síál, equal.)

سيالداري syáldári, relationship.

سياه syáh, black. P.

syáh-áf, } perennial stream of water.  
 syáh-jo, }

syáh-már, snake.

syáh-gwar, "black breast." The black partridge.

سياهي syáhi, ink.

سيبك seabak, wholesome.

سيث síth, profit, advantage. P. súd.

سير ser, full, satisfied.

seráf, satisfied. P. seráb.

سير sir, marriage.

sír-khanagh, to marry.

sír-bíagh, to be married.

sír-wájh, marriageable.

سيرب serab, shaving.

سیرمخ sírmugh, collyrium for the eyes. P. surma.

سیستان sístán, custom.

سیسی sesí, the chakor, also the sísí or *Ammo Perdix Bowhami*.

سیشین síshin, needle. P. sozan.

سیک saiak, one-third.

سیکن síkun, } porecupine.  
 سیخن síkhun, }

síkun-tír, porecupine-quill.

سیلهی selhí, necklace of shells worn by mares, camels, oxen, &c. Si.

سیم sím, boundary.

سیماندر símándar, neighbour.

سیمون símsún. See sesí.

سیمی saimí, third.

سیند sínd, hissing. (Si. sindh, whistling.)

sindá khanagh, to hiss.

سینز senz, whistling.

senzár janagh, to whistle.

سینزده senzdah, thirteen. P.

سینغ senagh, breast. P. sína.

- سيوال sewál, s. rubbish left by a flood.  
 سیه síh, spit. P. síkh.  
     tufak-síh, ramrod.  
 سيها síhá, lead. Si.  
 سيدنغ sehnagh, v. to bear, endure. Si. sahnú.  
 سيدنغ síagh, v., p.p. sítha, to swell. P. ámá-sídan.

## ش Sh.

- شا shá. See shawá, you. P.  
 شانلو shátlo, dove.  
 شاخ shákh, branch. P.  
 شاندي shádki, rejoicing, merry-making. P. shádí.  
 شار shár, (Ar. شعر), poem.  
 شانغ shágh, a small tree (*Grewia Vestita*).  
 شاغا shághá, guitar or banjo. See dambíro.  
 شال shál, blanket. P.  
 شام shám, the evening meal. P.  
 شان shán, power, powerful, honourable. Ar.  
 شان 'shán, for ashán, from that.  
     'shán-go, thence.  
     'shán-phalawá, from that direction.  
 شانذ shánd, sign.  
 شانزده shánzdah, sixteen. P.  
 شانغ shánagh, backbone, nape of neck. P. shána.  
 شانكهه sháukh, stony ground at foot of hills.  
 شاه sháh, horn.  
 شاه sháh, king. P.  
     sháh-murdán, forefinger.  
 شاه كپتر sháhkaptar. See shafkástir.  
 شاهد sháhid, witness. Ar.  
 شاهدي sháhídí, evidence.  
 شاهي sháhí, a 2-anna piece. P.  
 شاپر sháir, (Ar. شاعر), poet.

- شب چراغ shabchirágh, firefly. P.  
 شدت shiddat, disputing, argument. Ar.  
 شادو shaddo, a turban (poet). Si. shado.  
 شدغ shudhagh, v., p.p. shustha, to hunger.  
 شدغ shudhagh, v., p.p. shustha, to wash, intr.  
 شدي shudhí, adj. hungry.  
 شر sharr, good, fine, beautiful.  
 شرت shart, gambling. A.  
 شردو shurdo, a small species of *Dianthus* found on the Sulaiman

## Range.

- شرا shará, a law-case. A.  
 شرم sharm, shame. P.  
 شرو shurú, beginning. A.  
 شريك sharík, partner. A.  
 شست shist, sight of a gun. P.  
 شستغ shastagh, v. p.p. shastátha, to send. Cf. P. firstádan.  
 شش shash, six. P.  
 ششمي shashumí, sixth.  
 شار shár, poem. A.  
 شغر shaghar, sharp, harsh (in speech).  
 شغان shaghán, scorn, mockery.  
 شغین shighín, upside down, topsy-turvy.  
 shighín-bíagh, to be upset.  
 شف shaf night. P. shab.  
 shaf-chirágh, firefly.  
 shaf-kástir, a plant. *Sophora Griffithii*.  
 shaf-khor, nightblind.  
 شفانك: شافانك shafánkh, shepherd, goatherd. P. shabán.  
 شفاك شفاك shafak, s. iron peg on which a mill stone revolves.  
 شك شك shakk, doubt. A.  
 شكار شكار shikár, hunting, sport. P.  
 شكاري شكاري shikári, hunter.  
 شكور شكور shukr, thanks. A.

شكهل shakhal, tamarisk sugar. (The manna produced in the hot weather on *Tamarix articulata* and *Tamarix gallica*).  
P. shakar.

شكهل shakhal, adj. sweet, fair.

شلوار shalwár, }  
شلور shalwar, } the loose trousers worn by Balochis.

gwáth-shalwar, puffed up, proud.

شم sham, boundary, water-parting.

شمب shamb, branch.

شمشغ shamushagh, } p.p. shamushta, to forget. Cf. P. fará-

شموشغ shamúshagh, } moshídan.

شمول shamol, water-parting.

شنز shinz, the camel-thorn. (*Alhagi Mauroram.*)

Cf. Pashto, zoz.

شذكه shanikh, kid (f.)

شوكش shav-kash. For shaf-kash, the night-expeller, *i. e.* Venus, the morning star.

شوا shawá, }  
شا sh'á, } you. P. shumá.

شوانكه shawánkh. See shafánkh, shepherd.

شونغ shodhagh, p.p. shustha, to wash. P. shustan.

ján-shodhagh, to bathe.

شورغ shoragh, saltpetre. P. shora.

شوشكغ shawashkagh, v., p.p. shawakhtha, to sell. (Cf. P. farokhtan).

شوكغ shúkagh, to smell.

شوم shúm, miser, avaricious. Ar.

شوهازكهغ shúház-khanagh, to like, prefer.

شهر shahr, town, village. P.

شهور shahúr, good manners. Ar.

شي sh'í. Contraction for ash-í, from this.

sh-í phalawá, from this direction.

شیدی shídí, a negro. Ar.

شید shédh, hence, from here. (For ash-edh.)

- شیدک بهندا *shedh-phadhá*, henceforward.  
 شیدنا *shedhá*, hence.  
 شیشخن *shíkhán*, s. cloth in which the flour from the mill is collected.  
 شیر *shír*, milk. P.  
     *shír-wár*, suckling, unweaned.  
     *shír-deokh*, milch.  
     *shír-doshokh*, milker.  
     *shír-dán*, bladder.  
 شیر *sher*, under, from under. (P. zer.)  
     *sher-phalavá*, from the underside.  
     *sher-gwáth*, leeward.  
     *sher-tharagh*, to be crushed beneath.  
 شیرزک *shezirk*, a low furze-like shrub, (*Caragana* sp.)  
 شیف *shéf*, slope. P. *shíb*, *nishíb*.  
     *áf-shéf*, watershed, slope of a drainage basin.  
 شیفغ *shefagh*, pin or rod for applying collyrium to the eyes.

## غ Gh.

- غرق *gharragh*, to snore.  
 غریب *gharib*, poor, inoffensive. A.  
 غلت *ghalat*, mistake, false statement. A.  
 غلام *ghulám*, a slave. A.  
 غم *gham*, grief, sorrow. A.  
 غمناک *ghamnák*, sorrowful. A. P.  
 غمی *ghamí*, mourning. A.

## ف F.

- فال *fál*, an omen. Ar.  
 فایده *fáida*, advantage, profit. P.  
 فرشتغ *firishtagh*, angel. See *phirishtagh*. P.  
 فرق *fark*, difference. Ar.  
 فصل *fasl*, harvest. Ar.

- فلاسي falási, carpet, Ar.  
 فلاسه fulána, certain, such a one. Ar.

## ك K.

- كابل kábil, able. A.  
 كاتر kátar, dagger.  
 كار kár, work, business. P.  
 كارچ } káreh, }  
 كارچه } kárcha, } knife. P. kárad.  
 كاري kárí, basket. See khárí.  
 كارير kárez, underground aqueduct.  
 كارينگر kárigar, ox.  
 كازي kází, the Qází. A.  
 كاسه kása, a measure of corn, one-sixth of a harwár. Contains  
 about 6 sers, 9 chitáks Indian weight.  
 كاشد káshid, messenger. A.  
 كاغد kághadh, letter. P.  
 كافر káfir, unbeliever. A.  
 كاك kák, Baloch bread baked round a heated stone.  
 كالرا kálrá, flea. Si. káriřo.  
 كامباني kámbání, sling.  
 كان kán, mine. P.  
 كانديري kánderí, thistle. Si. kánderí.  
 كانوني kánwuí, cormorant.  
 كوش káosh, the month of Asoj.  
 كاهي káhí, ditch. See kháhí.  
 كبر kabr, tomb. A.  
 كبول kabúl, acceptance, agreement. A.  
 كبد kubba, a domed building.  
 كپتغ kaptagh, v. to attack.  
 كپتغ كاپيناغ kapainagh, to expend.

- کت kut, blunt.  
 کت kut, lap.  
 کتاکھانغ kutákhanağh, to adopt.  
 کتار katár, string of camels. A.  
 کتب kutb, the North Pole.  
     kutb-astár, the polestar.  
 کتري katre, a little while. A. qadr.  
 کتغ kuttigh, thorn.  
 کتغوخ kuttanoğh, thorny bushes. Two or three species of *Cara-*  
     *gana*.  
 کتهه kath, spinning. Si.  
 کتهان kithán, which? what?  
 کتي kuttí, death.  
 کترغ kutrağh, to gnaw.  
 کتغ kağagh, to dig, conquer, overcome.  
 کتغ kuğagh, to thrash. Si. kuğanu.  
 کتکو kağakar, sand-grouse. Si. kağangar.  
 کثمان kithán. See kithán.  
 کتجغ kajagh, v., p.p. kajathá, to cover. Si. kajanu.  
 کجبل kajal, coarse flood grass.  
 کچ کھانغ kach-khanağh, to measure. Si. kachh.  
 کچتوي kuchtoe, a plant.  
 کچپھري kachehrí, an assembly, darbar. H.  
 کدال kudál, a mattock. Si. kođari.  
 کده kadah, a cup. P.  
 کذام kudhám, s. nest.  
 کذين kadhen, when?  
 کور kur, a stable, Si. kuřhi.  
 کورا karrá, ring, link of a chain. S. kařo.  
 کورپاس karpás, cotton. Skr. karpása.  
 کراکت karákuř, noise, rattling, clashing.  
 کورتا kurtá, long coat. Si. kurto.  
 کورتی kurtí, short coat. Si. kurtí.

- کرتغ *karthagh*, mongrel, of mixed breed.  
 کروشک *kirishk*, a slip, stumble.  
 کروشکغ *kirishkagh*, to slip, stumble. Si. khiskanu.  
 کراوغ *karkávagh*, a thorny plant.  
 کركذي *karkaní*, a kind of grass.  
 کرم *kirm*, insect, worm. P.  
 کرمساكهه *karmsákh*, blackguard, a term of abuse.  
 کروي ياي *karvelí*, the caper bush. (*Capparis spinosa*.) Si. kalavári.

See *godhán-din*.

- کري *karrí*, an earring. Si.  
 کري *kirí*, a Baloch hut. Si. Pashto.  
 کريهه *kireh*, hire, wages. P. kiráya.  
 کتر *kiṛ*, ashes. Si. kiri.  
 کزغ *kizagh*, p.p. kishtha, to leave.  
 کس *kas*, any, any one. P. kas.

kase, some one.

har-kas, every one.

- كس *kus*, vulva.  
 كسائين *kisáin*,  
 كسان *kisán*, } little, small. P. kib, kihtar.  
 كسانك *kisának*, very small.  
 كسسه *kissa*, story. A.  
 كشك *kashk*, kaurí.  
 كشك *kshik*, dog (m.)  
 كشكول *kashkol*, faqír's begging dish.  
 كل *kil*, a wart.  
 كل *kull*, all, the whole. A.

*kullá-phajyá*, altogether.

- كل *kal*, knowledge, skill. Si.  
 كلات *kilát*. (Ar. قلعة), a fort.  
 كالاي *kaláí*, tin. P.  
 كلتري *kaltrí*, a saw.  
 كلدار *kaldár*, of European manufacture, as a gun, a rupee.

- كاشك kulishk, a kind of grass.  
 كاغ kullagh, to cough. See khullagh.  
 كلف kulaf, lock. P. kufi.  
 كلو kulo, a small earthen pot. See khulo.  
 كله kulla, cap.  
 كله kulla, a warning.  
 كم kam, little, few. P. (Also kham.)  
 كم بخت kambakht, unlucky. P.  
 كumb kumb, tank, pool, rock hollow containing water.  
 كمبر kambar, variegated, stained. See khambar-kambar kha-  
   nagh, to write.  
 كمبىغ kumbigh, s. mushroom. S. khumbí.  
 كمیده kamína, mean, low. P.  
 كنت kunt, blunt.  
 كنتغ kuntagh, thorn.  
 كنجري kanjarí, prostitute. Si.  
 كنجي kunjí, key. Si.  
 كنجیته kunchitha, a plant.  
 كنجیث kunchith, sesamum. See kwenchigh. P. kunjid.  
 كند kund, near. See khund.  
 كندغ kandagh, a mountain pass. See khandagh.  
 كندی kandí, necklace.  
 كندی kundí, a hook. Si.  
 كندغ kindagh, p.p. kindatha, to spread out. Si. klinđanu.  
 كندر kunar, the ber-tree, jujube-tree. P.  
   dig-kunar, *Zizyphus jujuba*.  
   khokar-kunar, *Z. nummularia*.  
   tholagh-kunar, *Z. oxyphylla*.  
 كذی kany, a virgin. Si. kanyá.  
 كوات kawát, a young male camel up to 3 years. Si.  
 كوان kawán, bow. Share of spoil taken in a raid. P. kamán.  
 كوانتغ kwántagh, to stoop.  
 کوتله kotila, young camel from 6 months to 1 year old.

- کوچ kúch, s. pommel of saddle.  
 کودی kodí, metal cup for drinking.  
 کودال kođál, mattock. See kuđál.  
 کور kor. See khor.  
 کور kaur, the phalálí-tree (*Acacia modesta*).  
 کورو koro, whip. H. korí.  
 کورکی korkí, trap, snare. Si.  
 کوش kaush, Baloch shoes. P. kafsh. Pashto, kośha.  
 کوب kavg, the chakor. P. kabk.  
 کولمیر kolmír, an aromatic plant; (*Grantea*, sp.) Si.  
 کونتر kontar, a bush. (*Grewia*, sp. ?).  
 کونتر kontar, a pigeon. P. kabútar.  
 کونر konar, the fruit of the dwarf palm (*Chamærops ritcheana*).  
 کوه koh, mountain; stone. P.  
     koh-gurágh, raven.  
 کوهی kohí, the female márkhor.  
 کونینچ کwenchigh, }  
 کونچ kunchigh, } til (*Sesamum indicum*). P. kunjíd.  
 کہا kahá, cause, reason.  
 کہادی kháđí, chin. Si.  
 کہاری khárí, a basket. Si.  
 کہاریغر khárigar, an ox.  
 کہال khál, a species of salsola. Also the sajjí or barilla manu  
     factured from it.  
 کہاهی kháhi, a ditch. Si.  
 کہپتغ khaptagh, to attack.  
 کہتری khatrí, a washerman. Si.  
 کہت khaṭ, }  
 کہتره khatra, } bedstead, charpoy. Si.  
     khaṭ-pháđhagh, the four stars forming the body  
     of Ursa Major.  
 کہجی khají, the date palm (*Phoenix dactylifera*). Si.

- کھاځ khad, hole, pit. Si.  
 کھار khar, ass (f.). P. *khar*.  
 کھار کھار kahar, auger, curse. Ar.  
 کھار کھار khar, deaf. P. kar.  
 کھار پھار kharpfaz, a mattock.  
 کھار کھار khard, separate.  
     khard-biagh, to be separated.  
 کھار کھار khurdagh, to be scattered.  
 کھار کھار kharde, some. (Cf. A. P. qadre).  
 کھار کھار khuragh, a colt.  
 کھار کھار kharghá, above.  
 کھار کھار kharag, the ák-bush, (*Calatropis procera*).  
 کھار کھار khargaz, the vulture. Pashto, gargas.  
 کھار کھار khargoshk, the hare. P. *khargosh*.  
 کھار کھار kharo-biagh, to stand up. Si. B.  
 کھار کھار khurí, heel, hoof. Si. khurí.  
 کھار کھار khur, stable.  
 کھار کھار khas. See kas. P.  
 کھار کھار khishálá, difficulty, trouble.  
 کھار کھار khishár, cultivation, crops.  
 کھار کھار khushár, slaughter.  
 کھار کھار khashagh, v., p.p. khashtha, to draw, turn out, discharge,  
     blow (of the wind). P. kashtan.  
     phost-khashagh, to flay.  
     phor-khashagh, to smoke a pipe.  
     hon-khashagh, to bleed, tr.  
     líkh-khashagh, to draw a line.  
     gwáth-khashaghen, the wind is blowing.  
 کھار کھار khishagh, v., p.p. khishtha, to cultivate. P. khishtan.  
 کھار کھار khushagh, v., p.p. khushtha, to kill. P. kushtan.  
 کھار کھار khafagh, v., p.p. khaptha, to fall, lie down. To begin (quali-  
     fying another verb in the gerund).  
     khanaghá khafagh, to begin to do.

er-khafagh, to descend, come down, alight.

dar-khafagh, to come out, issue.

daryá dar-khaphtha, the river has risen in flood.

کھکھو khakhar, wasp. (Sindhi. See gwamz).

khakhar-mánáro, wasp's nest.

کھل khil, peg or axle on which a millstone revolves.

کھلڱ khullagh, to cough.

کھلڱر khalgar, stony ground; large stones.

کھلو khulo, an earthen pot or *loṭa*.

کھلی khali, a small water skin (kid's skin) carried on journeys.

(Si. khalirí, skin).

کھلیرو khaler, the *Capparis aplylla*.

کھلیرو khacro, wild asparagus.

کھم kham, little, less. P. kam.

کھمب khumb, pool in a stream. See kumb.

کھمبو khambar, variegated, striped, spotted, piebald, stained, (of animals).

کھنارو khanáwa, a sword, (poet.). Si. khano.

کھنڱ khund, adv. near. S. A piece of ground enclosed by a bend in a torrent bed.

کھنڱغ khandagh, s. a pass over a crest or ridge.

کھنڱغ khandagh, v., p.p. khanditha, to laugh. P. khandídan.

کھنڱغ khanagh, v., p.p. khuttha, to do. P. kardan, kun. To be able, can (qualifying a preceding verb in the past participle); e. g., khuttha khanán, I can do.

er-khanagh, to lay down, place.

el-khanagh, to imprison.

áwár-khanagh, to mix.

bahr-khanagh, to divide.

phol-khanagh, to ask, enquire.

phur-khanagh, to fill.

jalo-khanagh, to attack.

kach-khanagh, to measure.

gur-khanagh, to run away.

much-khanagh, to collect.

كهنځ Kahnagh, old clothes, rags.

كهنوخ Khanokh. Verbal noun from *khanagh*, doer.

كهنه Kahna and kuhna, old. P.

كهنه كاهني Kahne, s. pigeon.

كهنه كهنه Kuhne, s. hip.

كهنه كهنه Khopar, skull. Si. kopirí.

كهنه كهنه Khoprá. The *Withiana coagulans* used for curdling milk.

كهنه كهنه Khokhar, a kind of wild turnips (*Brassica*, sp.)

كهنه كهنه Khúdagħ, a tripod for cooking.

كهنه كهنه Khaur, a large hill torrent. (Cf. Pashto *khwar*.)

كهنه كهنه Khor, blind. P.

كهنه كهنه Khorí, pursuit.

كهنه كهنه Khosá, fever. Panj.

كهنه كهنه Khofagh, shoulder.

khofagh jüzainagh, to shrug the shoulders.

كهنه كهنه Khofaghá, the shoulder muscles.

كهنه كهنه Khaulú, a fawn.

كهنه كهنه Khontar, a bush, (*Carissa diffusa*).

كهنه كهنه Khawinjar, a partridge.

كهنه كهنه Khonḍ, the knee.

khonḍ bhorainagh, to kneel.

كهنه كهنه Khaí, } who?

كهنه كهنه Khaighen, } whose?

كهنه كهنه Khair, ox.

كهنه كهنه Kahír, the kanda or jhand tree, *Prosopis spicigera*. See also Sol.

كهنه كهنه Kher, the penis. P. kír.

كهنه كهنه Khaizán, perhaps, may be.

كهنه كهنه Khísagh, pouch, pocket. P. kása.

كهنه كهنه Khín, the anus.

khíná-phur-biokh, a breechloader.

- كھيندار khíndar, naked.  
 كھينو khenú, a ball. Si. kheno.  
 كيتخ kítagh, a water-melon.  
 كينغو kaigho, itch, mange. Si. kháji.  
 كيلار kílár, unripe fruit of *Chamærops ritchiana*.  
 كينگ kínag, envy, grudge. P. kína.  
 كيوا kíwá, in exchange.

## گ G.

- گادي gádí, pad, cushion. Si.  
 گار gár, lost, destroyed.  
     gár-bíagh, to be lost.  
     gár-khanagh, to lose, make away with.  
 گار gár. See gál, speech. Si.  
 گارا gára, quarrel.  
 گاغ gágh, v., p.p. gátha, coire.  
 گال gál, speech. Si. gálhu.  
 گالوار gálwar, conversation, matter of discourse.  
 گالی gálí, a visit.  
 گالی gálí, bedding.  
 گام gám, a pace.  
     gámá juzagh, to walk (of a horse).  
 گپ gap, quicksand, quagmire. Si.  
 گپھل gaphall, a piece, bit. Si. gapalu.  
 گتني guttaní, retreating.  
 گتھا githá, cheek.  
 گت gaṭ, chasm, precipice.  
 گتخ gutṭiḡh, the kidney.  
 گتور gaṭúr. See ghatúr.  
 گتھه guṭh, the throat.  
 گتھي guṭhí, bridle.  
 گتھي gatṭí, wooden handcuffs. Si.  
 گج gaj, a wooden arrow.

- گچ guch, the colocynth gourd, bitter apple. *Cucumis Colocyn-*  
 گدکبه gadikh, kernel. [this.  
 گدوبار gadobar, maize.  
 گدی gudí, a toy-kite.  
 گد gad, female uriál. (See guránd). (Cf. Pashto, gad ram).  
 گدا gudá, then, again, and.  
 گدغ gudagh, to chop, to kill animals, to butcher. Si. guđanu.  
 گدی gađí, the middle finger.  
 گد gudh, cloth.  
 گار gar, a pimple, boil.  
 گار gur, s. kauří.  
 گار gur, running.  
 گارکهنغ gur-khanagh, to run away. Cf. Pehl. giríkht, fled.  
 گار گارrá, piebald, skewbald (of a horse).  
 گرانغ grádhagh, v., p.p. grástha, to boil.  
 گرانهه girárth, a span (with the thumb and 3rd finger).  
 گراغ gurágh, crow.  
 koh-gurágh, raven.  
 گران girán, heavy, dear. P.  
 گرانده guránd, a ram. The male uriál. (*Ovis cycloceros*).  
 گرانی girání, weight, dearth. P.  
 گرانز gránz, nostril.  
 گربرا gurburá, in a whisper. Si. gurburí.  
 گربهغ gurphugh, small-pox.  
 گربهیل garphíl, a whirling cloud of dust or "devil."  
 گرجغ girjagh, to catch, seize, p.p. girjíttha.  
 گردغ gardagh, v., p.p. gartha, to return. P. gardídan.  
 گردن gardan, neck. P.  
 گردینغ gardainagh. Causal of gardagh.  
 گردغ gradhagh, v., p.p. grastha, to cook.  
 گوغ giragh, v., p.p. gipta, imp. gír. P. giriftan, gír, to take,  
 accept, seize, lay hold of.  
 bál-giragh, to fly.

bo-giragh, to smell.

hál-giragh, to hear news.

zahr-giragh, to be angry.

sar-giragh, to set out.

گَرغ garragh, to roar or bellow.

گَرگخ gurkagh, to growl. Si. guranu.

گَرگه gurkh, wolf. P. gurg.

gurkh, the Wolf, *i. e.*, the last star in the tail of *Ursa major*. See under Guránd.

گرم garm, hot, warm. P.

گَرچ granch, a knot.

گَرِد garand, thunder.

گَراند guránd, (1) ram; (2) the male urial (*Ovis cycloceros*).

Guránd, the Ram, *i. e.*, the first star of the three forming the tail of *Ursa major*. This is supposed to be pursued by the second, the Dog, which in its turn is pursued by the last star, the Wolf.

Guránd-drikh, the Milky Way (lit. the Ram's leap). This refers to the legend of the Ram brought from heaven to take the place of Ismáíl when Abraham was about to sacrifice him. The Milky Way is supposed to be the Ram's track.

گَرندغ garandagh, v., p.p. garandatha, to thunder.

گَرزخ girozh, s. lightning.

گَرخ girozh. Verbal noun from giragh, a taker, creditor.

گَره giroh, s. fife, pipe.

گَرِي garí, speech, song.

گَرِي garí, bald.

گَرِي garí, piebald, skewbald (of a mare).

گَرِيغ giregh, v., p.p. girenthá, to weep. P. gírgan.

گَرِه gríh, voice, sound.

zor-gríhá, in a loud voice.

- گَر gar, a precipice, sudden descent, chasm. Pashto, garang.  
 گَز gaz, tamarisk. Especially *Tamarix gallica*.  
     gíth-gaz, *Tamarix articulata*. P.
- گَز gaz, a yard:  
 گَزَر guzar, makeshift.  
 گَزَران guzrán, maintenance.  
 گَزَرین gazaren, ought, is necessary.  
 گَزَع guzagh, v., p.p. gwastha, to pass. P. guzishtan.  
     guzagh-ravagh, to pass by.
- گَزِیر gazír, miser.  
 گَسَر gisar, mistake, forgetting. Si. bisiranu.  
     gisar-biagh, to forget.
- گَسور gasúr, s. anger.  
 كَشَت gasht, coarse long grass on the hill side, not eaten by  
     cattle.  
 كَشَغ gushagh, v., p.p. gushtha and gwashtha, to speak, say, tell,  
     sing, recite. (Skr. vach).
- گَشوِخ gushokh, singer, reciter.  
 گَشِيْدِغ gishainagh, v., p.p. gishaintha, to choose. P. gizídan.  
 گِغ gugh, owl. P. buh.
- گُفْتار guftár, speech, song. P.  
 گُفَغ gufagh. See گُفَغ gwafagh, to weave.
- گَل gal, cheek. Si. galu.  
 گَل gal, a number, quantity. Used in composition to form  
     nouns of quantity as jan-gal, a band of women.
- گِل gil, clay, earth. P.  
 گُل gul, a flower. P.  
 گُلانِغ galágh, p.p. galáitha, to praise.
- گُلالِكِه gulálakh, long curls worn by Balochis.  
 گُلپِهان galphán, a groom, syce.  
 گُلْدِه galatha, rotten. Hindi, galá.  
 گُلِر gullar, dog's pups. Si. guliru.  
 گُلِغ galagh, a band of mares, or of horsemen.

galagh-tháshí, horse-racing.

گگلگ gulgul, water with which the mouth is rinsed after eating.

گلو galo, door.

گله galla, a káfila, caravan. Si.

گلي galí, a street. Si.

گليم galím, a rug or blanket. P.

گناس gunás, (rare) } fault, sin. P. gunáh.  
گناه gunáh, (common) }

گنج gunj, crease, wrinkle. Si. gunyu. Pashto gunjah.

گنجي ganjí, a measure of corn.

گند gand, s. a branch water-course.

گند gand, s. filth, manure. P.

gand-bo, stink.

گند gund, testicles.

gundí, an entire horse.

گنداخو gandákhó, Indian ruc (*Peganum harmala*).

گندرف gandraf, sulphur. Si.

گندخ gandagh, bad.

گندخ gandagh, v., p.p. gandatha, to join.

گندخ gindagh, v., p.p. دینه dílha, imp. gind, to see. P. bín, dídan.

گندل gandal, s. felt, namda.

گندیل gandíl, a short fodder grass in the lower Sulaimáus and plains. Si.

گندیم gandím, wheat. (P. gandum.)

گند gand, Adam's apple.

گنوخ ganno<sup>kh</sup>, fool, idiot.

asulá-ganno<sup>kh</sup>, a born idiot.

گو go, prep. with. P. bá.

گو go, s. race, prize.

go-bar, a race-winner.

گوات gwáth, air, wind. P. bád.

gwáth-má, climate.

er-gwáthá, on the leaside.

gwáth-shalwar, puffed up.

گوانخ gwáthagh, a gelding.

گوانو gwátho, windy.

gwáthen hálwar khanagh, to talk big.

گوارش gwárish, rain. P. bárish.

گواز gwáz, bark of a tree.

گواش gwásh, ground at the foot of a hill.

گوانغ gwáfagh, v., p.p. gwáptha, to call together, summon.  
(Cf. P. guftan.)

گوانغا gwághá, immediately.

گوالغ gwálagh, packsaddle for oxen, bags.

ganda-gwálagh, (lit. spoil-bags), the small red  
ant. Also the name of a Baloch sub-tribe.

گوامیش gwámesh, buffalo. P. gáv-mesh.

گومیش gwámish, a small plant used in washing.

گوان guwán, doubt, hesitation. P. gumán.

گوانزغ gwánzagh, a swinging cradle.

گوانكه gwánkh, voice, sound. P. báng.

gwánkh-janagh, }  
gwán'-janagh, } to call out.

گوبر go-bar, a horse that has won a race.

گوت got, bridegroom. Panj.

گوج goj, a large lizard, "go-sámp." Si.

گوچ gwach, a buffalo-calf. Si. vachhi. Skr. vatsa.

گوخ gokh, an ox, cow. P. gáv.

گوخ gaukh, nape of the neck.

گوحراند gokhránd, dung-beetle.

گوخو gokho, a span with the thumb and forefinger. Si. goñkú.

گودر godur, a plant.

گودي godí, mistress, lady.

گون godh, menstruation.

گوزان gwadhán or godhán, udder.

gwadhán-din, the caper-plant. *Capparis spinosa*.

(lit. udder-tearer).

گودر godhar, wasp's nest.

گور gwar, adv. near. P. bar.

gwará, nearly.

گور gor, wild ass. P.

gor-dil, *Daphne mucronata* (so called from its red berries).

گور gor, }  
گورستان goristan, } tomb.

گور gwar, woman's breast. P. bar.

gwar-sar, nipple.

gwarán dír khanugh, to wean.

gwar-ambázi, embracing.

گوراند goránd, a ram, male uriál.

گوربند gwarband, path leading round the foot of a hill.

گورپهار gwarpahar, flock of lambs.

گورغ gwaragh, v., p.p. gwartha, fut. 3rd pers. sing. gwári, to rain.

P. bárián.

گورکها gwarakh, a lamb.

گورکها gorkhá, a kind of coarse grass called in Sind and the S. Panjáb sin or sain, good for fodder.

گورم goram, a herd of cattle. (P. gáv, rama.) (Si. goramu.)

گور gur, gur or coarse molasses.

گوزاغ gwazagh. See گوزاغ guzagh, to pass. P. guzashtan.

گوزد gozhd, fiesh, meat. P. gosht.

گوس gwas, enough. P. bas.

گوسکری goskarí, crystal, felspar; fossils in rock.

گوش gosh, ear. P.

gosh-deagh, to listen, attend.

گوشا goshá, s. the pan of a matchlock.

گوشاغ gwashagh. See گوشاغ gushagh, to say.

گوغرا goghra, s. a snore. Goghra janagh, to snore.

- گوفغ gwafagh, v., p.p. gwaptha, to weave. (P. báftau.)
- گوكرد gokurd, sulphur. P.
- گومان gomádh, a kind of grass, the seed of which is eaten in times of scarcity, called in Sindh and the Deraját, gam. *Panicum antidotale*.  
nar-gomádh, a kind of grass with star-shaped flowers, found in the Upper Sulaimáns.
- گومز gwanz, a wasp.
- گون gon, with, together with.  
gon-deagh, to overtake. .  
gon-khafagh, to meet.
- گون gwan or gon, the wild pistachio. *Pistacia khinjuk*.
- گوند gwand, short.
- گوندان gwandádh, shortness.
- گوندو gwando, an alligator.
- گوندوش gondosh, s. a large needle.
- گونگ gúng, dumb. Si.
- گونگرو gúngrú, turnip. See zang. Si.
- گوه goh, a large lizard. Si.
- گوهار gohár, sister. P. khwáhar.
- گوهر gwahar, cold.
- گويل goil, s. breakfast-time.
- گهت ghaṭ, inaccessible place, precipice.
- گهتغ ghaṭṭagh, v. to smother.
- گهتور ghaṭúr, a lamb or young sheep suitable for eating. (Cf. Si. ghaṭo, ram).
- گهر guhar, adj. See گوم gwahar.
- گهرياي ghuriái, s. a stranger.
- گهري ghari, hour. Si.
- گهل ghal, a band, a raiding party, a raid. Si. ghali.
- گهن gahn, a pledge. Si. gahno.
- گهرو ghoro. A band of horsemen. (Si. ghoro, horse.)
- گيانچ giánch, a small bird found in sandy parts of the country, called Malála in the Deraját.

- گیترة getra, a kind of melon.  
گیتھ geth, the willow, *Salia acmophylla*. P. bed.  
گیتھشک gethishk, the Sinetta or Bog-myrtle. *Dodonaea viscosa*.  
گیتھگاز gith-gaz, a kind of Tamarisk. *T. articulata*.  
گیتھماھسک gídh-mahisk, house-fly.  
گیر gir. Imp. of giragh, take.  
گیر gir, s. memory.  
گیر-آراھ gir-áragh, to remember.  
گیرآر دآراھ girár dāragh, to remind.  
گیرا girá, dove. Si. gero. (See sháhllo )  
گیزغ gezhagh, v., p p. gíhhta, to bring forth dead offspring.  
گیست gíst, twenty, sai-gíst, 60, chyár-gíst, 80. P. bíst.  
گیستمی gístumí, twentieth.  
گیش gísh, s. a female kid.  
گیشتار gíshtar, a shrub, *Periploca aphylla*.  
گیستار geshtar, many, more. P. beshtar.  
گیشن geshin, a sieve.  
گیکار gíkár, belch.  
گیلر gelar, a squirrel. Hindi galerí.  
گین gín, life, breath.  
do-gín, pregnant.  
گیھا gehá, great, good.  
گیدشغ gíeshagh, v., p.p. gíeshtha, to pick out, to pay.

## J L

- لاپھر láphur, (láf-phur), pot-bellied, pregnant.  
لاڈ láḍ, sport, play. Si. láḍu.  
لاڈا خاناھ láḍá khanagh, to play.  
لار lár, s. crookedness.  
لاغ lágh, a male donkey.  
لاغر lághar, thin, lean. P.  
لاف láf, belly, stomach.  
لاف-بند láf-band, belt.

láf-dor, bellyache.

láf-ser, bellyful.

لاکځ lákagh, to bark.

لال lál, ruby. P.

لانو lánav, lana, (*Salsola sueda*). Si. láno.

لاندو lándav, adj. fat.

لانك lánk, a waistcloth, dhoti. Si. lánġ.

لارو lárará, young of animals.

لاينغ láinagh, v., p.p. láitha, to touch, apply. Si. láinu.

لب lab, the priming of a gun. Si. labu.

lab-chaṭagh, to flash in the pan.

لبز labz, promise.

لبه labh, obtaining, getting. Si.

لاتارغ latáragħ, to rub off, dismiss, get rid of. Si. latáranu.

لاهه laṭh, stick, rod, flail. Si. laṭhi.

لاهه laṭh, embankment. Panj.

لاهنا laṭhná, bag for drugs.

لاجه laj, shame. Si.

لجه luch, wretch, profligate. Si. luchu.

لذ lid, horse-dung. Si.

لذغ ladagh, v. to run away.

لذغ luḍagh, to move. See lodagh. Si. laṣanu.

لذغ laḍagh, p.p. laḍatha, to lade beasts of burden, to march, start. Si. laḍanu.

لذ ladh, jungle.

لذغ ladhagh, kick. P. laghat.

ladhagh janagh, to kick.

لر lar, a branch of a tree.

لر lar, a sword.

لرزغ larzagħ, to tremble. P.

p.p. larzitha.

لرکځ larġkagh, to hang (intr.). Si. larġkanu.

لرکينغ larġkainagh, to hang (tr.).

لاس las, all, the whole.

- لشكر *lashkar*, army. P.  
 لغام *laghám*, horse's bit. P. *lagám*.  
 لغد *laghadh*, kick. See لذغ *ladhagh*.  
 لغر *laghar*, *áf-laghar*, a rapid or water-fall.  
 لغشغ *laghushagh*, v., p.p. *laghushtha*, to slip, slip out. (Ar. *laghz*, slip).  
 لغور *laghor*, adj. wretched, mean, cowardly, poor.  
     *laghoren dighár*, poor ground.  
     *laghoren daḍḍav*, a wretched pony.  
 لك *lak*, a hundred thousand. P.  
 لكغ *likagh*, to hide (intr.). Si. *likanu*.  
 لكوري *lakaurí*, butterfly.  
 لكهغ *likhagh*, to write. Si. *likhanu*.  
 لكيدنغ *likainagh*, to hide, conceal. (Causal of *likagh*.)  
 لله *lalla*, s. *lisp*ing.  
     *lalla khanagh*, to lisp.  
 لاما *lammá*, south. Panj.  
 لامب *lamb*, a branch.  
 لامبي *lambí*, s. a kind of grass, (*Cenchrus eclimatus?*)  
 لانج *lanj*, blood.  
 لانگ *lang*, adj. lame. P.  
 لانگ *lang*, s. a torrent.  
 لواشغ *lawáshagh*, v., p.p. *lawáshtha*, to drink.  
     *hon-lawásh*, bloodthirsty.  
     *mar-lawásh*, cannibal.  
 لوپ *lop*, s. branch of a valley; a small alluvial plain in the bend of a stream.  
 لوتهه *loth*, s. a bag.  
 لوڤاغ *loṭagh*, v., p.p. *loṭtha*, to demand, to want.  
 لوڤاغ *lodagh*, v., p.p. *lodatha*, to move, shake, (intr.). Si. *loḍanu*.  
 لوڤاينغ *lodainagh*, to shake (tr.). Causal of *lodagh*.  
 لور *lúr*, s. hot wind.  
 لور *lawar*, s. a stick.

- لورھاف lúraháf, s. a stream which runs occasionally. Flood irrigation as distinguished from perennial stream irrigation.
- لوري lorí, s. a minstrel.
- لونغ logh, s. home, household; (met.) family, wife.  
logh-wázhá, goodman, master.  
logh-bánukh, housewife, mistress.
- لوندري laundrí, s. the temples. Si. laundirí.
- لوه loh, s. hot wind. Si. lúh.
- لوهيغ lohígh, s. a small pond.
- لهر lahar, s. a hill-torrent.
- لهم lahm, adj. timid, bashful.
- لهيف libef, s. a blanket, quilt. P. liháf.
- ليتغ letagh, v., p.p. leṭṭha, to lie, recline. Si. leṭanu.
- ليتر leṭo, s. a male camel (full-grown).
- ليكهه líkh, s. a line. Si. lík.  
líkh khashagh, to draw a line.
- ليكهغ lekhangh, v., p.p. lekhtha, to count, reckon. Si. lekhanu.
- ليكهو lekho, s. account, reckoning. Si.
- ليها lílhá, a bush, *Daphne mucronata*. (See phífal, gordil).
- ليمو límú, s. lemon. A.
- ليو lev, s. play, sport. A. la'b. Pashto lobah.  
lev khanagh, to play.

## م M.

- ما má, pro. we, plural of mau.
- ماتون mátún, s. stepmother.
- مات máth, s. mother. P. mádar. Pehl. máđ.  
máth-phíth, parents.
- ماخته mákhta, adv. immediately.
- مانغ mádhagh, adj. female. P. máda.
- مانن mádhin, s. mare. P. mádián.
- مار már, s. snake. P.  
syahmár, cobra.

már-val, a kind of creeper.

مارفتا márifatá, prep. by means of. A.

ماري mári, a house with an upper storey. Si. márí.

مازات mázáth, s. a two-year-old camel. (Cf. Si. májádú.)

ماسي másí, s. maternal aunt. Si.

ماش másh, s. dál. P.

ماشغ máshagh, s. the hammer which holds the match of a match-lock. Si. másho.

ماكورا mákúrá, s. vermin. (Cf. Si. mákoṛo, black ant.)

مال mál, s. cattle. A.

مالدار máldár, cattle-owner. P.

ماليم málim, known, clear. A. málúm.

ماما māmá, maternal uncle. Si. mámo.

مان mán, prep. in, into.

مان آغ mán-ágh, to be applied, touch, reach (lagná).

مان دینغ man-deagh, to apply (lagáná).

مان رشغ mán-rashagh, to attack.

مان رواج mán-ravagh, to enter.

مان کهنغ mán-khanagh, to put in.

مان گزارغ mán-guzáragh, to meet together.

مانغ mánagh, v., p.p. mantha, to tire, become weary. P. mán-dan.

ماه máh, s. a month; the moon. P.

ماه غما máh-ghumá, eclipse of the moon.

ماهغ máhgh, an udder.

ماهگان máhkán, s. the moon.

mahkání shaf, a moonlight night.

ماهلو máhlo, early in the morning.

ماهي máhí, fish. P.

متبیل matbal, meaning, selfishness. (Ar. matlab.)

متبیلی matbalí, selfish.

متهه math, death.

متهغ mathagh, v. to shake (a churn). Si. mathanu.

- مات maṭ, equal. Si. maṭu.  
 ماتدنگ maṭṭainagh, v. to exchange, barter. Si. maṭáinu.  
 مجال majál, power. Used as an expression of apology or re-  
 pentance. A.  
 مجالس majális, society. (A. majlis.)  
 مچ much, assembled. (Si. muchu, a heap.)  
 much-khanagh, to assemble, bring together.  
 much-bíagh, to assemble, come together.  
 مچھ muchh, joint.  
 phádh-muchh, ankle.  
 dast-muchh, wrist.  
 مچھی muchí, assembly.  
 مخته makhta. See mákhta, immediately.  
 مد mudd, season, time. (A. muddat.)  
 مدرک madrik, bead.  
 مادی mađí, goods and chattels. Si.  
 مدخ madhakh, locust. P. malakh.  
 مدغ madhagh, v., p.p. mastha, to freeze, curdle. P: mastan.  
 مر mar, man. P. mard.  
 mar-khushokh, murderer.  
 mar-khushí, murder.  
 mar-lawásh, }  
 mar-wár, } cannibal, man-eating.  
 مراد murád, aim, object. A.  
 مرای marái, gums.  
 مرجان murján, pepper.  
 مرد mard, man. P.  
 مردان murdán, s. finger.  
 sháh-murdán, forefinger.  
 nyámaghí murdán, middle-finger.  
 مردانغ murdánagh, the fingers.  
 phádh-murdánagh, the toes.  
 مردم mardum, a man, human being. P.

- مردین marden, } human, belonging to man.  
 مردینه mardena, }  
 مرزى marzí, pleasure. A.  
 مرغ murgh, bird. P.  
 مرغ miragh, v., p.p. murtha. Imp. mír, to die. P. murdan.  
 مرکا marká, s. a deputation.  
 مرکهو markhav, a horse. P. markab.  
 مرگادی margávi, curse.  
 مروانر murvádhir or murwhádhir, pearl. P. marvaríd.  
 مرورغ maroragh, to twist. Si. maroṛanu.  
 مرویهی marvehí, see! behold! (an expression of astonishment).  
 مروشی maroshí, to-day. P. imroz.  
 میراند miránd, } fight, battle.  
 میراو miráo, }  
 میرای maṛái, however.  
 میرغ miragh, v., p. p. miṛatka, to fight. (Cf. Si. miḍanu, to meet.)  
 میړوخ miṛoḵh, s. a fighter.  
 میړاگرغ mazágiragh, to taste. P.  
 میزار mazár, tiger, &c. Pashto mzarai.  
     mazár-trap, tiger's leap! The name of a game  
     resembling draughts played on a board.  
 مزین mazain, } great, large. Zend. mazdáo. Skr. mahá. P. mih.  
 مزن mazan, }  
 منزل mizil, stage, march. P. manzil.  
 مژ muzh, mist after rain.  
 میژغ mizhagh, v., p.p. mishtha, to piss.  
     Cf. Pashto mítal. Imp. mízhah.  
 میژگ mazhg, brain. P. maghz.  
 میژگژ mizhguzh, a small plant found in the Sulaimán range.  
 میژگان mizhagán. See mishásh.  
 مس mas, ink. Si.  
 مستر mastar, large, greater. (Comp. of mazain.)

- مسدغ mastagh, curds. (From masta, p.p. of *madhagh*.)  
 مستی mustí, coarse sugar or molasses, gur. Si.  
 مسرا masará, in front.  
 مسك misk, s. musk. P. mushk.  
 مسك misk. See mahisk, fly.  
 مسیت masít, mosque. A. masjid.  
 مشانا mushádhá, s. show.  
 مشاش mishásh, eyelashes.  
 مشال mashál, torch. A.  
 مشت musht, s. fist. P.  
 مشت musht, s. hilt of a sword.  
 مشر mashar, celebrated. (A. mashhúr.)  
 مشغ mishagh, v., p.p. mishta, to suck. (Cf. Ar. mizz.)  
 مشغ mushagh, v., p.p. mushhta, to rub. (Cf. A. muzz.)  
 مشك mashk, water-bag, mussuck. P.  
 مشك mushk. See múshk.  
 مكرز mikráz, scissors.  
 مكهبرنا makherná, fringe over horse's eyes. See riband. B.  
 ملامت malámat, rebuke, punishment, curse. A.  
 ملايخ maláikh, angel. A.  
 ملندري malandrí, warrior. (Poet.)  
 مم mam, the black bear.  
 من man, I. P.  
 منا manná, forbidden. Ar. mana.  
 منا minná, } ease, security. (Poet.)  
 منيا minniyá, }  
 منان manán, to me, me.  
 مننت minnat, entreaties, supplication. A.  
 مند mind, daughter (among the Marris).  
 مند mund, spring of water.  
 مندری mundrí, ring. Si. mundrí.  
 مندو mundo, altogether, entirely.  
 منديل mandíl, turban, lungí.

du-mandíl, a respectable man.

منسف munsif, just. A.

منغ managh, v., p.p. *manit̄ha*, to attend, mind. Si. mananu.

منی maní, my. See also maín.

موارگی mavárkí, congratulations.

موتبه moth, star on the forehead of a horse.

موتبه moth, moth. (Dál). (*Phaseolus Aconitifolius*) Si.

موچی mochí, a leather worker. Si.

موخو mokho, spider.

mokho-logh, spider's web.

مور mor, ant. P.

مور بند morband, spotted.

موژاغ mozhagh, a boot, legging. P. moza.

موسم mosim, season. A. mausim.

موشك múshk, rat, mouse. P. músh. Skr. múshika.

Pashto mazhak.

موشن moshin, butter.

موكل mokal, leave, permission to depart. A.

موكلينغ mokalainagh, to take leave. Old Hindí mukkalná.

مولد molid, a female slave.

مومريز momrez, spur.

مومند momand, merciful.

ماه mah, I. See man.

مهربان mihrván, friendly, kind. P. mihrbán.

مھري muharí, foremost, in front. Si. muháro.

مھر mahar, corpse.

مھسك mahisk, fly. (Cf. P. magas).

benagh-mahisk, bee.

bíng-mahisk, horse-fly (lit. dog-fly).

gíd̄h-mahisk, house-fly.

ásk-mahisk, blow-fly (lit. deer-fly).

مھل mahl, patience, leisure. A.

mahlá-dár, be patient.

- مهلت muhlat, time, while, opportunity. A.  
 مهمان mihmán, guest. P.  
 مهمانی mihmání, entertainment. P.  
 مهیرا mahairá, in welfare, all's well. Answer to the salutation  
     biyá durr'shák/ktaghei.  
 میار mayár, shame.  
 میچ mech, hint, making signs. Si. mechh.  
     dast-mechdeagh, to beckon.  
 میخمار mekhmár, mallet. Si.  
 مید míd, goat's hair or beard.  
 مدھ medh, a boatman.  
 میوز mero, s. assembly.  
 میزغ mezagh. See mizhagh.  
 میسک mesk, a small plant, also a kind of soap made from it, used  
     in cleaning jewellery.  
 میش mesh, sheep. Especially dumbas.  
 میغی maighí, pregnant.  
 میکغ míkagh, to mew.  
 میگر megar, flock of sheep.  
 میل mel, meeting. Si.  
 میذتھغ menthagh, wet.  
 میذفر mainar, a kind of grass.  
 میذھو mízhav, a tree. The wild horseradish tree, *Moringa Con-*  
     *canensis*.  
 میور maivar, a bush, (*Grewia villosa*?).  
 میوو mevo, a chief, leader.  
 میوۛ meva, fruit. P.  
 میھ meh, peg. P. mekh.  
 میھر mehar, flock of sheep.  
 میھی mehí, buffalo. Si.  
 میئین main, my. See maaní.

## ن N.

- نا ná, not, (un —, in composition).  
 نابالغ ná-báligh, minor.  
 ناپدید ná-paid, uncommon.  
 نادراه ná-duráh, ill.  
 ناسهیی ná-sahí, unknown.  
 ناکامá ná-kámá, helpless, under compulsion.  
 نالایک ná-láik, unworthy.  
 ناوش ná-wash, unhappy.  
 ناچیکین náchíken, a little.  
 ناخن nákhun, nail. P.  
 ناخو nákho, uncle (paternal).  
 ناخوزاخت nákhózákht, cousin. (Paternal uncle's son.)  
 نارغ náragh, v., p.p. náritka, to groan.  
 ناز náz, s. a horn (to blow).  
 ناز náz, pleasant, pretty. P.  
 نازبو názbo, sweet scent. P.  
 نازک názuk, delicate, tender. P.  
 ناش násh, snuff. Si. nás.  
 نافغ náfagh, the navel. P. náf.  
 نال nál, horse shoe. A.  
 نام nám, name. P.  
     am-nám, namesake.  
 نانا náná, maternal grandfather. Si.  
 نانی nání, maternal grandmother. Si.  
 ناورش návarish, anything eaten as a relish with bread.  
 نبی nabí, prophet. A.  
 نپت napt, s. lightning. (Met.) a gun. (P. naft, naphtha.)  
 نپورغ nipúragh, v., p.p. nipúratka, to wring. Si. nipúranu.  
 نطه nuth, s. face.  
 نختبوخ nakhinbokh, s. bedclothes; clothes given by a host to a guest.

- نَحْيِف *naḥhíf*, slave.  
 نَدَخ *nadhakh*, lemon-grass, (*Cymbopogon iwarancusa*).  
 نَر *nar*, male. P.  
 نَر *nar*, fife, pipe. Si. *narí*.  
 نَرَم *narm*, soft. P.  
 نِرْوَار *nirwár*, justice, decision of a disputed case. Si. *nirwáru*.  
 نَرِيَان *naryán*, a horse (m.).  
 نَزَكِهِنَغ *naz-khanagh*, v. to close, bring together.  
 نَزِي *nazí*,  
 نَزِيَكِه *nazíkh*, } near. P. *nazdík*, *nizd*.  
 نِشَار *nishár*, brother's wife; daughter-in-law. Skr. *snushá*.  
     Pashto, *nzhor*.  
 نِشَان *nishán*, mark, standard. P.  
 نِشْتِيَجِنِي *nishtejaní*, bedding.  
 نِشْتِيَدِنَغ *nishtainagh*, to spread out. Causal of *nindagh*.  
 نِشَك *nashk*, mark, sign, distinction. A. *naqsha*.  
 نِغَاه *nigháh*, sight, show. P. *nigáh*.  
 نِغُر *nughur*. See *noghar*.  
 نِغُرَة *nughra*, silver. P. *nukra*.  
 نِغُرْدِيَنَا *nughraená*, of silver.  
 نِغَن *naghan*, bread. P. *nán*.  
 نِغُور *nighor*, side, direction.  
 نِغُوشَغ *nighoshagh*. See *nigoshagh*.  
 نِفَا *nafá*, profit. A. *nafa'*.  
 نِفْسَخ *nafuskh*, stepdaughter.  
 نِكْرَا *nukrá*, white (of a horse). P.  
 نِكْرَغ *nikragh*, to separate, part (intr.).  
 نِكَل *nakl*, imitation, copying. A. *naql*.  
     *nakl-khanagh*, to imitate.  
 نِكِهِه *nakh*, } old woman.  
 نِكِهَو *nakho*, } ditto.  
 نِگَاه *nigáh*, care. P.  
 نِگَاهِ بَانِي *nigáhbáni*, carefulness.

نگوشغ nigoshagh, to listen, attend. Cf. Pashto, *nghwatal*.

p.p. nigoshtha.

نلي nali, s. the forearm. Si. nari.

phádlh-nalí, the shin.

نلي nali, s. the barrel of a gun. Si.

نماش namash, prayers. P. namáz.

نامبو nambo, the búí plant, *Crotalaria burhia*.

نمبى nambí, s. fresh feeling in the air after rain.

نمك namak, in namak-harám, traitor. P.

نمونه namúna, pattern. P.

نگ nang, honor, dignity. P.

ننگار nangár, plough.

nangár bahaġh, to plough.

نندغ nindagh, v., p.p. nishtha, to sit, dwell, stay.

P. nishastan, nishín. Pashto, nástal.

er-nindagh, to sit down.

نواسغ nawásagh, grandson, granddaughter. P. nawása.

نواشي nawáshí, to-morrow.

nawáshí-begá, to-morrow evening.

نوان nawán, perhaps.

نوتربن nautiren, a game resembling gobang, played on a board.

نوخ nokk, new. The new moon, the moon. P. nau.

نوخ naukh, a bride. Pashto, náve.

نود nawad, felt. P. namda. Pahl. namad.

نون nodh, rain clouds, rain.

نور nor, mungoose, ichneumon. S. noru.

نورا núra, silver.

نور navz, pulse. A. nafs.

نوزد núzd, }  
نوزده núzdah, } nineteen. P.

نوغر noghar, }  
or } skirt of the hills.  
نغر nughur, }

- نوک nok, beak of a bird. P.  
 نوکر naukar, servant. P.  
 نوکړي naukarí, service. P.  
 نه nah, no, not. P.  
 نه nuh, nine. P.  
 نهر nahar, canal. A.  
 نهرم nuhram, ugly.  
 نهمت nahmat, intention. A.  
 نهمي nuhmí, ninth.  
 نې ní, } now. Pázand nuñ. Pashto nan.  
 نېن nín, }  
 نېانغ nyádhagh, v., p.p. nyástha., to post, establish, appoint.  
 P. nihádan.  
 نېام nyám, middle. P. miyán.  
 nyámá, in the middle.  
 نېامچي nyámjí, one who goes between, arbitrator.  
 نېامغ nyámagh, middling, in the middle.  
 نېانوان nyánwán, in the middle, in (from nyámá).  
 نېت niyat, object, desire. A.  
 نېخ nek, good. P. nek.  
 nekhen du'á, prayer.  
 نېرموش nermosh, noon (for nem-rosh). P. nem-roz.  
 نېر nír, s. roast meat.  
 نېزغ nezagh, spear. P. neza.  
 نېستا nestá, } was not.  
 نېستت nestath, }  
 نېستين nesten, is not.  
 نېستكار nestkár, poor, destitute. P.  
 نېش nesh, tooth. (Sí. Pashto, neśh, tusk.)  
 نېغار neghár, in the direction of. See nemgha.  
 نېكاه nekah, marriage ceremony. A. nikáh.  
 نېلاغ nilagh, blue.  
 نېم nem, half. P.

nem-ráh, halfway.

nem-shaf, midnight.

نيمغ *nemagh*, butter.

نيمغا *nemghá*, in the direction of, towards.

نيمون *nímon*, lemon. A.

نيس *nen*, no, not.

نينه *nína*, modern, belonging to the present time.

*nína-vakhat*, now-a-days. See *ní*.

## و W. V.

واجبا *wájá*, } like, resembling.  
واجهه *wájh*, }

وار *wár*. (In composition) eater. P. *khor*.

*mar-wár*, man-eater.

*shír-wár*, suckling.

وارس *wáris*, heir. A. *wáritk*.

واژا *wázhá*, lord, master, sir. P. *khwaja*.

*dighár-wázhá*, landlord.

*logh-wázhá*, goodman.

واگو *vágú*, a large lizard, alligator. (S. *vághú*, alligator.)

واگي *vágí*, that very one. S.

وام *wám*, debt.

وامدار *wámdár*, debtor.

وانچ واپرا *vánij-vápará*, give and take, buying and selling (uncommon.) Si.

واندا *wándá*, leisure. Si. *wándo*.

وانغ *wánagh*, v., p.p. *wántha*, to read. P. *khwándan*.

واهو *wáhú*, outcry, the alarm.

واباه *wabáh*, cholera. (Ar. *wabá*, pestilence.)

واپسغ *wapsagh*, v., p.p. *waptha*., to sleep. P. *khuftan*, *khusp*.

ورت *waṭ*, wick. Si. *vaṭi*.

ورتا *waṭṭá*, stone. Panj.

وتهمي *vitthí*, space, interval. Si. *vithí*.

- وٲ *wath*, self, oneself. P. *kħud*. Skr. *swad-īya*.  
 وٲى *wathī*, one's own, own.  
 وٲٲ *vaħht* time. Ar. *waqt*.  
 وٲ *wad*, increase.  
 وٲاٲنػ *vađáinagh*, to increase. Panj. *vađáwan*.  
 وٲرى *vađrí*, leather strap. Si. *vađhí*.  
 وٲرى *vađrí*, bribery. Si. *vađhí*.  
 وٲ *wadh*. See وٲ *wath*, self. P. *kħud*.  
 وٲى *wadhí*, birth.  
     *wadhí khanagh*, to foal.  
 وٲرىا *warbariyá*, excellently, stoutly.  
 وٲ *ward*, food.  
 وٲػ *waragh*, v., p.p. *wártha*, imp. *bawar*, to eat, drink.  
     P. *kħurdan*. Skr. *hvar*.  
 وٲنا *warná*, youth, young man. P. *barná*.  
 وٲو *warú*, beam. Si. *waro*, rafter.  
 وٲرٲنػ *warainagh*, causal of *waragh*, to feed.  
 وٲ *was*, strength. Si. *wasu*.  
     *be-was*, helpless.  
 وٲسر *wasar*, wild onion. See *whasar*.  
 وٲستاد *wastád*, master of a subject, skilful. P. *ustád*.  
 وٲسرزاٲٲ *wasarzákht*, brother-in-law. Cf. P. *kħusar*, *záda*.  
 وٲسرك *wasarik*, father-in-law. P. *kħusar*.  
 وٲسرىا *wasariyá*, in front, foremost.  
 وٲسم *wasam*, inhabited. Si. *wasarw*.  
 وٲسى *wasí*, mother-in-law. P. *khusú*. Skr. *çvaçrú*.  
 وٲش *wash*, sweet, happy. P. *kħush*. Skr. *swádu*.  
 وٲشكى *washkí*, male of any beast of chase.  
 وٲشى *washí*, sweetmeats.  
 وٲكىل *vakíl*, agent. A.  
 وٲ *val*, }  
 وٲان *valán*, } reaper. Si. *valí*.  
 وٲنى *vanní*, bride. Si.

- وڤي vanní, name of a plant.  
 وڤيڭ vanijagh, v. to yield up.  
 وڤيڭيڭ vinyainagh, v. to spoil. Si vinyáinu.  
 وهان whádlh or wabádlh, salt.  
 وهار whár, dirty, foul. P. *lhor*.  
 وهان whán, tray, dish. P. *lhwán*.  
 وهار wháv, sleep. P. *lhwáb*. Z. qafna.  
 وهرد whard, food. P.  
 وهسر whasar, the wild onion, *Allium rubellium*. A.  
 وڤس ves, clothing. Si. vesu.  
 وڤلا velá, time. Si. velo.  
 وڤهي vehí, street. Panj.

## x H.

- هاجي hájí, pilgrim. A. حاجي.  
 هاخ hákh, earth, clay. P. *khák*.  
 هاذر hádlhir, heart. Ar. *khátir*.  
 هارغ háragh, dates. P. *khárik*.  
 هازر házir, present, Ar. حاضر.  
 هاش hásh, double tooth. (Cf. Pashto *ghásh*).  
 هاغا hághá, awake.  
 هال hál, circumstances, new. A. حال.  
     hálá dai! give the news!  
 هالوار hálwar, conversation.  
 هامغ hámagh, raw, unripe, uncooked. P. *khám*.  
 هان hán, khán, chief. P. *khán*.  
 هباسي habásí, (عباسي 'abbásí), an eight-anna piece.  
 هببر habar, discussion, conversation. P. *khábar*.  
 هبڭغ habkagh, v. to stutter. Si. habak.  
 هڤت hapt, seven. P. haft.  
 هڤتغ haptagh, a week. P. haftá.

- هپتۇمىي haptumí, seventh. P.  
 ھتەر hatar, danger, apprehension. Ar. *khaṭar*.  
 ھت hat, shop. Si. haṭu.  
 ھتھ hatk, the wild olive, *Olea cuspidata*. P. zaitún.  
 ھېچ buch, horse's hough. Si. khuch.  
 ھېچھو hachho, thus, so. P.  
 ھېچىي hachí, any. Often contracted to 'chí. P. hech.  
 ھىڭىرغ hadíragh, to chop up.  
 ھىڭ had, bone. Si. haḍu. Pashto, haḍ.  
 ھىڭكىي hiḡkí, hiccough. Si. hiḡikí. Pashto haṭkaí.  
 ھىڭا }  
 ھىڭاي } God. P. *khudá*.  
 ھىڭىن }  
 ھىڭىن hadhen, then.  
 ھىر hir, a young male camel up to six months.  
 ھىر har, every, each. P.  
 har-do, both.  
 har-rangá, of every kind.  
 har-ro, daily, always.  
 har-sál, every year.  
 har-kas, every one.  
 har-ki, every thing that—, each.  
 har-va $\dot{k}$ htá, }  
 har-velá, } always.  
 har-handá, everywhere.  
 ھىر hur, adv. apart.  
 hur-janag $\dot{h}$ , to drag apart.  
 ھىرب harb, jawbone.  
 ھىرتال hartál, arsenic. (Si. hartálu, yellow orpiment.)  
 ھىرتىل hartel, large saddle bags.  
 ھىرچىن hurjín, saddle bags. P. *kzurj*.  
 ھىردىك hirdik, squirrel.  
 ھىردىھات hardhát, metal. Skr. dhátu.  
 ھىرس هىرس hirs, avarice. A.

هرش harsh, } a cubit.  
هرشه harsha, }

هرغ harragh, s. an infirm person.

هرغ harragh, s. a saw.

هرف harf, letter. Ar.

هرمزاده harmzáda, bastard, scoundrel. A. P.

هرونولي harnolí, dhatura.

هروار harwár, a measure of corn containing nearly 10 maunds  
Indian weight. P. *kharwár*.

هري harri, } mad (of dogs).  
هريا harriyá, }

هژده hazdah, eighteen. P.

هژگر hizgar, anywhere.

هس has, an ornament, a "hassí" or silver necklace. Si. hasu.

هستل hastal, mule.

هشت hasht, eight. P.

هشتر hushtur, camel, (the generic term). P. shutur.

Skr. ushtra. Brahui huch. Zend. ustra. Pashto úsh.

هشتمی hashtumí, eighth.

هشغ hushagh, p.p. hushtha, to dry (intr.).

هشك hushk, dry. P. *kushk*. Skr. çushká. Z. huska.

hushken dođ, skeleton.

هشكي hishkí, scarlet.

هك hak, rights.

هكل hakal, drawing.

هكلغ hakalagh, v., p.p. hakalatha, to drive, to urge on.

هكم hukm, (A. hukm), order.

هل hal, melting; hal biagh, to melt, thaw.

هل hil, a kite. Si.

هلاس hulás, frec. P. *kulás*.

هالك halk, village, collection of huts. (Cf. Ar. *kalk*, *kalkat*.)

هاليد haledh, speics.

هاليني halení, adv. undoubtedly.

همباچه hambácha, ammunition pouch. Si. hambácho.

- همبار hambár, a collection of corn, and enclosure round it.  
 P. ambár.
- همونأ hamodhá, there, in that very place.
- هميدأ hamedhá, here, in this very place.
- هميش hamesh, this very one.  
 hameshiya phar, on this account.
- هن han, neighing, whinnying.  
 han-khanagh, to neigh, whinny.
- هنجوري hinjri, the shoulder-blade. See bardast. Si. hanjhí.
- هنجيري hinjír, fig. (P. anjír.)
- هنچهو hanchho, thus, so. P.
- هند hand, s. place, dwelling. (P. *khána*.) (Si. handhu.)  
 handá, in place, instead.  
 thí-handá, elsewhere.  
 har-handá, everywhere.  
 hech-handá, anywhere.  
 hech-handá *nen*, nowhere.  
 handiyá, somewhere.  
 ya-handá, in one place, together.  
 ás-hand, fire-place.  
 zahm-hand, scar of a sword-wound.
- هند nind, bitch.
- هندي hindí, weapon.
- هندينغ handainagh, to be useful.
- هنر hunar, skill.
- هنكغ hinkagh, to neigh.
- هنگر hangar, charcoal. (Cf. Sindhi *angaru*.)
- هنگلو hingalo, variegated. (Si. hingulú vermilion.)
- هو hau, yes.
- هوان hawán, that. (P. ham-án.)
- هوانكر hawánkar, as much as that.
- هوانگو hawángo, thither.
- هوت hot, hero, warrior.

- هود haud, tank. Ar.  
 هوداه havdah, seventeen. P.  
 هوداه دار hodadár, official (for P. uhdadár).  
 هود hod, hole, cave, den.  
 هور haur, rain. Si. horu.  
 هور hor, }  
 هورگ horg, } empty.  
 هورگین horgín, }  
 هورجین horjín. See hurjín. Saddle bags.  
 هوش hosh, sense. P.  
 هوشخ hoshagh, s. an ear of corn. (P. *khosha*.)  
 هوشیار hoshyár, skilful. P.  
 هوف hauf, leprosy; a severe illness, violent fever.  
 هول hol, }  
 هول پوش hol-posh, } armour, accoutrements. Si.  
 هوم hom, the air-plant.  
 هون hon, blood. P. *khun*.  
 هودیش hawesh, this, this one.  
 هونین hawen, adj. this.  
 هي hí. See *hídhishk*.  
 هي hai, or.  
 hai hai, either, or. (P. *khwáh*, *khwáh*.)  
 هيا hayá, shame. A.  
 be-hayá, shameless.  
 هیت hait, camel's pack-saddle.  
 هیت híth, green corn, khasíl. P. *khawíd*.  
 هیچ hech, any. P.  
 هیچی hechí, anything.  
 hechí na, }  
 'chí na, } nothing, none, not at all.  
 هیچ híkh, swine. P. *khúk*.  
 هید hedh, sweat. (Skr. svid. P. pa-sína.)  
 هید شک hídhishk, the khip bush, *Orthanthera viminea*.

هیرو hír, a houri. (Ar. húr.)

هیر hair, welfare, (Ar. *khair*.)

hair *khanagh*, to salute.

ma-hairá, all's well.

هیران hírán, dish, plate.

هیرتهه hírth, fine, thin.

هیزه haiza, cholera.

هیزوخ hízhokh, a waterfall.

هیس hes, rust, dirt.

هیل híl, hope.

هیلاك helák, tame, subdued, accustomed. Si. heráku.

هیلوند hílwand, hopeful.

هینز hínz, a leather churn.

hínzár *mathagh*, to churn.

هینه hína, weak. Si. híno.

## ي Y.

ياژده yázhdah, eleven. P.

ياژدومي yázhdumí, eleventh. P.

ياتيم yatím, orphan. A.

ياکين yakín, certain. A.

ياک yak, one. P.

yak-áptiyá, one another.

yake, only one.

yake-chyár, fourfold, } &c.

yake-sai, threefold, }

يله دینغ yala deagh, to let loose. See الځ دینغ ilagh deagh.

Pashto, yalah.

يامارا yamará, for ever. See jamará.

يه ya, one. Cf. Pashto yau, yavah.

ya-bará, at once.

ya-bare, once.

ya-rangá, of one sort.

ya-handá, in one place, together.



SPECIMENS  
OF  
THE BALOCHI LANGUAGE.

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I.

*The Wanderings of the Rind Balochís.*

[This poem is very widely spread, and I have met with it in almost every Baloch tribe. The versions differ very slightly. The present one, as the dedication in the last two lines shows, was recited to Jalál *Khán* a former Chief of the *Leghárís*. Another version, from a Gurchání *Dom*, similarly brings in the name Nilál *Khán*. The poem is probably of considerable age; it is very elliptical in expression, many of the grammatical forms are antiquated, and the versification is loose and formless. It gives the legendary account of the Wanderings of the Baloches before they settled in the countries they now inhabit, distinguishes the tribes entitled to rank as Rinds from those not so entitled, and concludes with a catalogue of their leaders.]

Shukr Alláh hamdá guzará  
    badsháh mulka wathen  
Thí jibán *khák* o gilo bí  
    Heku nindo wash-dilá.  
Má aulád Mír Hamzáigh-ún  
    Sob dargábá gur en  
Azh Halabá *phádh* kháyán  
    go jazízán jheroen  
Masará Míren Jalál Hán  
    chhil-o-ehyár bolak en  
Kalabalá Bompúr ma-nyánwán  
    shahr Shistán mizile  
Khá<sup>h</sup>htún Hárína bandá  
    Keel rásten phalawá

Makurána Hot nindí  
     Khosagh man Kech-dehá  
 Azh Halabá Chándiyeghá  
     Kalamthí e logh pha-guren  
 Jo mítáf bahr-khanána  
     Kul sardár Shaihak en  
 Maz Naliyá Noh nindí  
     Jistkání pha-guren  
 Phuzh, Míralí, Jatoí  
     Drust man Seví Dhádará  
 Dríshak *Khán*, Mazarí  
     E go Rindá yagsar en  
 Azh bunyadá Phuzh Rinde  
     Sar go Mír en Chákur en  
 Golo, Gopáng, Dashti  
     Rind thaliyá dar-ant  
 Thí Baloch báz bisháren  
     Drust man Rindá manahá  
 Nashk-daur pha Gorgezán  
     E man Thaliyá dehá  
 Noh korái áwáren  
     E go Rindá yagsaren  
 Rindán man Shorán nindí  
     Láshar man Gandávagh en  
 E maní perá o rand en  
     E Balocha daptar en  
 Má deún sí sál jangá  
     E Balocha sbiddat en  
 Shaihak o Sháhdád dání  
     Las sardár Chákar en  
 Chhil hazár khái Mír gwánkhá  
     Thewaghán dáde-potar en  
 Hol-posh dast-kaláyá  
     Druh khawán o jábah en  
 Paṭh pechá go khawá  
     Phádh lalen mozhagh en  
 Kárch kátar nughraená  
     Dast mundrí thangaven  
 Bakar o Gwaharám Ráména  
     Zar-zuwál Nodh bandagh en  
 Phuzhán Járo jaur-jawáv en  
     Hadden Dine brádkar en

Pheroz o Bijar Rehán  
 Mírán Rindán zahm-jan en  
 Sohábá, Míhán, Alí,  
 Jám, Sahák o Alan en  
 Haivtán Bívaragh man Rindán  
 Mír Hassan go Brahim en  
 Sháir ki sherán jorí  
 Mír Jalál Hán surphadh en.  
*Translation.*

Thanks and praise to God; himself he is Lord of the land. When the rest of the word becomes dust and clay, alone He remains with serene heart.

We are the offspring of Mír Hamza; victory is in the worship of God. From Halab do we arise, there are fights with the unbelievers. Foremost is Mír Jalál *Khán*, there are four and forty tribes. By stages (we march) from Kalabalá (Karbalá?) to Bompúr and the cities of Sístán. We came to Hárún's band, on the right side of Keeh. The Hots settle in Makrán, the Khosas in the land of Keeh. From Halab come the Chándyas, near the home of the Kalamthís. Dividing out running water and dry land, the chief of all is Shaihak.

In Nalí the Nohs settle, close to the Jistkánís. The Phuzhes, Míralís and Jatoís, all in Seví and Dhádar. The Drishaks, Kháns and Mazárís are one with the Rinds. In origin the Phuzhes are Rinds, they were with Mír Chákar. The Golos, Gopángs and Dashtís are outside the Rind circle (dish). The other very numerous Baloches are all included in the Rinds. Distinguished for wealth among the Gorgezes are those in the country of Thalí. The Nohs and Korais are mixed together, they are one with the Rinds. The Rinds settle in Shorán, the Lasháris in Gandává. This is our foot-print and track, this is the Baloch record. For thirty years we are engaged in battle, this is the Baloch struggle.

In the time of Shaihak and Sháhdád, Chákar was chief of the whole. Forty thousand come at the Mír's call, all descendants of one ancestor. All with armour upon their forearms, all with bows and quivers; with silk scarves and overcoats, and red boots on their feet; with silver knives and daggers, and golden rings on their hands. There were Bakr and Gwaharám and Rámen, and the gold-scattering *Nodhbandagh*. Of the Phuzhes was Járo, venomous in reply, and Hadde his brother by religion. There were Pheroz, Bijar, Rehán, and Míran, the swordsman of the Rinds. There were Sohábá, Míhán, Alí, Jám, Ishák and Alan; Haibat Hán and Bívaragh of the Rinds, and Mír Hassan with Bráhim.

It is the poet that composes the songs, and Mír Jalál *Khán* comprehends them.

## II.

*Poems relating to Mír Chákar.*

Mír Chákar is the great legendary hero of the Rind Baloehes. He is represented as having led them into the countries they now occupy from Makrán, and as having founded a kingdom with its capital Seví (Síbí). He waged war with the Turks under Humáú Chughattá. On the civil war between the Rinds and Lasháris breaking out, the Turks under their leader Zunú joined the Rinds, and the Lasháris were defeated. The Turks seized the Lasháris women, but released them on the expostulation of Chákar, who said that Baloehes would be disgraced by being accomplices in such a deed. At one time Chákar was a prisoner of Humáú, who called him up and asked him "What is the best of all weapons?" Chákar replied, "Anything that a man can lay hold of in a fight." The king then had Chákar brought unarmed into a narrow street, and a savage elephant turned loose at the other end. As it rushed upon Chákar, he caught up a dog that was lying in the road, and threw it in the elephant's face with such violence that it turned and fled. Chákar is said to have founded the old fort at Síbí, which he ultimately abandoned at the end of the civil war on his way to the Panjáb. His name has been given to several places in Baloehistán, among them Chákar-máris 'Chákar's upper storey,' a hill near Sangsila in the Bugtí country, from which he is said to have taken his last look back at Síbí. This is a physical impossibility, but Chákar was a 'godlike man' (*Hudháí mard*), and could do things which the present generation is not capable of. Another place, named after him, is Chákar Tankh 'Chákar's defile' in the Marri country.

It is difficult to say how far any part of Chákar's adventures are historical. Baloehes began to arrive at Multán and the neighbourhood from Makrán in the time of Hussain Langá, towards the end of the 15th century. (Briggs' *Ferishta*, Vol. IV, p. 388.) Soon afterwards came one whose name is transliterated by Briggs Meer Jakur Zund, which should probably be Mír Chákar Rind. He obtained a jágir in Uchl from Jám Báyazid (Ib. p. 396).

This Mír Chákar is said to have come from Solypur, but I have not been able to discover this place. This was about 1520 A. D. About the same time we find Baloehes in the Panjáb as far north as Bahrah and Khusháb on the Jehlam. (Erskine's *Baber*, p. 256.)

This irruption of Baloehes into the Panjáb was probably caused by the pressure on them of the Turks or Mughals who were then under the *Arg'húns* invading Kachhí and Sindh. Sháh Beg, son of Zúlmún Beg *Arg'hún*, took Síbí first in A. D. 1479 and a second time about A. D. 1511. This occupation may have been the cause of Chákar's emigration. Sháh

Beg made Sibi his capital for some time, and it is probable that he and not Chákar really built the old fort there (Erskine's Baber and Humáyún. Ed. 1854, Vol. I, pp. 342, 347, 348.) There is no record of any collision between Humáyún and the Baloches except during his flight in A. D. 1543, when he seems to have been plundered by them in the Bolán Pass. (Baber and Humáyún, Vol. II. p. 266) and again fell in with them between Kandahár and Sístán (p. 271). This is perhaps sufficient for the introduction of his name into the legends. Zúnú, the Turk leader, perhaps stands for Zúhnún Beg in whose name Sháh Beg fought.

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*The Quarrel of Mír Chákar and Gwaharám.*

[This poem also seems from its language to be an old one. It describes the causes of the division between the Rinds and Lasháris, the two sections into one of which all true Baloches fall. The Rinds were under Chákar, the Lasháris under Gwaharám. Finally Chákar in disgust emigrated to the Panjáb, and settled at Satghar in the Lahore District, where he died and is said to be buried.]

Kilátí Havív gushí: Sarí Rínd *Ghulám* Bolak gushí: Chákar Gwaharám Karákuṭán gushí: Gohar báutiyá kharde gál gushí: phílaven sí-sál-jang gushí.

Yád khanán náme Iláhí  
 man awwal sar-návaghán  
 Haidar o phusht o phanáh  
 sar hazrate ákhir-zamán  
 Biyá lorí go sawáhá  
 zír maní guftáraghán  
 Bar gwara belán dileghá  
 no sakátí bráddharán.  
 Mangehá Rinda pha Bompur  
 Keeh bághe Makurán  
 Mastaren loḡh Domkí en  
 man Balochi meraván  
 Rind Lásháris áwará  
 trán bastha pha-wathán  
 ‘Biyáeth, shedhá bilaḡún  
 bilún giyáfen ulkahán  
 Jo mítáfá bi-kaṭún  
 bahr-khanún bi pha wathán.

Ráji ráná *kadh* ma lekún '  
     *biyákhthán dan logh githán*  
 Hukmí *tonde nakhífán*  
     *nokh khuthantesh ádimán*  
 Bozh borán *báraghená*  
     *kotwání andará*  
 Saj khane *bázen biháná*  
     *nuh-hazári markhaváq*  
 Biyárún *bagán girdaghená*  
     *azh Naliya khaur dafá*  
 Gwánkh-*jatla jodhán bi kádán*  
     ' *er-khafe azh Chajuá*  
 Khash gálí o *palangá*  
     *jhul suhren kamalán*  
 Bauf *morbanden lihefán*  
     *hingaloen manjaván*  
 Sikh o *tásán bijoren*  
     *Makurání kadahán*  
 Chakurí deh na *nindí.*  
     *ro wathí díren ámilán. '*  
 Phoshitla *Rindán wathí díq*  
     *pha khawáh o shaddaván*  
 Phádh *lálen mozhaghán*  
     *Rind kásathant pha Deraván*  
 Dhádar o *Seví gwáftha*  
     *Dan Jhal o Nílahá dafá,*  
 Hab, Phab, Moh, Malí  
     *dan Nali khaur dafá*  
 Gáj *shahra basthaghená*  
     *Dan Marágaho dehá*  
 Sangar o *khoh Sulemá*  
     *Gwáfthaghen sher-narán*  
 Sáng *Mundáhlí dhaníyá*  
     *Dan pá bi Methirá*  
 Bághchaen *Kácho Síamá*  
     *Dan Dharí o Bhanará*  
 Nangare *Bijár theghá*  
     *Jám Sulemána lurá.*  
 Gohar *báutí ki ákhtha*  
     *gwar Nawáve Chákurá*  
 ' *Mál maní othíya bag en*  
     *hande phe-dáre manán'*

Chákurá dír-zánaghená  
     gwash bi durren Gohará  
 ‘Barav o Során joá  
     Kachrákí phalavá,  
 He-miuná bagá bicháren,  
     nind be-anden shafá.’  
 Rosh azh Gwaharám shabrá  
     raftthagbant kharde chariáan  
 Bára ghen borán zawárant  
     pha shikár o sailahán.  
 Hir khushthant juftaghiyá  
     phar wathí láf-serihán  
 Ráj bundáthant hazári  
     azh du-demí ziánehá  
 Kahravá thekán khawáthant  
     pha badhen kirdáraghán  
 ‘Shin-gurá Gwaharám theghá  
     ’shán-gurá Mír Chákurá  
 Phílaven sí sál jang ath  
     Gohará hir phadhá  
 Sar galói báithagbantí  
     nesh rikthant azh dáfá  
 Mára dí ekhawá dí ishtha  
     pha Hudháí ásurá  
 Guḍá Sultáne Balochá  
     sahl khultha bi pha wathán  
 Chákur azh bráthí gasurá.  
     Gwastha Satten Gharán.

*Translation.*

Kilátí son of Habíb says : to the lofty Ghulám Bolak Rinds he says : about the quarrel between Chákar and Gwaharám he says : of the refuge-taking of Gohar in few words he says : of full thirty years war he says, as follows :

First I remember the name of God, my morning-star of old ; lord, and support and protector to the most illustrious prophet.

Come minstrel at early morn, learn my sayings and carry them to the friends of my heart, and the assembly of my brethren.

The bold Rinds came to Bompúr, to Kech and fertile Makrán, the greatest family was the Domkí in the Baloch assemblies.

The Rinds and Lasháris met together, they took counsel among

themselves. "Come, let us march hence, let us leave these widespread lands. Let us conquer streams and dry lands, and deal them out among ourselves. Let us take no count of rule or ruler."

They came to their own homes. The chiefs (turban-wearers) ordered their slaves to saddle their young mares. "Loose the slender chestnut (mares) from their stalls, saddle the numerous fillies, steeds worth nine-thousand each. Let us bring in herds of camels from round about, from the mouth of the torrent of Nalí." The men called to the women "Come down from Chajú, take out your wrappings and beds, earpets and red blankets, pillows, and spotted rugs, and many-coloured bedsteads, moulded cups in abundance, and Makráni drinking vessels. Chákar will not stay in this country, he will go to his own far land."

The Rinds clothed their bodies in overcoats and turbans, with red boots on their feet. The Rinds were distinguished for hospitality.

They called together Dháqar and Seví, in Jhal and the mouth of the Nílah; Hab, Phab, Moh and Mali in the mouth of the Nalí torrent. They stayed at the city of Gáj in the land of Marágah. The tigers of men assembled Sangar and the Sulaiman mountains, the rulers of Sáng and Mundábi became payers of tribute to our chief.

In the boundaries of fertile Kachhí, in Dharí and Bhanar. There was generous Bijar with his scimitar, and the leader Sulaimán with his sword.

Gohar came for refuge with the Nawáb Chákar, saying "Show me a place for my cattle, and herds of camels." The far-seeing Chákar said to the fair Gohar "Go to the streams of Shorau in the direction of Kachrak. There stay at ease with your herds of camels, and have no anxiety by night."

One day some madmen went forth from Gwaharám's city, they were mounted on fine chestnut (mares), for the sake of hunting and exercise.

They killed a pair of young camels (of Gohar's), to fill their bellies withal.

The chief fell into a great rage (lit. rage of a thousand), on both sides damage was done. A curse falls upon the wicked, upon the doers of evil. On this side was Gwaharám with his sword, on that side Mír Chákar. For full thirty years war continued about these young camels of Gohar's. All the excellent youths have been slain, the teeth have dropped from their mouths, and God's mercy has spared us only. Then the Baloch rulers made peace among themselves, and Chákar on account of this feud among brethren passed away to Satghar.

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*Chákar's denunciation of his foes on leaving Síbí.*

Chákar Shaihak gushí: sarí Rind Bádsháh gushí: *án* rosh ki Seví  
khillí kharde gál gushí: Gwaharámár phasave dáth gushí.

Bilán mar-lawáshen Seví  
Gauren sadhaní margáví  
Jáme Nindavá bhāṭṭiyá  
Sai-roshán Baharám neghá  
Sí-sál uvt o uzhmára  
Ján-jebhavan jangiya  
Thegh azh balgavá honená  
Chotán cho kamándí boghán  
Jukhtán na nashant lárená  
Warnáyán du-mandílená.  
Laḍ ma ḍraván na rusthaut  
Misk ma barátán na mushthant  
Whard dumbaghán mesháni  
Karwálí sharáb sharr joshant  
Sháhán pha nishán yakbe nest  
Drustán wárthaghán hindíyán  
Shartán dáthaghán shímenán  
Bachaki lawar bánziyá  
Gwaharám muzhen Gandávagh  
Singhe ma zirih phirenta  
Máchiya lawáshtha lanjaíth  
Alí o Walí druh-darán  
Yákí kiláta beronen  
Hágh kávalí Turkánán  
Rind báraghen boránán  
Gwaharám azh dude hande bí  
Ne Gor bí ne Gandávagh.

*Translation.*

Chákar son of Shaihak says: the exalted Ruler of the Rinds says: on the day he leaves Síbí these few words he says: in reply to Gwaharám he says (as follows):

I will leave man-devouring Seví, curses on my infidel foes! For three days shall the Jám Nindo from his oven (distribute bread) in honour of Bahrám (slain). For thirty years, for ever shall there be war with these gigantic men, nor shall my sword be clean from stains of blood. I will bend it like jointed sugarcane, so that through crookedness it will not go into the sheath.

The distinguished (lit. two-turbaned) youths do not rise up to sport among the houses, they rub no scent on their moustaches, but they eat fat-tailed sheep and boil strong liquor in their stills. There is not one of them with signs of a ruler about him. They have eaten all their weapons, they have gambled away their heads, they have children's sticks in their hands. Let Gwaharám stay in dusty Gandáva, a stone thrown into a well. Máchí has drunk blood; Alí and Walí are traitors. The rebels' fort has been surrounded, and reduced to earth by the tyrannous Turks and the Rinds on highbred mares (chestnuts). Gwaharám (will be expelled) from both places, (and possess) neither a grave nor Gandáva.

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### III.

#### *Dosten and Shíren.*

The legend on which the following poem is based is as follows :

During the war between Mír Chákar the Rind leader and Humáú Chughattá king of the Turks (*i. e.* the Bádsháh Humáyún), Chákar was forced to consent to give up some Rind maidens to Humáú, but actually sent instead young men in disguise. On this being discovered, they were ordered to be kept in perpetual imprisonment in the fort of Harrand. Among these prisoners was Dosten. He had been engaged to marry his cousin Shíren, who remained faithful to him during his many years' imprisonment. At last her parents said that she must no longer remain unmarried, no hope being left of Dosten's return ; so they found for her another husband, also named Dosten. (This is alluded to in line 93, where she says 'Not this Dosten, but the old one.')

Him she long refused to marry, but at last yielded to the pressure put on her, and arrangements were made for the ceremony. Meanwhile Dosten in prison at Harrand had succeeded in gaining the favour of the Mughal or Turk Governor of the fort, and some liberty was allowed him. His mare had died, but had first borne a fine colt which had grown up, and which Dosten was allowed to keep. One day games and races were going on, and Dosten asked and obtained leave to join in the race. Mounting his horse, he said good-bye to the Governor, turned its head towards the Cháchar Pass and went off at full speed. Several pursuers followed him, but no horse had the endurance of his chestnut. At intervals along the rocky pass they stumbled and fell, and these spots bear the horses' names to the present day. At last he was left alone, having wearied out all his pursuers, and travelled homewards. On nearing his tribe, he overtook a minstrel (Dom or lorí). He asked him the news, and where he was going. The minstrel told him of the imped-

ing marriage of Shíren, and said that he was on his way to sing at the wedding. Dosten then told his story and prevailed on the minstrel to change clothes with him. Thus disguised, he made his way into the assembly with the other minstrels, and sang the poem which follows, bringing in the substance of a message he had received in captivity from Shíren. He was immediately recognized by Shíren, who declared that she would marry him and no other, and they were happily married then and there.

In the poem Dosten first begins by saying how his mare could not live in the heat of the plains, and then passes on to say how a *Khorásán* merchant brought him down Shíren's message, which constitutes the remainder of the poem. It begins with an animated description of a Nomadic Baloch tribe in the hills moving to fresh pastures after rain, and then turns to Shíren weeping in her little hut for her lost lover. Her companions try to console her, but she will not be consoled, since he is in captivity. She then describes how when she wanders over the hills with the other Baloch women, according to their custom, she always picks a flower for her lover's sake, and ends with a prayer for his safe return home again.

Lines 40-44 seem to be an interpolation. They have no connexion with the subject matter of the poem.

- Zangí maní badero  
 Gwaharám maní jám o bel  
 Whántkár Shíhane Sháhiye  
 Saughan pha tháí risháná  
 5 Nokhí-ákhthaghen masáná  
 Síghen gor-khushen syáhará  
 Áfa na wárth Báh neghá  
 Kikh o Karjalán Sindeghán  
 Loṭí báhirán Dashteghán  
 10 Loṭí wadh-mabáren jídhán  
 Phitozh dafá mádh-gorán  
 Dorí phur kunáren áfá  
 Sutí phurí khaiáván  
 Whává kálrá nelán  
 15 Márwáří jawán zivirenán  
 Marde azh Hurásán ákhtha  
 Leghár chádar o humboen  
 Bár rodhanání gonath  
 Hurjín maidhen blangání  
 20 Sarbár Kandaháří miskant  
 Phaighám gon-athí Rindání

- Tahkíken shalám Shírene.  
*Nodhán shanz-jatha* Konára  
 Dasht-o-dámana Muungáchar
- 25 *Sanniya nughor* humboen  
 Dor phurant-í amrezán  
 Larzant cho gwanáni thákhán  
 Chotant cho kawándí boghán.  
 Lađí máncha~~tha~~ máldarán
- 30 *Meshí buzí whántkárán*  
 Mezhdár Sahák Yáran  
 Bumbár basthaghan bínukbán  
 Sarbár lárit~~han~~ gwánechán  
 Bháwanar khandagh o Nágáhú
- 35 *Khondán phrushtaghan* zardoán  
 Lokán phashaví katárán  
 Kádán go himáren phádhán  
 Shírená jatha srá~~dhen~~ kul  
 Ma Narmukh geáven rejá.
- 40 *Mesh azh draniná ser khar*  
 Buz azh gwárig~~há~~ lál phulá  
 Rínd azh maid~~hen~~ gandímá  
 Pahnwál azh phanír ponehá  
 Lahri azh gwan phothákhá
- 45 *Gwán' janth dilsaren* dáiyá  
 Zirí kadahe me~~teí~~  
 Ro da shakhalen no~~khá~~fá  
 Malgor shusthaghen mablíjá  
 Randíth mushi malgorán
- 50 *Khaithí da wathí chyár-kulá*  
 Kullá darríya bandí  
 Shiskant thaghard nisht~~hent~~ í  
 Jhul phalavá le~~tení~~  
 Dast janth avr barziyá
- 55 *Khashí nughraen* ádená  
 Era Kamálú sar záná  
 Gindí droshamá heriyá  
 Greg~~h~~ khant humáren ehhamá  
 Anzí ríshant pha dramá
- 60 *Jígh sar katiká mená*  
 Much ban janán jedí gohár  
 Sharren somaren eh~~hil~~-o-chyár  
 Biáyant o gwara er-nindant  
 Shár phalavá le~~tená~~

- 65 Phursant-í dila o hálá.  
 ‘ Pharche khumalat khordema  
 Suhren man makh o nilána  
 Bríkh thái bambaven danzená’  
 Greggh bíth, janán telánk dáth
- 70 ‘ Dir bíth, o janán, jawán e ná  
 Dir bíth, o janán, dir ninde  
 Bilán khunal o khor-demá  
 Subrán man makh o nilá bant  
 Bríkh o bambaven dānzen bant
- 75 Dost shume phakár nen  
 Annar ki jána dozwáhá  
 Suhrá reá darkárá  
 Dílha harraghen bad-duáyán  
 Turkán azh hareb gwázenthá
- 80 Ma zar-joshen Arandá shahrá  
 Sunjen isp-tah’alen láfá.’  
 Dúng bant janikh Rindáái  
 Maláni phadhá shef ban.  
 Kháyant khargazí krámáná
- 85 Nekhen-niyaten gwandáná.  
 Maurán azh kurmán sindáná  
 Phatán gwáraghí lálphulán  
 Nem jamaven jígha jant  
 Nem khunal o sar-hoshán
- 90 Nem pha sammáen khauliyá  
 Yakhe pha maní níyatá  
 Chitho ma wathí musht khan’  
 Ba phusht azh badhán jaurená  
 ‘Shíth daz-gohár jediyá
- 95 Dastán pha Hudhá burzáre  
 ‘Alláh ki biyár Malik Dostená  
 Sauten sammáen khauliyá  
 Eshiyá ná, hawán oliyá  
 Bor pha lammaghán sheriyán
- 100 Baro mizilán dírená  
 Biyár wázhá amírená  
 Nind-o nyádh phith-o-máthání  
 Dímá shakhalen bráthání  
 Rozí bá Malik Dostená
- 105 Dídar khasha rozí bá.

*Translation.*

Zangí is my chief, Gwaharám my leader and friend, the owner of excellent mares. I swear by your beard, by the new grown hair of your face. My mare, hunter of wild asses, is sad, she will not drink water by the Indus, nor eat the reeds and karjal grass of Sind. She longs for the herds of wild asses of the Dasht, she longs for her own pleasant pastures, for the female wild asses of the Phitozh Pass, and the pools full of fresh water; the sandflies and musquitos irritate her, the vermin will not let her sleep, the Márwári barley is coarse to her.

A man came from *Khorásán*, his clothes and face dirty; he brought with him loads of madder, saddle-bags of fine bhang, and bales of *Kandahár* musk.

He had with him a message from the *Rinds*, a true greeting from *Shíren*.

The clouds have rained on *Konár*, on the plain and hill-skirts of *Mungáchar*, on the pleasant slopes of *Sanní*.

The pools are filled to over-flowing, (the water) trembles like the leaves of the gwan-tree (*Pistacia khinjuk*), and bends like joints of sugarcane. The graziers have given the word to mareh, the owners of the sheep and goats, *Mezhdár*, *Sahák* and *Yár Khán*; the housewives have tied up their bundles, the eamel-drivers have loaded their bales. On the hill-passes of *Bháwnar* and *Nágáhu*, the yellow-camels bend their knees, the male eamels in long strings, the women with tender feet. *Shíren* has pitched her fair tent on the wide spreading land of *Narmukh*.

Feed the sheep on dramin-grass, the goats on red-flowered *gwárigħ*, the *Rinds* on wheaten flour, the shepherds on eurds, and the *Lahrís* on gwanberries.

She calls her beloved nurse and takes up an earthen cup, she goes to the sweet, fresh water, and her handmaiden washes her hair. She combs and smooths her hair and comes to her four-sided hut. She closes the door of the hut. They plait and spread the matting, and she reclines on the earpet.

She puts her hand into her bag and takes out a silver mirror, rests it on her shapely thigh and looks at her houri-like countenance. She weeps with her tender eyes, tears drop upon her cheeks and on her variegated breast-garment. Her companions and sisters assemble, fair comrades forty and four; they come and sit down by her, they recline upon blankets, they ask after her heart and condition.

They say, "Why are your face and earrings uncleaned, your red and blue clothes unwashed, your locks unkempt and dusty?" Weeping, she pushes the women away and says, "Away from here, women, you are not

good. Away! sit far off! Let my face and earrings be uneleaned, my red and blue clothes unwashed, my locks tangled and dusty; I do not want you for friends. He who was the friend of my heart, for whose sake I should adorn myself, I saw carried off from his native land by evil cursed Turks, shut up in the wealthy city of Harraud, within an empty stable.

The daughters of the Rinds form a band, (and wander) following in the track of the showers. The vultures come croaking, invoking good fortune. Breaking the Maur-flowers from their stems, and plucking the red gwáragh flowers, some place them in their boddices and breasts, some in their earrings, lower and upper, and some (keep them) for their true love's sake. Pluck one for my good luck, and keep it in your elosed hand; and, secretly from my bitter foes, my own sister and love says, with hands raised up to God. "May God bring baek Malik Dosten, aecording to his true promise, not this one, but the old one. Swiftly, tiger-like chestnut mare, bear him southwards, come by long stages, hring home my noble lord to dwell with his father and mother and the assembly of his beloved brethren. May Malik Dosten appear, may he appear to my sight.

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#### NOTES ON THE TEXT.

The text of this poem is taken from two versions, one recited by a Shambání, the other by a Marri. There are some variations which are noted below, the Shambání version being marked (*a*), the Marri version (*b*). The Shambání version is the base of the text. A fragment marked (*c*) from a Gurchání Dom supplies a line or two.

Lines 10 and 15 are supplied from (*c*).

Line 11 is only found in (*b*) and (*c*).

Line 18. For *rodhanání* (*b*) reads *mehlavání* 'spices.'

Line 27. *Larzant* is from (*b*). (*a*) reads *drafshant*.

Line 32. For *bánukhán* (*b*) reads *godiyán*, with the same meaning.

Lines 40—44 appear to be interpolated. They only occur in (*a*), which contains several passages not in the other version.

Lines 46—48 are from (*b*). The whole passage from line 45 to line 57 is almost identical with one in the poem of Lailí and Majnú. Lines 56 and 57 are from (*b*).

(*a*) reads: 'Phullen zán sará er-khant

Gindí azh *wath* o gouáfá

Line 62 is from (*b*). (*a*) reads 'Híirth jedirí ehilil o ehyár'

Line 68. For *danzená* (*b*) reads *be-zauuk-an*, 'unornamented.'

Line 69. For *gregh bíth* 'weeps' (*b*) reads *zahr gíirth* 'is angry.

Line 75 is from (*b*).

Line 77 (*b*) reads 'Suhrání riár rakhí.'

Line 79 from (*b*) (*a*) reads :

Turkán mughalán giptha.

Between lines 72 and 80 (*b*) inserts

Gaujen ispahán phár bítha

the meaning of which is not clear. Also after l. 81 (*b*) inserts,

Bakhá mír janeghá khushtha

Dost o ispahána bozhtha,

which is equally unintelligible.

Line 99. For pha 'towards' (*b*) reads phalav 'direction.'

Line 100. From (*b*) (*a*) reads :

Khosará dehán dírená

'Swiftly to his distant country.'

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#### IV.

##### *The Rise of the War between the Rinds and Lasháris.*

[This poem is another fragment of the Chákar eyele, giving an account of the spoiling of Gohar's camels by the Lasháris, and Chákars' vow of revenge. The episode of the refugee-lizard is quoted by one of the characters as an illustration of the extreme Baloch doctrine of hospitality. Rehan and Járo the Rind warriors mentioned were sister's sons to Chákar. Dodá who is mentioned at the end is Dodá Gorgez, celebrated for the revenge he took for the spoiling of Sammí's cattle.]

Nodh Bahrám gushí: jaren Rashkání Baloch gushí: imar Bulmat  
Kalimat karákuṭán gushi: bághár báutián gushí.

Whazh-gushen Lorí biyár wathí shághár

Má sará eharen bairame phághár

Jawán mard dátará gire dádhá

Zi azh Sannía giyáfená

Laḍitha durren Gohará shodhá

Akhthaghá báutí gwara Mírá

Chákurá shírá zí gawar-zírá

Gohará durrená hawar dátha

"Bagavo Mílahá avan dánen"

Go má Lásbáris jherave mánen"

Gohará laḍe sar-jamagh dáshtha

Dastá Gohar man Kaeharak nyáshtha

Rapphaghant Shorána phare sailá  
 Chakurá Mírí bandane shahrá.  
 “ Má tháshún dan baghchaen Gájá  
 Gohar dáchí ma beghaván danzent  
 Máíghá shír dan náfaghán shanzant”  
 Chákurá phurs’ azh Malaven jatá,  
 “ Zíth khan jat, de manán hálá,  
 Cho khuttha khai go Gohara málá ?”  
 Cho jawáb dáthla Melaven jatá,  
 “ Akhthaghá Lásári hame chindrí  
 Khushthaghá hir cho khenaghá mardí  
 Chham jattha durrghoshen Maheriyá  
 ‘ Jat, hame gálá bile sheriyá  
 Phuṭuren Rind ma deraván druáh ant  
 Dáchí pha hirán hardame záhant’ ”  
 Baḏh burtha Rehána Nawávená  
 Phuzh Járavá jaur-jawávená  
 “ Má phara durren Gohará hirán  
 Havbará shámálo janún shirán  
 Shart khanún háisi chotavá birán”  
 Bágár Jatoí jawáb dáthla  
 “ Ba-khú-án durren Gohara Sammí  
 Hota pha báután niyath khamí.  
 Shah Hussain cheravá roshá  
 Bibarí pheshá nishtha ma loghá.  
 Dar-shuttha bágghár azha gedá  
 Choraván ilgá bozhtha pha dínía (or pha randá)  
 Gur-khanána dan medhira loghá ;  
 Demá dar-khaptha mardume jawáncn  
 Shar kalánch ant cho dushthaghen shírá  
 Dholant oshíshe karáiyán.  
 Kíámahá minnate khuttha-í bázen  
 ‘ Choraván, bágghár bil, maní shámen  
 I-katar mára phar watlí námen’  
 Na-jánen joraçjaven jatán  
 Kálíhán bágghár khushtha pha latán  
 Oḏh niya’ loghá Sammaven sálo  
 Dast kauliyá phijatha dánhí  
 ‘ Agh phara bágghará na-ro báí  
 Man thái bhen, tho maní bhái’  
 Hot miráni dará ákhtha  
 Súrlihá pha demá jawáb dáthla

‘ No Amul-máin, no Amul-máin !  
 Yarbare bosht, gal mayá goná.  
 Man phara bágghára khanán choná  
 An díghár shalmí bíth azh honá  
 Shingurá shast skángurá phanjáh  
 Drust pha bágghára bíthaghá yag-jáh  
 Omará nashke ishtha pha kaulá  
 Hon gire Bálácha phara honá  
 Súrih Dodá phara gokhán.

*Translation.*

Noḏh son of Bahrám sings: to the fierce Rashkání Baloches he sings: of the war between the Bulmats and Kalmats, of the lizard becoming a refugee he sings.

Sweet singing minstrel bring your guitar, bind a large pagri on your head, let the good man receive gifts from the generous.

Yesterday thence out of fertile Sanní, marched the fair Gohar: she came for shelter to the Mír, to Chákar ever-victorious with the sword. Then spake fair Gohar “The Lasháris are set on quarrelling with me, they let not my camels remain in the Mílah pass.”

He collected all Gohar’s camp and goods and placed her in the valley of Kacharak. Then they (*i. e.* the Lasháris) came wandering to Shorán; to a town under Mír Chákar’s rule (saying), “We will gallop (our mares) to grove-encircled Gáj; let Gohar’s female camels mourn for their young in the evening; let the milk from their (unmilked) udders drip down to their navels.

Chákar asked Mela the camel-herd, “Quick, camel-herd give me tidings. Who dealt thus with Gohar’s cattle?” The camel-herd Mela thus replied: “The Lasháris came down here in wrath, they slew the young camels as if with the anger of men, Gohar the fair camel owner hinted to me to be silent about it, saying, ‘Herdsman, keep this matter quiet, let the true Rinds remain in peace, the female camels daily bear more young ones.’”

Then Rehan the Nawáb became angry, and Járo the Phuzh bitter in reply. “In exchange for fair Gohar’s young camels we will take a seven-fold revenge with our swords, we will gamble with heads and hair and turbans.” And Bágár Jatói answered and said, “Where are the fair Gohar and Sammi (her sister)? When was a hero wanting to his refugees? As in Sháh Hussain’s day of trouble, Bíbarí sat in front of her house.

A lizard dropped out of a dwarf-palm, and the boys pursued it, chasing it into the chief’s house. Then the good woman came out in front to meet

them, wearing beautiful ivory bracelets, white as fresh drawn milk, slipped on over her soft arms. She entreated and implored them saying, 'Boys, leave the lizard alone, it is my refugee. Do so much for me, for your own honour's sake.'

The boys, ignorant and boorish camel-herds, killed the lizard with sticks. Her husband and lord was not there. She sent a complaint to him by letter, saying, 'If you do not go and fight on account of this lizard I am your sister and you are my brother!' Hot returned to his home, and the hero thus answered back 'Hear Amul-máin! hear Amul-máin;' stay where you are, do not speak.

I will act in such a way about this lizard that the ground will be filled with blood, and corpses lying sixty on one side and fifty on the other, all collected into one place for the lizard's sake, as when Omar was released on his own promise, as when Bálách took his revenge for blood, or the hero Doda for the cattle.

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V.

*The Competition between the Poets Sobhá and Gáhí.*

Part I. Sobha addresses Gáhí on the question of the *Laghári* refugees with *Jawának*, and taunts his tribe on their modern origin.

[These four poems constitute a complete specimen of a kind of exercise not uncommon among Baloch poets. Sobha a Khosa and Gáhí a *Laghári* draw comparisons between their tribes and chiefs, challenging each other's claim to have come in with the original settlers under Mír Chákar, and taunting each other with failing in the exercise of the cardinal Baloch virtue, hospitality to refugees. Relán the Dom minstrel is commissioned by each poet to learn the words of his song, and to carry it back, and recite it in the assembly of the hostile tribe. The *Lagháris* and Khosas are old enemies, and their hostility still smoulders after thirty years of British rule.]

Sobha *Thegh* Alí gushí: Jarwáren Baloch, gushí: Khosagh Kaloí karákuṭá gushí: *Laghári* báutiyań kharde gál gushí:

Whazh-gushen Relána shádhíhání shághá bare  
 Maín salámá bi sháiren Gáhiyá diye  
 Nishtho droghámí zawána wash khane,  
 Ewakhí será go manán chaekhón ṭule?  
 Bhúcharí Dálán kilát nám gire  
 Nuh-manen bíránrá wathár kans diye  
 Jawának updání raghazá roshe khafe

*Ahin* shar háthí raghasá chít áρθhaghe  
 Sher chápulá azh Kharrá thalá guze  
 Go manán hair bí, zaminá jáhí lahe  
 Phesh guḍá main sailavání depánthave  
 Agh thará wahm bí zaminá jáiz khane  
 Dav-charen zahmání ná-washen jáhá rase  
 'Shingura 'shángur lashkarán dem-o-dem khuthe  
 Zahranen mardán nodh-dilá seráfá jathe.  
 Jawának urdání tawáren goshán khafí  
 Har-chyár demá ghoravání dáto rudhí  
 Cho tháí bachhání dafání gonáf hushí  
 Nodhí berána beghavá biyáyan thánahí.  
 Biyá, O Lasháí, azh gwareyá dar-khaphthaghe ?  
 Guḍe Zunuwá ghoravá roshá gár athe  
 Sailáí Míren Chákurá phauzhán ruthaghe  
 Rind nar-borán azh zaminá resinthaghe  
 Khushthaghá Rámen damámo charenthaghe.  
 Dai manán nashkán tho kithán rosh khard bíthaghe,  
 Bakar O Rámení kithán laḍá gon athe ?  
 Ghoravo urdán phelatho Turkání rukh ath  
 Doshí ma Jhalá Turk ghoráyán grandaghá  
 An demá Gandávagh Hudhá main dem bíthaghá  
 Turkán shád kámá Rind 'shamedhá zahr gipthaghant  
 Hon azh chamání chimáká dar-khaphthaghant  
 Gwashtha Nayáníyá ' Main hudhábund go-khaphthaghant.'  
 Lajavo, Shorání dhaníyán grán bithaghant  
 Bijar, Phuzh, Chákar Shahdhár ákhtaghant  
 Allan o Miskání Sabák Mádán athant  
 Bagavo lajjání sará katár dáthaghant  
 Asp go sonáen zariyá bashkáthaghant  
 Rind azh nokh-zenen bibáná er-khaptthaghant  
 Piyádhaghá Rind azh takht Shorána ákhtaghant  
 Thorave Rindára olí Lásháí war adh  
 Mir go Phulá azh Kawará drikhenthaghant.  
 Whazh-ghushen Relán shádkihání shághár bizír  
 Mard pha báután choshaut, sardáre maní  
 Gáhwar o Háneñ Sáhíbaná jag-sahí  
 Gwar Nawáv Hán kúk burtha bázen barí  
 Gorisháníyá sángať o Káhan Marri  
 Burzá go Summenzáiyá brádhargarí  
 Ákhtagha gwar Háneñ Jawánaká báután tháí  
 ' Khosaghán, ki man neyán Lagháí khadhí'  
 Go má chyár sálá nishthaghá báutí shariḱh

Bandave khohen nashkato hapt phushtí guzí  
 Mánik lo $ghá$  har-khase omedhá duráh  
 Mánik ka $to$  bihisht jo sará  
 Gudí sammá, kotái pahráe phadhá  
 Do shafán bí $tha$  gwar theí khánen Methirá.  
 Chham anzíyán raphthaghant grihána phadhá  
 Dobahá dá $then$  markhave, paidáish khuthen  
 Lajji bánukhán phar wathí sháná bashkathen  
 Doda theí námúz man jiháná mashhar athen  
 Gu $dá$  dráhiye basthai go Hánen Shakalá  
 Túmí gwá $d$ henthwa wa ganjen Bakará  
 Jawának phauzhání sara Gájí barbará  
 Sháh máriyá gone $khá$  go sheren Haidará  
 Ní ki á $kh$ tha dan Sirí Mitháwaná  
 Niyám $ghí$  Zíhár maín shari $khán$  har do sará  
 Jahl-burziyá hek-byá resintha jarán  
 Deúni rebá er-khafi jáhíyá buná  
 Sher ki gwámesh phrushí lo $phiyá$  dará  
 Bá $nz$  ki símurgh jhatí $th$  maidáná sará  
 Hánen Arziyá gwán $kh$  be ambráyá jat $há$   
 Khosaghá nál bastha galaghá kurká khuthá  
 Laj whántkárán phíl- $athí$  símurghíá burtha  
 Ispar o savzen nezaghán Bashkyá sáh khutha  
 Hánen Dilshád mardiyá berá tharatha  
 Shái phí $tha$  ashk en ki shawár paidá khutha  
 Har do urdání nyámaghá sámí suhr khutha  
 Dodá Hánen Jawánakár zí $then$  hair khutha.

*Translation.*

Sobha son of Thegh Alí sings : to the Jarwár Baloches he sings : of the fight between the Khosas and Kalois he sings : of the Laghári refugees he sings, as follows :

Sweet singing Relán take away your guitar from the assembly, give my salutation to the poet Gáhi (saying), Sit down and make clean your tongue from falsehoods. How can you weigh single *seers* against *maunds*. You mention the forts of Bhúcharí and Dálán, you are placing nine-maund weights upon yourself. In the fae of Jawának's armies you will fall in a day, beneath that elephant's foot you will be crushed, beneath its blow you will pass away from the valley of Kharf. Make peace with me that your land and place may remain to you before you are again terrified by

my sword. If you are anxious, then legalize (the possession of) your land, for when swords are biting you will be in an unpleasant place, when on this side and on that armies stand face to face, and angry men are satisfying their swords' hearts (with slaughter).

When the shout of Jawának's hosts falls upon your ears, and the dust of the horsemen rises on every side, so that the moisture of your sons' mouths dries up, and the cloud-like (mares) come galloping (loose) to their stables in the evening.

Come O Lashá'í, where did you originate from? You were missing on the day of Zuní's horsemen; did you reap (a harvest) of Mír Chákar's army? did you chase the Rind chargers (lit. male chestnuts) from the land? When Rámen was killed you played the drum. Give me your tokens (to show) when you became separate from us. Did you march away with Bakar or with Rámen? Did you accompany the horsemen or the army to meet the Turks? That night when the Turkish cavalry thundered in Jhal, or towards Gandáva when God was on our side, when the Turks rejoiced and the Rinds became angry; blood issued from their eyelids, and the women said "our lords have met them."

The rulers of Shorán became heavy with shame; Bijar, Phuzh, Chákar and Shahdhár arrived there, Allan and Sahák Miskání were there; they gave a string of camels to ransom the shame-faced ones (*i. e.*, the women taken by the Turks), horses they gave and bright gold, the Rinds alighted from their newly-saddled fillies, and on foot (having given up their horses) the Rinds returned from the throne of Shorán. Formerly the Lashá'ís also showed kindness to the Rinds, when they let Mír (Chákar) gallop away from Kawar on Phul (the name of a mare belonging to *Nodhbandagh*).

Sweet-singing Relán, take up your guitar of merry-makings, (and declare) what sort of man my chief is towards refugees. Gáhwar and the Chief Sáhíb Kán are the most trustworthy of men; many times did they complain to the Nawáb, that the Gurchanis had made a union with the Káhan Marrís, and a brotherhood with the upper Summenzais. Your refugees came to our chief Jawának, saying, "we are Khosas, we are no longer Leghárís." Four years did they stay with us, sharing in our protection.

The marks of their dwelling on the hills shall remain till seven generations pass. In Mánik's house every one lived in great hope; (for this) Mánik (shall have) a dwelling on the streams of Paradise.

(To your chief), in his latter age after the stage of deceit (in his second childhood?) came two Baloch women seeking for refuge; two nights they stayed with your mighty lord. Tears fell from their eyes and they cried aloud. He gave them the mares for twice their value, he made a profit of it, to his own shame he gave them to the shame-faced women.

Doda your chief became celebrated in the world ! Then he made an agreement with Shakal Khán, and made them pass on to Túmí and wealthy Bakar.

The helper of Jawának's armies is the Pír-Gájí Barbar. The saint accompanies us, riding on a swift camel, with the lion-like Ali. Now that we are come into the Sirí and Mitháwan (names of torrents on the Deráját frontier). Zihár is the arbitrator between the parties on both sides. Up and down did the two bulls pursue each other (*hek-byá* a Punjábí phrase). Let us deceive them that they may descend to a lower place. Just as a tiger strikes down a buffalo outside its hedge, or as a Símurgh strikes a hawk on the plain, so did the *Khán* call Arzí and his companions. The Khosas shod their horses, the troop made a rattling. Your chiefs were ashamed, as when the Símurgh carries off an elephant. With shields and grey spears Bashkyá made a shade. Dilshád *Khán* heroically encompassed them about, honour to the father who bore you ! Between the two armies they made their graves red. Dodá then quickly made peace with Jawának *Khán*.

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Part II.— *Gáhí replies, praising bravery and taunting Sobha with being a coward, and not a true Rind.*

Gáhí Gorish gushí : Kaloí gushí : Sobhár phasave dúth gushí.

Whazh-gushen Relán shádhíhání shághá biyár  
 Kaunsh bángavá gwar maní báládhá bidár  
 Chambare sak jan, malgí dílá gham guzár  
 Jangí katára dil machande : jawánán bisár  
 Nishthaghe satá whash nish námúdh-ṭawár  
 Azh waliyání khasthaghe rand o kissawán  
 Hair phadhá : ráj-hán rosh ant, jang syáhen shaf ant,  
 Jang phadhá mard o markhavan jawain rosh nayant  
 Gáhwaren hindí bingaven hotán charant  
 Dhauraven koṭání sawádá zel khanant  
 Chandeán warná pha dafá gozán janant  
 Jangavo ninja bí, phadhá pahnádh girant  
 Bingaven hotání raghámá ambráh nayant  
 Azh phadhá gudá nishtho amsodh warant  
 Go doen dastán sar o záná janant  
 Jangání dahká har-chyár khundán phirant  
 Gwadilen mar go gindaghá goriyá trahant  
 Áshikání kúren medháná ravant

Taukal beṛiyá dilár telánká diant  
 Malgí dílá pha ziriḥ o ziriḥ-phosh kḥanant  
 Kadahán zahrená sharábí nosh-kḥanant  
 Ma sagḥárání thafthagḥen jhorán kḥafant  
 Gáḥwaren theghá phar wathí námúdh janant  
 Go wathí khánen Methirá miskí zar ant.  
 ——. Whazh-gushen Relán shádhíhání shághá bare  
 Maín salámá bi sháiren Sobhá diye  
 Methira randá zír ki Bompurá khai e  
 Man dílá zán ki tho Khosaghá máthí bráth naye  
 Sov labán nyámaghí dárán sushe  
 Armáná ! zánant azḥ saḥḥen sálán gwastḥagḥe  
 Hai gannoḥk e hai zha thána kistḥagḥe  
 Bakar o Rámení shaghána mára jane  
 Tho kḥithán roshí Rind Lashári bíthagḥe.  
 Ki man daryáyání lahravo chalán gár-athe  
 Begḥavá míren Chákurá chaukídár athe  
 Má wathí shán cho mastḥaren Rindán pholatha  
 Ewakhí ser go manán har-ro ṭolatha  
 Man tháí háthí magḥazá shon dián  
 Biyá medḥáná chambavá símurgh bián janán  
 Arava mardán Sáwano lahrí rastḥagḥe  
 Nokḥ-nochán phágh phithí mardum bastḥagḥe  
 Mark násenthe, pha chihán roshe shádehá  
 Shán phirenthe, gandagḥen gín dostehá  
 Man dílá zán ki maut thará nelí dásará  
 Dodái dāng bíthen man bawren chádḥará  
 Medḥ Máchíya Hamzahá jorí na be  
 Khosaghá Rindá manavo máníya dare  
 Phuṭuren Rindán cho kḥutha bát phadhá  
 Gohare hirání sara cho kḥutha Míren Chákurá  
 Sammíya gokḥání phadhá Dodá lurá  
 Khoh sardemá keharen máná lurá  
 Sar wathí dáṭḥái garímen mál sará.

*Translation.*

Gáhi son of Gorish sings; the Kaloi sings; in reply to Sobhá he sings.

Sweet-singing Relán bring hither the guitar of rejoicings; bring into my life the fresh breeze of the morning; strike powerfully with your fingers, drive out grief from the bright (coloured) body. Do not frighten

the heart with battle-array ; praise heroes ! Thou hast sat in the assembly with an ever sweet song of praise, and from our forefathers hast drawn forth our tracks and legends.

After greeting : The chief is the day, battle is black night ; after a battle for men and horses there is no blessed day. The glittering weapons devour youthful warriors, and make populous forts empty of display. Some youths boast with their mouths, " We will be bold in the fight," but afterwards they turn their backs and are not in the company of the storm-cloud of young heroes. And afterwards they sit and lament and strike their heads and thighs with both hands.

At war's alarm they wander to all the four quarters. Cowardly men flee like wild asses, at mere sight (of a foe). The business of strong men is to go to the battle-field : they give their hearts a push off (from the shore) in the boat of confidence : they clothe their bright bodies in helmets and armour : they drain cups of fiery spirits ; with burning white brands they fall upon the crowds, they wield their glittering blades to their own fame ; with their own Lord and Chief they become like a sweet odour.

Sweet-singing *Relán*, take away your guitar of rejoicings ; give my greeting to the poet *Sobha*, and say ' Examine the tracks of our Chiefs, and see who was at *Bompur*. Know in your heart that you are not whole brother to the *Khosas*. A venal awarder of victory, you will be burnt with wood. Wretched man ! They know that you have past a hundred years, that you are either a fool or have abandoned your home. And in that you cast scorn at me regarding *Bakar* and *Rámen*, when was it that you became a *Rind* or a *Lasháí* ?

For you were lost in the waves of the river's flood, you were *Mír Chákar*'s attendant for your (daily) evening food, while we, like mighty *Rinds*, sought for glory and every day weighed our single seers against maunds. I will explain things to your elephant's brain. Come into the battle-field, and, becoming a *Sínurgh*, I will strike you down with my talons, as in *Sáwan* (the rains) the torrent sweeps away the men of *Áro*. You bind on the new and fine pagri of other men ; you are gasping in death, when can you have any pleasure ? You have cast away honour and made yourself a friend of worthless life ; know in your heart that at last death will not spare you. There was disgrace on your head in the matter of *Dodá*. *Medhs* and *Máchís* are not fit companions for *Hamzah*. You are excluded from home and food with *Khosas* and *Rinds*. For how did the true *Rinds* act with regard to refugees ? How did *Mír Chákar* act with regard to *Gohar*'s young camels ; and about *Sammi*'s cattle, how acted *Dodá* with the sword ? when, like a tiger on the mountain tops, sword in hand, he gave up his life to protect the cattle of the poor.

N. B.—Dodá here alluded to is Dodá Gorgez, a legendary hero, not the Dodá Kaloi mentioned in the former poem.

III.—*Sobha's rejoinder, going over the legendary adventures of the Rinds, and asking what share the Kalois took in them.*

Sobhá Thegh Alí gushí : Jarwáren Baloch gushí : Gáhíyá phasave dáth gushí.

Kádir námá har sawáhá yád khanán  
 Sag-satáren bandaglí ardáse manán  
 Relání Lorí biyá hadísání durr-gehán  
 Sáz-khanc shághá gwash Balochání nugdahán  
 Dáimá nyádhe bíthen go Sultání sarán  
 Rind o Lášhári ma buná bráthán dáimá  
 Má khutha Lashárí Baloch khaptha pha shaghán  
 Mehna e zánki roth Panjgúra dehán  
 Kech Panjgúr kissaván gosh dár ki gushán  
 Má hawán Rind ún, azh Halabá phádh-ákhthaghún  
 Dubarán jangí go jazízá mán-ákhthaghún  
 Dem rosh-ásán saríná er-khaphthaghún  
 Hamzaí aulád sobh rasúlá bashkáthagh-ún  
 Hári malhána ráhí sháh-dagá khaphthaghún  
 Ungurí dastá thíbare jangá gipthaghún  
 Pha Karím sáz kuzratán shodhá gwastthaghún  
 Shahr Istámbol go Imámá wath charthaghún  
 Ma Jaghína gwar Shams-dín Sháh ákhthaghún  
 Shodhá Hárína pha turá jangí klashthaghún  
 Ungurí Kech Makuráná bahr bíthaghún  
 Shahr Sístáná o khamáná bahr bíthaghún  
 Shedh pha demá má Baloch tálá bíthaghún.  
 Shedh pha demá tho wathí nashkán de manán :  
 Rind mán Kechá ; Kech thán demá nishthaghe ?  
 Chil o chyár halkán ; go khai laqá gon-athe ?  
 Ní ki laqána khaurí sarhaddá ákhthaghún  
 Las-Belá o Kalmatíyá gíwar-thaghún  
 Habb Báráná pha muvárik she-bíthaghún  
 Pheshá Núhání azh Nalíyá er-khaphthaghant  
 Jistkúní ma Gáj siháf ákhthaghant  
 Lak Salárí Chándeh azh Káchá khaphthaghant  
 Rind Lashárí Narmukh rej bukthaghant

Rinde Dháqará saríná er-khaphthaghant  
 Láshár pha Gandávagh saráerá bíthaghant  
 Jalikán Loí tho khithán joán bahr athe ?  
 Gind ! nawán Gáhí tho radhíyá gon khaphthaghe  
 Arna Hárín basthaghen baldán gon athe  
 Tho hawán roshe be-mayárí ákhtaghe  
 Sáhib rosh zurthaghen, zarán árthaghe  
 Sherá mán-dátha pha do-handá khard bíthaghe  
 Zindagh o druáhá mán dighárá sar-bitaghe  
 Phurse Gábíyá, tho chi maskífí zindaghe  
 Wapthaghen mardáni tafákhán go man gane?  
 Tho go dah loghá ákhtho báut bíthaghe  
 Hán míriyá pha barátán ehári athe  
 Túpak daste Umar Hán bashkáthaghe  
 Man dilá zán ki tho mazain shán mat niye  
 Tho ráj áhan-e, án thái sultáni sar-ant  
 Gwar maní mírá ákhtho báut bíthaghe  
 Har chyár khundán har hamú Ráján díthaghe  
 Kumbhí gokhání shagháná mára jane  
 Khoh phísh-buren, ambaráni sifát khane  
 Gwashthaghán gálán Gáhí, tho saharál na be  
 Medhírá randá zír pha Bompúra kháyant  
 Mánika halká hon avo lajján rikhtaghant  
 Dau phadh-o-pheshí ehedhaghí nashk oshtáthaghant.

*Translation.*

Sobha son of Thegh 'Alí sings; to the Jarwár Baloches he sings; in answer to Gáhí he sings.

Every morning I remember the Creator's name, my trust is in the service of God.

Come, minstrel Relán with your beautiful legends, play on your guitar, chant the praises of the Baloches. You have ever been a dweller with kings, Rinds and Lasháris from the first have ever been your brethren.

I who called the Lasháris Baloches am scorned by you. Know that the scorn will travel to the country of Panjgúr. Attend, then, while I tell you the stories of Keeh and Panjgúr. We are those Rinds who arose from Háláb, and twice joined battle with the infidels. Setting our faces to the rising sun, we descended from the west; we are Hamza's offspring, the Prophet gave us victory. Leading our strings of camels, we pursued our way along the highroad. Coming in this direction we fought again, and by the might of the Merciful we passed on thence. At the town of

Istámbol we rode with the Imám himself; In *Jaghín* we met with Shams-u'd-dín Sháh.

Thence we rapidly drove out *Hárín* in fight. Hither *Kech* and *Makrán* we distributed, we divided the cities of *Sistán* by *khamáns* (*i. e.* bows, a bow representing a man's share). Henceforward we *Baloches* separated, henceforward do you give me information about your track. The *Rinds* were in *Kech*: in what part of *Kech* did you settle? There were forty-four settlements: with which camp were you? Now when marching on we arrived at the torrent boundary, at *Las-Bela* and *Kalmatí* we separated, and we settled in prosperity at *Habb* and *Barán*. First the *Nuhánís* descended by the *Nalí* pass. The *Jutkánís* came to the running water of *Gáj*. The *Chándehs* descended from *Kách* by the *Lak* and *Silárí* passes. The *Rinds* and *Lasháris* pitched on the irrigated lands of *Narmukh*. The *Rinds* descended from the west to *Dhádar*, the *Lasháris* came from above down to *Gandáva*. In *Jálikán* and *Loí* what streams did you share in? Look! *Gáhi*, perhaps you were with us by mistake. Or perhaps when *Hárín* was defeated, you were among the captives. You came shamelessly on that day, when, having robbed *Sáhib* of life (*lit. day*), you carried off his wealth. Having attained the low-lands you separated into two parties, alive and well you lay down (*hiding yourselves*) on the ground. Ask (*and find out*), O *Gáhi*, in what disgrace you are living; will you compare with us the dreams of sleeping men? You came with ten wives (*lit. houses*) and became a refugee, you posted yourself on the look out for our *Khán's* charities; you received a gun as a gift from the hand of *Umar Khán*; know in your heart that you are not worthy of great honour: You are their chief, and he is overlord of your chieftainship, for you came to our chief and became a refugee, and it was seen by all the chiefs in all four directions. You taunt me about the cattle at *Kumbhí*? You are but a cutter of *phísh* on the hills. (*The leaves of the phísh or Chamærops ritichiana are cut to make matting.*) You extol servants (*not chiefs*). My song is sung *Gáhi*, though you may not understand it. Take up the tracks of the chiefs who came to *Bompúr*. In *Mánik's* village blood has been shamefully shed, and formerly and lately cairns have been erected in memory of the slain.

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IV.—*Gáhi's final answer, following up the Rind legend, and taunting Sobha with cowardice.*

*Gáhi Gorish gushlu: Kaloícn Baloch gushí: Sobhár phasave dáth gushí.*

*Biyá o Relán shádlíhání  
Sháhghází cháravání*

Majlis jawánen sarání  
 Zír maní guftár-gálán  
 Bar gwar jang-dosten syálán  
 Band-bozh gálán dahena  
 Phasaván sar pha sarena  
 Gondalán serán manena  
 Bar dan Sobháen nighoshí  
 Olí guftárán shamoshí  
 Zírí randá phírukeghá  
 Bahr khant milká phitheghá  
 Chi gushán man sháírara  
 Dil-harífen sugharára  
 Khashí Rindání shaghána  
 Yád khan' olí jihána  
 Gosh sobha mangihání  
 Daftári e Khosaghání  
 Rand zurthe Makurání  
 Rind Láshár dehání  
 Rind Láshári áwará  
 Raffhaghant azh Keeh shahrá  
 Akhthaghant Hárín malána  
 Mulk mítáfá girána  
 Bráth-yári bahr-khanána  
 Bithaghún bahr khamáná  
 Má kí Jatoí yagsar athún  
 Síim joá pha-do athún  
 Mulk shahrá nemagh athún  
 Roz bahr pha thír-darán  
 Chyáarakhe ma Dháqdar athant  
 Sermá ma Khánpur athant  
 Hand ma Rej deh athant  
 E maní perá o rand-en  
 Phuturen Rindání hand-en  
 Nám ma ráján buland-en  
 Agh thará itibár na-bítha  
 Khasá go chamán na-dítha  
 Khatte kuhne gwar niyáthen  
 Gawáh sháhid kadh niyáthen  
 Kissavání kissav-áthant  
 Har-khase 'shí hanchosh-athant  
 Man sáhíyán Sobha, káp káte  
 Ne pha rand perowáte

Sov drapá Jawánakeghá  
 Júfo jhaṭá wathíyá  
 Drogh bande záhiriyá  
 Rást gushagh rást riwáh-en  
 Drogh pha ímáná khatá-en  
 Ar pha guftáre taiyár be  
 Shedh-demá gawáhíyá de,  
 Khatte mára khash phe-de,  
 Biyá, azh shairán karár khan,  
 Olí Rindán pha-phadhá khan  
 Nínava~~k~~hta kissavá khan  
 Surphadhení pha-gwará khan  
 Maín hadísán man dilá khan  
 Sobha khapthaghe azh drikh-bálán  
 Thai nigkwári sher nálán  
 Sunya thai 'Túví dálán  
 Zurthíyá jangá maníyá  
 Zulm-zorá sahibíyá  
 Phrusthaghá be-ronaghíyá  
 Zurthaghe mardán gibená  
 Chandehá juhl-khenaghená  
 Rúnghan Báḍor yárán  
 Sanghar ládi mazárán  
 Shán hilálen khohistáná !  
 Muhammad Hán druh-giháná  
 Zeb Buzdará hilál-an  
 Shaddav o khes go khawáhán  
 Nind-nyádh gwar Umaráhán.  
 HáI khárthán hánskári  
 Gwar maní Sardár Háná  
 Gwar má báutí ki ák~~k~~tha  
 Azh thai jangá rahetha  
 Rúnghan o Kanḍor Báḍor  
 Shángo Sanghar dan Siríyá  
 Band Bázen Bákhariyá  
 Ráj athant símán dariyá  
 Drust khá~~k~~thaghant whazh-dilíyá  
 Gwánkh Leghár charíyá  
 Phurs, Sobha shairára  
 Sughar o leklí wathára  
 Wházhá 'shí meh~~d~~hirára  
 Wházhá thai dem ma shustái

Lashkarán Jáme ma khushtái  
 Shakula ber shamushte  
 Mangchí shair pha hisáv-ant  
 Gál pha uzhmár o kitáv-ant  
 Majlise ma meraván bant  
 Dan nighoshán nishthaghen sat  
 Akhthaghen báut ki kháiyant  
 Gird sardárán gihená  
 Dostant cho chhamán doená  
 Azh bachh-bráthán bingoená.  
 Sh'á pha báután wathíyá  
 Lajj neshtha pha-phadhíyá  
 Bakhoen shwái mangeho shán  
 Kadh na khant chho ma Balochán  
 Akhthaghe lajján wathíyá  
 Khashthaghant gudr lavílán  
 Mál madí go galímán  
 Basth-khárthant maín vakílá  
 Azh thái koṭá garhená  
 Thái mehdhírá dír-zánaghená  
 Dítha go chhamán doená  
 Gosh Sobha o niyází  
 Esh maní guftár-bází  
 Tho ki guftáre kahitha  
 Man dí pha goshán sunitha  
 Túpaka dānga ganitha  
 Chi ma sháná sar-ákhtha ?  
 Phurse' sardára wathíyá  
 Jawánaká be-ámilená  
 Bakmal o bor go khawáhán  
 Dálthaghen maín Umará Hán  
 Hán Balochána Nawáva  
 Nukarí bokhtha azh tháná  
 Dáltha hoten Jawánakára  
 Pholathí olí ba-nindán  
 Bithaghe báut go Rindán  
 Khoh phish-buren nihengan'  
 Phish phara khohá shaghán nest.

*Translation.*

Gáhí, son of Gorish, sings to the Kaloi Baloches : in answer to Sobha he sings :

Come, O Relán, to the assembly, king and hero of song; In this assembly of young chiefs, take my speech and song, carry them to our war-loving foes. With propriety utter these few (lit. ten) words, answers given categorically, (head on head). They are arrows, of which a ser weighs a maund. Take them to Sobha, that he may listen to them, and forget his former songs. He will, he says, take up the track of our ancestors, he will distribute the paternal inheritance; what shall I say to the poet, to the cunning poet? Let him give up mocking at the Rinds and remember the former world. Say, O brave Sobha, you are the bard of the Khosas; you took up the track in Makrán, the lands of the Rinds and Lasháris.

The Rinds and Lasháris together set out from the city of Kech. They marched upon Hárín, taking the land of the country and dividing it among the brotherhood. We divided it by bows (*i. e.* a share to every one armed with a khamán or bow). We and the Jatois were united. At the border stream we separated into two parts, town and country we divided into halves, distributing our substance by arrow-stems. One-fourth were in Dhádar, we got our satisfaction in Khánpur, our dwelling was in an irrigated country. This is our track and trace, the abode of the true Rinds, a name exalted among chiefs. If you do not believe it, no one has seen it with his eyes, there are no ancient documents forthcoming, there were no witnesses to attest it, but there are tales upon tales, every one says that so it was.

I am right, Sobha, you are blind and deaf, nor is your footprint to be found on the track. Fear to speak of the victory of Jawának, take your bribe quickly, for you are manifestly inventing falsehoods. To tell the truth is the true custom; falsehood is a blot upon honour. If you are ready with a song, henceforth give your evidence, bring forth and show me your documents. Come! desist from any further poems, let alone the Rinds of bygone days, and tell stories of the present times. Surround yourself with men of understanding and lay to heart our traditions. Sobha, you have past the time for leaping and flying, your youth is under your feet, bare are the branches of your Túba-tree. You were carried away in battle with us, by the fury and force of our chief, you were broken ingloriously.

You were defeated by brave men, by the deeply-hating Chándyas, by our friends of the Rúnghan and Vidor torrents, by the mighty tigers of Sanghar. Honour to the faithful hill-country, to the perfectly-brave Muhammad Khán, jewel of the loyal Bozdárs, with silken turbans and garments, dwelling with Umar Khán.

A sure message I brought to our chief 'Those who have taken refuge with me, have ceased to be with you in war. The Rúnghan, Kandor and

Vidor territories, from Sunghar to the Sirí torrent, the Band Báz and Bákhar, who were outside your chief's territories, have all come of their own accord and mount at the call of the *Lagháris*.

Ask, O poet Sobha! reckon yourself up in your mind and call our chief 'Lord.' If our chief has not washed your face, then you did not kill Lashkarán and Jám. Have you forgotten the revenge taken for Shakul?

An account is kept of good poems, their words are enduring and are written in books, they are recited in the assembly and they remain firm in the (recollection of the) listeners. Whenever refugees have come or shall come to worthy chiefs, they are dearer to them than their two eyes or than young sons and brothers. You, for those who take refuge with you, have not given up shameful conduct for the future. Where is your great honour? No one does so among Baloches. You brought your disgrace upon yourselves (by the way you acted towards the refugees). They displayed anger and rage.

Their cattle and property had been seized by the enemy. Our vakíl (demanded them) and brought them back bound from your fort! Your far-seeing chief saw with both his eyes then! Listen Sobha and attend. This is all my song. The song that you sang I also have heard with my ears. I have counted your gun-barrels. What honour is left to you? Ask your own chief, the unworthy Jawának. Velvet and chestnut mares and silk did our chief Umar Khán give him. The Baloch Kháns and Chiefs unloosed their white mares from their stables and gave them to the valiant Jawának!

Ask of your forefathers how refugees fared with the Rinds. It is the phish-eaters on the hills that are the tigers. There is no disgrace in cutting phish on the hills.

#### VI.—*A love-song.*

(Said to be by Jám Durrak a Dombkí, a celebrated poet who lived in the reign of Nasír Khán of Kalát in the last half of the eighteenth century. He is said to have undergone great persecution from the Khán on account of his love for a lady of the zanána.)

O Samín be-phursá bihishtiye  
 Azh latífá nema<sup>ghá</sup> khaiye  
 Man gulá dema mail *khuthe* doshí  
 Bairamo así sár *khuthe* mátos  
 Bo azh brí<sup>khán</sup> raph<sup>aghan</sup> washen  
 Hijr manán momín janant pásán  
 Cho kahírání áraven ásán  
 Be-karár-án ma nemshafí pásán

Pha whashí o dost hubbo iklásán  
 Zillatán sáhsáre deáe jáná  
 ' Nah' na khanán pha dost pharmáná  
 Cho isparán dempán maní jáne  
 Chábuk o chashm díd paikáne  
 Kahr amulání girgireñ názant  
 Dadame gár-ant dadame báz-ant  
 Nain dafá gir ki gál khanán roshen  
 Nain manán kurzat mazál chosh-en  
 Pha dafá mahlíjá dí ján áyán  
 Nishtho duá go hawán roshe  
 Wa hudhá mephán man dilá shefi  
 Er-khafí dost azh thangaven thakhtá  
 Biái rodhána cho chyárdahí máhán  
 Masaron bí cho Akbare Sháhán  
 Guḍá azh durr-chíren dafá phursán  
 ' O badhashkání grán bahá lálén  
 Mára thái loghwáren saren saughan  
 Irmiri gon-khapton annágáhi  
 Phar thái sahtli sakalen nyádkhán  
 Hon bahá ban pha sakalen khulkán.'

---

*Another Song by Jám Durraḱ.*

Doshí dil-raváhen jání  
 Sartáj o samand kháḍání  
 Gwashtthom pha dafi phanání  
 Osá thau machar haivání  
 Gird-i áraván phirwání  
 Chandí áshkánrá ziyání  
 Kulfo phrushtaghán shakání  
 Ishk o maniṭha hakání  
 Gwashtthom keghadhen sázará  
 Durchíno hazár názará  
 Phulkand o shakar guptará  
 O hál i fakíre esh-an  
 Zirde azh phirúḍhán resh-an  
 Án ki málik dozdár-an  
 Án azh munkirán bezár-an  
 Jám jámaván kháksár-an  
 Harzatá darúd kár-an

Sháhca kirdagár ásár-an  
Gwafshe nem-shafán nál-an.

*Translation.*

The rain that un-asked for falls from Heaven comes from the direction of the beloved one. Last I met a love face to face. The lightning springs forth, it is my love that has awaked me. The scent of her locks has sweetly seized me. The pain of separation sharply stings me in the night-watches, I spring up like the flame of Kahír-wood (*Prosopis spicigera*), I am without rest in the midnight watches, for the sweetness of meeting with my love. Give my body some breathing-space from pain, I will not say 'No' to my loves command, my body is as a shield stretched forth. Let my eyes be gladdened by the sight of my fair one, let the pain caused by my lady be a little appeased; sometimes it disappears, sometimes it increases. I cannot use my mouth to speak by day, I have no strength, she is so strong, to come to meet and speak to her.

I sit and pray for that day: 'O God, be merciful, and incline your heart to me.' Let my love come down from her golden throne, let her come growing like the waxing moon on its fourteenth day, let her be in front of me, and I shall be king Akbar. Then I shall ask from her pearly mouth 'O priceless ruby like the *badhashk* fruit, make me your husband, bound by oath, my heart has been irrevocably taken possession of, I will live for the sake of your jewel-like beauty, I will spend my blood for you, fairest of beings.'

*Second Song.*

Last night I saw my heart-enchancing love, the crown and ornament of women. I spoke to her with my lips and said 'Do not behave foolishly, like the moth flying round a flame, O bane of many lovers.' The locks of hesitation are burst open, I have obeyed the call of true love. I said to my beautiful love, 'O fair one of a thousand wives and sweet sugared speech, this poor wretch's state is this, his heart is galled with his complaints, he who is a chief and true friend is apart and averse from the avaricious. The heart of Jám is covered with dust. It remains but to say *bism'il-láh* in the divine presence, to remember the King and Creator, and to pray through the cold midnight.

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*Riddles, Proverbs, &c.*

The Baloches are very fond of riddles, which are always in rhyme. They are of a primitive type and generally defy solution. The more far-fetched they are, the more appreciated. Those first given are by Bráhim a Shambání who died about two years ago. He was celebrated for his riddles as well as for more serious compositions.

1. *Bujhárat*.—Ya shai jawain ulkahá astá  
 Duzhmanéa resen-tha-ish khashtha  
 Báng-havá pahre ráh sará gwastha  
 Go minnat mephán niyadh dastá  
 E bujhárat Bráhimá bastha.

*Bozh.* Warnái.

*Riddle*.—There was one good thing in the world; an enemy has pursued and turned it out. In the morning watch it passed along the road. Neither begging nor praying will bring it baek again. Bráhim composed this riddle.

*Answer*.—Youth. (The enemy is old age.)

2. *Bujhárat*.—Hudháí kurzat o kára  
 Zamín nestath o dighára  
 Be khishthaghen khishára  
 Hudháí kurzat o kára  
 Sabz o phul bahára  
 Pha phashaghá di taiyára.

*Riddle*.—By God's might and power  
 With neither ground nor soil  
 Without a field being ploughed  
 By God's might and power  
 A green plant has flowered  
 And now its fruit is ripening.

*Answer*.—This was composed on seeing an ear of eorn growing on the beam across the mouth of a well.

3. *Bujhárat*.—Bráhimá pairí gwasthaghá gále  
 Díthaghún 'chie rangá be hále  
 Rangén kojhá andaren lále

*Bozh*.—Askhohe.

*Riddle*.—Last year Brahím said 'I saw something of an indescribable sort. Its appearanee was foul, but there was bright red within.

*Answer*.—A flint.

4. *Bujhárat*.—Ya shai jawain ulkahá yaká  
 Go jherave jangán sadhbare saká  
 Har-khase kháith, jatlí wathí ehaká  
 Man na gindání jagahe dhakká  
 Gosh dánáhá shára bozh wa hakka

*Bozh*.—Chháth.

*Riddle*.—There is one good thing in the world, a thousand times attacked with disputes and quarrels; every one comes and throws it over

himself, yet I cannot see anywhere a sign of hurt. Let the wise ear attend and guess it right.

*Answer.*—A well.

5. *Bujhárat.*—Ya drashke jorentha páken hudháyá  
 Ma zamín phushtá pha jinden razáyá  
 Bund yaken-í lám-b-en duáyá  
 Yake rek<sup>h</sup> bílha, yake sawáyá

God has planted a tree, of itself it has grown up on the face of the earth ; the root is one, the branches two ; one is dust, the other ashes.

*Answer.*—The tree is mankind, the branches Musalmáns and Hindús.

6. Talabí naukarant kharde ajab bhat  
 Kadam pha lek<sup>h</sup>av-ant-ish kár o khidmat  
 Hame fauj dhurá be hathyár en  
 Philhí phoshindaghán yák o řawár en  
 Hamodhá lashkar khosh o khushár en

A few servants of strange forms  
 They step by calculation on duty and service  
 They are an army bare and unarmed  
 Moving at the voice and call of other men  
 And there the army meet death and slaughter.

*Answer.*—The pieces at chess.

7. Nishtho dílhom pha nadhar  
 An shahr be sáh watan  
 Ahání adh jang o jadal  
 Nyámjí nawant yake dígar.

Sitting I saw with my sight  
 A city and masterless country.  
 There was war and strife between them  
 And no umpire betwixt the one and the other.

*Answer.*—A game at chaupar.

8. Wiláyat thars-en, dost bar-karár-en  
 Ravaghá gohár kisánaken taiyár-en  
 Na rothí máth, baehh olá sawár-en  
 Phith nestení, phíruk haiyát-en

The country (in) fear, the mistress in comfort  
 The little sister ready to start  
 The mother will not move, the son is already mounted,  
 The father does not exist, the grandfather is alive.

*Answer.*

The above contains a series of puns on the names of a family, partly, in Sindhí. The name of the country Dádar contains in the last syllable 'dar' the allusion to fear. The name of the mistress Begam, read as 'begham,' is the equivalent of 'bar-karár.' The sister's name is Haurí, the mother's Gaurí, meaning in Sindhí light and heavy. The son's name Sháh-sawár, the fathers Gháibí, and the grandfather's Haiyát explain themselves.

9. Hudhá pakko kuzraten bandá pálíth  
 Rusúl Muhammad *en* ummatwálí  
 Hazáren bandagh yaken thálí  
 Chamodhá khas no roth horg o khálí  
 Hamodhá giptho harchí dí wártha-ish  
 Hamá whán zurtho loghá dí ártha-ish  
 Guḍá jatho bhorentho thálí ujártha-ish

After an invoeation to God and the prophet—  
 There are a thousand men to one dish,  
 No one goes thence empty-handed  
 There they take and eat everything  
 They take up the dish and earry it home,  
 And having thrown it down and broken it they leave it bare.

*Answer.*—This contains a pun on thálí, which means the hedge round a threshing-floor as well as a dish. After every one has carried away the corn he wants, the hedge also is torn down and carried away.

10. Dánki sháhá parwaren khaptha man logh buná  
 Ní ki bandaghán razentha bíttha pha husn o pharán  
 Wash hadíth o khush lisán  
 Roth go phulen ambalán

As long as God had charge of him he lay at home ;  
 Now that men have eonstrueted him he has become fresh and fair.  
 With sweet discourse and pleasant speech  
 He walks about with his fair companions.

*Answer.*—A man with a wooden leg.

11. Pyáláe phuren dítha májái  
 Nishthaghá lalo nestathí dáí  
 Pyáláe wártho lál shahíd bíttha  
 Chonán ki kullen álímá dítha

I saw a cup in a certain place  
 A bright one sat down without an attendant  
 This ruby like one drank up the cup, and then died  
 So that all men saw it.

*Answer.*—The flame of an oil-lamp which goes out after having drunk up the oil.

12. Do gohárán díthá ambázi  
 Ajab khush ant gwar ambázi  
 Nainí suratá khamí  
 Yake khor dígar chamí
- I saw two sisters embracing  
 Very happy at the embrace  
 There is not the slightest difference in their appearance  
 One is blind and the other has eyes.

*Answer.*—The reflection in a mirror.

13. Phairí khákhán pha gidkár  
 Man Bakri shahr gwara  
 Bolí athí washen řavár  
 Dastán giphí nar-mazár.
- Yesterday as I passed along the road  
 In the town of Bakkar  
 I heard a very sweet voice  
 But when I seized it, it was a fierce tiger.

*Answer.*—A snake.

14. *Proverbial sayings.*

Kahne litir o phíren zál  
 Warná sará sár-bár.  
 Old shoes and an old wife  
 Are the burden of a young man's life.

Savzen eho híthén, eharpi eho meshí dumbaghán.  
 As green as young corn, as fat as long-tailed sheep.  
 This saying refers to the Gwar or wild pistaehio (*Pistacia khinjuk*).

Khařán sohhtha áfá phúkí wáarth.  
 One burnt by hot milk will not drink even water without blowing on

it.

This corresponds with the Hindustání proverb 'Dúdh ká jalyá ehánehh lí píwat phúnk,' or the English. 'A burnt child dreads the fire.'

Málá sar-dai várá dosh.  
 Let the cattle go and milk the hedge.

This answers to 'Penny wise and pound foolish.'



## ERRATA.

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- Page 3, line 8, *read* *ǰ* for *ǰ*
- ” 5, ” 33, ” pronounced for pronounced.
- ” 7, ” 9, ” *nyánwán* for *nyánwán*.
- ” 7, ” 40, ” *rasída* for *rasída*.
- ” 8, ” 19, ” *nadhkar* for *nadhra*.
- ” 10, ” 2, *add* and *jawahar* after *zik*.
- ” 13, ” 18, *read* *phalo* for *phale*.
- ” 13, ” 29, ” *límú*, a ” *límúa*,
- ” 16, ” 33, ” *shákhá* ” *shákhá*.
- ” 17, ” 8, ” *marde* ” *mardá*.
- ” 24, ” 18, ” *kithán*, *thán* for *kithán thán*.
- ” 25, ” 35, ” *biyár* for *riyár*.
- ” 32, ” 14, ” see it himself for see himself.
- ” 33, ” 38, *transpose* { nowhere *hizhgarnen*.  
elsewhere *thihandá*.
- ” 37, ” 25, *read* *welcome* for *welceme*.
- ” 42, ” 20, ” *phádh-ágh* for *Pádh-ágh*.
- ” 43, ” 24, ” *bilí* for *kilí*.
- ” 44, ” 7, ” *amnám* for *annám*.
- ” 44, ” 10-14, ” *án* — ” *an* —
- ” 46, ” 16, ” *leeward* ” *lee-ward*.
- ” 47, ” 12, ” *بáki* *báki* ” *بáqí* *báqí*.
- ” 47, ” 34, ” *baṭerá* ” *baterá*.
- ” 49, ” 5, ” *baragh* ” *beragh*.
- ” 49, ” 10, *dele* *P. burú*, *Skr. bhrú*.
- ” 49, ” 10, *after* *برويت* *baroeth* *add* *بروان* *barwán*, s. the eye-brow.  
*P. burú*, *Skr. bhrú*.
- ” 54, ” 13, *read* *panwar* for *panwar*.
- ” 57, ” 4, ” *phashk* ” *phaskk*.
- ” 64, ” 21, *add* ef. *Pashto jowal* after *to chew*.
- ” 66, ” 23, *read* *oxen, mate* for *oxen mate*.
- ” 66, ” 27, *add* *Pashto* after *joru*.
- ” 67, ” 9, ” *P.* ” *world*.
- ” 71, ” 25, *read* *dágh* for *dágh*.
- ” 72, ” 33, ” *tear* ” *burst*.

- Page 74, line 12, ,, *dáragh* for *dáragh*.  
 ,, 85, ,, 20, ,, *sará sá* ,, *sará sa*.  
 ,, 87, ,, 32, ,, *sumb* ,, *samb*.  
 ,, 93, ,, 13, ,, *Maurorum* for *Mauroram*.  
 ,, 95, ,, 13, ,, *sixtieth* ,, *sixth*.  
 ,, 98, ,, 10, ,, *khambar*. *Kambar* for *khambar*—*kambar*.  
 ,, 105, ,, 13, ,, *گراڻد* for *گراڻد*  
 ,, 105, ,, 31, ,, *giryán* ,, *girgán*.  
 ,, 108, ,, 21, after *گوانكه* *gwánkh* insert *گونيچ* *gwánech*, a camel driver.  
 ,, 108, ,, 33, read *گوزان* for *گوزان*  
 ,, 109, ,, 26, ,, *flesh* ,, *flesh*.  
 ,, 110, ,, 3, ,, *گوماد* ,, *گوماد*  
 ,, 110, ,, 34, after *گيانح* *giánech* insert *گيان* *giyáf*, fertile, extensive.  
 ,, 111, ,, 2, read *Salix* for *Salia*.  
 ,, 114, ,, 24, ,, *man* ,, *mau*.  
 ,, 115, ,, 16, ,, *mán-deagh* for *man-deagh*.  
 ,, 115, ,, 27, ,, *máhkáuí* ,, *mahkáuí*.  
 ,, 117, ,, 21, ,, *leap*. ,, *leap!*  
 ,, 119, ,, 31, ,, *mahisk* ,, *mahisk*.  
 ,, 124, ,, 30, ,, *نېغا* *neghá* ,, *نېغار* *neghár*.  
 ,, 124, ,, 31, ,, *níkah* ,, *nekah*.  
 ,, 125, ,, 8, ,, *vakhtá* ,, *vakhat*.  
 ,, 125, ,, 16, ,, *P. khwája* ,, *P. khwaja*.  
 ,, 127, ,, 6, after *وهان* *whán* insert *وهانكار* *whántkár*, master, owner.  
 ,, 127, ,, 26, read *عبابي* for *عبابي*  
 ,, 129, ,, 33, after *هاليني* *halení* insert *همار* *himár*, tender, delicate,  
 beautiful.



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JOURNAL  
OF THE  
ASIATIC SOCIETY OF BENGAL.



VOL. XLIX.

PART II. (NATURAL HISTORY, &c.)

(Nos. I to IV.—1880.)

EDITED BY

THE NATURAL HISTORY SECRETARY.

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"It will flourish, if naturalists, chemists, antiquaries, philologers, and men of science in different parts of *Asia*, will commit their observations to writing, and send them to the Asiatic Society at Calcutta. It will languish, if such communications shall be long intermitted; and it will die away, if they shall entirely cease." SIR WM. JONES.

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CALCUTTA :

PRINTED BY J. W. THOMAS, AT THE BAPTIST MISSION PRESS,

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ASIATIC SOCIETY, 57, PARK STREET.

1880.





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*Date of issue of the different numbers of Journal, Part II, 1880.*

No. I.—Containing pp. 1—84, with Plate I, was issued on June 26th, 1880.

No. II.—Containing pp. 85—134, was issued on August 30th, 1880.

No. III.—Containing pp. 135—180, with Plates VII—XI, was issued on December 14th, 1880.

No. IV.—Containing pp. 181—250, with Plates II, III, VI and XIII, was issued on March 7th, 1881.

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## LIST OF PLATES.



- I. Annual Variation of Barometer and Sunspots.
- II. } Indian, Burmese and Andaman Mollusca.
- III. }
- IV. } Not issued.
- V. }
- VI. New Papilio from the Andaman Islands, &c.
- VII. Abnormal Dentition of Rhinoceros.
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- XII. Not issued.
- XIII. New Species of Hestia from Burmah.





## ERRATA AND ADDENDA.



- p. 14. Bones of fishes from the Trias of Tibet referred to under the head "Cretaceous," should have been mentioned in the preceding paragraph.
- p. 24. At the time of writing the notice of Siwalik Carnivoras I had not seen the paper by Mr. Bose on that subject,\* and consequently was not aware that *Felis grandicristata* and *Canis cautleyi* are merely provisional species. It should also have been mentioned in treating of the genus *Ursus*, that there is in the collection of the Indian Museum, a canine-tooth from the Irawadi Siwaliks probably belonging to this genus.
- p. 31. In treating of the Pleistocene Proboscidea it should have been mentioned that the first described teeth of *Mastodon pandionis* are said to have been obtained in the Deccan by Col. Sykes.
- p. 34. Line 5 from top for *duvancellii* read *duvaucellii*.
- p. 35. After *Lutra paleindica*, there should be mentioned the probable occurrence of a second Siwalik species.
- " The name Clift, in place of Falconer and Cautley, should be appended to *Mastodon latidens*.
- " After the name *Chalicothercium sivalense* add (F. and C.)
- p. 37. Line 8 from top; after *Megaloscelornis sivalensis* (Lyd.) add S.
- " " 21 from top; after *Colossochelys atlas* (F. and C.) add S. I.
- p. 49. For  $EI \equiv O_1 + 0.4775 P_{.01}$  read  $EI \equiv O_1 + 0.04775 P_{.01}$
- also "  $P_{.01} \equiv 0.009947$  "  $P_{.01} \equiv 0.009956$ .
- p. 52. Line 22, for "resect" " "result."
- " " 23, "  $P_{.1}$  "  $P_{.6}$  in one place.
- p. 53. " 23, " W " O
- " " 23, "  $W_1$  "  $O_1$
- p. 63. " 5, from bottom for " " read " — "
- " Last line for "Sq" read "SG"
- p. 69. Last line "  $0.64475 P_{.03}$  read  $0.60475 P_{.03}$ .

In the right side of each equation of condition on p. 55, a decimal point has been substituted in each for a space of separation, and the differences have thus been made to appear as decimals forming the right sides to the corresponding equations.

Thus in line 3.

$$\dots\dots\dots + 0.020194 R_1 \equiv 0.275 R_1$$

Should read

$$\dots\dots\dots + 0.020194 R_1 \equiv 0 \quad \text{Diff.} \quad 275 R_1$$

\* Q. J. G. S. Vol. XXXVI, p. 119.

### ADDITIONAL ERRATA.

---

- Page 182, line 27 from top, *for* Five *read* Two.  
,, 186, ,, 8 from top, ,, "*angulata-lunaris*" *read* "*angulato-lunaris*."  
,, ,, ,, 2 from bottom, *omit* "it is figured here".  
,, 190, ,, 19 from top, *for* "*contingens*" *read* "*contingentibus*".  
,, 191, lines 24 and 26 from top and in footnote, *for* "*Situla*" *read* "*Sitala*".  
,, 192, bottom line, *for* "*ponsa*" *read* "*pansa*".  
,, 216, line 4 from top, *for* "specimen" *read* "specimens".  
,, 221, ,, 4 from top, *for* "I have described the species" *read* "I have *never* described the species."

The mistakes on pp. 182 and 221 are important.

NEW SERIES.

VOL. XLIX.

No. CCXXXII.

# JOURNAL

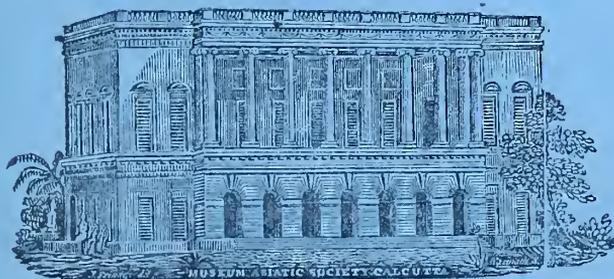
OF THE

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Vol. XLIX, Part II, No. I.—1880.

EDITED BY

THE NATURAL HISTORY SECRETARY.



“The bounds of its investigation will be the geographical limits of Asia: and within these limits its inquiries will be extended to whatever is performed by man or produced by nature.”—SIR WILLIAM JONES.

\*\* *Communications should be sent under cover to the Secretaries, Asiat. Soc., to whom all orders for the work are to be addressed in India; or, in London, care of Messrs. Trübner and Co., 57 & 59, Ludgate Hill.*

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# JOURNAL

OF THE

## ASIATIC SOCIETY OF BENGAL.



Part II.—PHYSICAL SCIENCE.

No. I.—1880.

I.—*On a Simple Method of using an insignificant Fraction of the Main Current produced by a Dynamo-Electric Machine for Telegraph Purposes.*—By LOUIS SCHWENDLER, M. INST. C. E. & C.

(Received 29th October ; read November 5th, 1879.)

The currents which a dynamo-electric machine is able to generate through a small external resistance, are so enormously strong and also so constant and exceedingly cheap, that I have always thought it would be of technical as well as of economical importance to use them for signalling purposes. The difficulty only was how to solve the problem practically. Manifestly, the currents could not be produced through the telegraph lines, in the ordinary manner of applying dynamo-electric machines, for, in the first place, telegraph lines offer high resistance, and, in the second place, the use of *the closed-circuit system* would become imperative. However, some time ago a very simple method occurred to me which appears to contain the germs of practical success, and, having lately made some experiments on the subject, I do not hesitate to communicate the result.

Suppose we have a dynamo-electric machine, the two terminals of which are connected by a resistance  $r$  through which any kind of *useful work* is to be performed by the current.

For instance, during the night,  $r$  may consist of an electric arc, and the useful work done by the current is given out as *light* for the *signalling office*; or during the day-time  $r$  may consist of another dynamo-electric machine which acts as an ordinary electromagnetic engine, performing

some useful mechanical work, *i. e.*, pulling the punkhas, lifting messages, producing a draught of cool air, &c. ; or the current may be made to pass through a galvanoplastic apparatus in connection perhaps with the Surveyor General's Office, &c.

Now connecting the *negative pole*\* of such a dynamo-electric machine to earth, the positive pole to *all* the lines terminating in a telegraph office, while the two poles are permanently connected by the resistance  $r$  through which the current produces the useful work above-mentioned, then it will be clear, without demonstration, that *all* the lines so connected can be provided with signalling currents (which are exceedingly weak as compared with the strong main current) by simply *tapping* the main current, and that without perceptibly reducing it, *i. e.*, without affecting the *useful work* performed by the main current through  $r$ . Supposing that the useful work performed by the main current repays all the expenses connected with the erection and working of the dynamo-electric machine, then obviously this would be a method which would supply the signalling currents for nothing. This might be an inducement for telegraph-administrations to introduce the electric light, since they would get the signalling currents into the bargain, and the costly and cumbersome galvanic apparatus might be dispensed with.

An example will show this more clearly. A Siemens dynamo-electric machine of medium size can easily be made to produce through an electric arc a current of 30,000 milli-oersteds, of which not more than 3 milli-oersteds are required to work the Siemens's polarized relay with engineering safety. Suppose that the sent current is made equal to twice the current which is required to arrive, we have the following calculation for Calcutta office :—14 long lines terminate at Calcutta, hence  $14 \times 6 = 84$  milli-oersteds would (as a maximum) have to be tapped off from the main current of 30,000 milli-oersteds. This represents a loss of only  $0.28\%$ ,—which is so small that not even the most sensitive eye would be able to detect any variation in the light.

Hence in this case we would feed the Telegraph lines with currents which actually cost nothing, as the electric light alone would repay all expenses.

During my recent light experiments in London, it was experimentally established that the current in milli-oersteds which a dynamo-electric machine is able to produce, can be expressed as follows :—

$$C = E \left\{ \frac{1 - \kappa \left( \frac{v}{r + m} \right)^2}{r + m} \right\} \times 1000$$

\* In India we use positive signalling currents.

E and  $\kappa$  are two *constants* for any dynamo-electric machine. E is an electromotive force in volts;  $\kappa$  is of such dimensions that  $v \sqrt{\kappa}$  represents an electrical resistance;  $m$  is the internal resistance of the dynamo-electric machine;  $r$  is the external resistance through which the useful work by the main current has to be performed.

$m$  and  $r$  are to be expressed in ohms. The resistance of the leading wires has been supposed *nil*.

If we call R the resistance of a telegraph line, which we wish to feed from the main current, then the signalling current passing into that line when the main current is tapped would be

$$\frac{C r}{R + r} = E \left\{ \frac{1 - e^{-\kappa \left(\frac{v}{r+m}\right)^2}}{r+m} \right\} \times \frac{1000 r}{R + r}$$

and this current, in the case of the Indian lines, should not be less than 6 milli-oerstedts. Hence we have the following equation:—

$$E \left\{ \frac{1 - e^{-\kappa \left(\frac{v}{r+m}\right)^2}}{r+m} \right\} \times \frac{1000 r}{R + r} = 6$$

from which  $r$  can be calculated, since E,  $\kappa$ ,  $m$ ,  $v$  and R are known.

I need scarcely point out, that as R is invariably so large that  $r$  can be neglected in comparison with it; the current in *one* line only depends on the resistance of that line, and not on the resistance of the other lines in connection with the dynamo-electric machine. Hence the signalling through one line is not influenced by the signalling on other lines; and in this respect the method is on a par with signalling through different lines by separate batteries.

We will take a special case.—For a Siemens's medium machine, making  $r = 3$ , we have a main current of about 17,710 milli-oerstedts, and the current passing into a line of 8000 resistance (800 miles of  $5\frac{1}{2}$  wire) would be 6.6 milli-oerstedts. Supposing that all the 14 lines at Calcutta office are to be supplied with 6.6 milli-oerstedts each, the current carried off would be  $6.6 \times 14 = 92.4$  milli-oerstedts, or 0.5% of the main current.

It is best to make all the lines equal in resistance by adding to the shorter lines some artificial resistance. This measure would prevent a dead earth (occurring on one of the lines and close to Calcutta) from having any effect on the working of the other lines. In Europe, where the lines are much shorter, the signalling currents supplied by a given dynamo-electric machine, working through a given resistance  $r$ , could be much greater than 6.6 milli-oerstedts.

For any given R (resistance of the line) the currents can be increased by selecting a dynamo-electric machine with the right internal resistance.

The advantages of the method appeared to me sufficiently great to justify a practical trial:—

*Experiment, October 11, 1879.* With a Siemens's dynamo-electric machine (medium size) I produced a powerful electric light; and between the poles of the dynamo-electric machine I connected up four artificial lines, each of 10,000 units resistance, with relays ranging between 500 to 1000 units. These four parallel circuits worked very well, singly and simultaneously. No variation of the electric light during telegraphing could be noticed, even when the line resistance was reduced to 1000 units. Further, the resistance of one line was increased to 20,000, and the signalling currents were still sufficiently strong (1·6 milli-oersteds).

*Experiment, October 14, 1879.* Same as above; but a branch current was conveyed by the store-yard line (from the store-yard where the dynamo-electric machine with its electric light was put up) to Calcutta signalling-office (4 miles), and one of the Agra lines (850 miles in length) worked by this current.

The sent current, measured at Calcutta, was 9·6 milli-oersteds; the received current, measured at Agra, 1·85. The great loss was due to the exceedingly low insulation of the line near Calcutta. It is now the breaking up of the monsoons, when the climate in lower Bengal represents almost a hot vapour bath.

Several messages were sent to Agra, but no variation in the electric light could be observed.

---

## II.—*On the Occurrence of the Musk-Deer in Tibet.*

By R. LYDEKKER, B. A.

(Received November 17th, 1879.)

Some degree of doubt seems, hitherto, to have prevailed among naturalists whether the Musk-Deer (*Moschus*) occurs on the Tibetan plateau, or whether it is confined to the wooded districts of the Alpine Himalaya. Thus in a paper contributed by Mr. W. T. Blanford to the 'Proceedings of the Zoological Society of London,'\* the author says that he has grave doubts whether the Musk-Deer occurs anywhere on the Tibetan plateau. In a paper published by myself in the Society's Journal,† I mentioned that, from having seen skins in Ladák, as well as from the fact of the Ladákis

\* 1867, p. 634.

† 1877, Pt. II, pp. 287-8.

having a name for the animal, I was of opinion that the Musk-Deer must occur somewhere in Tibet, though I had at that time no positive proofs to offer. Lately, however, I have obtained such evidence as seems to leave no doubt that this animal should be reckoned among the fauna of Tibet.

Firstly, it will, I think, be generally admitted that the musk-pods of the Musk-Deer are an important article of export from Tibet to India.\* Although this affords *primâ facie* evidence that the Musk-Deer occurs in Tibet, yet it might be objected that this musk was first taken from China to Tibet, and thence exported through Nepál or Ladák to India; I, therefore, now proceed to bring forward the more direct proofs of the occurrence of the animal in Tibet proper.

The earliest evidence which I have to notice, is that of the great traveller Marco Polo.† That writer mentions the occurrence of the Musk-Deer at a place which he calls Ergiul, which Colonel Yule locates to the north of Tibet, and south of the great Gobi desert, in latitude 40°. From Marco Polo's description, there can be no doubt of the identity of the animal referred to with the Musk-Deer, though he commits the error of mentioning a pair of lower as well as upper tusks. Again, the same traveller‡ mentions the occurrence of the same animal in eastern Tibet, probably somewhere near the longitude of Lhása, and also that the Tibetans call the animal Gureri.

A later traveller, Mr. Bogle, the envoy of Warren Hastings, describes§ most circumstantially the hunting and capture of a Musk-Deer (or, as he calls it, Musk-Goat) at Rinjaitzay, which is situated north of the Tsánpú river near Shigátze in Tibet. Mr. Bogle describes the animal as being hornless, coated with stiff hair, and with tusks depending from the upper jaw of the male: he also mentions that the Tibetan Musk-Deer is of a lighter colour than the Musk-Deer of Bhútán. This description leaves no possible doubt as to the animal referred to.

General Cunningham|| mentions that the Musk-Deer (known to the Ladákis as Lá) is found in Tibet as well as in Kashmir.

During the past summer, I met in Lahúl with a Tibetan who had formerly occupied a high official position at Lhása, and who informed me,

\* Markham, 'Tibet.' Int. p. cxxii, p. 197.

Hodgson 'Trade of Nepál.'

Cunningham. 'Ladák,' p. 242.

† Yule's 'Marco Polo,' Vol. I, p. 267.

‡ Yule, loc. cit., Vol. II, p. 37.

§ Markham, loc. cit., p. 114.

|| Loc. cit., p. 202.

that the Musk-Deer was of common occurrence on the Tsánpú river in the neighbourhood of Lhása.

Mr. W. H. Johnson, the Governor of Ladák, informs me that the Musk-Deer is found in the country below and to the east of Lhása, along the course of the Tsánpú river. The musk brought from this district, Mr. Johnson says, has wrongly acquired the name of Khoten musk; this seems to have originated from the fact that when Khoten was a large Buddhist city, and important trading place, the musk was carried there from Lhása, and thence to India. Mr. Johnson also observes that the Musk-Deer occurs only where the birch tree grows.

The whole of this evidence taken together appears to me to afford abundant evidence as to the occurrence of a species of *Moschus* in Tibet, though I have no means of knowing whether it be the same as *M. moschiferus*. The Musk-Deer is of common occurrence in Bhútán, and it appears to me to be probable that it extends north of that district in most of the open countries up to Tibet, and thence across, or round, the Gobi desert into Siberia.

The occurrence of the Musk-Deer far in on the Tibet plateau is a fact of considerable importance, as it is the only instance of any of the large mammals of the forest clad Alpine Himalaya extending its range into the dry and desert regions to the north.

In my former paper, quoted above, I thought it probable that the Musk-Deer occurred in Ladák; this, however, I now find is not the case; I can find no evidence of the animal occurring anywhere in the upper Indus valley.

---

### III.—*Note on some Ladák Mammals.*—By R. LYDEKKER, B. A.

*Otter.*—In his report on the Mammalia of the second Yarkand Mission\* (p. 32), Mr. W. T. Blanford mentions that the late Dr. Stoliczka, in his notes, referred to the occurrence of a small species of otter (*Lutra*) in the Indus at Leh, but was unable to procure a specimen.

During the past summer I purchased at Leh a flat skin of an otter, said to have been obtained from the Indus at Shushot, near Leh. This skin is of very dark colour superiorly, and the length of the body-part is about 30 inches; the tips of the hairs are paler. Unfortunately, neither the skull nor the claws remain in my specimen, so that specific determination is quite impossible. The skin, however, seems to be very like that of the European

\* 'Scientific Results of the Second Yarkand Expedition,' Mammalia, by W. T. Blanford. Calcutta, 1879.

otter (*L. vulgaris*), and the animal, therefore, may very possibly belong to the same species as a skin obtained by Major Biddulph in Gilgit (? from the Indus), and which Mr. Blanford, in the above-quoted note, thinks is very like *L. vulgaris*.

I learn from Mr. Elias, the British Joint-Commissioner at Leh, that otters are said to be of common occurrence at the bridge which spans the Indus below Leh; these otters live in the stone-work piers of the bridge. I may add that Mr. Elias has promised to endeavour to procure a specimen of the skin and skull of one of these animals.

Dr. Stoliczka speaks of the Leh otter as being a small species; since, however, he never procured a specimen, and as my specimen is a large skin, it is probable that Stoliczka's estimate of size was not exact.

*Marmots.*—I cannot quite agree with Mr. Blanford\* in calling the Red Marmot (*Arctomys caudatus*) the common marmot of Ladák, as it appears to me that the species is only found on the outskirts of that region. I have procured specimens of that species on the range between Kashnür and Tilel (Kishenganga valley), on the pass between Tilel and Drás, and on both sides of the Zoji-Lá, separating the latter place from Kashmir. I have, however, never seen this species in the more interior parts of Ladák, where it appears to me to be replaced by *Arctomys himalayanus*, or the Yellow Marmot, which appears to me to be entitled to be called the "Ladák Marmot" *par excellence*. I have seen or procured specimens of the latter species, from the mountains above Khalchi, on the Indus; on the pass separating the Markha river from the Gia river, to the south of Leh; and, still further south, on Kiang-Chu Maidân, in Rúpsú; to the north of the Indus in Ladák, on the Chang and Kai passes, forming the watershed of the Indus and Shyok rivers; around the Pangong lake; and in the Chang-Chenmo valley. *Arctomys caudatus* seems to me to be confined to the country on the confines of the rainless districts, while *A. himalayanus* occurs only in the inner, and thoroughly Tibetan, districts.

In the field, the two species can be at once distinguished by their respective cries. The cry of the Red Marmot is a peculiar long screaming whistle of great shrillness: the Yellow Marmot on the other hand utters a short chirping bark. It is not easy to convey an idea of the two sounds to the reader, but when they have been once heard in the field, they never can be mistaken for one another.

I should be much inclined to doubt the suggestion of Mr. Blanford† that the marmot said by Dr. Stoliczka to range up to a height of 17,000 feet in Ladák is *A. caudatus*; it is much more likely to be *A. himalayanus*, which I have killed above 18,000 feet; the former I have never seen above 14,000 feet (Drás and Tilel pass).

\* Loc. cit. p. 37.

† Loc. cit. p. 39.

IV.—*A Sketch of the History of the Fossil Vertebrata of India.*—  
By R. LYDEKKER, B. A.

(Received January 6th; read February 4th, 1880.)

As far as I am aware, there has not hitherto been written a complete history of the whole Fossil Vertebrate Fauna of India, as far as it is at present known to us, and I have, therefore, thought that it may interest many members of this Society, as well as others, to know something of the extent and affinities of this fauna, without the labour of wading through the various works in which its history is recorded. The history of the Fossil Vertebrata of India is, indeed, intimately connected with this ancient Society, since some of the earliest workers in this branch of enquiry were formerly among its members, and many of the results of their labours are to be found scattered through its earlier records. Pre-eminent among those workers will always stand out the names of Baker, Durand, Cautley, Colvin, Falconer, Hislop, M'Clelland, and Spilsbury. And it must always be remembered, to their honour, that these workers in this most interesting department of palæontology were solely amateurs, and that in their time the study of vertebrate palæontology in this country was enumbered with difficulties of which we, at the present day, can have no adequate conception. The labours of Mr. Hislop were mainly expended in searching the Gondwana rocks of the Central Provinces, from which he obtained many interesting remains of reptiles, batrachians, and fishes; Col. Sykes' collections were chiefly made among the fossil fishes of the Deccan; while the field of labour of the other workers lay mostly among the mammaliferous beds of Northern India, and the Narbada (Nerbudda) valley.

I very much regret to say that since these illustrious workers, no amateurs in India seem to have entered upon this interesting field of research, and during the five years which I have been upon the staff of the Geological Survey of India, we have not, I believe, received, in the Indian Museum, a single fragment of a fossil vertebrate from a non-professional worker. It is partly in the hope that this paper may reach the eye of amateurs interested in natural science, and especially of those who lead a wandering life in India, and induce them to endeavour to collect specimens of vertebrate fossils for the Indian Museum, that it has been penned.

Apart from members of the Geological Survey of India, to whom I shall refer presently, there are other workers who, though not members of this Society, have contributed largely to the history of the extinct verte-

brate life of India. Noticeable among these are the names of Buckland, Crawfurd, and Clift. Crawfurd, on his return from his mission to the court of Ava in 1826, brought back some Tertiary mammalian remains from the valley of the Irawadi, which were among the first obtained in Asia by Europeans, and which were subsequently described by the late Mr. Clift in the 'Transactions of the Geological Society of London.\*' In the same volume of the 'Transactions,' a memoir was also published by the late Dr. Buckland on the Ava bones. Another memoir also appeared in the same volume by Mr. Pentland, on certain mammalian remains from the Siwaliks of Sylhet, collected by Sir T. Colebrooke. As you are doubtless aware, the fossil vertebrate fauna of the Siwaliks and the newer Narbadas, were subsequently fully illustrated, and in part described, by our former illustrious associates, Falconer and Cautley, the results of whose labours are abundantly dispersed through our Society's publications, and displayed in that now classic work the 'Fauna Antiqua Sivalensis.'

Dr. Charles Murchison, the editor of the 'Palæontological Memoirs' of Dr. Falconer, has rendered one of the most important services to the cause of vertebrate palæontology in this country, by collecting and publishing the scattered notes and memoirs of that distinguished palæontologist. Professors Owen and Huxley have contributed largely to our knowledge of the fossil Reptilia and Batrachia of India; while the fossil fish have been enriched either by the discoveries or the writings of Messrs. Egerton, Miall, Sykes, and Walker.

A valuable memoir on the extinct Siwalik genus *Sivatherium* was contributed to the 'Geological Magazine' by Dr. Murie; another on *Bramatherium*, by Mr. Bettington and Professor Owen, to the 'Journal of the Royal Asiatic Society.' A few Siwalik fossils collected by the Messrs. Schlagintweit were described in the German 'Palæontographica' by the late H. von Meyer. The late Dr. J. E. Gray also determined a few of the Indian fossil reptiles. Professor A. Milne-Edwards determined some Siwalik bird-bones. Some mammal-bones from the Tibet Tertiaries were determined by Mr. Waterhouse.

Among the later contributors to our knowledge of the fossil vertebrata of India must be mentioned Professor Rüttimeyer, who has afforded valuable information on the Siwalik ruminants in the British Museum; and Mr. P. N. Bose, who has described some of the fossil Siwalik Carnivora in the same collection. Mr. Davies, of the British Museum, has also contributed to the 'Geological Magazine' a valuable paper on Siwalik birds. Professor Leith Adams has published some notes on *Elephas namadicus* in the Palæontographical Society's publications.

The above names are only the chief among the workers in Indian

\* Ser. 2, Vol. II.

vertebrate palaeontology who are unconnected with the Geological Survey of India. Of the former or present officers of that department, I must mention, among discoverers, the names of Messrs. W. T. and H. F. Blanford, Fedden, Foote, Hacket, Hughes, Medlicott, Theobald, Tween, and Wynne, and, among writers, Messrs. W. T. and H. F. Blanford, Foote, Oldham, Stoliczka, Theobald, Waagen, and, lastly, myself.

Minor contributions, in the way both of specimens and papers, have been made by other gentlemen, all of whose names it would be both tedious and difficult to bring together, but for whose exertions the workers in this branch of enquiry have, none the less, good cause to be grateful. Among these names I may mention, Bell, Dr. (Ichthyolite from Kach); Blyth, E. (Siwalik Mammals); Burney, Col. (Ava Vertebrates); Burt, Lieut. (Jamna Bones); Cantor, T. (Siwalik fish-skull); Carter, Dr.; Colebrooke, Sir T. (Tibet Tertiary Mammals); Dawe, W. (Tertiary Vertebrates); Dean, E. (Jamna Mammals); Everest, Rev. R. (Siwalik Vertebrates); Felix, Major, (Narbada Mammals); Foley, Capt. (*Diodon* from Ramri Island); Frazer, Capt. (Narbada Mammals); Fulljames, Capt. (Perim Mammals); Godwin-Austen, Col. (Siwalik Mammals); Gowan, Major (*Archegosaurus* from Bijori); Hügel, Baron (Perim Fossils); Ewer, W. (Siwalik Vertebrates); Lush, Dr. (Perim Vertebrates); Ousely, Col. (Narbada Mammals); Pepper, Miss (Perim Mammals); Payre, Sir A. (Ava Mammals); Prinsep, J. (Tertiary Mammals); Rivett-Carnac, H. (*Archegosaurus* from Bijori); Royle, (Siwalik Mammals); Sim, Lieut. (*Archegosaurus* from Bijori); Smith, Capt. E. (Jamna Mammals); Strachey, Genl. (Tibet Tertiary Mammals); Trail, Dr. (Tibet Tertiary Mammals); and Verchere, Dr. (Siwalik Mammals).

The extinct vertebrate fauna of India, with the noticeable exception of the mammalian upper Tertiary fauna, is generally remarkable for its extreme poverty; a poverty which may be due in some cases to the want of adequate research, and in others to the small number of fossils preserved in the different strata. Only here and there, in the great Gondwana series of India—which, as far as regards its higher and fossiliferous part, in serial position, in mineralogical composition, and in its fresh-water character, seems to correspond very closely with the Trias-Jura of the Connecticut valley in America,—do we find fossils locally abundant, as the reptiles of the Panchet group, and the fish and reptiles of the Kota-Maleri and neighbouring groups. With the exception of a few Cretaceous reptiles, the fossils from the above-mentioned groups, which are really very few, are the only representatives of the Pre-Tertiary land and fresh-water vertebrate fauna of which we have any traces in India.

In place of the numerous and gigantic dinosaurs of the secondary lands of Europe and America, we have in India only here and there a few bones,

indicating the former existence of a small number of species; while of the more specialized and bird-like dinosaurs of those countries, we have as yet no trace in India; neither of the toothed birds, which present so remarkable a feature in the secondary epoch of America, are there any vestiges in India. The numerous species of the volant and toothed pterodactyls of Europe, and of their toothless representatives in America, are also totally unknown from Indian strata.

Of the gigantic estuarine or marine saurians, so characteristic of the secondaries of Europe and America, Indian strata have hitherto only yielded a few remains of a single *Ichthyosaurus* and *Plesiosaurus*. Of the lower batracians, only a few species are known from the (probably) Triassic rocks of India, and the great number of species so characteristic of the Carboniferous and Trias of Europe are almost totally unrepresented in this country. The marine fish fauna is likewise remarkable for its general poverty.\*

It must, however, be observed that many of the vertebrates which do occur are only known by a single skull, or a tooth, or a few bones or scutes, and it, therefore, seems probable that many other species must have left similarly scattered remains through the strata of India, which from their extremely local distribution have hitherto escaped detection.

No distinctly recognizable traces of mammals have been as yet detected in India below the Nummulitic rocks, and in the latter only by a few generically undeterminable bones; indeed, we meet with no well-developed mammalian fauna till the period of the Upper Miocene and Lower Pliocene, when we suddenly come upon the evidence of the former existence of a vast and varied fauna which is, probably as numerically abundant in its species and genera as any known fossil fauna in the world. Previous to the Tertiary, the whole history of mammalian life in India is a complete blank. The bird-fauna of India, with a few exceptions, is almost totally unknown previously to the present epoch.

The above remarks have an important negative bearing on evolution. We know that the greater part of the peninsula of India has existed as land for an incalculable period of geological time,—at all events from the Triassic epoch, and we further know that in other regions mammals have existed on the globe since the Triassic, and birds since the Jurassic, period. As regards the above two groups of vertebrates, India throws not a single ray of light on their origin. We have not a trace of any one of the curious generalized forms of the Eocene mammals of North America in the strata of India, and yet we cannot think that ancient India was almost without mammalian life till the upper Miocene. It is indeed probable that the lost

\* Marine rocks are absent over most parts of peninsular India, though present in force in Trichinopoly, Kach, Sind, and the Himalaya.

mammals of Secondary and early Tertiary India may have filled many a puzzling gap in the animal series.

It is the same with the reptiles, which were doubtless the dominant forms during the epoch of the Trias-Jura, and which have only here and there left a trace of their former existence in this country. Why may not many forms of those half-birds, half-reptiles have inhabited Secondary India of whose existence we have ample proofs in other countries; and why may not many of such Indian forms have still more closely bridged the gap which even yet exists between birds and reptiles? Great and numerous as are the advancements in uniting the scattered links of the broken chain of vertebrate evolution, it must ever be borne in mind that, while we have evidence of a large Secondary land-surface like India, which has hitherto yielded scarcely any links to this wondrous chain, we must never despair if we find that other countries are still of themselves unable to make the chain extend across all the gaps, owing to the want of a few links. Who shall say that such missing links never inhabited Secondary India, where their remains either still lie buried, or have been for ever lost beyond recovery? I, indeed, imagine that early India must have teemed with reptiles, and perhaps with higher forms of life, for it is inconceivable that this country was ouce mainly a mere forest of plants, of the existence of which we have such ample evidence in the Trias-Jura, unenlivened, except in one or two small spots, by vertebrate life.

I now proceed to sketch what is known of the fossil vertebrates of India, commencing with the lowest class, and tracing it through the various formations from the lowest in which it occurs to the highest; and similarly with the higher classes. I must premise that very many of the Indian fossil vertebrates are only known by extremely scanty remains, and that their affinities are consequently obscure. Of others, again, only very slight preliminary descriptions, without figures, have yet been published, and consequently foreign palæontologists have not yet had the opportunity of comparing them with other species, by which their affinities might be more fully illustrated.

#### FOSSIL FISHES.

*Carboniferous.*—The earliest fishes of which we have at present any record in India are only known by some few teeth and fin-spines, collected by Dr. Waagen and Mr. Wynne of the Geological Survey, in the Salt-Range of the Punjáb, and described by the former writer in the ‘*Palæontologia Indica.*’\* These fish remains were obtained from strata termed by Dr. Waagen the “*Productus-Limestone,*” corresponding in the main to the Carboniferous. *Sigmodus dubius* is a fish belonging to a new genus founded upon a single tooth; this tooth is of an elongated conical form, and much resem-

\* Ser. XIII, parts 1 and 2, 1879-80; the latter part in the press.

bles the teeth of some saurians; it is referred by Dr. Waagen to the ganoids. Another tooth, referred provisionally by Dr. Waagen to the genus *Pocilloodus*, under the name of *P. paradoxus*, is of the flattened cestraicont type. *Psephodus indicus* is a species formed upon the evidence of another tooth. Both these genera belong to the *Cochliodontidae*, which Dr. Waagen classes among the Dipnoi, though they are more generally referred to the Elasmobranchii. Of the undoubted Elasmobranchii (Selachii), Dr. Waagen describes four species, belonging to three genera, from teeth, and four species, belonging to two genera, from fin-spines (ichthyodorulites). Of the teeth, two are referred to a genus (*Helodopsis*) allied to *Helodus*, under the names of *H. elongata* and *H. abbreviata*. A fragment of a tooth is referred, without specific determination, to the European genus *Psammodus*, characteristic of the Carboniferous. A fourth tooth is referred to the European genus *Petalorhynchus*, with the specific name of *P. indicus*: it is extremely doubtful whether *Petalorhynchus* is really distinct from *Petalodus* of the Carboniferous. Of the spines, or "ichthyodorulites," three specimens are referred to the American Carboniferous genus *Xystracanthus*, under the names of *X. gracilis* and *X. major* and *X. giganteus*. If I rightly understand Dr. Waagen's notes, he thinks it possible that these spines may belong to *Helodopsis*. A third spine is referred to a new genus under the name of *Thaumatocanthus blanfordi*.

As far as the evidence of these fishes goes, we find that the cestraicont-toothed sharks were the dominant forms in the Indian, as well as in the European and American Carboniferous.

*Trias-Jura*.—In the upper part of the great Gondwána system of India, which, as I have said, probably corresponds as a whole to the Trias-Jura of other countries, remains of fishes have been found in some abundance, all of which, as far as determined, are of fresh-water types, and belong to the Ganoidci and Dipnoi, no traces of the more modern Teleostei having yet been found in these rocks. The earliest groups of rocks in the Gondwána system in which fish remains have been detected are the Mangli and Srípermatúr groups; but these remains have not yet been even generically identified. In the Kota-Maleri\* group there occur nine species of Ganoids and three of Dipnoi; the former from the Kota beds have been described under the genera *Dapedius*, *Lepidotus*, and *Tetragonolepis* by Messrs. Egerton and Sykes; † many of them show Liassic affinities: the three genera

\* Mr. King has lately shown a distinction between the Kota and Maleri beds; confirming the original distinction as to the Liassic affinities of the fossils of the former, and the Rhæto-triassic of those of the latter.

† Quar. Jour. Geol. Soc. of London, Vols. VII, IX, X. Palæontologia Indica, Ser. IV, part 2.

have a united range in Europe from the Lias to the Eocene: *Lepidotus* is very characteristic of the Wealden of England. Of the Maleri Dipnoi, teeth of four species of the living Queensland genus *Ceratodus* were named by the late Dr. Oldham, three of which have lately been figured by Professor Miall,\* who does not admit the fourth species, *C. oblongus*.

*Cretaceous*.—A few fish-remains have been obtained from the Lameta rocks (of middle Cretaceous age), but are not yet determined. The next group of rocks in which fish-remains have been obtained are the upper and middle Cretaceous rocks of Trichinopoly; these remains have been described by the late Dr. Stoliezka† and Sir Philip Egerton.‡ They comprehend seventeen species of elasmobranchs, ranged under the genera *Corax*, *Enchodus*, *Lamna*, *Odontaspis*, *Otodus*, *Oxyrhina*, *Ptychodus*, and *Sphaerodus*, and one ganoid doubtfully referred to *Pycnodus*. No Teleostei have been described, which is very probably owing to the less facility with which their remains are preserved; it being almost certain that they must have been represented in the Indian Cretaceous seas. The above-named genera are mainly characteristic of the Cretaceous rocks of Europe: two species are common to Europe and India. Bones, apparently of fishes, have been lately obtained by Mr. Griesbach from the Trias of Tibet. Mr. Griesbach tells me that these bones are not uncommon in the Trias limestone, but that he has not yet been able to extract any specimens in a determinable condition.

*Eocene*.—From the probably Nummulitic rocks of Port Blair, in the Andamans, and Rámri Island, off the Arakan coast, there have been obtained the oral teeth of a large species of *Diodon*, which I have lately provisionally called *Diodon foleyi*, after Captain Foley, the discoverer of the Rámri Island specimen.§ The living *Diodon hystrix* is now abundant off the coasts of the Andamans and Arakán, where the genus has doubtless lived since the Eocene. From Nummulitic rocks in the neighbourhood of Thyatmyo, cycloid fish-seales have been obtained,|| but are not generically determined.

From the Nummulitics of the Punjáb, some fish-scales and the dental plate of a species of ray (*Myliobatis*) have been obtained by Mr. Wynne.¶ From strata immediately overlying the Nummulitics of Kohát, Mr. Wynne has obtained the incisor of a sparoid fish belonging to the genus *Capitodus*, which has been recently described by myself as *C. indicus*;\*\* the genus

\* Palæontologia Indica, Ser. IV, part 2.

† Ibid., Cretaceous Fauna of S. India, Vol. IV.

‡ Quar. Jour. Geol. Soc. Lon. Vol. VII.

§ R. G. S. I. Vol. XIII, part I.

|| Manual of Geology of India, p. 716.

¶ R. G. S. I. Vol. X, p. 43.

\*\* Ibid. Vol. XIII, part I.

*Capitodus* was previously only known from the Mioocene of Vienna and Silesia, and is allied to the living genus *Sargus*.

*Mio-Pliocene*.—From the Siwalik rocks there were, I believe, a considerable number of fish-remains procured by Falconer and Cautley, but these were never described: the collection of fossil fish-remains from the Siwaliks in the Indian Museum is but small. Among the Teleostei, we have the siluroids represented by a very perfect skull, originally described in the Society's Journal\* by Dr. Cantor as the skull of a huge frog: subsequently this skull was referred by M'Clelland† to the siluroid fishes. The latter writer describes the skull as being remarkable for its great breadth, and as carrying teeth on the jaws, but not on the palate: M'Clelland also thought that the skull might belong to a species of *Pimelodus*: this determination is, I think, certainly erroneous, because the latter genus, with one African exception, is entirely West Indian, and it is unlikely that a fresh-water genus of fishes should be found in the Pliocene of India, and now only in Africa and the West Indies. Many of the living Indian siluroids (*Clarius*, *Heterobranchus*, *Silurus*, *Silurichthys*) have palatal teeth, and the fossil cannot, therefore, belong to any of those genera. The Indian genus *Chaca*, on the other hand, is characterized, according to Dr. Günther,‡ by its exceedingly broad and depressed head, and absence of palatal teeth, and I think, therefore, it is not improbable that the fossil may belong to that genus, though, in the absence of specimens for comparison, I cannot be sure. Detached vertebræ, from the Siwaliks, also indicate the existence of teleostean and, probably, fresh water fishes, but of what group is uncertain. Of the Elasmobranchii, a few teeth indicate the former existence of a Siwalik *Lamna*, which probably inhabited the larger rivers: a single tooth from the mammaliferous beds of the Irawadi belongs to a species of *Carcharias*, and large squaline vertebræ have been obtained from Perim Island. From the Siwaliks of Sind and the Punjab, we have some crushing palatal teeth of an undescribed fish, which I have lately sent home for determination.

Scales of teleostean fishes have been obtained by Col. Godwin-Austen from the Tertiaries or post-Tertiaries of Kashmir; they are not, however, determined.

The above notes indicate the extreme poverty of the fossil fish-fauna of India—a poverty, I think, in great part due to the want of sufficient search.

\* Vol. VI, p. 583.

† Calc. Jour. Nat. Hist. Vol. IV, p. 83.

‡ Brit. Mus. Cat. of Fishes, Vol. V, p. 29.

## FOSSIL BATRACHIANS.

*Trias-Jura*.—We now come to the history of the fossil Batrachia (Amphibia), where we shall find an equal poverty of species and genera; such as are known being merely, in all probability, a few relics left from a large fauna. The oldest Indian batrachians, like their European and American contemporaries, belong to the labyrinthodont order, characterized by the peculiarly infolded structure of their teeth. The oldest form of the order in India is only known from an undescribed skeleton obtained from a group of the Gondwána system at Bijori, hence named by Mr. Medlicott the Bijori group.\* This skull was originally exhibited before our Society in 1864, and commented upon by Mr. H. F. Blanford, who thought that it should be referred either to *Archegosaurus* or *Labyrinthodon*,† adducing some evidence to shew that it belonged to the former genus. Subsequently, the specimen was alluded to as a true *Archegosaurus* by the late Dr. Oldham,‡ and still later by Mr. Medlicott.§ I cannot discover what has become of this most interesting fossil, which is certainly not in the collection of the Indian Museum, where it is only represented by a cast. Judging from this cast, I think it not improbable that the specimen really does belong to *Archegosaurus*: it much resembles a skull of that genus from the European Carboniferous figured by H. von Meyer.|| The European species being from the Carboniferous rocks does not at all preclude the Indian species from being of Triassic age, since there is considerable difference in the range in time of the Pre-Tertiary land faunas and floras of the two countries; genera having very frequently survived to a later period in India than in Europe.

From the Panchet group of the Gondwánas, we have two labyrinthodonts, to which the generic names *Pachygonia* and *Gonioglyptus* have been applied by Professor Huxley;¶ these genera are only known by fragmentary skulls and jaws; they were slender-jawed forms and allied to the labyrinthodonts of the Keuper. They are classed by Professor Miall in the group Euglypta with *Mastodonsaurus* and *Capitosaurus*. The fossils on which the two above-named Indian genera were founded are in the collection of the Indian Museum. From the nearly contemporaneous Mangli group, we have another labyrinthodont, *Brachyops laticeps* of Owen, also belonging to a genus otherwise unknown, and allied to European Jurassic, and African

\* M. G. S. I. Vol. X, p. 159, (art. II, 27.)

† J. A. S. B., Vol. XXXIII, p. 337.

‡ R. G. S. I. Vol. IV, p. 70.

§ Loc. cit.

|| Palæontographica, Vol. VI, pl. XI, fig. 5.

¶ Pal. Ind. Ser. IV. part 1.

and Australian (probably) Triassic forms. The skull on which the genus is founded was described by Professor Owen.\* The European Jurassic genus to which it is allied is *Rhinosaurus*, the African (Triassic ?), *Micropholis*, and the Australian, *Bothriceps*; the genus seems to me to be also closely allied to *Tullitanus radiatus* of the American Carboniferous. *Brachyops* belongs to the short-jawed group of labyrinthodonts; and, with the first three above-mentioned genera, constitutes the group "Brachyopina" of Professor Miall. The skull of *Brachyops* is, I believe, in the collection of the Geological Society of London: it is represented by a plaster cast in the Indian Museum.

*Tertiary.*—From the Trias to the Tertiary is a long leap, but hitherto no batrachian remains have been found in India between these two formations. In the lower Tertiaries of the island of Bombay, there occur a large number of the remains of frogs belonging, apparently, to two species. The smaller of these two species was first described by Professor Owen† under the name of *Rana pusilla*; subsequently, however, Dr. Stöliczka,‡ from the absence of vomerine teeth and from the structure of the limbs, referred the species to the genus *Oxyglossus*, at the present time living in China and Siam, and, possibly, in India. A larger frog from the same beds, noticed by Professor Owen in the same paper, has not yet been generically determined. I believe that these Bombay frogs are the oldest representatives of the group.

#### FOSSIL REPTILES.

*Trias-Jura.*—The oldest members of the class Reptilia hitherto found in India belong to the orders Dinosauria and Dieynodontia (Anomodontia), and occur in the presumably Triassic rocks of Panehet near Rániganj, in the horizon known as the "Panehet group." The *Dieynodon* was originally described by Professor Huxley§ under the name of *D. orientalis*; additional remains have subsequently been described by myself,|| which show that this species belonged to the sub-genus *Ptychognathus* of Professor Owen. Other remains noticed in the latter memoir, seem to indicate the former existence of a second and larger species of *Dieynodon*. This group of reptiles seems, on the whole, to be characteristic of the Trias of India, Russia, and Africa. The dinosaur has been named *Ankistrodon indicus* by Professor Huxley,¶ and is the only known representative of the

\* Q. J. G. S. L. Vol. XI, p. 37.

† Ibid. Vol. V, p. 173.

‡ M. G. S. I. Vol. VI, p. 387.

§ Pal. Ind. Ser. IV, Vol. I, part I.

|| Ibid. part 3.

¶ Loc. cit.

genus. The teeth of *Ankistrodon*, of which only two are known, have laterally compressed crowns, with serrated edges, like those of the dinosaurian *Megalosaurus* and the mammalian *Machærodus*, and are implanted in distinct sockets. The genus is allied to the Jurassic and Cretaceous *Megalosaurus*, and to various Triassic genera.

From the Denwa group of the Gondwana system, a large crocodilian scute has been obtained by Mr. Hughes,\* which seems to belong to Professor Huxley's undescribed genus *Parasuchus*.

From the neighbouring Kota-Maleri group, we have the crocodilian *Parasuchus* and the lacertian *Hyperodapedon*. The genus *Parasuchus* has never been described, but only incidentally alluded to by Professor Huxley†; it was formed for the Kota-Maleri bones: it seems to have been closely allied to the Triassic *Belodon* and *Stagonolepis*. On labels attached to the bones of *Parasuchus*, now in the Indian Museum, there occurs the specific name of *hislopii*, in Professor Huxley's handwriting. *Hyperodapedon*‡ is closely allied to the living genus *Hatteria* (*Sphenodon*), represented by two species in the New Zealand Islands, and, according to Professor Huxley, to the Triassic *Rhynchosaurus*, though this is doubted by Professor Owen.

From the undoubtedly Jurassic rocks of Kach (Caehh), there has been obtained (Chári group) a vertebra which I think very probably belongs to *Parasuchus*, though I cannot be certain;§ and (Umia group) a fragment of a lower jaw of a *Plesiosaurus*, which I have named *P. indicus*:|| the specific affinities of the latter cannot be fully determined from the fragment.

*Cretaceous*.—From the Cretaceous rocks of India, we have, among the Dinosauria, a species of *Megalosaurus*, certainly from the Trichinopoly, and probably from the Lameta rocks (middle Cretaceous);¶ this genus is only known in India by detached teeth; in Europe, it ranges from the Jurassic to the lower Cretaceous (Wealden). From the Lameta rocks, there have also been obtained the remains of another gigantic genus of dinosaur, allied to the Wealden *Pelorosaurus* and the Jurassic *Cetiosaurus*, which I have named, from the great size of the bones, *Titanosaurus*;\*\* from the evidence of the vertebrae, there appear to have been two species, *T. indicus* and *T.*

\* Pal. Ind. Ser. IV. part 3.

+ Q. J. G. S. L. Vol. XXVI, p. 49, XXXI, p. 427.

‡ Ibid. XXV, p. 151.

§ R. G. S. I. Vol. X, p. 35.

|| Pal. Ind. Ser. IV, part 3.

¶ Ibid.

\*\* Ibid.

*blanfordi*. *Titanosaurus* was a gigantic and, probably, land reptile, but whether bipedal or quadrupedal is not known. Remains of another, but much smaller, reptile have been also obtained by Mr. Hughes from the Lameta rocks; the remains are, however, not sufficient for generic determination, but I think it not impossible that they may have belonged to a dinosaur.

Of the Cretaceous Crocodylia, we only know of one species by some amphicoelian vertebra and scutes obtained by Mr. W. T. Blanford from the upper Cretaceous rocks of Sind.\* As far as I can judge, from these imperfect remains, they appear to indicate an animal allied to *Suchosaurus* of the Wealden of England.

The Chelonia are only known to have existed in India during the Cretaceous period by the evidence of some broken plates, in the collection of the Indian Museum, obtained from the Lameta group, from the intra-Trappeans of Rajamahendri (Rajamundry), and from the upper Cretaceous rocks of Sind. These remains are in far too imperfect condition for even generic determination.

A large species of *Ichthyosaurus*, which I have called *I. indicus*,† is known solely by a few vertebræ collected by Mr. Foote in the middle Cretaceous rocks of Trichinopoly. *Ichthyosaurus*, in England, ranges from the Lias to the Chalk.

*Eocene*.—The only specifically known Eocene Indian reptile with which I am acquainted, has been referred by the late Dr. Gray‡ to the genus *Hydraspis* belonging to the family Emydidæ. The specimen on which the determination rests is a carapace, from the intra-Trappean rocks of Bombay, originally named by Mr. Carter *Testudo leithii*. The genus *Hydraspis* is now found living exclusively in Tropical America. From the Nummulities of the Punjab, remains of Crocodylia have been obtained by Messrs. Theobald and Wynne, of the Geological Survey, but are not generically determined.

*Mio-Pliocene and Pleistocene*.—From the Mio-Pliocene Siwaliks and from the Pleistocene Narbadas, a considerable number of reptilian remains have been obtained, but, in many cases, have not yet been described. Remains of Crocodylia have been obtained in considerable numbers from the Sub-Himalayan Siwaliks and from the corresponding rocks of Burma, Perim Island, and Sind; and many of them have been named by Falconer. Of the genus *Crocodylus*, a Siwalik species has been identified with the living *C. palustris (bombifrons, Gray)*.§ Remains of a crocodylian have

\* Pal. Ind. Ser. IV. part 3.

† Ibid.

‡ Ann. Mag. Nat. Hist. Ser. IV, Vol. VIII, p. 339.

§ Cat. Foss. Vert. A. S. B. p. 200. The cranium there named *C. paleindicus* seems to belong to *C. palustris*.

also been obtained from the Irawadi and the Narbada, but their specific determination is difficult. Of the genus *Gharialis* (*Leptorhynchus*), one Siwalik species has been identified with the living *G. gangeticus*; a gharial from the Manchhars of Sind also belongs to this species. Another long-jawed Siwalik erocodile with slender teeth has been named *Gharialis leptodus*; and another with much shorter jaws and teeth, *G. crassidens*; the latter has been obtained from the Siwaliks and from Sind.

Of the order Lacertilia, only one Siwalik representative is known, belonging to the genus *Varanus*, and named by Falconer *V. sivalensis*.\* This determination was made on the evidence of a distal extremity of the humerus, now in the British Museum.

The Opbidia are only known by some vertebræ, much like those of the genus *Python*, obtained from the Siwaliks of the Punjáb and Sind: these vertebræ have not yet been generically determined.

The Chelonia are known by a considerable number of Siwalik, and two Narbada, species. Of the land tortoises, we have, firstly, the gigantic extinct species, *Colossochelys atlas* of Falconer and Cautley, from the Siwaliks and the Irawadi. Falconer says that the fossil species is mainly distinguished from the living genus *Testudo* by the thickening of the anterior (episternal) portion of the plastron; this character was considered to be only of subgeneric value, and I think the species might well be named *Testudo atlas*. The length of the carapace, according to Falconer's restoration, is 12 feet 3 inches, and of the entire animal with the head and tail extended, 22 feet. In addition to *Colossochelys*, there is good evidence of the former existenece of other gigantic tortoises in the Siwalik period. In the Indian Museum, there are several specimens of the ankylosed episternals of tortoises belonging to two distinct species. These bones are as thick, but not so elongated, as the episternals of *Colossochelys*; they have diverging but shorter extremities than in the latter genus. The animals to which these bones belonged must have been, I think, two-thirds as large as *Colossochelys*, and may not improbably have belonged to *Testudo*. A broken episternal indicates a third, but smaller species. A fourth species is indicated by three episternals, which are not bifurcated at their free extremities: these bones indicate a smaller animal. The episternal bones, from their solidity, seem more frequently preserved than any others. A single carapace of a small tortoise in the Indian Museum, from the Siwaliks, seems to belong to the genus *Testudo*. Among the hard-shelled emydine tortoises, we have, from the Siwaliks, a species of *Bellia* described by Mr.

\* Pal. Mem. Vol. I, pl. XXXII, figs. 4-7.

Theobald\* under the name of *B. sivalensis*. This species, according to Mr. Theobald, is very closely allied to *B. erassicollis*, which, according to the same writer,† inhabits Tenasserim, Siam, and Sumátra. The other living species (*B. nuchalis*) inhabits Jáva. Another carapace of a Siwalik emydine, in the Indian Museum, seems to belong to a second species of *Bellia*. In labels on the casts of Siwalik fossils from the British Museum, a three-ridged carapace of an emydine bears the name of *Emys hamiltonoides* (Fale. and Caut.): this name was doubtless given from the resemblance of this carapace to that of the living *Damonina* (*Emys*) *hamiltouii*, now inhabiting Lower Bengál: the generic name of the fossil should probably be *Damonina*. An imperfect carapace, collected by Mr. Theobald in the Siwaliks of the Punjáb, and now in the collection of the Indian Museum, seems to belong to *Emys* proper. Mr. Theobald has lately described,‡ under the name of *Cautleja annuliger*, a gigantic Siwalik emydine, from the evidence of a single marginal bone; the genus is said to be distinguished from all other emydines by the cartilaginous, in place of osseous, union of the marginal with the adjoining bones. In the family *Batagurida*, Dr. Falconer determined the identity of a Siwalik emydine with *Pangshura* (*Emys*) *tectum* of Bell§; subsequently, the species was shown by Dr. Stoliczka|| to occur in the newer Narbada deposits also: *Pangshura tectum* now inhabits Lower Bengál. Of the genus *Batagur*, a part of a plastron from the Narbada has been thought by Dr. Stoliczka¶ to belong very probably to *B. dhongoka*, now found living in the Narbada. Remains of a large *Batagur*, from the Siwaliks, are contained in the collection of the Indian Museum, but have not yet been specifically determined. A small carapace, with a ridge on the vertebral plates, lately presented by the Rúrki Museum to the Indian Museum, very probably belongs also to *Batagur*. Of the soft-shelled river-tortoises, a *Trionyx* from the Narbada has been thought by Dr. Stoliczka\*\* to be not improbably identical with the living *T. gangeticus*. Plates of an undetermined *Trionyx* have been obtained in considerable numbers from the Sub-Himalayan Siwaliks, and from those of Burma and Perim Island. A carapace of an *Emyda* in the British Museum, from the Siwaliks, has been identified by Dr. Gray with the living *Emyda vittata* (*ceylonensis*, Gray). This species, according to Mr. Theobald, inha-

\* R. G. S. I. Vol. X, p. 43.

† Catalogue of Reptiles of India, p. 10.

‡ R. G. S. I. Vol. XII, p. 186.

§ Pal. Mem. Vol. I, p. 382.

|| R. G. S. I. Vol. II, p. 39.

¶ Loc. cit.

\*\* Loc. cit.

bits Central and Southern India and Ceylon. In the Indian Museum there are numerous remains of *Emyda* from the Siwaliks of the Punjáb, Burma, and Perim Island, which may or may not belong to the last-named species.

*General Remarks.*—The foregoing notes will show that the fossil reptiles of India are noticeable for the extreme paucity of species known, and for the fragmentary remains of the known species. The Mesozoic Reptilia belong, as far as described, to extinct genera: the one known Eocene reptile (*Hydraspis*) belongs to a living genus, but one which is now far removed from India. The Siwalik (Mio-Pliocene) reptiles appear in great part to belong to living Indian genera, and in many cases to living species; the modern representatives are, however, in most cases, found no longer in the Sub-Himalayan districts, but are now confined to Southern India. The Narbada fossil reptiles, in all probability, belong altogether to living species, and probably to species inhabiting the same district.

#### FOSSIL BIRDS.

*Mio-Pliocene.*—Fossil remains of birds have hitherto been found in India only in the Sub-Himalayan Siwaliks, and there only in comparatively small numbers. Some of their remains are in the Indian Museum, and have been partly described by myself,\* while others are in the British Museum, and have been lately described by Mr. Davies.† Among the carinate birds, a tarso-metatarsus is considered by Mr. Davies to belong to a cormorant, possibly of the genus *Graculus*.‡ A species of pelican (*Pelecanus cautleyi*) is indicated by a fragment of an ulna; this bird, according to Mr. Davies, must have been somewhat smaller than the living Indian *P. mitratus*. Another part of an ulna has been referred to a new species (*Pelecanus sivalensis*) by Mr. Davies, with a reservation as to the generic determination. A gigantic wader has been described by myself, under the name of *Megaloscelornis sivalensis*, from the evidence of a sternum and tibio-tarsus. A distal extremity of a large bird humerus in the Indian Museum, collected by Mr. Fedden in Sind, has a diameter of 2 inches across the condyles: I cannot at present identify this bone with the humerus of any living genus of bird: from its size it might belong to *Megaloscelornis*; it makes some approach to the humerus of *Ploteus*. A species of adjutant has been named by Milne-Edwards *Argala falconeri*.§

\* R. G. S. I. Vol. XII, p. 52.

† Geol. Mag. January 1880, p. 18.

‡ This bone was doubtfully referred by M. Edwards to *Phaëton*.

§ The bone in the British Museum referred to by myself on page 56 of the above quoted paper belongs to this species.

There are also two small undetermined bird bones in the Indian Museum. The Struthioid or Ratitian modification of bird structure appears to have been represented by three Siwalik species; *viz.*, an ostrich (*Struthio asiaticus*) indicated by some of the bones of the lower leg and foot and by vertebra: an emeu (*Dromæus sivalensis*), by bones of the foot: and, according to Mr. Davies, a three-toed bird, intermediate between these two genera, by a single phalangeal bone. The living ostrich is confined to the African continent, and the emeu to New-Holland; the occurrence of fossil species of these genera in the higher Tertiaries of India, probably points to a late land connection between these countries.

#### FOSSIL MAMMALS.

*Eocene.*—No traces of mammals have hitherto been detected in India below the Eocene, and in the latter formation only some fragmentary bones have been obtained by Mr. Wynne in the Nummulitics of the Punjáb. The only determinable bones consist of the distal portion of the femur and metatarsals of a probably perissodactyle animal, and the astragalus of an artiodactyle.\* The femur was obtained from the Nummulitic (Subáthú) zone of the Punjáb, while the astragalus was obtained immediately above the Nummulitic clays of Fatehjang in the Punjáb, which are probably of upper Eocene age. The astragalus seems certainly to be that of a ruminant, as it belonged to an animal in which the navicular and cuboid bones were united. If this determination be correct, ruminants existed in the upper Eocene period.

*Mio-Pliocene.*—The Tertiary ossiferous rocks of Perim Island, Sind, the Punjab, the Sub-Himalayan Siwaliks, Sylhet, Tibet, and the valley of the Irawadi, have yielded a large number of mammalian and other vertebrate fossils, many of which are represented in the collection of the Society, now transferred to the Indian Museum. The fossils of the Irawadi valley were first brought to notice by Crawford and Clift, while those of the typical Siwaliks were rendered classic by the labours of Falconer and Cautley, and other former members of this Society. Some of these fossiliferous beds are of Mioecene, and others of Pliocene age, and an admirable *resumé* of their distribution and relations are given in the ‘Manual of the Geology of India,’ to which work I must refer my readers desirous of further information on this subject.

The Siwalik Primates are at present known merely by a few fragments of upper and lower jaws and teeth, and it is probable that more species remain to be discovered. The known forms comprehend a large anthropoid ape, which has been named *Palæopithecus sivalensis*;† this

\* R. G. S. I. Vol. IX, p. 92. In that passage the words “mammaliferous clays,” should be “nummuliferous clays.”

† R. G. S. I. Vol. XII, p. 38.

species is known by the palate of a female and the canine of a male, and seems to have been allied to the living orang of Borneo, but is distinguished by the form of its premolars; two species of (probably) *Semnopithecus* and two of *Macacus*\* have also been determined.

Among the Carnivora, we have a large tiger (*Felis cristata*)† characterized by its large sagittal crest; a second species has lately been described by Mr. P. N. Bose under the name of *F. grandicristata*,‡ with a still larger crest; while a third and much smaller species is indicated by a lower jaw in the Indian Museum. Of the genus *Machairodus* (*Machærodus*), there is *M. sivalensis* of Falconer and Cautley, said by Mr Bose to be equal in size to the jaguar, and a larger species described by the same writer under the name of *M. palæindicus*. The genus *Pseudæurus*, distinguished from *Felis* by the presence of an additional lower premolar, is known by one lower jaw, which I have referred to a new species under the name of *P. sivalensis*.§ Among the civet-like animals, we have *Viverra bakeri* of Mr. Bose, said to be closely allied to the living civet, and *Ictitherium sivalense* described by myself from a lower jaw.|| The hyænas are represented by *Hyæna sivalensis* of Falconer and Cautley, said by Mr. Bose to present relationship both to the Indian *H. striata* and the African *H. crocuta*; and *H. felina* of Mr. Bose, distinguished by the absence of the first upper premolar. The dogs, according to the same writer, are represented by two species of *Canis* (*C. curvipalatus* and *C. cautleyi*), the latter closely allied to the wolf; there is a specimen of the palate of a *Canis* in the Indian Museum, but I am at present unable to say whether it belongs to either of the above species. The genus *Amphicyon*, distinguished from *Canis* by the presence of an additional upper molar, is represented by *A. palæindicus*,¶ remains of which have been obtained from Sind and the Punjáb. The bears are known by a single undescribed cranium of *Ursus* in the Indian Museum, and by the remarkable genus *Hyænuarctos*, of which two species are known: *H. sivalensis*\*\* was the original species on which the genus was founded, and has the upper molars with quadrangular crowns; a tooth apparently belonging to this species has been described by Professor Flower from the newer Pliocene (Red Crag) of

\* R. G. S. I. Vol. XII. p. 92.

† Pal. Mem. Vol. I, p. 315. In manuscript the name of *Felis palæotigris* occurs.

‡ Of this and five other species of Siwalik Carnivora, described by the same writer, I have only seen the notice given in 'Nature,' Jan. 1st, 1880.

§ R. G. S. I. Vol. X, p. 83.

|| Ibid. p. 32.

¶ Pal. Ind. Ser. X, Vol. I, p. 84. *Megalotis* (*Otocyon*) normally agrees with *Amphicyon* in having three upper true molars: it may, however, according to Prof. Flower, have four of these teeth.

\*\* F. A. S. pl. O.

England: the second species, named by myself *H. palæindicus*,\* is known only by an upper jaw, not yet figured; the upper molars of this species have triangularly shaped crowns, somewhat like those of *Amphicyon*. Of the subursoid Carnivora, we have the living Indian and African genus *Mellivora*, represented by *M. sivalensis*,† apparently very closely allied to the living Indian species. A species of badger (*Meles*) is indicated by one lower jaw collected by Mr. Theobald.‡ Of the otters, one species of *Lutra* (*L. palæindica*) has been named by Falconer and Cautley from a skull and lower jaw§; another lower jaw in the Indian Museum, collected by Mr. Theobald, not improbably belongs to a second Siwalik species. *Enhydriodon*|| is a genus peculiar to the Siwaliks, and is allied to the living sea-otter (*Enhydria*) now inhabiting the shores of the North Pacific; the Siwalik genus was not improbably a river-dwelling form.

Of the Proboscidea, now represented only by the Indian and African elephants, there were a large number of Siwalik species, belonging to the genera *Elephas*, *Mastodon*, and *Dinotherium*. Of the first-named genus, there were three sub-genera living in Siwalik times, viz., *Euclephas*, *Loxodon*, and *Stegodon*. *Euclephas* was represented by *E. hysudricus*, provided with simpler molars than the living representative of the sub-genus; *Loxodon* was represented by *L. planifrons*, remarkable for being the only species of elephant in which premolars are known to have been developed. The sub-genus *Stegodon* is peculiar to South-Eastern Asia, and was represented by four species in the Sub-Himalayan and other Indian Siwaliks: these species are named *S. ganesa*, *S. insignis*, *S. bombifrons*, and *S. eliftii*. The molars of the two first are more complex than those of either of the other two, and are indistinguishable from each other; the skull of the first species is distinguished by its enormously developed tusks. The intermediate molars of *S. eliftii* have not more than six ridges each. From (probably) Pliocene deposits in China, two stegodons have been described by Professor Owen under the names of *S. sinensis* and *S. orientalis*, which appear to be respectively the same as *S. eliftii* and *S. insignis*.¶ Of the mastodons, five species, *M. sivalensis*, *M. latidens*, *M. perimensis*, *M. paudionis*, and *M. falconeri*, have been described from the Mio-Pliocene of India: the three first-named species belong to the tetralophodont, and the two last to the trilophodont, sub-division of the genus: the two first-named species have a tendency to a pentalophodont molar formula. Of the European

\* R. G. S. I. Vol. XI, p. 103.

† Ibid. p. 102: named in 'F. A. S.' *Ursitaxus*.

‡ R. G. S. I. Vol. XI, p. 102.

§ F. A. S. suppl. pl. Pl.

|| Ibid.

¶ Pal. Ind. Ser. X, Vol. I, pt. 5 (in the press.)

Miocene genus *Dinotherium*, three species, *D. indicum*, *D. pentapotamiæ*, and *D. siviense*, have been described from the Indian Mio-Pliocene: the last species presents a remarkable approximation to the mastodons in the form of its mandible.\*

The perissodactyle modification of the great order Ungulata is well represented, both in genera and species, in the Indian Mio-Pliocene. Of *Rhinoceros* there are four named species, *R. iravadiensis*, *R. sivalensis*, *R. palæindicus*, and *R. platyrhinus*; † the molars of the two first are constructed on the type of those of *R. sumatrensis*; those of the last on the type of those of *R. indiens*; *R. sivalensis* and *R. palæindicus* were unicorn, and *R. platyrhinus* was bicorn. Bones of one species have also been obtained from Tibet. The hornless rhinoceroses were represented by *Acerotherium perimense*, of which there is a fine undescribed skull from the Punjab in the Indian Museum. ‡ It is doubtful if the genus *Tapirus* is represented in the fossil state in India; a symphysis of a mandible has been figured in the second volume of the second series of the 'Transactions of the Geological Society of London' by the late Mr. Clift, and referred to *Tapirus*, but I think the determination is at least open to doubt. Molars of *Listriodon* were described in MSS. by Falconer under the name of *Tapirus* and so published in the 'Palæontological Memoirs.' § The genus *Listriodon* || is represented by two species, *L. pentapotamiæ* and *L. theobaldi*. The genus *Chalicotherium* is represented by one species (*C. sivalense*), ¶ presenting some peculiar points in its dentition: this genus has till lately been classed with *Anoplotherium* among the Artiodactyla, but Professor Cope has lately come to the conclusion that it is a perissodactyle allied to *Palæotherium*. The horses are represented by the genera *Equus* and *Hippotherium* (*Hipparion*). *Equus* is known by a Siwalik species (*E. sivalensis*), \*\* never fully described, and by one from the Tibetan

\* For figures and descriptions of the Indian fossil Proboscidea, see F. A. S. and Pal. Ind. Ser. X, Vol. I, pt. 5 (in the press): a jaw of *D. pentapotamiæ* was described as *Antolotherium* by Falconer.

† F. A. S. and Pal. Ind. Ser. X, Vol. I.

‡ Some molars of this species were described by myself under the name of *Rhinoceros planidens*. *R. Sivalensis* has lately been made the type of a new genus *Zalabis* by Prof. Cope, but on insufficient grounds.

§ Vol. I, p. 415.

|| Pal. Ind. Ser. X, Vol. I. and R. G. S. I. Vol. XI, p. 98 I have followed Professor Cope in classing this genus with the tapirs; Kowalewsky was inclined to place it among the artiodactyles.

¶ Pal. Mem. Vol. I, pl. XVII.

\*\* Professor Huxley (Q. J. G. S. L. 1870, Presid. Address) remarks that some of the Siwalik horses show traces of a "larnial" cavity on the skull. I do not know whether this remark applies to the Siwalik or Narbada horse, but probably the former as the older.

Tertiaries : of *Hippotherium*, there are two Siwalik species, *H. antilopinum* and *H. theobaldi*\*: remains of the genus have also been obtained from Tibet. M. Gaudry remarks† that the Siwalik *Hippotheria* have no lateral digits; this may possibly be the case with *H. antilopinum*, but it is certainly not so with the larger *H. theobaldi*, of which there is a nearly complete tridaetyly foot in the Indian Museum. *H. theobaldi* has not yet been fully described; it is very like *H. gracile*, to which species some Siwalik molars were referred by H. von Meyer‡ under the name of *Equus primigenius*.

Of the artiodaetyly modification of the Ungulata, there is a still longer list in the Indian Mio-Pliocene. In the bunodont sub-division, we have *Hippopotamus* represented by two species (*H. iravadicus* and *H. sivalensis*), both belonging to the hexaprotodont sub-genus. A Siwalik bunodont (*Tetraconodon magnum*)§ is noticeable for its enormous conical premolars; this genus is probably related to *Entelodon* (*Elotherium*) of the Tertiaries of Europe and America. The true pigs (*Sus*) are represented by three species, *S. giganteus*, *S. hysudricus*, and *S. punjabiensis*; the two former were named by Falconer and Cautley, while the last name was applied by myself.|| *Sanitherium* is a small suine animal, only known by the lower molars. *Hippohyus* is a genus of suine animals whose molars present a peculiar complexity of pattern, recalling that of the molars of the horse; the genus is peculiar to the Siwaliks, where it appears to have been represented by two species.¶ The European Mioene genus *Hyootherium* is represented in the Tertiaries of Sind and Perim Island by a species which I have provisionally named *H. sindiense*\*\* Of the suine animals with selonodont teeth, we have, among the forms with five cusps on the molars, a species of *Anthracootherium* (*A. silistrense*)†† from Sind, the Punjáb, and Sylhet, and a species of *Hypopotamus* (*H. sindiense*)‡‡ from Sind: among the forms characterized by having only four cusps on the molars, we have four genera, *Merycopotamus*, *Chæromeryx*, *Hemimeryx*, and *Sivameryx*,§§ all peculiar to the Sind and Punjáb Siwaliks, and each known only by a single species:|||| the two last genera are at present undescribed.

\* Milk-molars of this species were at first referred to a new genus, *Sivalhippus*, by myself (R. G. S. I. vol. X. pp. 31. 82).

† "Animaux Fossiles and Geologie de l'Attique" p. 231.

‡ Palæontographica, Vol. XV, p. 17.

§ Pal. Ind. Ser. X, Vol. I.

|| R. G. S. I. Vol. XI, p. 81. A suine animal has been named by myself *Hippopotamodon*, but I am now not certain of its generic distinctness.

¶ Ibid. p. 82.      \*\* Ibid. p. 77.

†† Ibid. p. 78, a jaw of this species was described by me as *A. punjabiense*.

‡‡ Ibid. Vol. X, p. 77.      §§ Ibid. Vol. XI, pp. 78, 80.

|||| Falconer in a MS. note described some teeth of *Dorcatherium*, under the name of *Merycopotamus nanus*. (Pal. Ind. Ser. X, Vol. I.)

Among the true ruminants, we have the deer family represented by several species of *Cervus*, namely, *C. triplidens*, *C. simplicidens*, and *C. latidens*; the genus of the last being somewhat doubtful. A fourth undescribed species has been named *C. sivalensis*.\* The genus *Doreatherium* is represented by the two species, *D. majus* and *D. minus*.† At least one of the Siwalik deer had branching antlers with a flattened beam, somewhat like those of the living *C. duvaucellii*. *Cervus triplidens* had a large accessory column in the molars, while *C. simplicidens* was a species as large as the Káshmir stag, with a much smaller accessory molar column. A single molar in the Indian Museum seems to indicate a Siwalik representative of the genus *Palæomeryx*. The giraffes were represented in India by probably two species, one of which has been named *Camelopardalis sivalensis*.‡ Of the family Sivatheriidae, which, with the exception of *Helladotherium*§ from the Pikermi beds of Attica, is peculiar to India, we have four genera in the Mio-Pliocene. *Hydaspitherium* is represented by probably three species, *H. megacephalum* known by the skull, which carried a massive conjoint horn-base above the occiput; and *H. leptognathus* and *H. grande*, by lower jaws and teeth. *Bramatherium perimense* is known by the skull, teeth, and jaws; this species seems to have carried a pair of horns over the occiput and a large conjoint horn-base on the frontals. *Vishnutherium iravadicum* is at present only known definitely by a fragment of a lower jaw from Burma of much smaller size than any of the other genera: it is not impossible, however, that some nondescript upper molars, in the Indian Museum, from the Punjáb, may belong to this genus. *Sivatherium giganteum* was the first known of this group of animals, and was originally described in the Society's Journal|| as a fossil elk: several skulls of this species are known; the male carried two pairs of horns, placed like those of the living Indian four-horned antelope (*Tetraceros*), while the female was hornless. An elaborate memoir on this interesting animal has been published by Dr. Murie.¶ The molar teeth seem to be nearest to those of the giraffes, and also approach those of *Cervus megaceros* and *Alces*: Dr. Murie comes to the conclusion that the horns of *Sivatherium* were intermediate in structure between the antlers of deer and the horns of the true cavicorn ruminants, and that they probably

\* Pal. Ind. Ser. X, Vol. I, Preface (in the press).

† Ibid.

‡ Remains of this species were described under the names of *C. sivalensis* and *C. affinis* by Falconer. See R. G. S. I. Vol. XI, p. 83.

§ Pal. Ind. Ser. X, Vol. I, R. G. S. I. Vol. XI, p. 90. M. Gaudry in his work, 'Les Enchainements du Monde Animal,' mentions that *Helladotherium* occurs in India: I am unacquainted on what grounds.

|| Vol. IV, p. 506.

¶ Geol. Mag. Vol. VIII, p. 438.

carried a deciduous sheath like those of the living American prong-buck (*Antilocapra*). Of the antelopes, several species have been described, the largest of which (*A. palæindica*)\* is supposed to have presented affinities to some African forms; *A. sivalensis*† is allied to the Indian blackbuck (*A. cervicapra*); while *A. patulicornis* and *A. acuticornis* do not appear to come close to any living forms. Other molar teeth belong to a species of *Portax*, now only represented by the living nilghai of India. Others again are like those of *Palæoryx*, a genus of antelopoid animals described from the Pikermi beds of Attica; this determination, owing to the absence of skulls and the great difficulty of precisely determining isolated ruminant teeth, is only provisional. The oxen are represented by five genera, among which *Hemibos* is represented by three species, *H. occipitalis*, *H. acuticornis*, and *H. antilopinus*:‡ this genus is peculiar to the Siwaliks, and connects the oxen and antelopes. *Leptobos falconeri* is another species of antelopoid oxen, known by some crania. The genus *Bubalus* is represented by *Bubalus platyceros*, a species with horns concave superiorly; and, in the highest Siwalik, by *B. palæindicus*, which is extremely close to the living wild buffalo of Assam. Of the genus *Bison*, there is only one species in the Siwaliks, which has been named *B. sivalensis*, and which seems to have been related to the extinct European *B. priscus*. Of the true oxen (*Bos*) there are three Siwalik species, namely, *Bos acutifrons* remarkable for its enormous horns and angulated forehead; *B. planifrons* with shorter horns and a flattened forehead, and allied to the gigantic *Bos primigenius* of Europe; and *Bos platyrhinus* only known by the lower half of a skull, and of which the generic affinities are doubtful. There seem to have been four species of goats in the Indian Tertiaries, most of which are probably of Pliocene age, viz., an unnamed species with horn-cores very like those of the Himalayan *Capra falconeri* (markhor), and two named species, *C. sivalensis* and *C. perimensis*, both of which are only known by frontlets and horn-cores: the fourth species has been described by Professor Rüttimeyer under the name of *Bucapra daviesii*. No remains of the genus *Ovis* have hitherto been described from the Sub-Himalayan or other Indian Siwaliks, but a cranium obtained from the presumably Siwalik strata of Tibet has been referred by the late Mr. Blyth to this genus. The genus *Camelus* is known by *C. sivalensis*, which presents a pe-

\* Pal. Mem. Vol. I, pl. 23.

† Pal. Ind. Ser. X, Vol. I. Two species (*A. picta* and *A. gyricornis*.) were named in MSS. by Falconer.

‡ These three species have been also described under the generic names of *Probulbus*, *Amphibos*, and *Peribos*; the synonymy will be found in the first volume of the tenth series of the 'Paleontologia Indica,' where all the other Indian fossil ruminants are noticed. Part of this volume is still in the press.

cularity in the lower molars, connecting it with the American auchenias, and distinguishing it from the other old-world camels.\* The similarity of the lower molars of the Siwalik camel and *Auchenia* is very noteworthy, since America is supposed to have been the original home of the *Camelidæ*: this supposition is supported by the connection between the living American camels (*Auchenia*) and the Pliocene old-world camels.

The other orders of Mammalia are only represented by a few species of Rodentia and one of Edentata. Among the rodents, a rat (*Mus*) is mentioned by Falconer as a member of the Siwalik fauna. A species of bamboo-rat (*Rhizomys sivalensis*) † has been named by myself, from some lower jaws collected by Mr. Theobald in the Punjáb. A porcupine (*Hystrix sivalensis*) is known by a part of a cranium and a lower jaw.

The edentates are only known by one species of pangolin (*Manis sindiensis*), which has been named on the evidence of a solitary phalangeal bone from Sind. ‡

The Mio-Pliocene mammalian fauna of India, as a whole, is characterized by the great number of forms belonging to the orders including animals of large corporeal bulk, and also by the admixture of modern African and Miocene European genera with those now peculiar to India. The Proboscidea and the perissodaetyle Ungulata, now so sparingly represented on the globe, were abundant in Mio-Pliocene India, and were probably the dominant forms: the ruminants have now diminished somewhat in numbers in several groups, but not to such a striking extent as the proboscideans. The selenodont hogs, like *Merycopotamus* and *Anthracotherium*, belong to a group which has completely passed away, while their congener the hippopotamus is now confined to Africa. Of the larger mammals now inhabiting India, nearly all are generically represented in the Pliocene, while forms, like *Anoa* (the living representative of *Hemibos*), inhabiting neighbouring countries seem to have descended from Indian ancestors. The micro-mammalia are practically unrepresented in the Mio-Pliocene, but this is probably due to the smaller chance of their remains being preserved in a fossilized condition, or, if so preserved, of being discovered.

#### PLEISTOCENE.

The mammals of the Pleistocene of India are as yet even less well known than those of the Mio-Pliocene, owing to the smaller areas in which

\* A second species of Siwalik camel was named in MSS. *C. antiquus* by Falconer. This species cannot now be identified.

† For descriptions of this and other Siwalik rodents, see R. G. S. I. Vol. XI, p. 100. *Rhizomys* is probably the same as *Typhlodon* of Falconer.

‡ Pal. Ind. Ser. X, Vol. I.

they are found. It seems, however, even with our present knowledge, to be pretty safe to say that the numerical strength of species of the larger mammals so characteristic of the Mio-Pliocene had disappeared in the Pleistocene. From the older alluvium of the Jamma river, mammalian bones have been obtained in considerable quantities, but only two species have been satisfactorily determined; the remaining bones have only been generically named, and are, therefore, not referred to here, as it is in many cases impossible to say whether they belong to living or to extinct species. The presence of *Hippopotamus* remains in a stratum is pretty good evidence of such stratum being not newer than the Pleistocene. The discovery of a molar and canine of this genus in the alluvia of the Penganga river, by Mr. Fedden, consequently shows that some of those deposits should be referred to the Pleistocene. In many cases, as in the delta of the Ganges, it is often most difficult, or impossible, to draw the line between the Pleistocene deposits and the Recent alluvium of the same area.

In the laterite of Madras, stone implements, and a human tibia have been found by Mr. Foote, and are assigned to the Pleistocene by Professor Boyd-Dawkins. Stone implements have likewise been obtained from the ossiferous beds of the Narbada valley, in association with the remains of extinct mammals. The mammalian fauna of the Narbada beds comprises, among the Carnivora, a species of bear (*Ursus namadicus*), named by the authors of the 'Fauna Antiqua Sivalensis' on the evidence of a portion of the maxilla with the molar dentition: this specimen is now in the British Museum, presented by Captain Frazer.\* Among the Proboscidea, we have the extinct *Euelephas namadicus*, characterized by the extraordinary ridge on the forehead; the molars of this species are very like those of the European *Elephas antiquus*, from which Professor Leith Adams has thought that the Indian and European forms might belong to the same species. *Stegodon* was represented by *S. ganesa* and, possibly, by *S. insignis*. Among the fossil perissodactyles of the Pleistocene, we have *Rhinoceros deccanensis*† of Mr. Foote from the Deccan, a species without permanent lower incisors, and shewing African affinities; and from the Narbada the living *R. indicus*, remains of which were at first named *R. namadicus*. A third species (*R. namadicus*) probably also existed in the Pleistocene. The horses are represented by *Equus namadicus*,‡ as yet not fully described. Among

\* F. A. S. plate O. I have elsewhere mentioned a species of *Felis* from the Narbada beds, the determination having been made on the evidence of the olecranal portion of an ulna in the old collection of the Geological Survey; the history of the specimen is, however, unknown, and from its mineral condition I am by no means sure that it is from the Narbada.

† Pal. Ind. Ser. X, Vol. I.

‡ Faun. Ant. Siv. *E. palconus* seems to be the young of *E. namadicus*.

the artiodactyles, we find two species of *Hippopotamus*, one of which (*H. namadicus*) belongs to the hexaprotodont type, while the other (*H. palæindicus*) is tetraprotodont, like the larger living species;\* *H. palæindicus* has also been found in the older alluvia of the Jamna. The pigs seem to have been represented by *Sus giganteus*.† A species of stag was named by Falconer *Cervus namadicus*, but never described; a single molar from the Narbada in the Indian Museum is indistinguishable from the corresponding tooth of the living *C. (Rucervus) duvaucellii*. Three species of Narbada oxen have been described, *viz.*, *Bos namadicus* of Falconer and Cautley, a taurine ox showing some affinities to the living Asiatic genus *Bibos*, also occurring in the Pem-ganga alluvium and, possibly, in the Deccan; *Bubalus palæindicus* of the same authors, very closely allied to the living wild Indian buffalo, also found in the Jamna alluvium; and *Leptobos frazeri* of Professor Rüttemeyer. A species of nilghai (*Portax*) has lately been described by the same writer from the Narbada rocks, under the name of *P. namadicus*; teeth of the same genus have also been obtained from the Pem-ganga alluvium.

The Pleistocene rodents are only represented by some incisors probably belonging to the genus *Mus*, obtained from the Narbada valley, and now in the Indian Museum.

#### RECENT.

The Recent deposits have not yet, as I have said, in many cases been satisfactorily separated from the Pleistocene, and the very local occurrence of mammalian bones renders this point of doubt one not likely to be soon cleared up. Any alluvial deposits of bones from which *Hippopotamus* is absent, and which do not contain any other extinct animals, I should be disposed to class as Recent.

Human remains have been obtained in the alluvium of the plains in various localities, at considerable distances below the surface, but generally in very imperfect condition. Specimens of the teeth and jaws of *Macacus rhesus* are exhibited in the Indian Museum, obtained from the alluvia of Assam and Madras; those from the former locality are in a highly mineralised condition. Molars of the Indian elephant have been obtained in the alluvium of the plains of India, and in that of the delta of the Irawadi. A last upper molar of *Rhinoceros indicus* has been obtained by Mr. Foote in the alluvium of Madras: this specimen is very interesting as shewing the former range of that species far to the south of its present habitat, which Jerdon gives as "the Terai from Bhotan to Nepal." *Sus*

\* The smaller Liberian hippopotamus (*Chæropsis*) has only two lower incisors.

† The authority for introducing this species in the Narbada fauna is the specimen drawn in plate LXX, fig. 8. of the F. A. S.

*indicus* has also been obtained by Mr. Foote in the same formation. *Antilope cervicapra* is represented by a fossil horn-core in the Indian Museum whose exact locality is uncertain. Antlers, horn-cores, and teeth of species of *Bos* and *Cervus* have been obtained from alluvia of various parts of the plains, and from raised beaches on the Kattiawar (Kattywar) coast; as, however, these specimens are not yet specifically determined, no more can be said about them.

#### LIST OF THE FOSSIL VERTEBRATA OF INDIA AND BURMA.

The following list exhibits in a systematic form all the well-established species of Indian and Burman fossil vertebrata, together with the best authenticated of the unnamed species with which I am acquainted. For the great divisions of geological times, the terms Anthropozoic (Age-of-Man), Theriozoic (Age-of-Mammals), Saurozoic (Age-of-Reptiles), and Ichthyozoic (Age-of-Fishes), have been employed in lieu of the old terms Post-Tertiary, Kainozoic, Mesozoic, and Palæozoic, as being more applicable to a chronology of vertebrate evolution, and as forming a series of symmetrical terms.

### I. ANTHROPOZOIC (POST-TERTIARY).

#### 1. RECENT ALLUVIA.

- MAMMALIA. PRIMATES. *Homo* (*sapiens* ?). Plains.  
*Macacus rhesus*. Gúlpára and Madras.  
 PROBOSCIDA. *Euelephas indicus*. India and Burma.  
 UNGULATA. *Rhinoceros indicus*. Madras.  
*Sus indicus*. Madras.  
*Cervus*. Kattiawar.  
*Antilope cervicapra*. Ganges Valley. (?)  
*Bos*. sp. Kattiawar and Plains.  
 REPTILIA. CHELONIA. ? (plates) Caleutta.  
 Other undetermined remains of, probably, recent species.

#### 2. PLEISTOCENE.

- MAMMALIA. PRIMATES. *Homo*. sp. Narbada (weapons) and Madras  
 (weapons and bones).  
 CARNIVORA. *Ursus namadicus*. (F. and C.) Narbada.  
 PROBOSCIDA. *Euelephas namadicus*. (F. and C.) Narbada.  
*Stegodon ganesa*. (F. and C.) Narbada.  
 ——— ? *insignis*. (F. and C.) Narbada.  
 ? *Mastodon pandionis*. (Falc.) Deccan.  
 UNGULATA. *Rhinoceros deccanensis*. (Footc.) Deccan.  
 ——— *indicus*. (Cuv.) Narbada.  
 ——— *namadicus*. (F. and C.) Narbada.  
*Equus namadicus*. (F. and C.) Narbada.

- MAMMALIA. UNGULATA. Hippopotamus namadicus. (F. and C.) Narbada.  
 ————— palæindicus. (F. and C.) Nar. and J.  
 ————— sp. P: G.  
 Sus giganteus. (F. and C.) Narbada.  
 Cervus sp (? duvancellii) (Narbada).  
 Bubalus palæindicus (F. and C.) Narbada and J.  
 Bos namadicus. (F. and C.) Narbada. P: G.  
 and (?) Deccan.  
 Leptobos frazeri. (Rüt.) Narbada.  
 Portax namadicus. (Rüt.) Narbada, and P: G.  
 RODENTIA. Mus. sp. Narbada.  
 REPTILIA. CROCODYLIA. Crocodilus (?) sp. Narbada.  
 CHELONIA. Pangshura tectum. (Bell. sp.) Narbada.  
 Batagur (? dhongoka) Narbada.  
 Trionyx (? gangeticus.) Narbada.

## II. THERIOZOIC (KAINOZOIC.)

### 1. PLIO-MIOCENE.

- MAMMALIA. PRIMATES. Palæopithecus sivalensis. (Lyd.) S.  
 Macacus sivalensis. (Lyd.) S.  
 ————— sp. S.  
 Semnopithecus subhimalayanus. (Myr.) S.  
 ————— sp. S.  
 CARNIVORA. Felis cristata. (F. and C.) S.  
 ——— grandicristata. (Bose.) S.  
 ——— sp. S.  
 Machairodus sivalensis. (F. and C.) S.  
 ————— palæindicus. (Bose) S.  
 Pseudælorus sivalensis. (Lyd.) S.  
 Ictitherium sivalense. (Lyd.) S.  
 Viverra bakerii. (Bose.) S.  
 Hyæna sivalensis. (F. and C.) S.  
 ——— felina. (Bose.) S.  
 Canis curvipalatus. (Bose.) S.  
 ——— cautleyi. (Bose.) S.  
 Amphicyon palæindicus. (Lyd.) S. Sd.  
 Ursus. sp. S.  
 ——— sp. I.  
 Hyænaretos sivalensis. (F. and C.) S. Sd.  
 ————— palæindicus. (Lyd.) S.  
 Mellivora sivalensis. (F. and C.) S.  
 Meles, sp. (Lyd.) S.

- MAMMALIA. CARNIVORA. *Lutra palæindica*. (F. and C.) S.  
*Enhydriodon sivalensis*. (F. and C.) S.
- PROBOSCIDA. *Euelephas hysudricus*. (F. and C.) S.  
*Loxodon planifrons*. (F. and C.) S.  
*Stegodon ganesa*. (F. and C.) S.  
 ——— *insignis*. (F. and C.) S.  
 ——— *bombifrons*. (F. and C.) S.  
 ——— *cliftii*. (F. and C.) S.  
*Mastodon sivalensis*. (F. and C.) S.  
 ——— *latidens*. (F. and C.) S. I. Sd. P.  
 ——— *perimensis*. (F. and C.) S. Sd. P.  
 ——— *pandionis*. (F.) Sd. S. P.  
 ——— *falconeri*. (Lyd.) Sd. S.  
*Dinotherium indicum*. (Falc.) S. P.  
 ——— *pentapotamiæ*. (Falc.) S.  
 ——— *sindiense*. (Lyd.) Sd. S.
- UNGULATA. { *Chalicotherium sivalense*. S. Sd.  
*Rhinoceros iravadicus*. (Lyd.) I.  
 ——— *palæindicus*. (F. and C.) S.  
 ——— *platyrhinus*. (F. and C.) S.  
 ——— *sivalensis*. (F. and C.) S. Sd.  
 ——— sp. Tibet.  
*Acerotherium perimense*. (F. and C.) P. Sd. S. I.  
*Listriodon pentapotamiæ*. (Falc. sp.)  
 ——— *theobaldi*. (Lyd.) S.  
 (?) *Tapirus*, sp. (Clift.) I.  
*Equus sivalensis*. (F. and C.) S.  
 ——— sp. Tibet.  
*Hippotherium antilopinum*. (F. and C.) S.  
 ——— *theobaldi*. (Lyd.) P. S. Sd.  
 ——— sp. Tibet.
- Artiodactyla. { *Hippopotamus iravadicus*. (F. and C.) I.  
 ——— *sivalensis*. (F. and C.) S.  
*Tetraconodon magnum*. (Falc.) S.  
*Sus giganteus*. (F. and C.) S.  
 — *hysudricus*. (F. and C.) S. P. Sd.  
 — *punjabiensis*. (Lyd.) S.  
*Hippohyus sivalensis*. (F. and C.) S.  
 ——— sp. S.  
*Sanitherium schlagintweitii* (Myr.) S.  
*Hyotherium sindiense* (Lyd.) Sd.  
*Anthracotherium silistrense*. (Pent.) Sy. S. Sd.  
*Hypotamus palæindicus*. (Lyd.) Sd.

## MAMMALIA. UNGULATA.

- Artiodactyla. {
- Merycopotamus dissimilis. (F. and C.) S.
  - Chæromeryx silistrensis. (Pom.) Sy.
  - Hemimeryx, sp. (Lyd.) Sd.
  - Sivameryx, sp. (Lyd.) Sd.
  - Cervus triplidens. (Lyd.) S.
  - sivalensis. (Lyd. Mss.) S.
  - simplicidens. (Lyd.) S.
  - (?) latidens. (Lyd.) S.
  - Dorcatherium majus. (Lyd.) S.
  - minus. (Lyd.) S.
  - Palæomeryx, sp. (Lyd.) S. Sd. (?)
  - Camelopardalis sivalensis. (F. and C.) S. P.
  - sp. S.
  - Hydaspitherium grande. (Lyd.) S.
  - leptognathus. (Lyd.) S.
  - megacephalum. (Lyd.) S.
  - Bramatherium perimense. (Falc.) P.
  - Sivatherium giganteum. (F. and C.) S.
  - Vishnutherium iravadicum (Lyd.) I. S. (?)
  - Antilope palæindica. (F. and C.) S.
  - patulicornis. (Lyd.) S.
  - porrecticornis. (Lyd.) S.
  - sivalensis. (Lyd.) S.
  - ? Palæoryx, sp. (Lyd.) S.
  - Portax, sp. (Lyd.) S.
  - Hemibos occipitalis. (Falc. sp.) S.
  - acuticornis. (Falc. sp.) S.
  - antilopinus. (Falc. sp.) S.
  - Leptobos falconeri. (Rüt.) S.
  - Bubalus platyceros. (Lyd.) S.
  - palæindicus. (F. and C.) S.
  - Bison sivalensis. (Falc. MSS.) S.
  - Bos acutifrons. (Lyd.) S.
  - planifrons. (Lyd.) S.
  - platyrhinus. (Lyd.) S.
  - Bucapra daviesii. (Rüt.) S.
  - Capra perimensis. (Lyd.) P.
  - sivalensis. (Lyd.) S.
  - sp. (Lyd.) S.
  - ? Ovis, sp. (Blyth.) S. T.
  - Camelus sivalensis. (F. and C.) S.

- MAMMALIA. RODENTIA. Mus. sp. S.  
Rhizomys sivalensis. (Lyd.) S.  
Hystrix sivalensis. (Lyd.) S.
- AVES. EDENTATA. Manis sindiensis. (Lyd.) Sd.  
CARINATE. Graculus (?), sp. (Dav.) S.  
Peleeanus cautleyi. (Dav.) S.  
———— ? sivalensis. (Dav.) S.  
Megaloscelornis sivalensis (Lyd.)  
Megaloscelornis. (?) sp. Sd.  
Argala falconeri (M. Ed.) S.  
RATITE. Struthio asiaticus. (M. Ed.) S.  
Dromæus sivalensis. (Lyd.) S.  
Gen. indet. (Brit. Mus. Col.) S.
- REPTILIA. CROCODYLIA. Croeodilus palustris (Less.) S. P.  
———— sp. I.  
Gharialis gangeticus (Gmel.) S. Sd. I.  
———— leptodus (F. and C.) S.  
———— erassidens. (F. and C.) S. Sd.
- LACERTILIA. Varanus sivalensis. (Falc.) S.  
OPHIDIA. Gen. indet. S. Sd.  
CHELONIA. Colossoehelys atlas. (F. and C.)  
Testudo (?), 5 sp. S.  
Bellia sivalensis. (Theo.) S.  
———— sp. S.  
Damoniam hamiltonoides. (Falc. sp.) S.  
Emys, sp. S.  
Cautleya annuliger. (Theo.) S.  
Pangshura teetum. (Bell. sp.) S.  
Batagur, sp. S.  
Trionyx, sp. S. I. P.  
Emyda vittata. (Pet.) S.  
———— sp. S. I. P.
- PISCES. ELASMO-BRANCHII. Carcharias, sp. I.  
Lamna, sp. Sd.  
? (vertebræ.) P.  
? (palatal teeth) S. Sd.
- TELEOSTEI. Chaca (?), sp. S.  
? (vertebræ.) S. Sd.

## 2. EOCENE (INTRATRAPPEAN AND NUMMULITIC).

- MAMMALIA. UNGULATA, (perissodaetyle femur). Punjáb.  
(artiodaetyle astragalus) Punjáb.

|            |             |                                               |
|------------|-------------|-----------------------------------------------|
| REPTILIA.  | CROCODILIA. | (teeth and vertebræ) Punjáb.                  |
|            | CHELONIA.   | Hydraspis leithii (Carter sp.) Bombay.        |
| BATRACHIA. | ANOURA      | Oxyglossus pusillus. (Owen. sp.) Bombay.      |
|            |             | ————— (?) sp. Bombay.                         |
| PISCES.    | ELASMOBRAN- |                                               |
|            | CHII.       | Myliobatis, sp. (Lyd.) Punjáb.                |
|            | TELEOSTEI.  | Diodon foleyi, (Lyd.) Ramri I. and Pt. Blair. |
|            |             | Capitodus indicus. (Lyd.) Punjáb.             |
|            |             | ? (Cycloid scales) Nr. Thayetmyo.             |

### III. SAUROZOIC (MESOZOIC).

#### 1. CRETACEOUS SERIES.

|           |                 |                                             |
|-----------|-----------------|---------------------------------------------|
| REPTILIA. | DINOSAURIA.     | Megalosaurus, sp. (Lameta and Trichinopoli) |
|           |                 | Titanosaurus blanfordi. (Lyd.) Lameta gp.   |
|           |                 | ————— indicus. (Lyd.) Lameta gp.            |
|           |                 | ? (unknown reptile.) Lameta gp.             |
|           | CROCODILIA.     | (amphicælian sp.) (Lyd.) Sind.              |
|           | CHELONIA.       | ? (plates.) Lameta, Rajamahendri, and Sind. |
|           | ICHTHYOSAURIA.  | Ichthyosaurus indicus. (Lyd.) Trichinopoli. |
| PISCES.   | ELASMOBRANCHII. | Corax incisus. (Eg.) Trichinopoli.          |
|           |                 | —— pristodontus. (Ag.) Trichinopoli.        |
|           |                 | Enchodus serratus. (Eg.) Trichinopoli.      |
|           |                 | Lamna complanata. (Eg.) Trichinopoli.       |
|           |                 | —— sigmoides. (Eg.) Trichinopoli.           |
|           |                 | Odontaspis constrictus. (Eg.) Trichinopoli. |
|           |                 | ———— oxypeion. (Eg.) Trichinopoli.          |
|           |                 | Otodus basalis. (Eg.) Trichinopoli.         |
|           |                 | ———— divergens. (Eg.) Trichinopoli.         |
|           |                 | ———— marginatus. (Eg.) Trichinopoli.        |
|           |                 | ———— minutus. (Eg.) Trichinopoli.           |
|           |                 | ———— nanus. (Eg.) Trichinopoli.             |
|           |                 | ———— semiplicatus. (Eg.) Trichinopoli.      |
|           |                 | Oxyrhina triangularis. (Eg.) Trichinopoli.  |
|           |                 | ———— sp. (Stol.) Trichinopoli.              |
|           |                 | Ptychodus latissimus. (Ag.) Trichinopoli.   |
|           | GANOIDEI.       | Pycnodus (?), sp. (Stol.) Trichinopoli.     |
|           | ?               | ? (scales) Lameta.                          |
|           | ?               | ? (scales) Intratrappean. Rajamahendri.     |

#### 2. JURA-TRIASSIC SERIES.

|           |             |                                        |
|-----------|-------------|----------------------------------------|
| REPTILIA. | DINOSAURIA. | Ankistrodon indicus (Hux.) Panchet gp. |
|           | CROCODILIA. | (amphicælian sp.) (Lyd.) Chari gp.     |

- REPTILIA. CROCODYLIA. Parasuchus, sp. (Hux.) (hislopianus. MSS.)  
 Maleri gp.  
 ——— ? sp. (Lyd.) Denwa gp.
- LACERTILIA. Hyperodapedon, sp. (Hux.) Maleri gp.
- DICYNODONTIA. Dieynodon orientalis. (Hux.) Panehet gp.  
 ——— sp. Panehet gp.
- PLESIOSAURIA. Plesiosaurus indicus (Lyd.) Umia. gp.
- BATRACHIA. LABYRINTHODONTIA. Brachyops latieeps. (Ow.) Mangli. gp.  
 Gonioglyptus longrostris. (Hux.) Panehet gp.  
 Pachygonia ineurvata (Hux.) Panehet gp.  
 Arehegosaurus (?) Bijori gp.
- PISCES. DIPNOI. Ceratodus hislopianus. (Old.) Maleri gp.  
 ——— hunterianus. (Old.) Maleri gp.  
 ——— virapa. (Old.) Maleri gp.
- GANOIDEI. Dapedius egertoni. (Syk.) Kota gp.  
 Lepidotus brevieeps. (Eg.) Kota gp.  
 ——— calcaratus. (Eg.) Kota gp.  
 ——— deeanensis. (Eg.) Kota gp.  
 ——— longiceps. (Eg.) Kota gp.  
 ——— pæhylepsis. (Eg.) Kota gp.  
 Tetragonolepis analis. (Eg.) Kota gp.  
 ——— oldhami. (Eg.) Kota gp.  
 ——— rugosus. (Eg.) Kota gp.  
 ? ? (Seales) Sripematúr gp. Kota gp.
- IV. ICHTHYOZOIC (PALÆOZOIC).
1. CARBONIFEROUS.
- PISCES. GANOIDEI. Sigmodus dubius. (Waag.) Salt-range.  
 ELASMOBRANCHII. Poeilodus paradoxus. (Waag.) Salt range.  
 Pséphodus indicus. (Waag.) do.  
 Helodopsis elongata. (Waag.) do.  
 ——— abbreviata. (Waag.) do.  
 Psammodus, sp. do.  
 Petalorbyncus indicus. (Waag.) do.  
 Xystracanthus gracilis. (Waag.) do.  
 ——— major. (Waag.) do.  
 ——— giganteus. (Waag.) do.  
 Thaumataeanthus blanfordi. (Waag.) do.

*Abbreviations used in the above.*

Ag. = Agassiz; Dav. = Davies; Eg. = Egerton; F. and C. = Falconer and Cautley; Gmel. = Gmelin; Hux. = Huxley; I. = Irawadi

(Irrawaddy) valley, Burma; J. = Jamna; Less. = Lesson; Lyd. = Lydekker; M. Ed. = Milne-Edwards; Myr. = Herman von Meyer; Old. = Oldham; Ow. = Owen; P. = Perim Island, gulf of Cambay; Pent. = Pentland; P. G. = Pem-ganga; Pct. = Peters; Pom. = Pomel; Rüt. = Rüttimeyer; S. = Siwaliks (including Punjáb); Sd. = Sind; Stol. = Stoliezka; Sy. = Sylhet; Syk. = Sykes; T. = Tibet; Theo. = Theobald; Waag. = Waagen.

#### CONCLUSION.

In the foregoing sketch of the fossil vertebrata of India, but few new facts have been recorded, and, indeed, the main objects in penning it were the hope, firstly, of inducing persons interested in scientific enquiries to aid us in our endeavours to increase our knowledge of this interesting branch of science, and, secondly, of making one of those landmarks, so necessary in an ever-increasing subject like the present, from whence new advances can again be made. With regard to the first object, it may be observed that District Officers in India, and other officials, in the course of their periodical professional tours through the country, have far greater opportunities of collecting the larger and more conspicuous fossils than can possibly fall to the lot of the officers of the Geological Survey of India, who are few in number, and who, for years together, are not called upon to visit many parts of the country. To all who have opportunities of travelling through unfrequented parts of India likely to contain fossil remains, the appeal is here made for assistance in our endeavours to obtain a more complete knowledge of the fossil vertebrata of India. Any fossils sent to the Superintendent of the Geological Survey of India (Calcutta) will be most gratefully received, and, after comparison or description, either returned to their owners, or, if presented, carefully preserved in the collection of the Indian Museum.

*Note.*—Additions to this paper have been made while it was passing through the press, bringing it up to date.



V.—*Account of the Verification of some Standard Weights with considerations on Standard Weights in general.*—By COL. J. F. TENNANT, R. E., F. R. S., *Master of Her Majesty's Mint.*

(Recd. Jan. 5th;—Read Feb. 4th, 1880.)

When I first contemplated the verification of a series of weights from a primary standard, I had little information as to procedure, and indeed I have till now had little as to details. I had intended in this paper to deal with the verification of a whole series of ounce weights; but circumstances beyond my control have delayed the latter portion, and I think that probably this shorter paper will be as much as the patience of my readers will stand: in it are described, with examples, all the cases I shall meet; while the explanations will, I trust, enable any one to follow my procedure and somehow to verify any other set of weights. This end being gained, the delay of the paper to add the numerical results of farther work, would add little to its popular, or even scientific value, and this circumstance has induced me to offer it in its present state to the Asiatic Society.

I am aware that I am open to the charge of excessive (factitious) accuracy, and I freely admit that I have used an excessive number of decimal places; but the number was originally fixed by the fact that it caused no trouble and saved thought. The difference between the trouble of dealing with 5 or 6 figures and 4 with an arithmometer is, in my case, more than compensated by the absence of the absolute necessity of watching the increase of the last figure: and too, I had not, till I had gone some way with these weighings, so clear an idea of the probable errors as I now have. The systematic calculation of these is, so far as I know, new: it has taught me much, and guided me where I might have gone wrong. I think that it should always be carried out; but of course, the foundation of the calculation—the estimation of the probable error of one comparison, will not commend itself to all men:—those who in other respects may follow my procedure may prefer a different course in this, and, when the system of weighment is different, this datum must be determined in a correspondingly different manner. Even then, I hope, that the conclusions I have come to may have their use, for the evidence they offer of the rapid accumulation of error in multiplying from a small primary standard, is quite independent of the amount ascribed to the error of one comparison.

I have added the Tables requisite in reducing the comparison of weights of varying density and in determining specific gravity. These are deduced from the same data precisely as those used in the British Standards Department, but I have employed Fahrenheit's thermometer, the English inch, and

the English grain, because, to me, those units were more accessible (as they will be to most readers of the English language) and not because I prefer them. I have thought that it was more important to avoid conversions of the data before using them than to adhere to general considerations; just as (with the late Warden of the Standards) I have preferred uniformity of data for reduction; rather than a possible scientific accuracy, which is, after all, not demonstrably gained.

SECTION I.—*On Weights.*

In May 1879, I received from England a set of Bullion Weights of gilt bronze, with their errors on the Commercial Standard of England roughly given, and a Troy Ounce of Platinum-iridium, with its error in vacuo in terms of the Parliamentary Standard Pound P S. I at the same time received a set of Metric Weights of Platinum-iridium from 100 grammes to one milligram, with their errors in terms of the Kilogramme des Archives, which is the Normal Standard weight of France. My paper here will be confined to dealing with some of the Bullion Weights: and it will be necessary in order to understand the procedure I follow, and also the scientific principles of weighing, that I should give an account of the English system of weights.

Ordinary weights are made of brass, iron, or some other cheap metal, but all these are liable to oxidation, and thus none of these metals is suitable for a Standard. The metal chosen for the English Standard was platinum, which is nearly indestructible. Since then it has been found that, whereas platinum is soft, an alloy with iridium is hard, has the other advantages of platinum, and can be made with sufficient readiness for the purpose required: this alloy is used in my Primary Standards as it is in the European Standards now being made in Paris. The use of such substances for Standard Weights, however, leads to some complication: these metals are heavy; while the metals and alloys ordinarily used are comparatively light. Now the weight of a body in air is different from its weight in vacuo by the weight of the air displaced, and this varies with the state of the atmosphere: consequently the relative weight of a pound of brass and one of platinum, which are alike in vacuo, will, in air, be found to vary continually relatively to each other. In order to avoid the inconvenience of this, it has been found desirable that the Commercial Standard should be of brass or bronze; both of which, having nearly the same density as the metals used in ordinary weights, will show the same differences at all times and places, with sufficient accuracy for commercial purposes; and which, moreover, are cheap enough to allow of the weights of all sizes being made of them. For general Standard purposes, weights are now made of gilt bronze, the gilding preserving them to a great extent from changing by oxidation.

As the Parliamentary Standard of England P S. has its true weight in *vacuo*,\* the first impression would be, that the Commercial Standard in ordinary air should weigh the same as P S. in *vacuo*: but this has not been the practical solution. When the Houses of Parliament were destroyed in 1834, the English standards were destroyed in them, and the new Standard was meant to be a restoration of the old one. Now the old Standard was a brass Troy Pound made in 1758, of which there were a variety of copies more or less accurate. On the evidence from these, and some other sources, was determined the difference between the lost pound and a piece of platinum, both taken in *vacuo*. Then (the Government of the day having determined that the new Standard should represent the Avoirdupois, and not the Troy Pound as before), a second piece of Platinum P S. was made which should weigh very nearly 7000 such grains as those of which the destroyed Pound (U) contained 5,760, both being taken in *vacuo*, and it is believed that the result was accurate to a very small fraction of a grain, thanks to the great labours of Professor Miller. In reverting to the Commercial Pound, that would be 7,000 grains of which U weighed 5,760, both taken in air, and then, as the density of the new commercial Pound was very close to that of U, all sensible uncertainty arising from the destruction of U and the impossibility of knowing its exact density would vanish.

Professor Miller found the Platinum Pound P S. to be 7000·00093 grains of U both weighed in *vacuo*, and by Act of Parliament, *this* was declared to be the true standard of weight, and that one grain should be a seven-thousandth part of it. The Commercial Pound W was an imaginary Pound, supposed to be made of brass of a density of 8·15034, which was what Professor Miller estimated as the density of the lost Pound U. Though the standard in *vacuo* was changed, as above, by a minute quantity, it would have been wrong to change the weight of W in air. In order then that its weight in *vacuo* should become that of the Pound P S., it became necessary to suppose that this weight in *vacuo*†, and consequently its density, were changed, and to ascribe to it a new density of 8·1430.

The present definition of the English Commercial Pound then is—

\* I have followed the wording of my predecessors, but I should prefer to call the "*weight in vacuo*" the "*Mass*," and restrict the term "*weight*" to the apparent force exercised. If this distinction were made, the questions involved would be much clearer. The Parliamentary Standard has been treated as one of *Mass*; hence two of the gilt secondary standards, each of the same *Mass* as P. S., will not have ordinarily the same *weight*, unless they have the same specific gravity.

† The weight in *vacuo* was 7000 grains of U, and in consequence of the Act of Parliament it became necessary that it should be the same as that of P S. or 7000·00093 grains of U.

The weight in standard air of a piece of brass whose weight in vacuo is the same as that of P S., and whose density, compared with that of water at its maximum density (the brass being at the freezing point), is 8·1430.

If we know the value of a weight in terms of P S., we shall be able to find its value in terms of W by adding the weight of air displaced by the same weight of brass similar to that of which W is supposed to be made, and deducting that actually displaced by the weight to be determined.

The Standard Platinum-Iridium ounce sent me is certified to weigh (in vacuo) 479·95979 grains in terms of P S., and the density has been assumed as 21·414, which is that of the 100 gramme weight. In English Standard Air its weight is given as 480·00502 grains, but that datum is useless for purposes of reference. It is called E I in the books of the Standards Office in London, and I propose to retain this name.

The ounce weight of the bullion set was certified to weigh 480·00145 grains in vacuo in terms of P S. and 480·00203 grains in English Standard Air in terms of W.

The following matter must be borne in mind in order that the procedure in my weighments may be understood :

The sign = means that the weights on each side of it are equal in vacuo.

The sign  $\equiv$  means that these are equal in air at the time ; and, in the case of Commercial Weights, that they are sufficiently equal for practical purposes at all times.

The sign  $\approx$  means that the weights on each side being in the respective pans of the balance there would be equilibrium. When no division of the scale is mentioned as the resting point, it is assumed to be 10 for Oertling No. 1 and 15 for Oertling No. 2.

$O_n$  is one of the set of Gilt Bullion Weights—the subscript number denotes its nominal value in Troy ounces.

$P_n$  is one of a set of grain weights which have been used for small quantities, and  $n$  is the number of grains nominally : all weights not less than 1 grain are of platinum and have been cleaned by incandescence in a spirit-lamp. The tenths of grains are of aluminum and the hundredths of uncertain material.

$R_1$  and  $R_2$  are two riders (approximately of one-tenth of a grain each) used with the balance Oertling No. 1.

The Tables I have used in my reductions have been calculated by myself to the units of the Barometer and Thermometer scales commonly used in England, and which it was most easy for me to refer to. That for the density of air, has been calculated from the formula given by Professor Miller, in his paper in the Philosophical Transactions, with the neces-

sary changes for units, and for the position of Her Majesty's Mint at Calcutta. The density of water has been calculated from a formula similar to Professor Miller's; but with the constants deduced from the new Tables of the British Standards Office. The other Tables, for the expansion of metals, are deduced from the same data as those of Professor Miller, but the form makes them more compact and convenient without any loss of accuracy. All will be found at the end.

#### SECTION II.—*The Balances.*

*Oertling No. 1* is a chemical balance by Oertling with a beam 365 m. m. (14.56 inches) between the extreme knife edges. The principal knife edge is 28 m. m. (1.1 inches) long and the smaller ones 16.5 m. m. or 0.65 inches; all are of agate resting on agate planes. The beam is divided for the use of riders, and I have satisfied myself that the divisions are sufficiently accurate for this purpose. The scale is placed on the lower part of the pillar, and is read by a long index attached to the centre of the beam: this is in my opinion, the best arrangement.

*Oertling No. 2* is a balance whose beam carries knife edges 404 m. m (15.9 inches) apart. The central knife edge is 38.4 m. m (1½ inches) long and those at the ends, 22 m. m or 0.87 inches. They are all of agate and rest on agate planes. The beam is very strong, and divided with sufficient accuracy for the use of a rider. There is an index of soft iron at each end of the beam to read an ivory scale. The left scale had very fine graduations and appeared to me useless. I have substituted a better one and removed the right scale.

#### SECTION III.—*Density of O Set of Weights.*

In order to compare  $O_1$  with  $E1$  it is necessary to have a density of  $O_1$ : I have determined that of  $O_3$  and assumed it to be the same as that of  $O_1$  and of the other  $O$  weights.

It appears from the papers received from the Standards Office that  $O_3 \equiv 3$  Troy ounces  $\equiv 1440$  grains with sufficient accuracy for this purpose, its exact value will be seen later.

On July 4th 1879, the balance Oertling No. 1 having been prepared for taking specific gravities, and a platinum hook, intended to support  $O_3$  in water, having been hung by a fine wire of platinum so as to be immersed in distilled water;  $O_3$  was placed in the pan in air, and counterbalanced with weights.  $O_3$  being then placed in the hook, and all air bubbles carefully removed, it was found that; X being about 1490.2 grains:

$X \simeq O_3$  in water (temp. = 84°. 1) + hook &c. in water + ( $O_3$  +  $O_{.04}$  +  $O_{.005}$  +  $O_{.004}$ ) in air + 4.  $\frac{R_2}{10}$  at 10.02 divisions of the scale—

then, removing  $O_3$  from water, carefully drying it, and placing it in the pan, I found after adding 180 minims of water

$$X \simeq O_3 \text{ in air} + \text{hook \&c. in water} + 2.72 \frac{R_2}{10} \text{ at } 10.02 \text{ divisions.}$$

Hence the loss of weight apparently =  $O_3 + O_{.04} + O_{.005} + O_{.004} + 1.28 \frac{R_2}{10}$ .

My approximate calculations gave me the sum of the above four weights as 167.5400 grains, and the value of the rider is approximately  $\frac{1}{10}$ th of a grain, the difference from the true value being negligible. Hence the loss of weight between air and water was 167.5528 grains, and, though I did not observe the Barometer, it may be considered as 29.46, and the temperature  $87^\circ.5$ ; this gives  $\Delta O_3 = 8.5649$ .

Again on July 7th, I found in the same way.

$$\left. \begin{array}{l} \text{(A) } X + 5 \frac{R_1}{10} \simeq O_3 \text{ in water} + \text{hook \&c. in water} \\ \quad + 167.54 \text{ grains} + 3 \frac{R_2}{10} \text{ at } 13.30 \text{ Div.} \\ \text{(B) } X + 5 \frac{R_1}{10} \simeq O_3 \text{ in water} + \text{hook \&c. in water} \\ \quad + 167.54 \text{ grains} + 6 \frac{R_2}{10} \text{ at } 4.72 \text{ Div.} \end{array} \right\} \begin{array}{l} \text{Temp.} \\ \text{water } 84.25 \text{ F.} \end{array}$$

and, after adding 169 minims of water.

$$\text{(C) } X + 5 \frac{R_1}{10} \simeq O_3 \text{ in air} + \text{hook \&c. in water} + 7 \frac{R_2}{10} \text{ at } 14.80 \text{ Div.}$$

Bar.  $29^\circ.445$ .

$$\text{(D) } X + 5 \frac{R_1}{10} \simeq O_3 \text{ in air} + \text{hook \&c. in water} + 9 \frac{R_2}{10} \text{ at } 8.35 \text{ Div.}$$

Temp.  $85^\circ.7 \text{ F.}$

Hence by interpolating between (A) and (B)

$$X + 5 \frac{R_1}{10} \simeq O_3 \text{ in water} + \text{hook \&c. in water} + 167.54 \text{ grs.} + 4.14 \frac{R_2}{10} \left. \begin{array}{l} \text{Temperatures} \\ \text{Water } 84.25 \text{ F.} \\ \text{Air } 85.7 \end{array} \right\}$$

and from (C) and (D)

$$X + 5 \frac{R_1}{10} \simeq O_3 + \text{hook \&c. in water} + 8.49 \frac{R_2}{10} \left. \begin{array}{l} \text{in.} \\ \text{Bar. } 29.445 \end{array} \right\}$$

Thus the loss of weight was apparently 167.4965 grains, and  $\Delta O_3 = 8.5676$ . Giving this last result triple weight, on account of better observing, we have as a mean;  $\Delta O_3 = 8.5669$ : which may be considered the density for all the weights of this set; and which will not be altered by the true values of the weights used, being substituted for the approximate ones.

SECTION IV.—*System of Weighments.*

I have adopted a uniform system of weighment for comparing the weights. Some years ago I made a considerable number of experiments on the species of errors which occurred in practice, and the present system is the outcome: there have been minute deviations, but in all material points the procedure has been uniformly followed, and I think it has been successful in eliminating all progressive errors. The principal of these is the tendency of the arms of the balance to expand unequally with temperature, but there are others which have occasionally been found. I annex specimens of the form I have used in work.

The weights to be compared being placed in the pans, a preponderance is given to one side of the balance; so as to make the resting point, when the whole is in equilibrium, lie on one side of the centre point; yet so slightly, that the weight used to get the value of the scale, shall deflect the resting point to the other side. In the first example with Oertling No. 1, it will be seen, that with EI in the left pan and  $O_1$  in the right, the Right Rider was placed at 1.2 of the beam scale; in this state the index had its resting point at 7.54 divisions (10 being the middle). Then the weight  $P_{.01}$  was added to the left side and the resting point became 15.81 Div. Each resting point is deduced from 4 readings, two low  $l_1$  and  $l_2$ , and two high  $h_1$  and  $h_2$ . The beam having been carefully released, the first excursion outwards, and the return towards the scale centre, are neglected; and the next four readings of the extremes of oscillation taken. The first reading will thus usually be low, if the resting point below; and high, if that be high: but, when signs of irregularity occur, this may not be the case, as I have always, in such cases, freely omitted readings till the oscillations have become regular. Then, supposing a low reading first,  $\frac{l_1 + 2h_1 + l_2}{4}$  and  $\frac{h_1 + 2l_2 + h_2}{4}$  would be readings of the resting points, and the sums in the numerators have been rapidly formed separately during the work, added, and divided by 8. This has been afterwards checked by  $\frac{l_1 + h_2 + 3(l_2 + h_1)}{8}$ : of course, when  $h$  comes first, the  $h$ 's take the place of the  $l$ 's in these formulæ, and *vice versa*.

We thus have two "*partial weighments*"

$$\text{EI} \simeq O_1 + 1.2 \frac{R_2}{10} \text{ at } 7.54 \text{ divisions and}$$

$$\text{EI} + P_{.01} \simeq O_1 + 1.2 \frac{R_2}{10} \text{ at } 15.81 \text{ divisions}$$

from which I get, by interpolation, as a result of the “*weighment*”

$$EI \cong O_1 + 1.2 \frac{R_2}{10} - P_{.01} \cdot \frac{2.46}{8.27} \text{ or } O_1 + 1.2 \frac{R_2}{10} - 0.297 P_{.01}$$

The second weighment is made after the weights are interchanged in the pans and the result deduced the same way. These together make one “*comparison*,” and then a second comparison is made, every operation being followed, but precisely in the reverse order, to make a “*complete comparison*.” The result of the four equations when summed is

$$\begin{aligned} 4 EI &\equiv 4 O_1 + 0.191 P_{.01} \text{ or} \\ EI &\equiv O_1 + 0.04775 P_{.01} \end{aligned}$$

The interpolations are made with sufficient accuracy with a slide rule.

In all the comparisons of the O set and P set, except those of EI with  $O_1$ , which were made with the balance Oertling No. 1, I have used one of the riders (the right) to add a constant weight to one side and the other in variable positions. Assuming that the rider can be accurately placed on the divisions, and that these are sufficiently accurate, it seems to me that I may safely use the rider in this way, and that the error of determination of the weight of the rider will thus be of less importance than that of a small weight.

In the case of the very small weights I have added the weight  $P_{24}$  to one pan, and  $P_{24}^*$  to the other, in order to steady them, with great advantage.

#### SECTION V.—*Determination of $O_1$ , in terms of the English Commercial Pound*

I have before mentioned that I have received as a Standard a Troy ounce of Platinum-Iridium, whose weight in terms of the Parliamentary Standard Pound P S. is 479.95979 grains of P S.; and I have explained the relations between the English Standard Pound and the commercial Pound. In order that I may determine the errors of the Bullion set of Weights, it is necessary that I should determine  $O_1$  in terms of the English Commercial Pound: I have it is true the determination made in London, but it is necessary to verify this, not only to make the standard of weight now, identical with that I should get again, but also because the gilt weights may have slightly changed in the long voyage.

The Barometer I have used is an Aneroid Barometer by Browning, which I have found give corrected Barometer readings without sensible error. I have, except in the first comparison, used two Thermometers which were examined for me some years ago at Kew, and whose zero point I have recently re-determined: these were suspended in the balance case of Oertling No. 1, so as to hang about half way between

the pillar carrying the central plane, and the suspensions of the scale pans. The Humidity has been deduced from a new Masons Hygrometer: I have not the errors of its Thermometers, but they are modern, and not likely to have any producing sensible corrections to my result.

The following is a specimen of computation for the comparison of EI and O<sub>1</sub> which is entered in the type form; in it, *v* EI = volume of water at its greatest density which is displaced by EI at 32°. F.

$$\text{it therefore} = \frac{\text{wt. EI}}{\Delta \text{EI}} = \frac{479.95979}{21.414} = [1.35051]$$

$$\text{similarly } v \text{ O}_1 = \frac{479.99760}{8.5669} = [1.74842]$$

May 24th, 1879 A. M.

Commenced at 6 h. 48 m.

Ended at 7 h. 33 m.

Dry Bulb 85°·9 F.

Dry Bulb 85°·4

Wet do. 81·0 } Vapour Tension  
Diff. 4·9 } 0·993 in.

Wet do. 80·1 } Vapour Tension  
5·3 } 0·960 in.

in.

Mean of Thermometers 85·5  
Correction 0·00

Mean Red. Barometer 29·605  
0·189(0·993 + 0·960) = 0·369

Mean Temperature 85·50

h. = 29·236 log — 1·46592  
log A<sub>t</sub> (Tab I.) 5·59005

7·05597 ..... 7·05597

log *v* EI ..... 1·35051 log *v* O<sub>1</sub> ... 1·74842

(Tab. III.) log (1 + E P<sub>t</sub>) 0·00035 (Tab. III.) log (1 + E B<sub>t</sub>) ... 0·00066

Air displaced by EI } log = 8·40683  
= 0·025517 grs. }

Air displaced by O<sub>1</sub> } log = 8·80505  
= 0·063834 grs. }

grains.

Weight EI in Vacuo = 479·95979 of P S.

Air displaced = — 0·025517

EI ≡ 479·934273

Air displaced by O<sub>1</sub> = + 0·063834

O<sub>1</sub> ≡ EI — 0·000475\*

O<sub>1</sub> = 479·997632

\* In section IV, I found EI = O<sub>1</sub> + 0·4775 P<sub>·01</sub> and (Sec. VI) P<sub>·01</sub> = 0·009947 grains.

*Abstract of Comparisons.*

|              |                             |             |
|--------------|-----------------------------|-------------|
| 1879 May 24, | O <sub>1</sub> = 479·997632 | P S. grain. |
| „ 28, „      | ·997489                     | „           |
| „ 30, „      | ·996732                     | „           |
| „ 31, „      | ·997266                     | „           |
| „ June 1, „  | ·996911                     | „           |

$$\text{Mean } O_1 = 479\cdot997206 \pm 0\cdot000115 \text{ P S. grains.}$$

I have received, from the Meteorological Reporter to the Government of Bengal, the following mean data for Calcutta which I take as the definition of Standard Air

|                       |               |                                     |
|-----------------------|---------------|-------------------------------------|
| Reduced Barometer,... | in.           | } whence $\Delta A_s$<br>= 7·06510. |
| Temperature,.....     | 79°0 F.       |                                     |
| Humidity,.....        | 0·76 percent. |                                     |

Hence I have weight of O<sub>1</sub> = 479·997206 grains of P S.

Deduct displaced Standard Air = — 0·065178

Add Standard Air for  $\frac{480}{7000}$  W = + 0·068571

$$O_1 \equiv 480\cdot000599 \text{ grains of English Commercial Pound.}$$

This value differs slightly from that sent me and which I have quoted before.

SECTION VI.—*On the determination of the errors of single weights.*

In the interval between O<sub>1</sub> and O<sub>10</sub> there are, in all English bullion sets, weights O<sub>5</sub>, O<sub>4</sub>, O<sub>3</sub>, and O<sub>2</sub>; so between O<sub>10</sub> and O<sub>100</sub> come O<sub>20</sub> O<sub>30</sub> O<sub>40</sub> and O<sub>50</sub>, and so on.

Between these weights we may make comparisons giving the following equations :

$$\begin{aligned} O_{10} &\equiv O_5 + O_4 + O_1 + x_1 \pm e \text{ (a)} \\ &\equiv O_5 + O_3 + O_2 + x'_1 \pm e \text{ (b)} \\ &\equiv O_4 + O_3 + O_2 + O_1 + x''_1 \pm e \text{ (c)} \\ O_5 &\equiv O_4 + O_1 + x_3 \pm e \quad \text{e being the } p. e. \text{ of one com-} \\ O_5 &\equiv O_3 + O_2 + x_3 \pm e \quad \text{parison.} \\ O_4 &\equiv O_3 + O_1 + x_4 \pm e \\ O_3 &\equiv O_2 + O_1 + x_5 \pm e \end{aligned}$$

$$\begin{aligned} \text{Hence we have } O_2 &\equiv 2 O_1 + x_4 - x_3 + x_2 \pm e \sqrt{3} \\ O_3 &\equiv 3 O_1 + x_5 + x_4 - x_3 + x_2 \pm e \sqrt{4} \\ O_4 &\equiv 4 O_1 + x_5 + 2x_4 - x_3 + x_2 \pm e \sqrt{7} \\ O_5 &\equiv 5 O_1 + x_5 + 2x_4 - x_3 + 2x_2 \pm e \sqrt{10} \end{aligned}$$

$$O_{10} \begin{cases} \equiv 10 O_1 + 2x_5 + 4x_4 - 2x_3 + 3x_2 + x_1 \pm e \sqrt{34} \text{ from (a)} \\ \equiv 10 O_1 + 2x_5 + 4x_4 - 3x_3 + 4x_2 + x_1' \pm e \sqrt{46} \text{ from (b)} \\ \equiv 10 O_1 + 2x_5 + 4x_4 - 3x_3 + 3x_2 + x_1'' \pm e \sqrt{39} \text{ from (c)} \end{cases}$$

which equations give the ascending series; and it is important to note, that if the probable error of the observations be alike, there is a disadvantage in using any comparison but (a), and that even if (b) and (c) be observed as checks, they should not be used in computing, as they will lower the weight of  $O_{10}$ , on the accuracy of which we are dependent for continuing the upward series; thus the mean value of  $O_{10}$  from (a) and (c) will be

$O_{10} \equiv 10 O_1 + \frac{1}{2} (4x_5 + 4x_4 - 5x_3 + 6x_2 + x_1 + x_1'') \pm e \sqrt{\frac{1.4.5}{4}}$   
and if the series (b) had been involved the loss of probable accuracy would have been greater.

*Next as to descending or decreasing series from  $W_{10}$ .*

1st. Descending through (a)

$$\begin{aligned} O_5 &\equiv \frac{5}{10} O_{10} + \frac{x_2 - x_1}{2} \pm e \sqrt{\frac{5.0}{10}} \\ O_4 &\equiv \frac{4}{10} O_{10} + \frac{1}{10} (2x_5 + 4x_4 - 2x_3 - 2x_2 - 4x_1) \pm e \sqrt{\frac{4.4}{10}} \\ O_3 &\equiv \frac{3}{10} O_{10} + \frac{1}{10} (4x_5 - 2x_4 - 4x_3 + x_2 - 3x_1) \pm e \sqrt{\frac{3.6}{10}} \\ O_2 &\equiv \frac{2}{10} O_{10} - \frac{1}{10} (4x_5 - 2x_4 + 6x_3 - 4x_2 + 2x_1) \pm e \sqrt{\frac{7.6}{10}} \\ O_1 &\equiv \frac{1}{10} O_{10} - \frac{1}{10} (2x_5 + 4x_4 - 2x_3 + 3x_2 + x_1) \pm e \sqrt{\frac{3.6}{10}}. \end{aligned}$$

Again descending through (b)

$$\begin{aligned} O_5 &\equiv \frac{5}{10} O_{10} + \frac{1}{2} (x_3 - x_1') \pm e \sqrt{\frac{5.0}{10}} \\ O_4 &\equiv \frac{4}{10} O_{10} + \frac{1}{10} (2x_5 + 4x_4 + 2x_3 - 6x_2 - 4x_1') \pm e \sqrt{\frac{7.6}{10}} \\ O_3 &\equiv \frac{3}{10} O_{10} + \frac{1}{10} (4x_5 - 2x_4 - x_3 - 2x_2 - 3x_1') \pm e \sqrt{\frac{3.4}{10}} \\ O_2 &\equiv \frac{2}{10} O_{10} - \frac{1}{10} (4x_5 - 2x_4 + 4x_3 - 2x_2 + 2x_1') \pm e \sqrt{\frac{3.8}{10}} \\ O_1 &\equiv \frac{1}{10} O_{10} - \frac{1}{10} (2x_5 + 4x_4 - 3x_3 + 4x_2 + x_1') \pm e \sqrt{\frac{4.6}{10}}. \end{aligned}$$

Also descending through (c)

$$\begin{aligned} O_5 &\equiv \frac{5}{10} O_{10} + \frac{x_3 + x_2 - x_1''}{2} \pm e \sqrt{\frac{7.5}{10}} \\ O_4 &\equiv \frac{4}{10} O_{10} + \frac{1}{10} (2x_5 + 4x_4 + 2x_3 - 2x_2 - 4x_1'') \pm e \sqrt{\frac{3.2}{10}} \\ O_3 &\equiv \frac{3}{10} O_{10} + \frac{1}{10} (4x_5 - 2x_4 - x_3 + x_2 - 3x_1'') \pm e \sqrt{\frac{2.3}{10}} \\ O_2 &\equiv \frac{2}{10} O_{10} - \frac{1}{10} (4x_5 - 2x_4 + 4x_3 - 4x_2 + 2x_1'') \pm e \sqrt{\frac{5.6}{10}} \\ O_1 &\equiv \frac{1}{10} O_{10} - \frac{1}{10} (2x_5 + 4x_4 - 3x_3 + 3x_2 + x_1'') \pm e \sqrt{\frac{3.9}{10}}. \end{aligned}$$

If we were to be guided here by the same consideration as before, we should absolutely prefer the use of series (a) alone, but it is easy to see, that as the probable error of  $O_1$  involves only  $\frac{1}{10}$  of that of  $O_{10}$ ; the

determination of its weight will be almost entirely dependent on the error generated in the comparisons of the group\* of the series, and not on that derived from the starting weight: this renders the choice less important.

As a matter of fact I have worked both through (a) and (b) taking the mean result and in this case.

$$O_5 \equiv \frac{5}{10} O_{10} + \frac{1}{4} (x_3 + x_2 + x_1 + x_1') \pm e \sqrt{\frac{25}{10}}$$

$$O_4 \equiv \frac{4}{10} O_{10} + \frac{1}{20} (4x_5 + 8x_4 - 8x_2 - 4x_1 - 4x_1') \pm e \sqrt{\frac{44}{10}}$$

$$O_3 \equiv \frac{3}{10} O_{10} + \frac{1}{20} (8x_5 - 4x_4 - 5x_3 - x_2 - 3x_1 - 3x_1') \pm e \sqrt{\frac{31}{10}}$$

$$O_2 \equiv \frac{2}{10} O_{10} - \frac{1}{20} (8x_5 - 4x_4 + 10x_3 - 6x_2 + 2x_1 + 2x_1') \pm e \sqrt{\frac{52}{10}}$$

$$O_1 \equiv \frac{1}{10} O_{10} - \frac{1}{20} (4x_5 + 8x_4 - 5x_3 + 7x_2 + x_1 + x_1') \pm e \sqrt{\frac{39}{10}}$$

My choice was a matter of accident, but it turns out that the sum of the squares of the probable errors of all the deduced weights is less than for any one of the single series.

The other system of weights, which I have in this paper slightly to deal with, is what I shall call the "*English grain system.*" In it the weights interpolated between 10 and 1 are 6, 3 and 2. Thus starting from either end of the decad there are four weights to be derived; but among these weights alone, only three equations can be obtained.

$$\begin{aligned} P_{10} &= P_6 + P_3 + P_1 + x_1 \\ P_6 &= P_3 + P_2 + P_1 + x_2 \\ P_3 &= P_2 + P_1 + x_3. \end{aligned}$$

To make a definite resect the best plan is to use a second  $P_1$  called  $P_1'$ :  $P_1 + P_3 + P_1$  from the next lower decad height be used but the equations would not be independent for the separate decads.

$$P_2 = P_1 + P_1' + x_4 \text{ and } P_1 = P_1' + x_5$$

and we now have 5 equations to determine 5 quantities, and the result is definite. Of course by substituting  $P_1'$  for  $P_1$ , we can get 3 more equations like the first three, but the labour would be increased, and the result would still be definite, though slightly more accurate, especially as regards the spare weight  $P_1'$ .

From the equations we have; *in ascending (increasing weights)*

$$P_1' = P_1 - x_5 \pm e.$$

$$P_2 = 2 P_1 - x_5 + x_4 \pm e \sqrt{2}$$

$$P_3 = 3 P_1 - x_5 + x_4 + x_3 \pm e \sqrt{3}$$

\* I use the term *decad* to include the weights from 0.1 to 1, or from 1 to 10, &c., the last being ten times the first; and a *group* of equations consists of those connecting the weights of a *decad*.

$$P_6 = 6 P_1 - 2x_5 + 2x_4 + x_3 + x_2 \pm e \sqrt{10}$$

$$P_{10} = 10 P_1 - 3x_5 + 3x_4 + 2x_3 + x_2 + x_1 \pm e \sqrt{24}.$$

While descending, we have

$$P_6 = \frac{6}{10} P_{10} - \frac{1}{10} (2x_5 - 2x_4 + 2x_3 - 4x_2 + 6x_1) \pm e \sqrt{\frac{84}{10}}$$

$$P_3 = \frac{3}{10} P_{10} - \frac{1}{10} (x_5 - x_4 - 4x_3 + 3x_2 + 3x_1) \pm e \sqrt{\frac{36}{10}}$$

$$P_2 = \frac{2}{10} P_{10} - \frac{1}{10} (4x_5 - 4x_4 + 4x_3 + 2x_2 + 2x_1) \pm e \sqrt{\frac{56}{10}}$$

$$P_1 = \frac{1}{10} P_{10} + \frac{1}{10} (3x_5 - 3x_4 - 2x_3 - x_2 - x_1) \pm e \sqrt{\frac{24}{10}}$$

$$P_1' = \frac{1}{10} P_{10} - \frac{1}{10} (7x_5 + 3x_4 + 2x_3 + x_2 + x_1) \pm e \sqrt{\frac{64}{10}}.$$

### SECTION VII.

I now proceed to the determination of the actual values of the weights below  $O_1$ , and of the P set, in commercial grains. The equations have all been determined in terms of the rider  $R_1$ , in the balance Oertling No. 1, and they are given in this way. Of course the whole of the computations were made with this unknown factor, but it has been determined (see page 56) and the value has been substituted in the results to save repetition. The differences between the two determinations of the constant term in each equation are given, and from them is derived a probable error of one equation. I had intended that the observations in each decad should be separately valued, but when that is done the results are so nearly alike that it seems unnecessary to adhere to this. The mode of determining the probable error of each weight is the subject of the next section, but the values are given in this.

#### *Value of Weights of W set below $W_1$ with Balance Oertling No. 1.*

I have here the following equations :

|           |                                      |                 |                   |
|-----------|--------------------------------------|-----------------|-------------------|
| $O_1$     | $\equiv O_5 + O_4 + O_1$             | $-0.213325 R_1$ | Difference = 2600 |
| $O_1$     | $\equiv O_5 + O_3 + O_2$             | $-0.238825$     | " = 1450          |
| $O_5$     | $\equiv O_4 + O_1$                   | $-0.001800$     | " = 350           |
| $O_5$     | $\equiv O_3 + O_2$                   | $-0.124325$     | " = 500           |
| $O_4$     | $\equiv O_3 + O_1$                   | $-0.002913$     | " = 825           |
| $O_3$     | $\equiv O_2 + O_1$                   | $-0.011113$     | " = 275           |
| $O_1$     | $\equiv O_{.05} + O_{.04} + O_{.01}$ | $-0.033200 R_1$ | Difference = 200  |
| $O_1$     | $\equiv O_{.05} + O_{.03} + O_{.02}$ | $-0.042213$     | " = 2925          |
| $O_{.05}$ | $\equiv O_{.04} + O_{.01}$           | $-0.020938$     | " = 475           |
| $O_{.05}$ | $\equiv O_{.03} + O_{.02}$           | $-0.032138$     | " = 1475          |
| $O_{.04}$ | $\equiv O_{.03} + O_{.01}$           | $-0.030838$     | " = 775           |
| $O_{.03}$ | $\equiv O_{.02} + O_{.01}$           | $-0.035763$     | " = 475           |

|                                                                |              |        |
|----------------------------------------------------------------|--------------|--------|
| $O_{.01} \equiv O_{.005} + O_{.004} + O_{.001} - 0.012263 R_1$ | Difference = | 425    |
| $O_{.01} \equiv O_{.005} + O_{.003} + O_{.002} - 0.021500$     | „            | = 150  |
| $O_{.005} \equiv O_{.004} + O_{.001} - 0.076963$               | „            | = 1625 |
| $O_{.005} \equiv O_{.003} + O_{.002} - 0.015813$               | „            | = 1725 |
| $O_{.004} \equiv O_{.003} + O_{.001} - 0.040638$               | „            | = 675  |
| $O_{.003} \equiv O_{.002} + O_{.001} - 0.093775$               | „            | = 100  |
| $O_{.025} \equiv O_{.02} + O_{.005} - 0.016100 R_1$            | Difference = | 200    |

From these equations I deduce

|            | grs.                               |                     | grs. | <i>p. e.</i> |
|------------|------------------------------------|---------------------|------|--------------|
| $O_{.5}$   | $\equiv 240.000300 + 0.056006 R_1$ | $\equiv 240.005927$ |      | $0.000064$   |
| $O_{.4}$   | $\equiv 192.000240 + 0.127762$     | $\equiv 192.013076$ |      | $0.000060$   |
| $O_{.3}$   | $\equiv 144.000180 + 0.100631$     | $\equiv 144.010290$ |      | $0.000047$   |
| $O_{.2}$   | $\equiv 96.000120 + 0.081700$      | $\equiv 96.008328$  |      | $0.000048$   |
| $O_{.1}$   | $\equiv 48.000060 + 0.030044$      | $\equiv 48.003078$  |      | $0.000037$   |
| $O_{.05}$  | $\equiv 24.000030 + 0.020606$      | $\equiv 24.002100$  |      | $0.000033$   |
| $O_{.04}$  | $\equiv 19.200024 + 0.015988$      | $\equiv 19.201630$  |      | $0.000040$   |
| $O_{.03}$  | $\equiv 14.400018 + 0.021269$      | $\equiv 14.402155$  |      | $0.000033$   |
| $O_{.02}$  | $\equiv 9.600012 + 0.031475$       | $\equiv 9.603180$   |      | $0.000012$   |
| $O_{.01}$  | $\equiv 4.800006 + 0.025537$       | $\equiv 4.802574$   |      | $0.000035$   |
| $O_{.005}$ | $\equiv 2.400003 + 0.030932$       | $\equiv 2.403111$   |      | $0.000033$   |
| $O_{.004}$ | $\equiv 1.920002 + 0.065261$       | $\equiv 1.926559$   |      | $0.000040$   |
| $O_{.003}$ | $\equiv 1.440002 - 0.018011$       | $\equiv 1.438193$   |      | $0.000033$   |
| $O_{.002}$ | $\equiv 0.960001 + 0.033130$       | $\equiv 0.963329$   |      | $0.000042$   |
| $O_{.001}$ | $\equiv 0.480001 + 0.042634$       | $\equiv 0.484284$   |      | $0.000035$   |
| $O_{.025}$ | $\equiv 12.000015 + 0.036101$      | $\equiv 12.003642$  |      | $0.000077$   |

The two largest weights  $P_{2.4}$  and  $P_{2.4}^*$  of the P set are each approximately equal to 24 grains and their sum is of course nearly =  $O_{.1}$  but they are of platinum while  $O_{.1}$  is of gilt bronze. Small as these are the errors cannot be neglected when accuracy is required. The purpose of the determination being mainly to get the values of the small weights of the P set with accuracy so that they may be used to determine differences, it is enough to correct the value above given of  $O_{.1}$  so that the deduced value of  $P_{2.4} + P_{2.4}^*$  may be the same as if the comparison had been made in standard air. For all ordinary purposes the resulting values of these weights may be used without correction.

I have found that 48 grains of platinum would weigh less in my standard air than under the circumstances of the observation by 0.000063 grains. Also  $O_{.1} \equiv P_{2.4} + P_{2.4}^* + 0.050238 R_1$ .

The value of  $O_{.1}$  is  $\equiv 48.000060 + 0.030044 R_1$

$\therefore$  in actual air  $P_{2.4} + P_{2.4}^* \equiv 48.000060 - 0.020194 R_1$

and the correction to standard air is  $- 0.000063$

Hence in standard air  $P_{2.4} + P_{2.4}^* \equiv 47.999997 - 0.020194 R_1$



By weighing the riders against the nearly equal weight  $P_1$  I have

$$R_1 \equiv P_1 + 0.003813 R_2 \quad \text{Diff. } 425$$

$$R_2 \equiv P_1 + 0.000375 R_1 \quad \text{,, } 600$$

Substituting successively for the value of  $R_1$ , of  $P_1$ , and of  $R_2$  we get

$$\begin{array}{l} \text{grs.} \\ R_1 \equiv 0.1003814 + 0.000847 R_1 \equiv 0.100466 \text{ grs. } p. e. = 0.000062 \\ R_2 \equiv 0.100000 + 0.001217 R_1 \equiv 0.100122 \text{ ,, ,, } = 0.000062 \end{array}$$

$$\text{Also—} P_{.1} \equiv P_{.06} + P_{.03} + 0.089038 R_2 \quad \text{Diff. } 825$$

$$P_{.06} \equiv P_{.03} + P_{.02} + 0.104750 \text{ ,, ,, } 1550$$

$$P_{.03} \equiv P_{.02} + 0.105075 \text{ ,, ,, } 900$$

$$P_{.01} \equiv 0.099438 \text{ ,, ,, } 137$$

$$\text{Whence } P_{.06} \equiv \frac{2}{3} P_1 - 0.059467 R_2 \equiv 0.060769 \text{ } p. e. = 0.000047$$

$$P_{.03} \equiv \frac{1}{3} P_1 - 0.029571 \text{ ,, } \equiv 0.030400 \text{ ,, } 0.000034$$

$$P_{.02} \equiv \frac{1}{3} P_1 - 0.134646 R_1 \equiv 0.019881 \text{ ,, } 0.000047$$

$$P_{.01} \equiv 0.099438 \text{ ,, } \equiv 0.009956 \text{ ,, } 0.000056$$

SECTION VIII.—*Determination of the probable errors of the values of the O and P sets.*

In Section VI, I have shown that if the probable error of the constant terms in the equations of a group be known, we can determine the probable errors of the determinations in the group, so far as they depend on it: and we have now to consider what may be taken as the probable error of one determination.

Each coefficient of  $R$  is derived in the preceding work from two determinations which rarely agree. The differences are noted in terms of the 6th decimal place of the coefficient. If we were certain that the true values of the constants lay between the determinations, then, calling the difference of the two  $2a$ , we should have  $\frac{\sum a}{n}$  = the mean of errors and  $p. e.$  of an equation =  $e = 0.8454 \frac{\sum a}{n}$ ; but this value is clearly too small; because, if the occurrence of positive and negative errors be equally probable, then there is an even chance that a fourth of the values of  $2a$  will be the difference and not the sum of the two actual errors.

I prefer therefore to use the formula

$$\text{mean of errors} = \frac{\sum v}{\sqrt{m(m-1)}}; m \text{ being the number of complete comparisons}$$

$$\text{and probable error} = 0.8454 \frac{\sum v}{\sqrt{m(m-1)}}$$

applying this to any one determination we shall have its probable error

$$= 0.8454 \frac{2a}{\sqrt{2 \times 1}} = 0.8454 \sqrt{2a} = 1.1955 a$$

Of course this is a very uncertain estimation, but we have a good many such equations, and the mean of the values may I think be taken as the fairest estimate. If then  $n$  be the number of equations, I take

$$p. e. \text{ of any one determination is } 1.1955 \frac{\sum a}{n}$$

The group of equations determining the P weights would give the probable error from their residuals; but, there being only 12 equations to determine 10 quantities, I do not think this is so satisfactory as the above method; and I have used, for evaluating the errors in them, the weights of the results, deduced as usual, combined with the  $p. e.$  of an equation derived as above. Assuming that we may neglect the difference between the values of  $R_1$  and  $R_2$  in these differences, we have 41 values of  $2a$ ; and it does not seem that there is any marked tendency to decrease with the weights: I therefore take the mean of all and I get

$$\frac{\sum a}{n} = 463.53 R \quad p. e. = 554.16 R = 55.651 = e \text{ of Section VI}$$

$$\text{in which } R \text{ is taken } 0.100464 = \frac{36 R_1 + 5 R_2}{41}$$

$$\text{Hence } e^2 \text{ is } 3097.0$$

The probable error of any determination as of that of  $O_{.03}$  for instance, depends:—

1st on the amount arising from its own group.

2nd probable error of the value assumed as known: in this case  $O_{.1}$

3rd on the probable error of the rider which was employed in taking the difference of weights in the pans.

Lastly  $O_1$  itself has its probable error 0.000115 grains from the determinations; but there is also a portion dependent on  $P_{.01}$ , which is involved in determining the difference between it and EI, the mean factor of  $P_{.01}$  being 0.0877. It is necessary, therefore, to start our evaluations with values of the probable errors of  $R_1$ ,  $R_2$  and  $P_{.01}$ ; and, fortunately, these are readily determined.

Let  $E$  be the  $p. e.$  of  $P_{.1}$  from all sources except  $R_1$

$e$  as before the  $p. e.$  of one determination

$\epsilon$  the  $p. e.$  of  $R_1$

It will be seen from the table of deduction of probable errors that the value of  $E^2$  is 758.2 and that it involves nothing unknown.

$$\text{Hence } (p. e. R_1)^2 = \epsilon^2$$

$$= (1.003813)^2 E^2 + (0.000842)^2 \epsilon^2 + e^2$$

$$= 764.0 + 0.0000007 \epsilon^2 + 3097.0 = 3861.0$$

$$\therefore \epsilon = 0.000062 = \frac{1}{10^6} \sqrt{3861.0}$$

$$\text{again } p. e. R_2 = \sqrt{E^2 + e^2 + 0.000375^2 \epsilon^2} = \frac{1}{10^6} \sqrt{3861.0} = 0.000062$$

$$p. e. P_{.01} = \sqrt{e^2 + 0.099438^2 (R_2)^2} = \sqrt{3135.2} = 0.000056$$

*Determination of Probable Errors.*

| Squares of Probable Errors (unit is 6th decimal place). |                        |           |                       |                         |         |           | Probable error. |
|---------------------------------------------------------|------------------------|-----------|-----------------------|-------------------------|---------|-----------|-----------------|
| From group.                                             | From preceding groups. | From E.I. | From R <sub>1</sub> . | From P <sub>.01</sub> . | Total.  |           |                 |
| O <sub>1</sub>                                          | ...                    | 13225.0   | ...                   | 24.1                    | 13249.1 | 0.000 115 |                 |
| O <sub>.5</sub>                                         | 774.3                  | ...       | 3306.2                | 12.1                    | 6.0     | 4098.6    | 64              |
| O <sub>.4</sub>                                         | 1362.7                 | ...       | 2116.0                | 64.2                    | 3.9     | 3546.3    | 60              |
| O <sub>.3</sub>                                         | 960.1                  | ...       | 1190.3                | 41.1                    | 2.2     | 2193.7    | 47              |
| O <sub>.2</sub>                                         | 1734.3                 | ...       | 529.0                 | 25.7                    | 1.0     | 2290.0    | 48              |
| O <sub>.1</sub>                                         | 1207.8                 | ...       | 132.3                 | 3.5                     | 0.2     | 1343.8    | 37              |
| O <sub>.05</sub>                                        | 774.3                  | 301.9     | 33.1                  | 1.6                     | 0.1     | 1111.0    | 33              |
| O <sub>.04</sub>                                        | 1362.7                 | 193.2     | 21.2                  | 1.0                     | ,,      | 1578.1    | 40              |
| O <sub>.03</sub>                                        | 960.1                  | 108.7     | 11.9                  | 1.7                     | ,,      | 1082.4    | 33              |
| O <sub>.02</sub>                                        | 1734.3                 | 48.3      | 5.3                   | 3.8                     | ,,      | 1791.7    | 42              |
| O <sub>.01</sub>                                        | 1207.8                 | 12.1      | 1.3                   | 2.5                     | ,,      | 1223.7    | 35              |
| O <sub>.005</sub>                                       | 774.3                  | 305.0     | 0.3                   | 3.7                     | ,,      | 1083.3    | 33              |
| O <sub>.004</sub>                                       | 1362.7                 | 195.2     | 0.2                   | 16.4                    | ,,      | 1574.5    | 40              |
| O <sub>.003</sub>                                       | 960.1                  | 109.8     | 0.1                   | 1.2                     | ,,      | 1071.2    | 33              |
| O <sub>.002</sub>                                       | 1734.3                 | 48.8      | 0.1                   | 4.2                     | ,,      | 1787.4    | 42              |
| O <sub>.001</sub>                                       | 1207.8                 | 12.2      | ,,                    | 7.0                     | ,,      | 1227.0    | 35              |
| O <sub>.025</sub>                                       | 3097.0                 | 2861.9    | 8.3                   | 19.8                    | ,,      | 5987.0    | 77              |
| P <sub>2.5</sub>                                        | 1447.5                 | 301.9     | 33.1                  | 0.2                     | 0.1     | 1782.8    | 42              |
| P <sub>2.4</sub> *                                      | 1447.5                 | 301.9     | 33.1                  | ,,                      | 0.1     | 1782.6    | 42              |
| P <sub>2.0</sub>                                        | 2310.6                 | 209.7     | 22.9                  | ,,                      | ,,      | 2543.2    | 50              |
| P <sub>1.6</sub>                                        | 2229.2                 | 134.2     | 14.7                  | 0.1                     | ,,      | 2378.2    | 49              |
| P <sub>1.0</sub>                                        | 1806.4                 | 52.4      | 5.7                   | ,,                      | ,,      | 1864.5    | 43              |
| P <sub>6</sub>                                          | 148.1                  | 18.9      | 0.9                   | 0.5                     | ,,      | 168.4     | 13              |
| P <sub>3</sub>                                          | 1245.2                 | 4.7       | 0.5                   | 0.1                     | ,,      | 1250.5    | 35              |
| P <sub>2</sub>                                          | 2541.5                 | 2.1       | 0.2                   | ,,                      | ,,      | 2543.8    | 50              |
| P <sub>1</sub>                                          | 1490.5                 | 0.5       | ,,                    | 0.3                     | ,,      | 1491.3    | 39              |
| P' <sub>1</sub>                                         | 1836.0                 | 0.5       | ,,                    | ,,                      | ,,      | 1836.5    | 43              |
| P <sub>.6</sub>                                         | 2601.5                 | 536.9     | ,,                    | ,,                      | ,,      | 3138.4    | 56              |
| P <sub>.3</sub>                                         | 1114.9                 | 134.2     | ,,                    | ,,                      | ,,      | 1249.1    | 35              |
| P <sub>.2</sub>                                         | 1734.6                 | 59.6      | ,,                    | ,,                      | ,,      | 1794.2    | 42              |
| P <sub>.1</sub>                                         | 743.3                  | 14.9      | ,,                    | ,,                      | ,,      | 758.2     | 28              |
| P' <sub>.1</sub>                                        | 1932.1                 | 14.9      | ,,                    | ,,                      | ,,      | 1997.0    | 45              |

$$\text{Also } p. e. P_{.06} = \frac{1}{10^6} \sqrt{2064.6 + 169.5 + 13.6} = \frac{1}{10^6} \sqrt{2247.7} = 0.000047$$

$$p. e. P_{.03} = \frac{1}{10^6} \sqrt{1032.3 + 84.2 + 13.3} = \frac{1}{10^6} \sqrt{1129.8} = 0.000034$$

$$p. e. P_{.02} = \frac{1}{10^6} \sqrt{2064.6 + 84.2 + 70.0} = \frac{1}{10^6} \sqrt{2218.8} = 0.000047$$

SECTION IX.—*Determinations of the Weights O<sub>2</sub> to O<sub>10</sub> and also Prinsep's Bronze Troy Pound.*

The comparisons of the weights from O<sub>2</sub> to O<sub>10</sub> have been made with the balance Oertling No. 2. Three complete comparisons were made in each case, and the weight P<sub>.03</sub> has been always used for valuing the scale. I have deduced the following equations of condition:—

$$\begin{aligned} O_3 &\equiv O_2 + O_1 & -0.37200 P_{.03} &\equiv O_2 + O_1 & 0.000000 - 0.37200 P_{.03} \\ O_4 &\equiv O_3 + O_1 + P_{.06} & + 0.74542 P_{.03} &\equiv O_3 + O_1 & + 0.060769 + 0.74542 P_{.03} \\ O_5 &\equiv O_3 + O_2 + P_{.1} & + 0.37867 P_{.03} &\equiv O_3 + O_2 & + 0.100085 + 0.37867 P_{.03} \\ && & & & \equiv O_4 + O_1 + P_{.02} & + 0.60467 P_{.03} & \equiv O_4 + O_1 & + 0.019881 + 0.60467 P_{.03} \\ O_{10} &\equiv O_5 + O_4 + O_1 & - P_{.1} - P_{.06} & + 0.45742 P_{.03} & \equiv O_5 + O_4 + O_1 & - \\ &&&&&&&&&& 0.160854 + 0.45742 P_{.03} \end{aligned}$$

Whence I deduce by the Formulæ in Sec. VI.

$$\begin{aligned} O_2 &\equiv 2 O_1 + P_{.06} + P_{.02} - P_{.1} + 0.97142 P_{.03} & \equiv 960.011294 \text{ grs.} \\ &&&&& p. e. = 0.000757 \text{ ,,} \\ O_3 &\equiv 3 O_1 + P_{.06} + P_{.02} - P_{.1} + 0.59942 \text{ ,,} & \equiv 1440.000584 \text{ ,,} \\ &&&&& p. e. = 0.000900 \text{ ,,} \\ O_4 &\equiv 4 O_1 + 2 P_{.06} + P_{.02} - P_{.1} + 1.34484 \text{ ,,} & \equiv 1920.084613 \text{ ,,} \\ &&&&& p. e. = 0.001194 \text{ ,,} \\ O_5 &\equiv 5 O_1 + 2 P_{.06} + 2 P_{.02} - P_{.1} + 1.94951 \text{ ,,} & \equiv 2400.123435 \text{ ,,} \\ &&&&& p. e. = 0.001438 \text{ ,,} \\ O_{10} &\equiv 10 O_1 + 3 P_{.06} + 3 P_{.02} - 3 P_{.1} + 3.75167 \text{ ,,} & \equiv 4800.061736 \text{ ,,} \\ &&&&& p. e. = 0.002795 \text{ ,,} \end{aligned}$$

In the last Section, I have given a general formula for finding a probable error of observation. In this case, I have  $\Sigma(o) = 3941.2 \frac{P_{.03}}{10^5}$ ,

whence the probable error of one equation of condition will be

$$= 0.8454 \cdot \frac{3941.2}{\sqrt{3.2}} \cdot \frac{P_{.03}}{10^5} = 0.000413.5$$

The probable error of each determination of a weight depends—

- 1st, on its error derived from O<sub>1</sub> of which it is nearly a multiple,
- 2nd, on the error derived through the weights of the P set used to nearly counterbalance,

3rd, on the error due to the fraction of  $P_{.03}$  which is involved in its determination,

4th, on the error generated in the weighings of the series.

The following Table shows the error from each source separately.

| Weights. | Squares of Probable Errors from |                 |           |                       |         | Probable Error $\times 10^6$ . |
|----------|---------------------------------|-----------------|-----------|-----------------------|---------|--------------------------------|
|          | $O_1$                           | Equil. Weights. | $P_{.03}$ | Weighments of Series. | Total.  |                                |
| $O_2$    | 52900                           | 5225            | 1179      | 514116                | 573420  | 757                            |
| $O_3$    | 119025                          | 5225            | 449       | 685488                | 810187  | 900                            |
| $O_4$    | 211600                          | 11968           | 2259      | 1199600               | 1425427 | 1194                           |
| $O_5$    | 330625                          | 18624           | 4747      | 1713720               | 2067716 | 1438                           |
| $O_{10}$ | 1922500                         | 47022           | 47581     | 5826648               | 7813751 | 2795                           |

In making these calculations, I have neglected to attend to the fact that the P weights used have a common origin; the sum of the squares of the probable errors given in the Table at the end of Section VIII is taken, and here (as will be seen by turning back) the error from their common origin  $O_1$  is unfelt, but this is not always the case.

Among the weights in the Assay Office is a bronze Standard Troy Pound in a wooden ease, on which ease is stamped  $\left\{ \begin{array}{l} \text{J. FIELD} \\ \text{Fecit} \end{array} \right\}$ , and in ink is written

J. Prinsep. }  
Std. 1 lb }

On the weight itself is engraved—

*British Troy Pound.*

= 5760 grains.

Royal Mint.

The surface of the weight is thinly oxidized, but it seems to be quite uninjured. I some time ago compared it, as well as I could, with the weights of the Gilt Troy set belonging to the Assay Office, which were supplied many years ago, and which were made by Bates in 1824. No record of any previous comparisons of these exists. The conclusion I came to was, that Prinsep's Troy Pound was about a mean of all the Gilt Pounds, the latter weights having sensible errors. I have then thought it worth while to determine the value of the Prinsep's Pound, and I find—

$$\begin{aligned} \text{Prinsep's Pound} &\equiv O_{10} + O_2 + P_1 + P_{.01} - 0.487 P_{.03} \\ &\equiv 5760.148354 \text{ grains,} \end{aligned}$$

from a single complete comparison.

To find the probable error of this we must substitute in the above equation the symbolic values of  $O_{1.0} + O_2$  and thus we have—

Prinsep's Pound  $\equiv 12 O_1 + P_{.01} + 4 P_{.02} + 4 P_{.06} - 3 P_{.1} + 4 23606 P_{.03}$   
 from which the probable error will (when the errors generated in determining  $O_2$  and  $O_{1.0}$ , and also in the single comparison of this weight are allowed for)

$$= \frac{1}{10^6} \sqrt{8878998} = 0.002890$$

and we may consider Prinsep's Pound  $\equiv 5760.148 \pm 0.003$  grains.

SECTION X.—*Considerations as to the Weights which should be made use of in a series.*

The only generally used decimal system of weights, is the metric, which is so largely diffused. In it the weights between  $W_1$  and  $W_{1.0}$  are  $W_{.5}$ ,  $W_2$  in duplicate, and  $W_1$ . When the system was adopted in England permissively, the intermediate weights chosen were  $W_5$ ,  $W_3$  and  $W_2$ . The other series in use, are those I have described before as the Bullion, and the English Grain Series. In making a series of weights of talahs for the use of the Indian mints, I have therefore a choice; and it is worth considering which series is the best.

*Commercially*, the fewer weights required to make any weighment, the better. I think, too, that commercially it is undesirable to have duplicate weights, and of course none should be superfluous. In the strict *French Metric* system there are 3 weights required to weigh 9 and 8, while two are wanted for 7, 6, and 3, and the 2 is in duplicate; and in the *English modification* there are 3 weights wanted for 9 only, while 8, 7, 6, and 4 require two each, and there is no duplicate: I think then that the English modification is preferable to the original system.

In our *English Bullion* system there are never 3 weights wanted for any purpose; and 9, 8, 7, and 6 require two weights. But there are more weights than are wanted, there being 5 weights in each decad instead of 4.

In the *English Grain* system there are never 3 weights wanted; 9, 8, 7, 5, and 4 require two each, there are no duplicates, and none superfluous. I think then that the English Grain system is the best for commercial purposes.

*Scientifically*, the best system is that of which the values can be most accurately deduced from the standard Prototype. It is worthy of note, that neither of the Metric systems, nor the English Grain system, admit of the weights of a decad being completely determined without a second unit in each decad.

This is not an unmixed disadvantage. The 1, 10, &c., being necessary for this purpose only, and not used in common, may be kept separately, and referred to for verifications whenever desired, and by such use the errors of the weights of any decad, can be determined with comparatively little

labour and without its being necessary to refer back to a primary weight. Thus, checking becomes much more manageable, and, by such a plan as I have adopted in dealing with the P set, one of the duplicates is far more accurately determined than the other, and can be laid aside for reference; the accuracy of the second being ordinarily sufficient.

The English Bullion system, as we have seen, contains the means of determining the values of all the weights without duplicates, and it is possible to have one weight practically unused, if we consent to make either 8 or 9 by three weights; this reference weight, however, is not so convenient for use as in the other cases.

The English Grain system has this advantage over all the others, that any weight from 1 to 10 requires at most two weights to make it. It has the disadvantage that 6 is not the half of ten, but, on the other hand, 3 is the half of 6; and I do not see the great gain of this relation, unless it be admitted that the system of division should be binary. In France, it was proposed that each multiple of a unit by ten, and each division by ten, should be a new unit. Some slight gain might have come if this had become a thoroughly practical procedure; but, in fact, one rarely hears of any but the kilogramme, gramme, and milligramme, and so of the other numbers of the series. I think, then, that the advantage of being able to have a single weight for half a hectogramme, &c. is dearly purchased, if there be a disadvantage in the determinations; and, in deciding on a system of weight, it is necessary to consider the probable errors of these determinations.

In each of these proposed systems, 5 comparisons, giving 5 equations, are enough to connect all the weights in a decade. If this number be alone used, then the probable errors of  $W_{10}$  derived from  $W_1$  will be

|                           |               |   |                                |
|---------------------------|---------------|---|--------------------------------|
| English Grain System..... | $e \sqrt{24}$ | } | if the best equation be taken. |
| ,, Bullion .....          | $e \sqrt{34}$ |   |                                |
| ,, Metric .....           | $e \sqrt{38}$ |   |                                |
| Original Metric .....     | $e \sqrt{26}$ |   |                                |

In this respect the English Grain system seems best, and the Modified Metric System the worst. The Original Metric system is nearly as good as the English Grain system, and it is possibly better if a good deal more labour be given to each; but I think—when it is considered that weighing by the English Grain system requires only two weights in each decade, and that the standard system should coincide if possible with that in use—the palm will be assigned to the Grain system.

I think, too, that those who have gone with me so far, will feel as strongly as myself the great gain of a “large primary unit.” It has

always been considered necessary to have the primary unit very indestructible, and no doubt this is a very important point: the lead was taken in France, where the Normal Kilogramme was made of platinum; platinum was again used in England for the Standard Pound, and now standards of reference are made of a Platinum-iridium alloy. The cost of the mere metal is very heavy (a kilogramme is at present worth £60 for mere material), and the use of such a metal for large weights is of course out of the question. It seems to me doubtful whether equal accuracy could not be obtained by employing a large weight of gilt or nickelized bronze; from which copies could be made with far greater accuracy than they could be separately deduced from the small primary. It is possibly too late to change the material of Primary Standards now, but at all events the standard of Commercial Weight should be a large mass of gilt bronze.

Acting on these principles, I have nearly made a set of weights from 1000 tolahs to 0·001 tolah from these bullion weights. There will be several copies of the largest, carefully compared, some of which I trust Government will allow me to distribute. The individual weights are on what I have called the English Grain system: that is, there are—

| 1000 tolahs. | 100 tolahs. | 10 tolahs. | 1 tolahs. | 0·10 tolahs. | 0·010 tolahs. |
|--------------|-------------|------------|-----------|--------------|---------------|
| 600          | 60          | 6          | 0·6       | 0·06         | 0·006         |
| 300          | 30          | 3          | 0·3       | 0·03         | 0·003         |
| 200          | 20          | 2          | 0·2       | 0·02         | 0·002         |
| 100          | 10          | 1          | 0·1       | 0·01         | 0·001         |

The final adjustments and deductions have yet to be made; but after what I have said, there will be little new in this. I have been very greatly assisted by Mr. Durham, Senior Assistant in the Assay Office, who has superintended all of the gilding; and to whom I owe devices which will allow the gilt weights to be made true almost to the accuracy of a single comparison by substitution.

TABLE I.

*Logarithms for calculating the Weight of the Air adapted to Fahrenheit's Thermometer.*

This Table gives 10 + the logarithm of the ratio which the weight of air at the temperature named and at Calcutta bears to that of the same volume of water when at its maximum density, the logarithm of the height of the barometer.

If B be the reading of the barometer reduced to freezing point; the temperature and V the elasticity of the vapour in the air

$$\text{then } \log \text{ sq. of air} = A_t + \log (B - 0\cdot238 V).$$

The value of  $A_t$  at sea-level in latitude  $45^\circ$  can be got from these numbers by adding 0.000785.7 to each and thence the value for any other place.

| Temp. | $A_t$ .   | $\Delta^{(1)} A_t$ . | Temp. | $A_t$ .   | $\Delta^{(1)} A_t$ . | Temp. | $A_t$ .   | $\Delta^{(1)} A_t$ . |
|-------|-----------|----------------------|-------|-----------|----------------------|-------|-----------|----------------------|
| 30°   | 5.6366164 | 8848                 | 55°   | 5.6150200 | 8419                 | 80°   | 5.5944469 | 8030                 |
| 1     | 6357316   | 8830                 | 6     | 6141781   | 8402                 | 1     | 5936439   | 8015                 |
| 32    | 6348486   | 8812                 | 7     | 6133379   | 8387                 | 2     | 5928424   | 8000                 |
| 3     | 6339674   | 8794                 | 8     | 6124992   | 8371                 | 3     | 5920423   | 7985                 |
| 4     | 6330880   | 8776                 | 9     | 6116621   | 8354                 | 4     | 5912438   | 7971                 |
| 35    | 5.6322104 | 8759                 | 60    | 5.6108267 | 8338                 | 85    | 5.5904467 | 7957                 |
| 6     | 6313345   | 8741                 | 1     | 6099929   | 8323                 | 6     | 5896510   | 7942                 |
| 7     | 6304604   | 8724                 | 2     | 6091606   | 8306                 | 7     | 5888568   | 7927                 |
| 8     | 6295380   | 8705                 | 3     | 6083300   | 8291                 | 8     | 5880641   | 7913                 |
| 9     | 6287175   | 8689                 | 4     | 6075009   | 8275                 | 9     | 5872728   | 7899                 |
| 40    | 5.6278486 | 8671                 | 65    | 5.6066734 | 8258                 | 90    | 5.5864829 | 7884                 |
| 1     | 6269815   | 8654                 | 6     | 6058476   | 8244                 | 1     | 5856945   | 7870                 |
| 2     | 6261161   | 8637                 | 7     | 6050232   | 8227                 | 2     | 5849075   | 7856                 |
| 3     | 6252524   | 8619                 | 8     | 6042005   | 8212                 | 3     | 5841219   | 7841                 |
| 4     | 6243905   | 8603                 | 9     | 6033793   | 8197                 | 4     | 5833378   | 7828                 |
| 45    | 5.6235302 | 8585                 | 70    | 5.6025596 | 8181                 | 95    | 5.5825550 | 7813                 |
| 6     | 6226717   | 8569                 | 1     | 6017415   | 8166                 | 6     | 5817737   | 7799                 |
| 7     | 6218148   | 8552                 | 2     | 6009249   | 8151                 | 7     | 5809938   | 7785                 |
| 8     | 6209596   | 8535                 | 3     | 6001098   | 8135                 | 8     | 5802153   | 7772                 |
| 9     | 6201061   | 8518                 | 4     | 5992963   | 8120                 | 9     | 5794381   | 7757                 |
| 50    | 5.6192543 | 8502                 | 75    | 5.5984843 | 8105                 | 100   | 5.5786624 |                      |
| 1     | 6184041   | 8485                 | 6     | 5976738   | 8090                 |       |           |                      |
| 2     | 6175556   | 8468                 | 7     | 5968468   | 8074                 |       |           |                      |
| 3     | 6167088   | 8452                 | 8     | 5960514   | 8060                 |       |           |                      |
| 4     | 6158636   | 8436                 | 9     | 5952514   | 8045                 |       |           |                      |

TABLE II.

*Logarithm of the Ratio of the Density of Water to its Maximum Density for each degree of Fahrenheit's Thermometer.*

This Table is founded on that given at page 66 &c. of the Report of the Warden of the Standards for 1871-72. Certain values of the Table there given, were taken and the constants found to express them in a series of the form  $A(t - n_1)^2 + B(t - n_2)^3$ , and, these having then been suitably modified to change the scale of the thermometer from Centigrade to Fahrenheit, the present Table was computed.

| Temp. | Log. Ratio. | $\Delta^{(1)}$ R. | Temp. | Log. Ratio. | $\Delta^{(1)}$ R. | Temp. | Log. Ratio. | $\Delta^{(1)}$ R. |
|-------|-------------|-------------------|-------|-------------|-------------------|-------|-------------|-------------------|
| 30°   |             |                   | 55°   | 0·0002400   | + 302             | 80°   | 0·0014313   | 639               |
| 1     |             |                   | 6     | 0002702     | 318               | 1     | 0·0014952   | 650               |
| 2     | 0·0000546   | — 143             | 7     | 0003020     | 335               | 2     | 0015602     | 659               |
| 3     | 0000404     | — 121             | 8     | 0003355     | 350               | 3     | 0016261     | 670               |
| 4     | 0000283     | — 99              | 9     | 0003705     | 367               | 4     | 0016931     | 679               |
| 35    | 0·0000184   | — 78              | 60    | 0·0004072   | 381               | 85    | 0·0017610   | 688               |
| 6     | 0000106     | — 56              | 1     | 0004453     | 397               | 6     | 0018298     | 698               |
| 7     | 0000050     | — 35              | 2     | 0004850     | 412               | 7     | 0018996     | 706               |
| 8     | 0000015     | — 15              | 3     | 0005262     | 426               | 8     | 0018702     | 715               |
| 9     | 0000000     | + 06              | 4     | 0005688     | 441               | 9     | 0020417     | 723               |
| 40    | 0·0000006   | + 27              | 65    | 0·0006129   | 455               | 90    | 0·0021440   | 732               |
| 1     | 0000033     | 47                | 6     | 0006584     | 469               | 1     | 0021872     | 739               |
| 2     | 0000080     | 66                | 7     | 0007053     | 483               | 2     | 0022611     | 747               |
| 3     | 0000146     | 86                | 8     | 0007536     | 497               | 3     | 0023358     | 754               |
| 4     | 0000232     | 105               | 9     | 0008033     | 509               | 4     | 0024112     | 762               |
| 45    | 0 0000337   | 124               | 70    | 0·0008542   | 523               | 95    | 0·0024874   | 768               |
| 6     | 0000461     | 144               | 1     | 0009065     | 535               | 6     | 0025642     | 775               |
| 7     | 0000605     | 162               | 2     | 0009600     | 548               | 7     | 0026417     | 782               |
| 8     | 0000767     | 180               | 3     | 0010148     | 560               | 8     | 0027199     | 787               |
| 9     | 0000947     | 198               | 4     | 0010708     | 572               | 9     | 0027986     | 794               |
| 50    | 0·0001145   | 216               | 75    | 0·0011280   | 584               | 100   | 0 0028780   |                   |
| 1     | 0001361     | 234               | 6     | 0011864     | 596               |       |             |                   |
| 2     | 0001595     | 251               | 7     | 0012460     | 607               |       |             |                   |
| 3     | 0001816     | 269               | 8     | 0013067     | 617               |       |             |                   |
| 4     | 0002115     | 285               | 9     | 0013684     | 629               |       |             |                   |

TABLE III.

*Logarithms for facilitating the Calculation of the Cubical Expansion of Metals.*

Log. (1 + EM<sub>t</sub>.)

|   | G = M<br>Gold<br>— 339·14 | S = M<br>Silver<br>— 441·41 | P = M<br>Platinum<br>— 208·32 | B = M<br>Baily's metal<br>— 394·98. | Br = M<br>Brass<br>— 398·27 |
|---|---------------------------|-----------------------------|-------------------------------|-------------------------------------|-----------------------------|
| 1 | 0 000010598               | 0 000013794                 | 0 000006510                   | 0 000012343                         | 0 000012446                 |
| 2 | 21196                     | 27588                       | 13020                         | 24686                               | 24892                       |
| 3 | 31794                     | 41382                       | 19530                         | 37029                               | 37338                       |
| 4 | 42392                     | 55176                       | 26040                         | 49372                               | 49784                       |
| 5 | 52990                     | 68970                       | 32550                         | 61715                               | 62230                       |
| 6 | 63588                     | 82764                       | 39060                         | 74058                               | 74676                       |
| 7 | 74186                     | 96558                       | 45570                         | 86401                               | 87122                       |
| 8 | 84784                     | 110352                      | 52080                         | 98744                               | 99568                       |
| 9 | 95382                     | 124046                      | 58590                         | 111087                              | 112014                      |

This table is founded on the supposition that up to 100° of Fahrenheit's Thermometer; log expansion for  $n^\circ = n \times$  log expansion for 1°; which is true sufficiently. The linear expansions of Gold and Silver have been taken from Vol. I of Professor Miller's Chemistry; the others from the paper in the 'Philosophical Transactions' on Standard Weights.

The argument of this Table is to be T — 32°; or T itself can be taken if the number at the head of the column be applied.

Thus for brass at 85·35° we have

|        |                   |           |                   |
|--------|-------------------|-----------|-------------------|
| Br 50° | 0·000622·30       | or Br 80° | 0·000995·68       |
| 3      | 37·34             | 5         | 62·23             |
| 0·3    | 3·73              | ·3        | 3·73              |
| 0·05   | 0·62              | ·05       | 0·62              |
|        |                   | Const.    | — 398·27          |
|        | <hr/> 0·000663·99 |           | <hr/> 0 000663·99 |

TYPE COMPARISON I.

May 24th, 1879.

Oertling, No. 1.

Comparisons of EI with O<sub>1</sub>.

| Weight on left side.              | Weight on right side.                 | SCALE READINGS. |              | Deducted Mean. | REMARKS.                                                                                           |
|-----------------------------------|---------------------------------------|-----------------|--------------|----------------|----------------------------------------------------------------------------------------------------|
|                                   |                                       | Low.            | High.        |                |                                                                                                    |
| EI                                | O <sub>1</sub> + 1.2 $\frac{R_2}{10}$ | 5.7<br>6.1      | 9.5<br>9.2   | 7.54           | h. m.<br>Commenced at 6.48 A. M.                                                                   |
| EI + P <sub>.10</sub>             | Do.                                   | 13.6<br>13.7    | 18.0<br>17.8 | 15.81          | in.<br>A. Bar. 29.60. Temp. 85.0° F.<br>Dry Bulb 85.9. Wet Bulb 81.0.                              |
| O <sub>1</sub> + P <sub>.01</sub> | EI + 1.2 $\frac{R_2}{10}$             | 13.1<br>13.4    | 17.4<br>17.2 | 15.21          |                                                                                                    |
| O <sub>1</sub>                    | Do.                                   | 3.4<br>3.8      | 10.7<br>10.3 | 6.95           |                                                                                                    |
| Do.                               | Do.                                   | 3.4<br>3.8      | 10.0<br>9.6  | 6.60           |                                                                                                    |
| O <sub>1</sub> + P <sub>.01</sub> | Do.                                   | 13.3<br>13.6    | 16.6<br>16.3 | 15.03          |                                                                                                    |
| EI + P <sub>.01</sub>             | O <sub>1</sub> + 1.2 $\frac{R_2}{10}$ | 12.8<br>13.3    | 18.9<br>18.5 | 15.99          |                                                                                                    |
| EI                                | Do.                                   | 3.0<br>3.6      | 11.9<br>11.4 | 7.61           | in.<br>Bar. 29.61. Temp. 86.0° F.<br>Dry Bulb. 85.4 Wet Bulb 80.1.<br>h. m.<br>Ended at 7.33 A. M. |

$$\text{Hence EI} \simeq O_1 + 1.2 \frac{R_2}{10} - \frac{2.46}{8.27} P_{.01} \simeq O_1 + 1.2 \frac{R_2}{10} - 0.297 P_{.01}.$$

$$\text{EI} \simeq O_1 - 1.2 \frac{R_2}{10} + \frac{3.05}{8.26} P_{.01} \simeq O_1 - 1.2 \frac{R_2}{10} + 0.369 P_{.01}.$$

$$\text{EI} \simeq O_1 - 1.2 \frac{R_2}{10} + \frac{3.40}{8.43} P_{.01} \simeq O_1 - 1.2 \frac{R_2}{10} + 0.404 P_{.01}.$$

$$\text{EI} \simeq O_1 + 1.2 \frac{R_2}{10} - \frac{2.39}{8.38} P_{.01} \simeq O_1 + 1.2 \frac{R_2}{10} - 0.285 P_{.01}.$$

$$\therefore 4 \text{EI} \equiv 4 O_1 + 0.191 P_{.01} : \text{or EI} \equiv O_1 + 0.04775 P_{.01}.$$

Note.—In the original the succession of observations has been distinguished, but want of space rendered it necessary to give this up.

TYPE COMPARISON II.

June 5th, 1879.

Oertling No. 1.

Comparisons of  $O_1$  with  $O_5 + O_4 + O_1 = S$ .

| Weight on left side.     | Weight on right side.      | SCALE READINGS. |              | Deduced Mean. | REMARKS. |
|--------------------------|----------------------------|-----------------|--------------|---------------|----------|
|                          |                            | Low.            | High.        |               |          |
| $O_1 + 5 \frac{R_1}{10}$ | $S_1 + 4.2 \frac{R_2}{10}$ | 6.3<br>6.6      | 10.2<br>10.0 | 8.34          |          |
| $O_1 + 6 \frac{R_1}{10}$ | Do.                        | 13.0<br>13.4    | 19.0<br>18.6 | 15.90         |          |
| $S + 0.6 \frac{R_1}{10}$ | $O_1 + 4.2 \frac{R_2}{10}$ | 3.0<br>3.3      | 10.6<br>10.3 | 6.88          |          |
| $S + 1.6 \frac{R_1}{10}$ | Do.                        | 11.0<br>11.4    | 17.6<br>17.2 | 14.40         |          |
| Do.                      | Do.                        | 9.9<br>10.4     | 19.4<br>18.8 | 14.49         |          |
| $S + 0.6 \frac{R_1}{10}$ | Do.                        | 4.1<br>4.4      | 9.7<br>9.4   | 6.98          |          |
| $O_1 + 6 \frac{R_1}{10}$ | $S + 4.2 \frac{R_2}{10}$   | 12.8<br>13.1    | 17.9<br>17.4 | 15.40         |          |
| $O_1 + 5 \frac{R_1}{10}$ | Do.                        | 6.0<br>6.2      | 9.9<br>9.6   | 7.99          |          |

$$\text{Hence } O_1 \cong S + 4.2 \frac{R_2}{10} - \left(5.0 + \frac{1.66}{7.56}\right) \frac{R_1}{10} \cong S + 4.2 \frac{R_2}{10} - 0.5226 R_1.$$

$$O_1 \cong S - 4.2 \frac{R_2}{10} + \left(0.6 + \frac{3.12}{7.52}\right) \frac{R_1}{10} \cong S - 4.2 \frac{R_2}{10} + 0.1015 R_1.$$

$$O_1 \cong S - 4.2 \frac{R_2}{10} + \left(0.6 + \frac{3.02}{7.51}\right) \frac{R_1}{10} \cong S - 4.2 \frac{R_2}{10} + 0.002 R_1.$$

$$O_1 \cong S + 4.2 \frac{R_2}{10} - \left(5.0 + \frac{2.01}{7.41}\right) \frac{R_1}{10} \cong S + 4.2 \frac{R_2}{10} - 0.5272 R_1.$$

$$\therefore 4 O_1 \equiv 4 S - 0.8481 R_1 \text{ or } O_1 \equiv O_5 + O_4 + O_1 - 0.212025 R_1$$

TYPE COMPARISON III.

October 22nd, 1879.

Oertling No 2.

Comparisons of  $O_5$  with  $O_1 + O_4 + P_{.02} = S$ .

| Weight on left side. | Weight on right side. | SCALE READINGS. |       | Deduced Mean. | REMARKS. |
|----------------------|-----------------------|-----------------|-------|---------------|----------|
|                      |                       | Low.            | High. |               |          |
| S                    | $O_5$                 | 9.5             | 14.1  | 11.91         |          |
|                      |                       | 9.9             | 13.8  |               |          |
| $S + P_{.03}$        | Do.                   | 15.0            | 22.7  | 18.73         |          |
|                      |                       | 15.5            | 22.2  |               |          |
| $O_5$                | $S + P_{.03}$         | 12.0            | 14.6  | 13.34         |          |
|                      |                       | 12.2            | 14.3  |               |          |
| Do.                  | S                     | 16.3            | 23.0  | 19.55         |          |
|                      |                       | 16.7            | 22.6  |               |          |
| Do.                  | Do.                   | 16.1            | 23.3  | 19.58         |          |
|                      |                       | 16.6            | 22.8  |               |          |
| Do.                  | $S + P_{.03}$         | 12.2            | 14.1  | 13.21         |          |
|                      |                       | 12.4            | 14.0  |               |          |
| $S + P_{.03}$        | $O_5$                 | 15.4            | 21.0  | 18.13         |          |
|                      |                       | 15.7            | 20.7  |               |          |
| S                    | Do.                   | 10.8            | 13.0  | 11.91         |          |
|                      |                       | 10.9            | 12.8  |               |          |

$$\text{Hence } O_5 \cong S + \frac{3.09}{6.82} P_{.03} \cong S + 0.453 P_{.03}.$$

$$O_5 \cong S + \frac{4.55}{6.21} P_{.03} \cong S + 0.732 P_{.02}.$$

$$O_5 \cong S + \frac{4.58}{6.21} P_{.03} \cong S + 0.737 P_{.03}.$$

$$O_5 \cong S + \frac{3.09}{6.22} P_{.03} \cong S + 0.497 P_{.03}.$$

$$\therefore 4 O_5 \cong 4 S + 2.419 P_{.03} \text{ and } O_5 \cong S + 0.60475 P_{.03} \\ \cong O_1 + O_4 + P_{.02} + 0.61475 P_{.03}.$$

P. S. *June 29th*, 1880.—After the earlier part of this paper was drafted, I learnt that M. St. Claire Deville had proposed to make standards of the Commercial Kilogram in a new manner. The metal is to be the Platinum-iridium alloy so as to secure hardness and indestructibility, but, in order that the density may be nearly that of brass, it is to be hollow, the parts are to be soldered together by fusion so as to enclose a constant mass of air, which, of course, will be included in the weighings. This plan has been adopted by the International Commission for making the European Metric Standards, and will no doubt be a great improvement on the old Commercial Standard of France, which is made of brass. The volume of these weights is to be 125 cubic centimetres, so that the density will be 8.0; which is a little lower than that of good sound weights of brass, and materially lower than that of gilt bronze; while it is greater than that of iron.

Certainly, the visible Commercial unit, to which reference can be made, appears preferable to the imaginary unit of England. Such a weight would vary in Calcutta with respect to the scientific unit to the extent of about 11 milligrams, and it would be needless to take notice (for commercial purposes) of the much smaller variations with respect to such weight as may be compared with it.

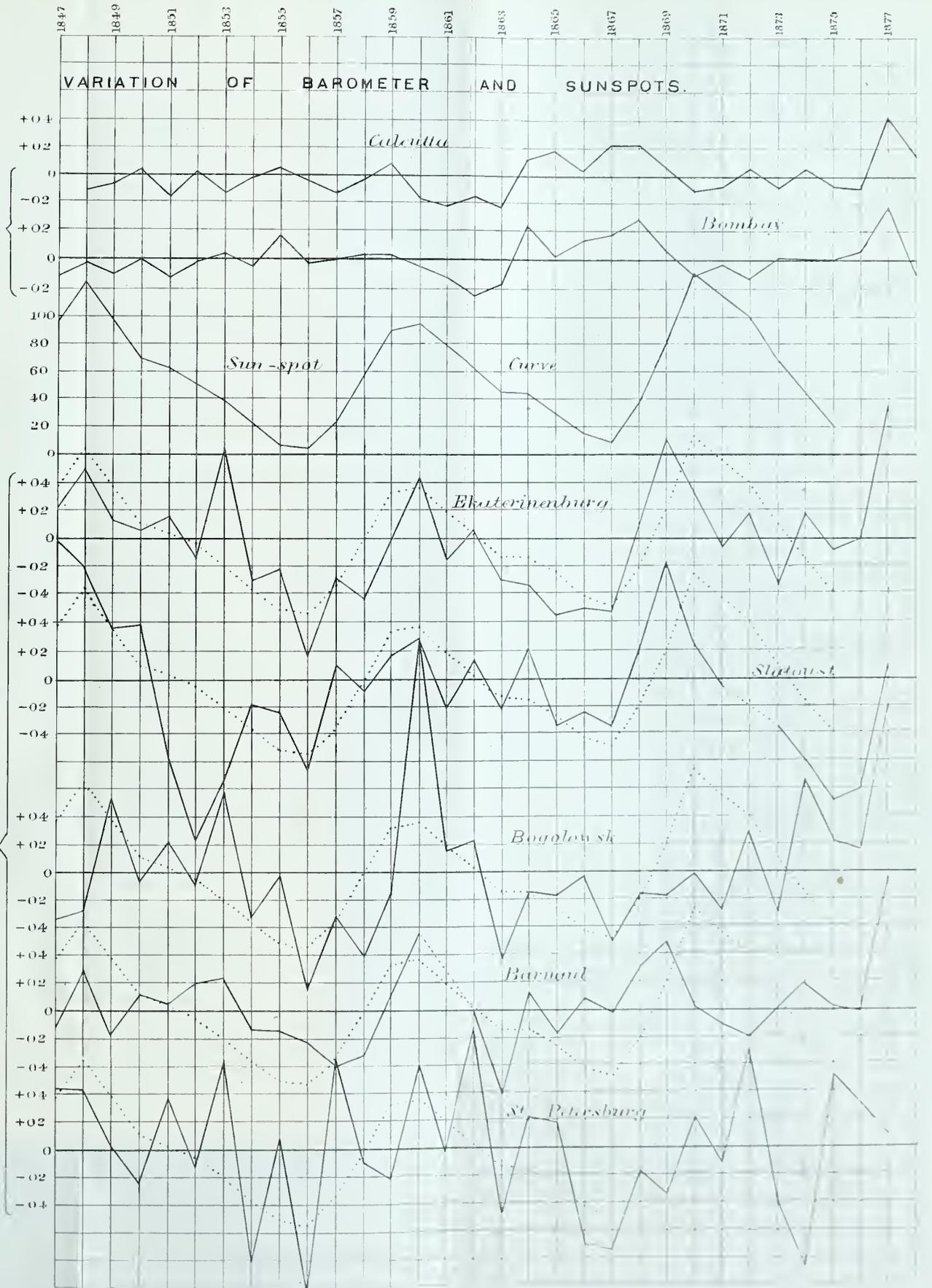
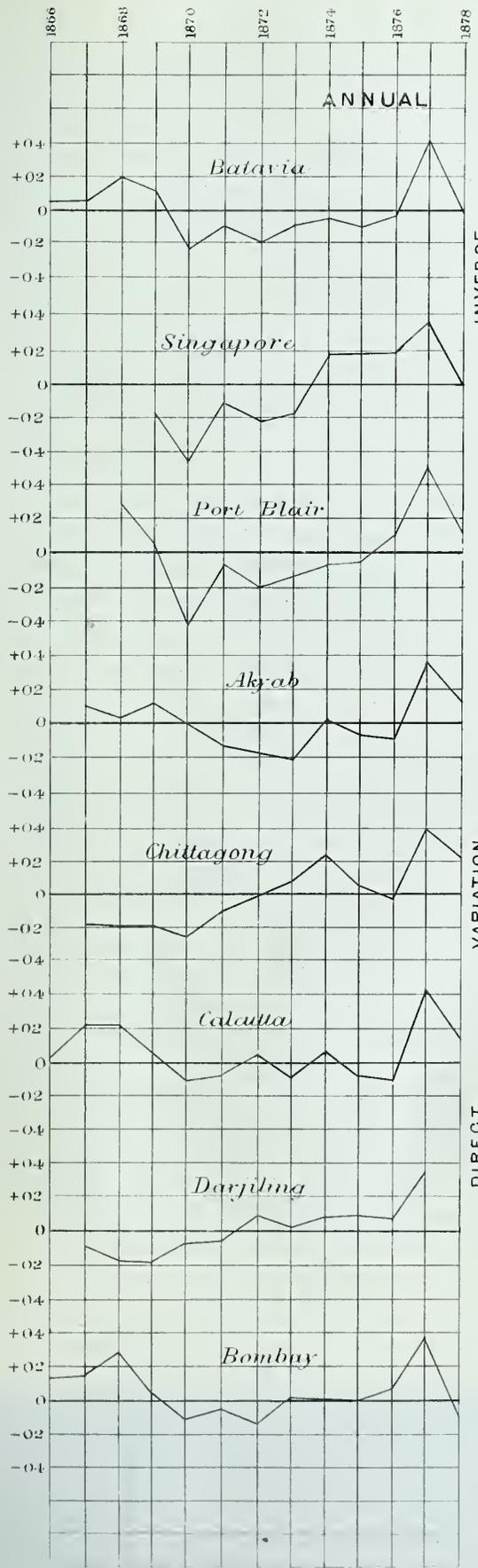
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VI.—*On the High Atmospheric Pressure of 1876-78 in Asia and Australia, in relation to the Sun-spot Cycle.*—By HENRY F. BLANFORD, *Met. Rep. to the Govt. of India.*

(Received December 24th, 1879; Read January 6th, 1880.)

(With Plate I.)

The three years 1876, 1877, and 1878, more especially the two former, were characterized by a deficiency of rainfall in one or many parts of India, and by a more general and very persistent excess of atmospheric pressure. With but slight and local interruptions, from August (in some parts of India from May) 1876 to August (in some cases only to May) 1878, over the whole of the Indian area, the barometer ranged above the average of many years. Nor was this excess of pressure restricted to the land. The register of Port Blair at the Andaman Islands, and that of Nancowry at the Nicobars, shew that, at these insular stations, the excessive pressure was of greater duration and more persistent and intense than at any continental station at or near the sea-level; indeed, with one striking exception, more intense than at any other station in the entire region. At these islands, the pressure rose above the average in May 1876; and, from that time to August 1878 inclusive, the mean pressure of every month was from .004" to .071" in excess of the average; derived, in the case of Port Blair





from eleven, and, in that of Nancowry, from six years' registers. On the mean of the whole period and of the two stations, the excess amounted to  $\cdot 0327''$ .

The single exceptional station, which shews a greater average excess than the Bay islands, is the hill station of Darjiling in the Sikkim Himalaya, at an elevation of nearly 7000 feet above the sea. At this station, where the barometer has been registered steadily for upwards of 12 years, the mean excess of the same period of 28 months was not less than  $\cdot 0332''$ ; or, since the first rise took place in August 1876, the mean of the whole unbroken period of 25 months' excess was  $\cdot 0379''$ . On the plains of Bengal, the mean excess (average of six stations) was only  $\cdot 0298$  on the 28 months and  $\cdot 0354$  on the 25 months, a reduction, as compared with Darjiling, which is probably explained by the fact that, in Bengal, as indeed generally in India, the mean temperature of the air was also on the whole considerably in excess of the average; so that the stratum of air resting on the plains had less than the average density. This fact is of pregnant importance; for it shews that the excessive pressure in question was due to the condition of the higher atmosphere; of those strata, at all events, that lay above the elevation of 7000 feet; and that, in fact, the prevailing excess, instead of being caused by the conditions recorded at observatories on the plains, was to some extent counteracted by a deficiency in the mass and static pressure of the lower strata.

In his report on the Meteorology of India in 1877, Mr. Eliot drew attention to the persistently high barometric pressure of that year, and pointed out that the barometric registers of Sydney and Melbourne in Australia also "indicated, on the whole, a marked tendency to excessive pressure; and that, therefore, there is a slight probability that this is a feature of the whole area, from India southwards to Australia, including the sea area of the Indian Ocean." Furthermore, that it appeared, from the register of Hongkong, "that the pressure in that part of China was as markedly and persistently in defect as it was in excess in India."

A re-examination of the data shews, however, that this latter conclusion is extremely doubtful, and indeed probably mistaken. I find that the Hongkong barometric registers of past years have been so variously treated that no trustworthy comparison can be instituted on them; and, on the other hand, I find that the excellent registers of Zi-ka-wei near Shanghai point to an opposite conclusion, and shew that here also, on the east coast of China, the pressure was excessive during the greater part of the period in question, though to a much less degree than in the Indian region.

In the case of Australia, Mr. Eliot compared the registers of Sydney and Melbourne only. I have examined that of Adelaide in addition, and find that not only does it confirm the general conclusion drawn from the two former registers, but, further, shews that in South Australia the excess

was more intense than at any other station yet examined either in Australia or India. At this station, the pressure rose above the average in May 1876 (as at the islands in the Bay of Bengal) and, with the exception of 4 months, remained in excess until June 1878; the average excess of the whole period being not less than  $\cdot 0681''$  or  $\frac{1}{15}$  of an inch of the barometer. At Melbourne, during the same period, it averaged  $\cdot 0387''$  and was less prolonged. For Sydney, I have registers only up to September 1878, and these shew an excess much below that of Melbourne. It would seem, therefore, that in Australia as in Asia the excessive pressure diminished towards the east coast of the continent.

As a link between the data of the Indian and Australian regions, I have the registers of Singapore and Batavia; for the latter of which I am indebted to the kindness of Dr. Bergsma. At Singapore, the same barometer has not been in use throughout. The barometer registered in 1869 and 1870 having been injured, was replaced by another in 1871 which had never been compared directly or indirectly with the former; and the relative values of the registers in the two former and subsequent years are, therefore, more or less open to doubt. The position of the instrument also has been changed once or twice; but, in comparing the registers of past years, I have applied an appropriate correction for the changes of level. The registers extend from May 1869 to the present time. According to these, during the four and a half years, from May 1869 to October 1873, and certainly from July 1871, in only two months, was the mean pressure of any month slightly above the general average of the month, as deduced from the whole series of years; whereas, from November 1873 to February 1875 (16 months in all), ten months ranged above it, and six only below it; and from March 1875 to June 1878, every month shews an excess, excepting April 1876 (which was the same as the average) and November 1876 and December 1877, which were slightly below it. Hence, it appears that the excessive pressure began earlier and was more prolonged at Singapore than at any other station yet examined; but it was less than half as intense as at Adelaide; the average of the 26 months, May 1876 to June 1878, being only  $\cdot 0293''$ .

The register of Batavia affords evidence very similar to that of Singapore. Here also from November 1869 to August 1873, a period of 3 years and 10 months, in only four months did the pressure range slightly above the average; from the latter date to April 1876, in ten months it exceeded the average; and from May 1876 to August 1878, it was above the average in every month except three. The average excess of this period was  $\cdot 0256''$ . Thus, at these two sub-equatorial stations, there is evidence of a gradual rise of atmospheric pressure since 1870; and the Batavian register recorded under the careful superintendence of Dr. Bergsma is of the highest validity.

In Ceylon and Southern India, the excessive pressure was of shorter

duration than at the Bay islands, and on the average of the whole period not more than half as great; *viz.*, '020'.

As far as can be judged, then, from the available evidence, the excess appears to have been greatest (in the Indian region) on an axis lying between the Nieobars and Bengal. And, in Australia, at Adelaide, or possibly to the westward of that station. In the absence of any sufficient registers for Western Australia, this must remain an open question. To the eastward, however, it certainly diminished greatly at Melbourne, and still more at Sydney. Whether, however, the condition of excessive pressure was continuous between Batavia and South Australia or otherwise, there is no distinct evidence to show.

In Asia, the excess was less in Assam than in Bengal, and was comparatively small at Shanghai (Zi-ka-wei). To the westward, it also diminished, but not quite regularly; since, in Orissa and on the Gangetic plains, it was less than on the plateaux of Chutia Nagpur and Bundelkand, and slightly less than in Rajputana and Sind. Some of these irregularities probably depend on variations of the temperature, and therefore density, of the lower atmosphere; and partly also are apparent only, and owing to the fact that the averages which have served as the standard of the comparison are derived, in some cases, from longer series of years than in others. That, notwithstanding these irregularities, there was, on the whole, a general decrease of the excessive pressure to the westward of the axis above defined, appears, however, pretty clearly, from the following average values of this excess for the whole period of the 28 months of its duration.

|             |          |                     |                     |                           |
|-------------|----------|---------------------|---------------------|---------------------------|
|             |          | Gangetic plain      | + '0191" ... Punjab | + '0132"                  |
|             |          | Chutia              |                     |                           |
| Bengal      | + '0298" | }                   | + '0284'            | { Rajputana               |
| Arakan      | + '0317" |                     |                     | { and Sind                |
| Bay islands | + '0327" |                     |                     | { and Sind                |
|             |          | Nagpur & Bundelkand |                     | + '0215"                  |
|             |          | Orissa              | + 0164"             | { Nagpur and              |
|             |          |                     |                     | { Berar                   |
|             |          |                     |                     | { Dakhan                  |
|             |          |                     |                     | { Carnatic                |
|             |          |                     |                     | + '0219" Bombay + '0196"  |
|             |          |                     |                     | + '0127" W.Coast + '0102" |
|             |          |                     |                     | + '0199" Ceylon + '020"   |

It may here be observed that this axis or ridge of greatest intensity, if prolonged, lay across the middle of the two great continental masses, Asia and Australia, from Western Siberia to South Australia; a position which suggests the probability that the phenomenon was in some measure dependent on the presence and position of these large land masses.

The variation of the anomalous pressure from month to month, at all the stations above referred to, is given in the accompanying Table I, which shows the deviation of the pressure, in each month, from the average of that month and place (or district), as derived from the registers of many years.

TABLE I.—*Deviation of pressure in each month from the*

|       |            |        | Punjab. | Gangetic plain. | Bundelkand, &c. | South Central Provinces and Berar. | Dakhan and Mysore. | East Coast and Carnatic. |
|-------|------------|--------|---------|-----------------|-----------------|------------------------------------|--------------------|--------------------------|
| 1876. | April,     | ... .. | —·045   | —·054           | —·033           | —·055                              | —·043              | —·054                    |
|       | May,       | ... .. | —·045   | —·046           | —·037           | —·043                              | —·018              | —·029                    |
|       | June,      | ... .. | —·008   | —·012           | +·008           | —·003                              | —·002              | —·008                    |
|       | July,      | ... .. | —·037   | —·048           | —·049           | —·041                              | —·026              | —·025                    |
|       | August,    | ... .. | +·004   | +·005           | +·015           | 0                                  | +·005              | —·015                    |
|       | September, | ... .. | +·024   | +·014           | +·016           | +·010                              | +·020              | —·001                    |
|       | October,   | ... .. | +·034   | +·044           | +·044           | +·042                              | +·028              | +·022                    |
|       | November,  | ... .. | —·008   | —·015           | —·004           | —·004                              | —·009              | —·004                    |
|       | December,  | ... .. | +·051   | +·034           | +·042           | +·044                              | +·032              | +·044                    |
| 1877. | January,   | ... .. | +·067   | +·067           | +·069           | +·059                              | +·030              | +·056                    |
|       | February,  | ... .. | +·024   | +·052           | +·054           | +·031                              | —·004              | +·021                    |
|       | March,     | ... .. | +·015   | +·024           | +·033           | +·029                              | +·005              | +·026                    |
|       | April,     | ... .. | +·053   | +·060           | +·065           | +·050                              | +·025              | +·045                    |
|       | May,       | ... .. | +·030   | +·025           | +·055           | +·033                              | +·010              | +·019                    |
|       | June,      | ... .. | +·032   | +·037           | +·038           | +·034                              | +·026              | +·033                    |
|       | July,      | ... .. | +·011   | +·012           | +·040           | +·057                              | +·054              | +·038                    |
|       | August,    | ... .. | —·022   | —·027           | —·005           | +·011                              | +·032              | +·022                    |
|       | September, | ... .. | +·020   | +·018           | +·051           | +·060                              | +·028              | +·045                    |
|       | October,   | ... .. | +·043   | +·048           | +·053           | +·060                              | +·033              | +·067                    |
|       | November,  | ... .. | +·014   | +·008           | +·016           | +·041                              | +·032              | +·031                    |
|       | December,  | ... .. | —·008   | —·007           | —·004           | +·002                              | +·003              | +·009                    |
| 1878. | January,   | ... .. | +·031   | +·035           | +·044           | +·018                              | +·011              | +·030                    |
|       | February,  | ... .. | +·030   | +·028           | +·034           | +·028                              | +·038              | +·046                    |
|       | March,     | ... .. | +·040   | +·043           | +·062           | +·034                              | +·031              | +·046                    |
|       | April,     | ... .. | +·022   | +·041           | +·050           | +·035                              | +·027              | +·038                    |
|       | May,       | ... .. | +·029   | +·050           | +·048           | +·023                              | +·012              | +·023                    |
|       | June,      | ... .. | +·014   | —·007           | +·020           | +·006                              | —·010              | —·008                    |
|       | July,      | ... .. | +·034   | +·033           | +·035           | +·012                              | —·015              | —·005                    |
|       | August,    | ... .. | +·018   | +·019           | +·002           | —·014                              | —·030              | —·009                    |
|       | September, | ... .. | —·039   | —·031           | —·023           | —·041                              | —·039              | —·028                    |

average of the month and place.

| Orissa. | Lower Bengal. | Darjeeling. | Assam and Cachar. | Arakan. | Bay Islands. | Singapore. | Batavia. | Rajputana and Sind. |
|---------|---------------|-------------|-------------------|---------|--------------|------------|----------|---------------------|
| — ·062  | — ·052        | — ·016      | — ·018            | — ·044  | — ·023       | 0          | — ·037   | — ·040              |
| — ·037  | — ·017        | — ·005      | — ·002            | — ·012  | + ·025       | + ·033     | + ·008   | — ·025              |
| — ·003  | + ·014        | + ·004      | — ·002            | + ·012  | + ·023       | + ·030     | + ·001   | + ·002              |
| — ·050  | — ·045        | — ·018      | — ·035            | — ·027  | + ·019       | + ·032     | + ·009   | — ·047              |
| — ·017  | + ·005        | + ·025      | — ·018            | — ·010  | + ·009       | + ·023     | — ·003   | + ·002              |
| — ·017  | + ·014        | + ·046      | + ·003            | + ·013  | + ·033       | + ·025     | + ·003   | + ·030              |
| + ·022  | + ·047        | + ·060      | + ·058            | + ·048  | + ·034       | + ·040     | + ·012   | + ·036              |
| — ·036  | — ·029        | + ·002      | — ·029            | — ·030  | + ·008       | — ·014     | + ·004   | + ·009              |
| + ·034  | + ·028        | + ·043      | + ·030            | + ·042  | + ·049       | + ·037     | + ·033   | + ·038              |
| + ·064  | + ·065        | + ·107      | + ·084            | + ·073  | + ·066       | + ·060     | + ·054   | + ·054              |
| + ·062  | + ·072        | + ·031      | + ·065            | + ·060  | + ·039       | + ·043     | + ·047   | + ·023              |
| + ·034  | + ·038        | + ·029      | + ·027            | + ·044  | + ·029       | + ·026     | + ·028   | + ·014              |
| + ·065  | + ·070        | + ·028      | + ·061            | + ·058  | + ·034       | + ·029     | + ·030   | + ·039              |
| + ·041  | + ·042        | + ·019      | + ·032            | + ·037  | + ·027       | + ·020     | + ·016   | + ·047              |
| + ·015  | + ·032        | + ·041      | + ·022            | + ·014  | + ·049       | + ·049     | + ·051   | + ·034              |
| + ·032  | + ·023        | + ·015      | — ·001            | + ·002  | + ·045       | + ·045     | + ·057   | + ·065              |
| — ·032  | — ·032        | + ·012      | — ·037            | — ·040  | + ·034       | + ·054     | + ·066   | + ·044              |
| + ·057  | + ·058        | + ·037      | + ·051            | + ·078  | + ·056       | + ·040     | + ·054   | + ·055              |
| + ·062  | + ·077        | + ·066      | + ·081            | + ·082  | + ·071       | + ·049     | + ·058   | + ·032              |
| + ·008  | + ·008        | + ·028      | + ·017            | + ·031  | + ·042       | + ·036     | + ·033   | + ·017              |
| — ·018  | — ·003        | + ·011      | — ·004            | + ·016  | + ·015       | — ·003     | + ·008   | — ·008              |
| + ·019  | + ·045        | + ·021      | + ·044            | + ·054  | + ·035       | + ·015     | + ·026   | + ·038              |
| + ·017  | + ·030        | + ·042      | + ·035            | + ·062  | + ·046       | + ·033     | + ·051   | + ·037              |
| + ·036  | + ·050        | + ·068      | + ·069            | + ·073  | + ·051       | + ·036     | + ·039   | + ·041              |
| + ·040  | + ·055        | + ·059      | + ·058            | + ·042  | + ·032       | + ·016     | + ·012   | + ·029              |
| + ·035  | + ·060        | + ·029      | + ·049            | + ·035  | + ·004       | + ·002     | — ·002   | + ·013              |
| — ·011  | + ·015        | + ·026      | + ·011            | + ·019  | + ·007       | + ·005     | + ·006   | + ·017              |
| + ·024  | + ·067        | + ·056      | + ·066            | + ·071  | + ·012       | — ·014     | — ·022   | + ·001              |
| + ·003  | + ·047        | + ·047      | + ·050            | + ·061  | + ·021       | + ·014     | + ·002   | — ·036              |
| — ·042  | — ·023        | — ·009      | — ·028            | — ·025  | — ·014       | — ·011     | — ·015   | — ·040              |

TABLE I.—*Deviation of pressure in each month from the average of the month and place.—(Continued.)*

|       |            |        | Bombay. | Ceylon. | Zi-ka-wei. | Sydney. | Melbourne. | Adelaide. |
|-------|------------|--------|---------|---------|------------|---------|------------|-----------|
| 1876. | April,     | ... .. | −·039   | −·039   | −·037      | −·167   | −·094      | −·002     |
|       | May,       | ... .. | +·009   | −·003   | +·030      | +·072   | −·106      | +·110     |
|       | June,      | ... .. | +·026   | +·002   | +·018      | +·039   | +·043      | +·094     |
|       | July,      | ... .. | −·020   | −·007   | +·021      | +·007   | +·097      | +·072     |
|       | August,    | ... .. | +·018   | −·007   | −·016      | +·013   | +·048      | +·101     |
|       | September, | ... .. | +·034   | +·006   | +·043      | −·061   | +·001      | +·100     |
|       | October,   | ... .. | +·045   | +·017   | −·018      | +·120   | −·060      | −·031     |
|       | November,  | ... .. | −·004   | −·013   | −·071      | −·191   | −·119      | −·053     |
|       | December,  | ... .. | +·023   | +·028   | +·014      | +·035   | +·056      | +·077     |
| 1877. | January,   | ... .. | +·038   | +·045   | +·022      | −·051   | +·007      | +·040     |
|       | February,  | ... .. | +·027   | +·032   | +·036      | +·052   | +·026      | +·026     |
|       | March,     | ... .. | +·025   | +·017   | −·011      | +·061   | +·060      | +·057     |
|       | April,     | ... .. | +·029   | +·027   | −·019      | +·024   | +·053      | +·079     |
|       | May,       | ... .. | +·035   | +·017   | +·012      | −·209   | −·152      | −·112     |
|       | June,      | ... .. | +·055   | +·057   | +·006      | +·196   | +·204      | +·285     |
|       | July,      | ... .. | +·097   | +·043   | +·005      | +·137   | +·163      | +·090     |
|       | August,    | ... .. | +·052   | +·050   | +·015      | +·065   | +·087      | +·118     |
|       | September, | ... .. | +·038   | +·040   | +·024      | +·077   | +·152      | +·162     |
|       | October,   | ... .. | +·034   | +·060   | +·030      |         | +·121      | +·101     |
|       | November,  | ... .. | +·020   | +·029   | +·004      |         | −·002      | +·081     |
|       | December,  | ... .. | −·015   | −·003   | −·008      |         | +·011      | +·063     |
| 1878. | January,   | ... .. | +·015   | +·020   | +·045      |         | +·125      | +·114     |
|       | February,  | ... .. | +·043   | +·037   | +·079      |         | +·064      | +·092     |
|       | March,     | ... .. | +·039   | +·035   | +·080      |         | −·018      | +·013     |
|       | April,     | ... .. | +·020   | +·026   | +·052      |         | −·039      | −·025     |
|       | May,       | ... .. | +·025   | +·009   | −·015      |         | +·072      | +·104     |
|       | June,      | ... .. | +·022   | +·007   | −·001      |         | −·099      | +·014     |
|       | July,      | ... .. | 0       | −·010   | +·020      |         | −·155      | −·161     |
|       | August,    | ... .. | −·049   | −·003   | +·033      |         | −·076      | +·003     |
|       | September, | ... .. | −·083   | −·009   | −·058      |         | −·115      | −·133     |

Evidence bearing on the northern prolongation of the axis of maximum pressure across Central Asia (at least up to the end of 1877) is afforded by the old established observatories of the Russian empire; the registers of which, since 1847, are given in the 'Annales de l'Observatoire Physique Central de Russie'. Before, however, proceeding to notice the barometric condition of this region during the special period in question, I must draw attention to another class of facts, which have an important bearing on the subject, and which, although not entirely new, have been brought out in the present investigation with remarkable clearness and prominence.

I have already noticed the evidence furnished by the registers of Singapore and Batavia, of a persistently low pressure from 1869 to the latter part of 1873, of its gradual rise during the subsequent years, and its culmination in 1877. The Batavian register extends as far back as 1866; comprising, therefore, a period of 13 years, and somewhat more than a complete cycle of sun-spot variation. The deviation of the mean pressure of each year from the general average of the whole period is given in the second column of Table II; and, in the first, I have given the variation of Wolf's sun-spots numbers up to 1875, the latest date for which I have them. I need only add that from 1875 to the early part of the present year, was a prolonged period of minimum solar activity. The coincidence of the barometric variation with that of the sun-spots is too obvious to need comment; and it is emphatically to be noticed that the minimum of pressure coincides with the maximum of spots, and *vice versa*. The remaining columns of the table give the annual deviation of the mean pressure of each year from the general local averages, for the stations Singapore, Port Blair, Colombo, Akyab, Chittagong, Calcutta, and Darjiling, from 1867 to 1878; and the accompanying plate represents graphically the course of variation at each station from year to year. All these exhibit, more or less distinctly, an oscillation similar to that of Batavia; being most pronounced at insular and sub-equatorial stations. Table III gives the annual barometric variation of Calcutta and Bombay from 1848 and 1852 respectively, and Plate I, the corresponding curves.

TABLE II.—*Annual variation of barometric pressure in Indo-Malayan region.*

| Years. | Wolf's sun-spot numbers. | Batavia. | Singapore. | Colombo. | Port Blair.          | Alkyab.              | Chittagong. | Calcutta. | Darjiling.           | Bombay. |                                            |
|--------|--------------------------|----------|------------|----------|----------------------|----------------------|-------------|-----------|----------------------|---------|--------------------------------------------|
| '67    | 8·8                      | +·006    | ...        | ...      | ...                  | +·009                | —·017       | +·022     | —·008 <sup>(6)</sup> | +·015   | (1) Last eight months.                     |
| '68    | 36·8                     | +·020    | ...        | ...      | +·029                | +·003                | —·019       | +·022     | —·017                | +·027   | (2) Last six months.                       |
| '69    | 78·6                     | +·011    | ...        | ...      | +·006                | +·012 <sup>(4)</sup> | —·019       | +·006     | —·019                | +·005   | (3) January, February and last six months. |
| '70    | 131·8                    | —·023    | ...        | ...      | —·042 <sup>(3)</sup> | —·001 <sup>(5)</sup> | —·026       | —·011     | —·009                | —·012   | (4) Wanting February and December.         |
| '71    | 113·8                    | —·009    | ...        | ...      | —·006                | —·013                | —·008       | —·008     | —·007                | —·004   | (5) Wanting January.                       |
| '72    | 99·7                     | —·020    | —·023      | —·020    | —·020                | —·017                | —·001       | +·004     | +·009                | —·014   | (6) Last six months only.                  |
| '73    | 67·7                     | —·010    | —·017      | —·005    | —·013                | —·021                | +·007       | —·008     | +·001                | —·010   |                                            |
| '74    | 43·1                     | —·006    | +·018      | +·003    | —·007                | +·001                | +·023       | +·005     | +·008                | —·011   |                                            |
| '75    | 18·9                     | —·011    | +·018      | —·004    | —·006                | —·008                | +·002       | —·008     | +·009                | 0       |                                            |
| '76    | ...                      | —·002    | +·019      | +·002    | +·010                | —·009                | —·003       | —·009     | +·006                | +·007   |                                            |
| '77    | ...                      | +·042    | +·037      | +·037    | +·052                | +·036                | +·039       | +·044     | +·035                | +·037   |                                            |
| '78    | ...                      | —·001    | —·002      | 0        | +·010                | +·012                | +·022       | +·014     | +·012                | —·011   |                                            |

TABLE III.—Annual variation of pressure at Calcutta and Bombay.

| Years. | Calcutta. | Bombay. | Years. | Calcutta. | Bombay. |
|--------|-----------|---------|--------|-----------|---------|
| 1847   | ...       | —·012   | 1858   | —·003     | +·003   |
| '48    | ...       | —·004   | '59    | +·009     | +·004   |
| '49    | ...       | —·011   | '60    | —·019     | —·005   |
| '50    | ...       | —·001   | '61    | —·023     | —·012   |
| '51    | ...       | —·013   | '62    | —·017     | —·026   |
| '52    | ...       | —·004   | '63    | —·024     | —·017   |
| '53    | —·013     | +·005   | '64    | —·011     | +·023   |
| '54    | —·002     | —·005   | '65    | +·018     | +·002   |
| '55    | +·005     | +·015   | '66    | +·001     | +·013   |
| '56    | —·004     | —·003   | '67    | +·022     | +·015   |
| '57    | —·013     | —·001   | '68    | +·022     | +·027   |

From these facts, it may be concluded that, in the Indo-Malayan region, the pressure of the atmosphere is subject to a cyclical variation, coinciding in period with that of the sun-spots; and such that the epoch of maximum pressure corresponds to that of minimum sun-spots and that of minimum pressure to that of maximum sun-spots. When, however, we turn to Western Siberia, we find an oscillation, not less, nay, far more pronounced, and precisely of the opposite character; the maximum of pressure there coinciding with the maximum of sun-spots, and *vice versa*. The station which exhibits this most prominently, is Ekaterinenburg at the eastern foot of the Oural. But it is also very distinctly recognizable at Bogolowsk to the North, at Slatoust to the South-west, at Barnoul at the northern foot of the Altai, and, as Mr. Archibald pointed out some time since in the pages of 'Nature,' at St. Petersburg. The annual differences at these stations are given in Table IV, and the corresponding curves in the accompanying plate.

TABLE IV.—*Annual variation of barometric pressure in Russia and Western Siberia.*

| Years. | Wolf's sun-spot numbers. | St. Petersburg. | Bogolowsk. | Ekaterinenburg. | Slatoust. | Barnoul. |
|--------|--------------------------|-----------------|------------|-----------------|-----------|----------|
| 1847   | 97·4                     | + ·045          | — ·034     | + ·022          | + ·097    | — ·011   |
| '48    | 124·9                    | + ·044          | — ·027     | + ·049          | + ·078    | + ·028   |
| '49    | 95·4                     | + ·003          | + ·053     | + ·011          | + ·033    | — ·017   |
| '50    | 69·8                     | — ·027          | — ·009     | + ·006          | + ·037    | + ·011   |
| '51    | 63·2                     | + ·036          | + ·023     | + ·014          | — ·055    | + ·007   |
| '52    | 52·7                     | — ·012          | — ·012     | — ·015          | — ·118    | + ·019   |
| '53    | 38·5                     | + ·065          | + ·059     | + ·065          | + ·074    | + ·023   |
| '54    | 21·0                     | — ·081          | — ·034     | — ·032          | — ·019    | — ·013   |
| '55    | 7·7                      | + ·008          | — ·003     | — ·023          | — ·024    | — ·013   |
| '56    | 5·1                      | — ·104          | — ·087     | — ·087          | — ·069    | — ·024   |
| '57    | 22·9                     | + ·064          | — ·032     | — ·029          | + ·009    | — ·040   |
| '58    | 56·2                     | — ·010          | — ·062     | — ·045          | — ·010    | — ·031   |
| '59    | 90·3                     | — ·022          | — ·016     | — ·004          | + ·015    | + ·008   |
| '60    | 94·8                     | + ·061          | + ·171     | + ·046          | + ·028    | + ·055   |
| '61    | 77·7                     | — ·005          | + ·014     | — ·016          | — ·021    |          |
| '62    | 61·0                     | + ·086          | + ·022     | + ·006          | + ·014    |          |
| '63    | 45·4                     | — ·049          | — ·064     | — ·031          | — ·023    | — ·062   |
| '64    | 45·2                     | + ·021          | — ·014     | — ·034          | + ·021    | + ·013   |
| '65    | 31·4                     | + ·018          | — ·018     | — ·056          | — ·036    | — ·017   |
| '66    | 14·7                     | — ·071          | — ·004     | — ·052          | — ·025    | + ·008   |
| '67    | 8·8                      | — ·073          | — ·052     | — ·053          | — ·035    | — ·003   |
| '68    | 36·8                     | — ·017          | — ·017     | + ·008          | + ·017    | + ·030   |
| '69    | 78·6                     | — ·034          | — ·019     | + ·071          | + ·082    | + ·050   |
| '70    | 131·8                    | + ·022          | — ·001     | + ·030          | + ·025    | + ·002   |
| '71    | 113·8                    | — ·012          | — ·029     | — ·009          | — ·007    | — ·011   |
| '72    | 99·7                     | + ·070          | + ·030     | + ·017          | ?         | — ·020   |
| '73    | 67·7                     | — ·040          | — ·033     | — ·038          | — ·034    | — ·001   |
| '74    | 43·1                     | — ·087          | + ·066     | + ·016          | — ·060    | + ·019   |
| '75    | 18·9                     | + ·051          | + ·022     | — ·007          | — ·088    | + ·003   |
| '76    | ...                      | + ·031          | + ·015     | 0               | — ·080    | — ·001   |
| '77    | ...                      | + ·008          | + ·121     | + ·095          | + ·010    | + ·098   |

All these stations, be it observed, are in Western Siberia or European Russia; and it now becomes of interest to ascertain over what area this kind of oscillation obtains. To do this, I have tabulated the barometric data for Tiflis on the South-west, and Nertschinsk and Pekin on the East. No one of these stations exhibits characters resembling those of the stations in Western Siberia; and the curve of Pekin, which is fragmentary, seems rather to exhibit the Indo-Malayan type of variation than that of the Ural stations. Hence, it would seem there is a reciprocal oscillation of atmospheric pressure between Western Siberia and the Indo-Malayan region

(perhaps including China) having a period which coincides with that of sun-spot variation; and that Tiflis on the one hand and Nertschinsk on the other lie beyond the limits of its influence.

Now, seeing that the Indo-Malayan barometric maximum of 1876-78 coincided with a portion of the prolonged sun-spot minimum of 1876-79, the facts detailed above would lead us to expect a corresponding deficiency of pressure in Western Siberia. Strange to say, however, this was not the case. The registers of Bogolowsk, Ekaterinenburg, Slatoust, and Barnoul agree in showing a great excess of pressure in 1877, which in the case of Ekaterinenburg was greater than that of any Indian stations, and nearly as great as that of Adelaide. I have not yet received the volume of the 'Annales' for the year 1878; but, on the average of the 20 months from May 1876 to December 1877, it amounted to '0611.' The great excess appears to have been restricted to the stations in Western Siberia. At St. Petersburg, although the pressure was above the average in 1876 and 1877, the excess was far less striking; and that of 1877 was less than that of 1876. At Tiflis, the pressure of the two years was either about the average or below it; and, at Pekin and Nertschinsk, it was not greater than at Shanghai [Zi-ka-wei].

Hence, there prevailed in Asia generally, in 1877, an anomalous (*i. e.*, apparently non-periodic) accumulation of atmospheric pressure, culminating in Western Siberia, and diminishing both to East and West, and also to South. And this seat of maximum lies on the prolongation to the Northwest of the Indo-Malayan axis of excessive pressure noticed in the earlier part of this paper. It is at least probable that this anomalous accumulation of pressure extended in a much diminished degree to the Indo-Malayan region, where it was superimposed on the normal periodic excess of that region, and produced a maximum which was more intense than any previously recorded. Also that the excessive pressure of Australia was a phenomenon of the same order as that of Siberia; indeed its southern counterpart. It is at least certain that they exhibit a resemblance in certain not unimportant features to which I shall draw attention in a subsequent paper; merely remarking that, in both cases, these great oscillations of pressure, both periodic and non-periodic, appear to depend mainly, perhaps, indeed, entirely, on the variations of the winter season. Of this, in the case of Ekaterinenburg more especially, the evidence is most striking and convincing, and, as far as I have yet examined the Australian registers, it appears to hold good in their case also.

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VII.—*Synopsis of the Species of Choeradodis, a remarkable Genus of Mantodea common to India and Tropical America.*—By J. WOOD-MASON, *Officiating Superintendent Indian Museum, and Professor of Comparative Anatomy, Medical College, Calcutta.*

(Received May 1st;—Read June 2nd, 1880.)

The paper of which the following is an abstract, will be published in full as soon as the illustrations which have been drawn on the wood under my supervision and sent to London to be cut are returned to this country.

The remarkable distribution of this genus of *Mantodea* is exactly paralleled by that of another genus of *Orthoptera*, namely *Mastax*, species of which from the southern slopes of the Peruvian Andes have recently been described by Dr. S. H. Seudder.

The nearest allies of *Choeradodis* are the Australian *Orthoderas*, which its young 'larvæ' resemble in the form of the pronotum.

Genus CHOERADODIS, Serville.

A. *Fore femora without a black blotch on the inner side.*

1. CHOERADODIS STRUMARIA.

Madame Mérian, *Ins. de Surinam*, 1726, tab. 27, ♀ et nymph.

Roesel von Rosenhof, *Der monatlich-herausgegebenen Insecten Belustigung*, 2ter Theil, 1749, *Locust.* tab. iii, fig. 1 et 2, ♀ et nymph (copied from Mérian).

*Mantis strumaria*, Linn., *Syst. nat. Ins.* t. i, pt. ii, 1767, p. 691, no. 13, ♀.

————— Fabr., *Ent. Syst.* ii, 1793, p. 18, no. 21.

♀ — *cancellata*, Fabr., l. c., 23.

—————, Stoll, *Spectres et Mantes*, pl. xi, fig. 42, ♀.

—————, Lichtenstein, *Trans. Linn. Soc. Lond.* vol. 6, p. 25.

*Choeradodis cancellata*, Serville, *Hist. nat. des Orthopt.* 1839, p. 206, ♀.

*Craurusa cancellata*, Burmeister, *Handb. d. Entom.* 1839, Band ii, p. 542, (Syn. Serv. et Stoll. fig. 75, exclus.)

*Choeradodis cancellata*, Saussure, *Mant. Americ.* p. 19, ♂, ♀.

HAB. Cayenne (♀, *Serville*); Surinam (♀, *Mérian*, *Stoll*; ♂ ♀, *Saussure*).

B. *Fore femora with a black blotch on the inner side.*

(a.) *The blotch on the lower half of the joint* (American).

In the females of the following two species, the posterior angles of the pronotal expansions are broadly rounded and are not produced backwards beyond the level of the hinder end of the primitive pronotum.

2. CHOERADODIS RHOMBICOLLIS.

*Mantis rhombicollis*, Latr. in *Voy. de Humboldt, Zool.*, *Ins.* p. 103, pl. 39, figs. 2, 3, ♂.

*Choeradodis peruviana*, Serville, Hist. nat. des Orthopt. 1839, p. 207, ♂.

————— *strumaria*, Stål, Syst. Mant., 1877, p. 15, ♂ ♀.

The blotch commences, in both sexes, near the base of the femur, extends through the unguis groove nearly to the middle of the joint, and is there succeeded by a marginal row of black points in contact with the bases of alternate spines.

HAB. ♂ ♀, Guayaquil, in the collection of the British Museum; nymph, Santa Fé de Bogota, in the collection of the Indian Museum, Calcutta; New Granada (♂ ♀, *Stål*).

### 3. CHOERADODIS SERVILLEI, n. sp.

♀. Closely allied to the preceding, from which it differs in having the marginal field of the tegmina proportionately narrower, and in the smaller size, as well as in the different shape, of the femoral blotch, which is small and oval, commences just beyond the unguis groove, and is followed by a marginal row of small black points.

HAB. 2 ♀, Cache, Costa Rica, in the collection of Messrs. Godman and Salvin; nymph, Chiriqui, in the collection of the Indian Museum, Calcutta.

In the females of the next two species, and in all probability in those of *Ch. rhomboidea* also, the posterior angles of the pronotal lamellæ are rounded-angulate and produced backwards so that the hinder end of the primitive pronotum projects in the bottom of an angular emargination.

### 4. CHOERADODIS LATICOLLIS.

*Choeradodis laticollis*, Serville, Revue p. 24; Hist. nat. des Orthopt. 1839, p. 208, pl. iv, fig. 2, ♀.

————— Saussure, Mantes Americ. p. 20, ♀.

————— *strumaria*, Id., ibid. p. 18, ♂.

————— *laticollis*, Stål, Syst. Mant. 1877, 17, ♀.

The blotch is situated, in both sexes, just beyond the unguis groove, is oblong-rhomboidal in shape, and is followed by two black points on the bases of alternate spines; there is a fuscous speck at the end of the stigmal spot of the tegmina; and the antero-lateral margins of the pronotal lamellæ are arcuate or convex, especially in the female.

HAB. 5 ♂, 5 ♀, Ecuador (*Buckley*), in the collection of the Indian Museum, Calcutta; Peru (♀, *Stål*); Cayenne (♀, *Serville et Stål*); Surinam (♂, *Saussure*).

### 5. CHOERADODIS STALII, n. sp.

Differs from the preceding in the shape of the blotch (which is pointed at both ends and commences in the unguis groove, and on either side of which the femur is pale luteous-yellow instead of being clouded with

fuscous); in being without a fuscous speck at the distal end of the stigma; in its shorter and differently shaped facial shield; and in having the antero-lateral margins and the lateral angles of the pronotal expansions sinuous-concave and more broadly rounded off respectively.

HAB. 1 ♂, 4 ♀, Ecuador (*Buckley*), in the collection of the Indian Museum, Calcutta.

#### 6. CHOERADODIS RHOMBOIDEA.

*Mantis rhomboidea*, Stoll, Spectres et Mantes, pl. xi, fig. 45, ♂.

The male insect from Pará, in the British Museum, agrees neither with Saussure's description (*loc. supra cit.* p. 18), nor with any of the specimens in the Indian Museum; it more nearly approaches Stoll's figure, agreeing therewith in the points in which it differs from them.

The blotch commences in the ungual groove, thence extending as far along the femur as in the preceding four species, but it is not followed by a marginal row of black points. The pronotal lamellæ have no posterior angles.

HAB. ♂, Pará, in the collection of the British Museum. A nymph, from Ega, in the same collection, probably also belongs to this species.

This species is nearest allied to *Ch. laticollis*.

(β) *The blotch on the upper half of the joint* (Indian.)

#### 7. CHOERADODIS SQUILLA.

? *Mantis cancellata*, Fabr. Ent. Syst. II, 1793, p. 18.

*Choeradodis squilla*, Saussure, Mél. Orthopt. t. i, 3me fasc. p. 161, pl. iv, figs. 3, 3a, ♂ et nymph.

Lucas, Ann. Entom. Soc. Fr. 5 sér. t. ii, 1872, p. 32, ♀.

HAB. India generally, from Ceylon (♂ et nymph, *Saussure*; larva, in I. M. Calc.); Madras (♀, *Lucas*); Central India (in coll. Hop. Oxon.); to the banks of the Killing River, in the N. Khasi Hills, on the N. E. Frontier (nymph, *A. W. Chennell*).

Obs. A specimen of this species in the British Museum is erroneously marked "Brazil."

Presented  
8 MAY 1885

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OF THE NATURAL HISTORY PART (PT. II.) OF THE

## JOURNAL OF THE ASIATIC SOCIETY OF BENGAL FOR 1879.

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No. 1, (issued June 10th, 1879). *On new species of the Genus Plectopylis of the Family Helicidæ.*—By LIEUT.-COLONEL GODWIN-AUSTEN. *On the Operations for obtaining the Discharges of the large Rivers in Upper Assam, during Season 1877-78.*—By LIEUT. H. J. HARMAN. *Hemiptera from Upper Tenasserim.*—By W. L. DISTANT. *Communicated by J. WOOD-MASON.* *On the Diurnal Variation of Rainfall Frequency at Calcutta.*—By H. F. BLANFORD. *Record of the Occurrence of Earthquakes in Assam during 1878.*—Communicated by the CHIEF COMMISSIONER OF ASSAM. *On some experiments made at H. M.'s Mint in Calcutta on coining Silver into Rupees.*—By COL. J. F. TENNANT. (With three Plates and seven Woodcuts).

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# JOURNAL

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### Part II.—PHYSICAL SCIENCE.

No. II.—1880.

VIII.—*On the past and present Water supplies of Calcutta.*—By  
ALEXANDER PEDLER, F. I. C., F. C. S., London and Berlin.

At the present day it is I believe universally acknowledged, that every town should be provided with a pure and sufficient supply of water for drinking, domestic and sanitary purposes. If the quantity be not sufficient or if the quality be not good, it may be safely asserted that injury, more or less profound, to the general health of its inhabitants will be the consequence. The very great importance which is attached to the quality and quantity of the water supply of towns, is clear from the prominence which this subject has attained throughout the civilized world during the past few years. In the present paper, it will be my purpose to contrast the nature of the water employed in Calcutta in former years (before the introduction of the present hydrant water) with the supply as it has been since the introduction of the Hooghly water, which is collected and filtered at Pultah, and then distributed by the hydrants, etc. It will be my endeavour to show that the old supply was deficient in quantity, and filthy and abominable in quality, whilst the present supply, though perhaps not so abundant in quantity as it ought to be, is in quality very good and wholesome.

Before proceeding to the discussion of the question of the two supplies, it will perhaps be well to consider what is the general history of natural waters, as this will enable us to understand some of the actual results which have been found by analysis.

The primary form of natural water is rain, and although at first sight it might appear that rain water should be very pure, yet it has been clearly shown\* that it is very seldom that such is the case, and that rain water almost always contains, as impurities, small quantities of organic matter, ammonia, and ammonium salts, derived from the atmosphere. In large towns especially, the rain water is so impure, that it cannot be considered a safe water supply for drinking and other domestic purposes. On reaching the ground the water becomes charged to a greater or less extent with the various soluble constituents of the soil, and with any other matters which may have accumulated in it. If it falls on land either cultivated or uncultivated, it rapidly drains off, and finds its way into streams and rivers, which in the earlier parts of their course certainly, will be tolerably free from organic impurity, except that derived from any manure, etc. which may have been on the land. Unless the river water is subsequently rendered impure by the admission of sewage from towns, villages, etc., or by the admission of manufacturing refuse, it will form, generally speaking, a comparatively pure and wholesome supply of water. In some cases, however, such water is used by the inhabitants of towns on its banks, and is after use returned to the river in the form of sewage, which will be charged with impurity derived from animal excreta, household and manufacturing refuse, soap, and other filth. Water contaminated in such a way is clearly unfit for domestic use. After returning to the stream it will perhaps in its course towards the sea become partially purified by slow oxidation of the organic matter and by the absorbent action of vegetation, but as will be subsequently shown this process of purification is an extremely slow one.

In the case of rain water falling in towns such as Calcutta, it will, as pointed out previously, be impure from the presence of organic matter, ammonia, etc.; of this impure water a considerable proportion of it as before shewn will find its way into the river or into smaller streams communicating with it, but another portion will be collected in the tanks, which are dug for this purpose, and a third portion after percolating through the soil will find its way into numerous shallow wells. These tanks and shallow wells may therefore be considered as being merely pits for the accumulation of drainage from the immediately surrounding soil. In the case of Calcutta the town is densely populated, and as the manners and customs of the native inhabitants are in many respects very primitive, the soil must be inevitably charged with excretal and other refuse, so that the water when it reaches the tank or well, will be largely contaminated with the impurities derived from these sources. In the absence of any system of drainage, as was the case in Calcutta some years ago, such tank or well water could only

\* Angus Smith on Air and Rain.

after use be thrown on the surface of the ground, or into the nearest ditch, from which it would either run or percolate into the tank or well a second time, and would naturally be in a still more impure condition. Such would appear to be the natural conclusions as to supplies of water derived from rivers, and from tanks and shallow wells in towns, and it will be subsequently seen that the quality of the Hooghly river water, and of the water of the tanks and wells within Calcutta, as deduced from numerous analyses fully bears out the above suggestions.

In speaking of the former supply of water to Calcutta, I have assumed that it was confined to the various tanks and wells distributed throughout the town; for though there is no doubt that the river water was used considerably by the inhabitants who lived near the banks of the river, yet the greater number of the inhabitants living as they did at a distance from the river, must have depended for their supply of household water on the tanks and wells nearest to them. The modern water supply of Calcutta which we have to consider is of course the Hooghly water collected at Pultah and, after filtration, etc., distributed through the ordinary mains.

For the purposes of this paper I have not thought it necessary to analyze all the tank and well waters in the town, which amount to many hundreds, but as I have examined 200 samples, some from the crowded districts of the northern part of the town, and some from the open maidan, I think a fair conclusion can be derived from them. I have also to mention, that a very large number of the well and tank waters which I have analyzed, have been noticeable for their bad quality, and for having apparently given rise to disease of one kind or another to the persons who were living in the neighbourhood. Therefore the numbers usually obtained represent the bad rather than the good waters of the old supply. I should however wish to point out, that there is every probability, that the water in the tanks and wells now, is of a much better quality than formerly it was, for by the present system of drainage and conservancy, a vast amount of excreta and filth of all kinds is removed from the town, which in former days must have remained to choke up the soil, and to render the tank and well water very much more impure than at present.

I will attempt first to shew, that, when the inhabitants of this town depended for their water supply on the tanks and wells, the quantity was decidedly insufficient during at least one half of the year.

With regard to the necessity of a sufficient supply of water being given to a town for domestic and sanitary purposes, a well known author on Hygiene, writes—\*

“It was there shown that want of water leads to impurities of all kinds; the person and clothes are not washed, or are washed repeatedly in

\* Parkes' Hygiene, 5th edition, p. 37.

the same water ; cooking water is used scantily, or more than once ; habitations become dirty, streets are not cleaned, sewers become clogged ; and in these various ways a want of water produces uncleanliness of the very air itself.

“The result of such a state of things is a general lowered state of health among the population ; it has been thought also that some skin diseases—scabies, and the epiphytic affections especially—and ophthalmia in some cases, are thus propagated. It has also appeared to me that the remarkable cessation of spotted typhus among the civilized and cleanly nations, is in part owing, not merely to better ventilation, but to more frequent and thorough washing of clothes.

“The deficiency of water leading to insufficient cleansing of sewers has a great effect on the spread of typhoid fever and of choleraic diarrhœa ; and cases have been known in which outbreaks of the latter disease have been arrested by a heavy fall of rain.”

In judging of the quantity of water necessary to be supplied to a town, notice must be taken of the purposes for which the water is used. These we may roughly summarise by saying that water is required for drinking, cooking and the washing of persons, clothes, utensils and houses, for the flushing and cleansing of sewers and drains and for the watering of streets, for the drinking and washing of animals, the cleansing of carriages and stables, for trade purposes, etc.

From European statistics given by the authority just quoted, it would appear to be generally admitted, that a fair allowance of water for the purposes above enumerated is 25 gallons per head of population per day. Thus taking some of the largest towns in England and including Paris, each inhabitant receives  $27\frac{1}{2}$  gallons per day ; the average daily supply of 14 English towns of second rate magnitude was 24 gallons per head, and that of 72 English and Scotch towns was found to be 26·7 gallons per inhabitant.

Let us now see the amount of water available in Calcutta during certain portions of the year when the old supply was depended upon. The tanks and wells in any town can of course only receive their supply of water from rain, and the rainfall of Calcutta is so unequally distributed, that almost three quarters of the whole fall takes place within 4 months of the year, whilst within 6 months, ten-elevenths of the rain falls. Thus the annual rainfall of Calcutta from 49 years' observation, has been found to be 65·85 inches, and during the months from November to April inclusive, only 6·03 inches fall on the average.

If we exclude from our calculation the months of heaviest rainfall, when the water would almost entirely run off into the river and be lost, and assuming for a moment that during these six months from November to April, the whole of the water which fell could be collected and

stored for use ; then knowing that, according to the last Calcutta Census, the density of the population was 109 persons per acre, it is easy to calculate that each person could receive but 6·8 gallons of *fresh* water daily. In all probability, however, not one-fifth of the rainfall finds its way into these tanks and wells, and this would leave the inhabitants less than  $1\frac{1}{2}$  gallons of *fresh* water per day during the hot season of the year. In the Coomartolle Section of the town where the density of the population is 214 per acre, this supply must be reduced to one half or to about three quarters of a gallon of *fresh* water per day.

If even we were to assume, that it was possible to store up the water which fell during the rains, for use during the dry season of the year, and granting as before that one fifth found its way into the tanks and wells, even then each inhabitant of the town could not have had more than 6 or 7 gallons of fresh water daily, and an inhabitant of some parts of the northern division, could not have had more than 3 or 4 gallons.

The conclusion seems to me to be inevitable, that at the time when Calcutta depended for its water supply on its tanks and wells, the inhabitants must have used the same water over and over again though of course without knowing it, not only for such purposes as bathing, washing clothes etc., but probably also for cooking and even for drinking, and it would also appear that there could have been absolutely no water for necessary sanitary measures.

That Calcutta, under these circumstances, should have had a high rate of mortality is scarcely surprising.

I will now endeavour to show that the quality of the old water supply was even less satisfactory than its quantity, and that in a large number of instances of tank and well water, if not in the majority of cases, the water was, and still is, simply sewage, sometimes concentrated, sometimes dilute.

That impure water may be the source of disease is, I believe, now admitted on all hands, and if confirmation were required, abundant evidence to this effect is given in the various reports of the Rivers Pollution Commissioners in England. The researches too of Chauveau, Burdon, Sanderson, Klein and others scarcely leave room for doubt that the specific poisons of the so-called zymotic diseases consist of organized and living matter ; and it is now certain that water is the medium through which some at least of these diseases are propagated. There does not appear indeed to be any doubt whatever that such diseases as cholera, typhoid fever, dysentery and diarrhœa may be produced by drinking impure or infected water. An excellent and most conclusive instance of the propagation of typhoid fever by water from one infected case near Basel in Switzerland is admirably described by Dr. Hägler, and is given in the sixth report of the Commissioners above referred to.

It is then evident that, in the analysis of water, the point to be aimed at would be, the detection of the presence of those impurities whether they be of the nature of germs or not, which would give rise to the diseases just mentioned, but unfortunately in the present state of science, we are quite unable even to say with any certainty whether such germs of disease will ever be isolated, and it is therefore clearly out of the power of the chemist to detect their presence in any sample of water. Failing therefore in this endeavour, the chemical analyst has to rest content with the detection and estimation of other substances, such as organic nitrogenous matter etc., which cannot be present in water, unless it has previously been in contact with the various forms of impurity, which we denominate sewage; and if such bodies are present in quantity, it is fair to infer that these germs or other bodies which produce the zymotic diseases, and which are undoubtedly present very frequently in sewage, may also be present in the sample of water. It has also been clearly shown, that in many instances water which is impregnated with animal or vegetable organic matter, even assuming any specific poison to be absent, will give rise to various unpleasant symptoms, such as diarrhœa, etc. It is therefore quite permissible and necessary to condemn any sample of water which is to be used as a potable or domestic supply, if it contains any quantity of organic matter, more especially if the organic matter be of animal origin.

The methods of water analysis have been improved very greatly during the past fifteen years, but even now there is a very warm discussion being carried on as to the respective merits of at least three distinct processes, and opinions differ materially as to which method gives most accurate and reliable results. The two methods for the determination of the amount of organic matter present in water, which have met with the greatest amount of support, are those of Professors Wanklyn and Frankland.

The method proposed by Prof. Wanklyn, which consists in the conversion of the nitrogenous organic matter into ammonia by boiling with an alkaline solution of potassium permanganate, has the immense advantage of being quickly performed with tolerably simple apparatus, and a whole water analysis by this method does not occupy more than a few hours. Against this method there is the well recognized fact, that it sometimes fails to detect and estimate the whole of the nitrogenous organic matter present in the water. It is therefore possible that a water may escape the condemnation which it deserves, but I believe it is generally accepted that a water which is condemned by this process must be really of very bad quality.

The method of analysis which was introduced by Dr. Frankland is an extremely elaborate one, and requires the use of very delicate and expensive apparatus. The greatest drawback to this process is however, the

amount of work and time which is required for it, as a satisfactory analysis by it cannot be performed in less than 4 or 5 days. On the other hand the results obtained by Frankland's process are eminently trustworthy, and the character of a water is determined by it with great precision.

As I have been obliged to perform the work of analysis of the tank and well waters of Calcutta during the spare time from my current duties, and as some two hundred analyses had to be made by my own hands, it was clearly impossible for me to use Frankland's more accurate process, and I was compelled rather against my own notions of scientific accuracy to work with Wanklyn's process, which as I have pointed out is not so trustworthy as the other. In addition to this reason, I found that my predecessor in the office of Analyst to the Corporation had been in the habit of testing the Calcutta hydrant water by Wanklyn's process. As I had to carry on this method of analysis on behalf of the Corporation, this therefore formed a very intelligible standard of comparison for my work with the former water supply of Calcutta. In addition however to these analyses of the hydrant water, as will be seen subsequently, I have carried out for the last four years monthly analyses of the hydrant water by Frankland's process, and it is upon these numbers that I shall base my conclusions as to the character and quality of the present water supply.

In Wanklyn's process there are two principal determinations. The first is the estimation of the free ammonia present in the water, and of the albuminoid ammonia obtained by distillation with alkaline potassium permanganate. In India, I have frequently combined these two processes, and the ammonia from both is called the "Total Ammonia." The reason why these two processes have been combined is, that in almost every case when I have tested the *potable* waters of India for free ammonia, I have found it to be almost entirely absent. The fact appears to be, that at the very high temperature which here obtains, the ammonia oxidizes with such extreme rapidity, that if any free ammonia were present at the collection of the water, it would become partially or wholly converted into inorganic nitrogenous matters before the analysis could be performed, or, if the whole of the free ammonia were not thus oxidized, the changes which go on from day to day are so great, that for any true comparison in respect of this constituent between the samples of water analyzed, it would be necessary to analyze them at definite intervals after collection. The "total ammonia" then, which is spoken of subsequently, is the free ammonia present, if any, added to the ammonia produced from the nitrogenous organic matter by the oxidizing action of alkaline potassium permanganate. As pointed out before, it frequently happens that the whole of the nitrogenous organic matter present in the water is not decomposed, and therefore the numbers obtained always represent the minimum amount of impurity which can be present in the water.

Professor Wanklyn says with regard to this method of analysis, that by the aid of the ammonia process, we are now able to divide potable waters into three broad classes :

(1) Waters which are of "extraordinary organic purity," *i. e.*, those which are almost free from any nitrogenous organic matter, and which contain less than 0.05 parts of albuminoid (or total) ammonia per million of water.

(2) "Safe waters," which are devoid of any excess of nitrogenous organic impurity, and which contain from 0.05 to 0.10 parts per million of albuminoid ammonia.

(3) Waters which are "dirty," *i. e.* charged with an abnormal quantity of organic matter, and which contain more than 0.10 parts of albuminoid ammonia per million of water.

The second important consideration is the determination of the amount of chlorine present in the water. Chlorine occurs in potable water in combination with several metals (as chlorides), such as sodium, magnesium, calcium and possibly potassium. The amount of chlorides or of chlorine present in drinking water is in itself of little importance, for as most people are aware, common table salt is simply sodium chloride, and this substance is a necessary ingredient of our food. The water analyst determines the amount of chlorine present in water because the presence of this substance in water is in most instances a clear indication of contamination by sewage in some form or another.

It will be understood how this is the case when we consider that rain water, which is the source of all water supplies when collected in the open country and at inland stations is practically free from chlorine. Drinking water also which is uncontaminated by sewage is comparatively free from this substance, but sewage and urine,\* are highly charged with chlorides, of which common salt is probably in largest quantity. If then a given sample of water contains no chlorine or very little, it *cannot* have been in contact with sewage, but if any considerable amount is present in a water, which is known not to have come from a tidal river or from any geological formation where deposits of salt are found, such a water would be viewed with the gravest suspicion, and if this were supported by other evidence, the water would at once be condemned. Unpolluted river and spring waters usually contain less than ten parts of chlorine per million of water, average town sewage in England about one hundred and ten parts; shallow well water may contain any quantity from a mere trace up to 500 parts or even more. The amount of chlorides is scarcely affected by any degree of filtration through soil; thus the effluent water from land irrigated with sewage contains the same proportion of chlorine

\* Human urine contains about 5000 parts of chlorine per million of liquid.

as the sewage, unless it has been diluted by subsoil water or concentrated by evaporation.

As an illustration of the quantities of total ammonia and of chlorine as chlorides found in samples of *good* or *fairly good* drinking water, I may quote some numbers taken partly from Prof. Wanklyn's work on water analysis, and partly from other sources such as the Rivers Pollution Commissioners' Reports. The numbers given in the following table show the number of parts of total ammonia and of chlorine in every million parts of the water, and the samples of water it will be seen are selected from a variety of sources, such as lakes, rivers, wells, springs, &c.

| DESCRIPTION OF WATER.                   | Total Ammonia<br>parts per<br>million of water. | Chlorine parts<br>per million<br>of water. |
|-----------------------------------------|-------------------------------------------------|--------------------------------------------|
| London water, Kent Company, ... ..      | 0.03                                            | 23.5                                       |
| " " New River Company, ... ..           | 0.08                                            | 15.7                                       |
| Glasgow water from Loch Katrine, ... .. | 0.08                                            | 7.6                                        |
| Edinburgh town water, ... ..            | 0.07                                            | 14.3                                       |
| Manchester town water, ... ..           | 0.07                                            | 9.0                                        |
| Chester (Dee) town water, ... ..        | 0.07                                            | 5.0                                        |
| Oxton (Birkenhead) town water, ... ..   | 0.02                                            |                                            |
| Guildford water, ... ..                 | 0.01                                            | 12.6                                       |
| Caterham water from deep spring, ... .. | 0.04                                            | 15.5                                       |
| Deep spring at Dorking, ... ..          | 0.01                                            |                                            |
| Deep Well at Chatham, ... ..            | 0.06                                            |                                            |

As an additional comparison of the quantities of "Total Ammonia" and of Chlorine, which a good potable water should yield, I will quote the amounts of these substances which have been obtained during the last four years from analyses of the Calcutta Hydrant water made twice in each week. In the following table there are given the average results obtained for each of the last four years, as well as the general average for the whole of this period.

*Calcutta Hydrant Water.*

|                      | No. of days<br>of Analysis. | No. of days<br>when<br>transparent<br>and<br>colorless.* | No. of days<br>when not<br>perfectly<br>filtered. | Total<br>ammonia<br>in parts per<br>million.. | Chlorine<br>in parts per<br>million. |
|----------------------|-----------------------------|----------------------------------------------------------|---------------------------------------------------|-----------------------------------------------|--------------------------------------|
| Average 1876, ... .. | 155                         | 137                                                      | 18                                                | 0.037                                         | 10.65                                |
| " 1877, ... ..       | 104                         | 72                                                       | 32                                                | 0.046                                         | 10.40                                |
| " 1878, ... ..       | 103                         | 75                                                       | 28                                                | 0.034                                         | 8.37                                 |
| " 1879, ... ..       | 103                         | 91                                                       | 12                                                | 0.035                                         | 8.50                                 |
| Sums, ... ..         | 465                         | 375                                                      | 90                                                | 0.152                                         | 37.92                                |
| Average, ... ..      | 116                         | 94                                                       | 22                                                | 0.038                                         | 9.48                                 |

\* When examined by transmitted light in a tube three feet in length.

In passing I may here remark, that a comparison of these numbers with those of the previous table, shows that the present water supply of Calcutta is really of excellent quality, and that very few of the *good* waters selected from those given in the works alluded to, are as pure as our hydrant water. That the purity of the hydrant water as determined by this process of analysis is not merely exceptional, is clear from the close agreement of the results of each year with the average of the four years. It will also be noticed that the hydrant water will fall in class one of Prof. Wanklyn's classification, as being a water of extraordinary organic purity.

On the other hand as examples of waters which are considered in England to be exceptionally bad, and which are at once condemned as sources of water for domestic purposes, and as examples of the results obtained from sewage, I may quote the following from Prof. Wanklyn's work on water analysis.

| DESCRIPTION OF WATER.                         | Total ammonia parts per million of water. | Chlorine parts per million of water. |
|-----------------------------------------------|-------------------------------------------|--------------------------------------|
| Unfiltered Thames water at Hampton Court, ... | 0.32                                      | 11.4                                 |
| „ „ Thames water at London Bridge, ...        | 2.11                                      | 17.1                                 |
| Well at Leek Workhouse (Staffordshire), ...   | 0.36                                      | 7.1                                  |
| Well in Windsor, ... ..                       | 1.28                                      | 80.0                                 |
| Well in Eton, ... ..                          | 0.84                                      | 80.0                                 |
| Pump in Drapers Hall, London, ... ..          | 6.31                                      |                                      |
| „ „ Bishopsgate St., London, ... ..           | 7.75                                      |                                      |
| „ „ Goodge St., London, ... ..                | .....                                     | 177.0                                |
| „ „ Oxford Market, ... ..                     | .....                                     | 474.3                                |
| Sample of Sewage, ... ..                      | 17.10                                     | 141.4                                |

In addition to these examples I have analysed the Calcutta sewage by the same process. Thus on December 18th, 1877, samples of sewage were collected at each hour from 6 A. M. to 6 P. M. at the Pumping Station, and the amounts of total ammonia obtained from three of the samples showed 84.0, 87.0 and 145.6 parts per million of water. The average amount of chlorine was 170.4 parts in the same volume. This shows a much more concentrated sewage than that analysed by Prof. Wanklyn, but it is fair to state that the three samples of Calcutta sewage were of extreme concentration, and of a most repulsive and disgusting character.

If we take the first two tables above given as representing good drinking waters, and the last as representing sewage, either dilute or concentrated as the case may be, we are now in a position to understand the meaning of the numbers obtained by the analyses of two hundred samples of Calcutta tank and well waters, which are given in the tables below.

I have previously noticed the three standards of purity suggested by Prof. Wanklyn, but as in the case of these Calcutta tank and well waters, we shall be dealing with very impure samples, it will be well to adopt some standards of greater impurity than before given. I think it will be well within the mark to consider, that any sample of water which produces more than 10 parts of total ammonia should be classed as a sewage and not as a water, and that if the amount produced is between 10 and 5 parts, the sample may be called a dilute sewage; from 5 parts to 1 part we have a water considerably contaminated with sewage, and from 1 part down to Prof. Wanklyn's limit of 0.10 parts of total ammonia, we have the class of Dirty Waters, which represent water contaminated more or less with organic or sewage matter. In the same way we may adopt a classification of the amounts of chlorine present, and there is apparently no doubt that a Calcutta tank or well water which contains more than 250 parts of chlorine per million should be classed as a sewage; that a water containing from 250 to 150 parts of chlorine may be looked on as a dilute sewage; that with from 150 to 100 parts of chlorine present we have a water considerably contaminated with sewage; and when from 100 to 50 parts are present a water may be said to be slightly contaminated, whilst if less than 50 parts of chlorine are present, the water may be considered moderately safe.

The first of the two following tables contains the results obtained from the analysis of the tank waters, and the second the numbers obtained from the well waters. The tables contain 9 columns, most of which are explained by their headings. Column 1 gives the date on which the water was analysed, 2 and 3 the locality from which the sample was drawn and the section of the town in which the tank or well is situated. Column 4 gives the reason why my attention was called to the state of the tank or well, and which lead to the water being analysed. Column 5 gives a very brief description of the physical characters of the sample, principally as to colour, smell, presence or absence of solid matters in suspension, presence of animal life etc., and under this head it may be mentioned that as most of the waters were extremely dirty and thick, the examination as to colour was made in a glass cylinder only six inches high standing on a white surface. Columns 6 and 7 give the amounts of total ammonia and of chlorine present in every million parts of water. Column 8 gives the decision as to whether the water was considered fit for potable purposes or whether it was condemned for such uses, and the last column shews whether the tank or well has been subsequently filled up or dewatered.

Most of these results have been submitted to the Health Officer to the Municipality in my capacity of Water Analyst, and it is due to the courtesy of Dr. McLeod that I am able to give the columns 4, 8 and 9.

## Tank Waters, 1876.

| Date.     | Locality.                                 | Section. | Reason why water was submitted to analysis. | Description.                                                                            | Total Ammonia parts per million. | Amt of Chlorine parts per million. | Whether condemned for domestic purposes or not. | What was done to the Tank. |
|-----------|-------------------------------------------|----------|---------------------------------------------|-----------------------------------------------------------------------------------------|----------------------------------|------------------------------------|-------------------------------------------------|----------------------------|
| March. 1  | No. 19, Goa Bagan Street, North Tank.     | C        | For cholera death in neighbourhood.         | Yellowish green color, very turbid. Full of life.                                       | 18.52                            | 582.00                             | Condemned.                                      | Filled up.                 |
| "         | No. 19, Goa Bagan Street, South Tank.     | C        | Do.                                         | Yellowish green color, very turbid. Full of life.                                       | 26.20                            | 639.00                             | Do.                                             | Filled up.                 |
| " 16      | Name of locality not clearly ascertained. |          | Do. and complaint.                          | Greenish color. Full of animal life.                                                    | 24.80                            | 568.00                             | Do.                                             | Filled up.                 |
| " 24      | Nihareeparah.                             | A        | Filthy state.                               | Green color, unpleasant smell, suspended matter.                                        | 18.00                            | 550.25                             | Do.                                             | Filled up.                 |
| " 27      | Nundoram Sen's Street.                    | B        | Do.                                         | Brown white color. Very turbid, Full of life.                                           | 10.00                            | 390.50                             | Do.                                             | Filled up.                 |
| " 28      | Krupanauth's Lane.                        | B        | Do.                                         | Tolerably clear. Full of life.                                                          | 2.40                             | 443.75                             | Do.                                             | Filled up.                 |
| " 29      | Boloram Ghose's Street.                   | A        | Do.                                         | Greenish color, very turbid. Full of life.                                              | 2.00                             | 514.75                             | Do.                                             | Filled up.                 |
| " 30      | Raja Rajbulhab Street.                    | A        | Do.                                         | Rather clear; small floating worms.                                                     | 2.00                             | 514.75                             | Do.                                             | Filled up.                 |
| April 20. | Bortollah Tank.                           | C        | Cholera death in neighbourhood.             | Yellowish white color, turbid, contains animal life.                                    | 2.20                             | 255.60                             | Do.                                             | Filling.                   |
| May 2.    | 7, Grey Street.                           | C        | Filthy state.                               | Yellowish green color, stinks horribly, full of suspended matter and animal life.       | 20.00                            | 710.00                             | Do.                                             | Filled up.                 |
| " 3.      | Kerr's Lane.                              | M        | Do.                                         | Green color, stinks horribly, full of sediment, animal life                             | 13.75                            | 319.50                             | Do.                                             | Do.                        |
| " 9.      | 141, Dhurruntollah Street.                | K        | Do.                                         | Whitish green color, rather strong stink, full of animal life.                          | 9.60                             | 268.25                             | Do.                                             | Do.                        |
| " 10.     | 102, Jaun Bazar Street.                   | N        | Do.                                         | Green color, stinks horribly, full of life, animal and vegetable.                       | 9.60                             | 284.00                             | Do.                                             | Filled up.                 |
| Aug. 15.  | Presidency Jail Tank.                     | Q        | Do.                                         | Of greenish color, slightly turbid.                                                     | 1.30                             | 46.15                              | Do.                                             | Filled up.                 |
| "         | Ahpore Jail Tank.                         | Do.      | Do.                                         | Yellowish color, slightly turbid.                                                       | 0.68                             | 35.50                              | Do.                                             | Filled up.                 |
| Sept. 19. | Sooke's St. Thana, North Tank.            | D        | Do.                                         | Brownish color, contains suspended matter and considerable amount of animal life.       | 1.62                             | 184.60                             | Do.                                             | Filling.                   |
| "         | Sooke's St. Thana, South Tank.            | D        | Cholera death in neighbourhood.             | Almost colorless, contains suspended matter, little if any animal life visible.         | .35                              | 142.00                             | Do.                                             | Filling.                   |
| Dec. 16.  | Komadan Bagan, Double Tank.               | N        | Do.                                         | Slight greenish color, faint smell, turbid, full of animal life.                        | 2.40                             | 266.25                             | Do.                                             | Filling.                   |
| "         | Tank Harco Tollowa.                       | N        | Do.                                         | Greenish white color, very unpleasant smell, very turbid, full of animal life.          | 7.65                             | 372.75                             | Do.                                             | Filling.                   |
| " 22.     | D Tank Water.                             |          |                                             | Of a whitish color, turbid, contains animal life, but apparently not in large quantity. | 0.60                             | 31.95                              | Do.                                             | Filling.                   |

## Tank Waters, 1877.

| Date.    | Locality.                                                  | Section. | Reason why water was submitted to analysis. | Description.                                                            | Total Ammonia parts per million. | Amt. of Chlorine parts per million. | Whether condemned for domestic purposes or not. | What was done to the Tank. |
|----------|------------------------------------------------------------|----------|---------------------------------------------|-------------------------------------------------------------------------|----------------------------------|-------------------------------------|-------------------------------------------------|----------------------------|
| Jan. 9.  | Godai Khansama's Lane, Colinga.                            | O        | Filthy state.                               | Greenish white color, turbid, and full of animal life.                  | 3.06                             | 156.20                              | Condemned.                                      | De-watered.                |
| " 12.    | Gopal Mitter's Tank in Brindabun Mullick's Lane.           | D        | Cholera death in neighbourhood.             | Of a greenish color, turbid, and full of animal life.                   | 2.52                             | 475.70                              | Do.                                             |                            |
| " 16.    | Dhankhit Tank, Colvin's Buzsee.                            | Q        | Filthy state.                               | Of a whitish color, turbid, and full of animal life.                    | 16.00                            | 170.40                              | Do.                                             |                            |
| Feb. 13. | 74, Dhurumtollah Street.                                   | B        | Complaint of do.                            | Of a whitish color, and turbid.                                         | 14.80                            | 195.25                              | Do.                                             |                            |
| " 23.    | Tolley's Nullah.                                           | R        | Filthy state.                               | Of a whitish color, and turbid.                                         | .10                              | 71.00                               |                                                 |                            |
| " "      | Hastings Bridge, (foot of).                                | R        | Do.                                         | Of a whitish color, and turbid.                                         | .10                              | 65.67                               |                                                 |                            |
| Mar. 6.  | Tolley's Nullah taken between High water and mid ebb-tide. | R        | Do.                                         | Of a whitish color, and turbid.                                         | .08                              | 22.36                               |                                                 |                            |
| " 12.    | 31, Neogipuker East Lane.                                  | N        | Cholera death in neighbourhood.             | Green color, stinks horribly, turbid, full of green suspended matter.   | 8.00                             | 230.75                              | Do.                                             | No. 30, Filled up.         |
| " 13.    | 42, Harepara Lane.                                         | N        | Do.                                         | Whitish brown color, smells badly, very turbid.                         | 61.28                            | 355.00                              | Do.                                             | Filled up.                 |
| " 14.    | 62, Lower Circular Road.                                   | N        | Do.                                         | Green color, suspended matter, stinks, turbid, full of animal life.     | 47.04                            | 230.75                              | Do.                                             | Do.                        |
| " 15.    | 32, Neogipuker East Lane.                                  | N        | Do.                                         | Green color, suspended matter, stinks, turbid.                          | 24.00                            | 142.00                              | Do.                                             | No. 33, Filled up.         |
| " 16.    | 30, Harepara Lane.                                         | N        | Filthy state.                               | Brownish color, faint smell, slightly turbid.                           | 24.00                            | 230.75                              | Do.                                             | Filled up.                 |
| " 17.    | 16, Neogipuker W. Lane.                                    | N        | Do.                                         | Greenish white color, faint odour, very turbid, green suspended matter. | 120.00                           | 337.25                              | Do.                                             | Filled up.                 |
| " 18.    | 19, Okur Dutt's Lane.                                      | K        | Cholera death in neighbourhood.             | Greenish white color, faint smell, turbid.                              | 12.84                            | 159.75                              | Do.                                             | Filled up.                 |
| " 19.    | 18, Holodhur Buddan's Lane.                                | K        | Filthy state.                               | Brown almost black color, stinks, very turbid, full suspended matter.   | 40.80                            | 319.50                              | Do.                                             | Do.                        |
| " 20.    | 15, Takoor Doss Paulit's L.                                | K        | Do.                                         | Brownish white color, stinks, excessively turbid.                       | 16.00                            | 248.50                              | Do.                                             | Do.                        |

*Tank Waters, 1877—Continued.*

| Date.    | Locality.                            | Section. | Reason why water was submitted to analysis. | Description.                                                                 | Total Ammonia parts per million. | Amt. of Chlorine parts per million. | Whether condemned for domestic purposes or not. | What was done to the Tank. |
|----------|--------------------------------------|----------|---------------------------------------------|------------------------------------------------------------------------------|----------------------------------|-------------------------------------|-------------------------------------------------|----------------------------|
| Mar. 20. | 10, Okur Dutt's Lane.                | K        | For Cholera death in neighbourhood.         | Brownish or blackish white color, stinks, excessively turbid.                | 24.00                            | 266.25                              | Condemned.                                      | Filled up.                 |
| "        | 15, Oriahpara Lane.                  | K        | Do.                                         | Do.                                                                          | 60.00                            | 355.00                              | Do.                                             |                            |
| "        | 16, Cornwallis Street.               | D        | Do.                                         | Greenish white color, stinks, turbid.                                        | 16.00                            | 159.75                              | Do.                                             |                            |
| "        | 22, Sunkar Ghose's Lane.             | D        | Do.                                         | Brownish white color, smells, slightly turbid.                               | 16.00                            | 284.00                              | Do.                                             |                            |
| "        | 36, Sankaritolah Lane.               | K        | Do.                                         | Brownish white color, stinks, excessively turbid.                            | 16.16                            | 408.25                              | Do.                                             |                            |
| "        | 103 & 104, Serpentine Lane.          | K        | Do.                                         | Greenish brown, stinks horribly, excessively turbid.                         | 240.00                           | 319.50                              | Do.                                             |                            |
| "        | 2 & 3, Holodhur Buddan's Lane.       | K        | Do.                                         | Brownish white color, slightly turbid, little suspended matter.              | 8.40                             | 230.75                              | Do.                                             |                            |
| "        | 21, Jallihapara Lane.                | K        | Do.                                         | Almost transparent, little suspended matter.                                 | 200.00                           | 159.75                              | Do.                                             |                            |
| "        | 8, Ukur Dutt's Lane.                 | K        | Do.                                         | Brownish color, smells, turbid.                                              | 1.80                             | 479.25                              | Do.                                             |                            |
| "        | 8, Kisto Laha's Lane.                | K        | Complaint.                                  | Stinks horribly, excessively turbid, full of bright green suspended matter.  | 26.40                            | 426.00                              | Do.                                             |                            |
| "        | 9, Serpentine Lane.                  | K        | Cholera death.                              | Whitish green color, stinks, very turbid.                                    | 8.00                             | 355.00                              | Do.                                             |                            |
| "        | 90, Chitpore Road.                   | G        | On H. O.'s report.                          | Yellowish brown color, no smell, slightly turbid with suspended matter.      | 0.48                             | 117.00                              | Do.                                             |                            |
| "        | 7, Grey Street.                      | C        | For Cholera death in neighbourhood.         | Yellowish brown color, smells, opalescent, little suspended matter.          | 16.00                            | 461.50                              | Do.                                             | Filled up.                 |
| "        | 115, Upper Chitpore Road.            | G        | Do.                                         | Brownish color, smells, opalescent, suspended and animal matter.             | 8.00                             | 266.25                              | Do.                                             |                            |
| "        | 22, Musjoedbarree Street.            | C        | Do.                                         | Bright green color, stinks horribly, extremely opalescent, suspended matter. | 19.84                            | 390.50                              | Do.                                             |                            |
| "        | 63, Hurry Ghose's Street.            | C        | Do.                                         | Brownish almost black color, stinks, suspended matter.                       | 12.60                            | 248.50                              | Do.                                             |                            |
| "        | 5, Fukeer Chand Chatterjee's Street. | C        | Do.                                         | Brown color, stinks horribly, extremely opalescent, much suspended matter.   | 28.56                            | 585.75                              | Do.                                             |                            |
| "        | 27, Tarnk Chatterjee's Lane.         | C        | Do.                                         | Brown color, smells, opalescent, suspended matter.                           | 20.00                            | 301.75                              | Do.                                             |                            |
| "        | 31, Durjeeparah Street.              | C        | Do.                                         | Yellow color, smells, suspended matter.                                      | 8.00                             | 390.50                              | Do.                                             |                            |

|           |                                                                         |     |                                          |                                                                                                                                                                     |                             |                        |
|-----------|-------------------------------------------------------------------------|-----|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|------------------------|
| April 10. | 28, Goa Bagan W. Goalla-<br>para,<br>16, Do.                            | C   | Complaint of rag-<br>ing cholera.<br>Do. | Greenish black color, stinks, opalescent, full of<br>suspended matter.<br>Bright green color, stinks, excessively opales-<br>cent, full of suspended matter.        | 6-40 426-00<br>20-96 337-25 | Con-<br>demned.<br>Do. |
| "         | 12, Double Tank, Komadar<br>Bagan, Joratolla.<br>99, Jaun Bazar Street. | O   | Foul state.                              | Greenish white color, stinks, with much sus-<br>pended matter and animal matter.                                                                                    | 3-90 177-50                 | Do.                    |
| "         | 16, Tank A.                                                             | N   | Do.                                      | Yellowish color, unpleasant smell, slightly<br>turbid, suspended matter & also animal life.<br>Almost colorless and smells unpleasantly ;<br>much suspended matter. | 7-20 124-25<br>Lost. 74-50  | Do.<br>Do.             |
| "         | Tank B.                                                                 | Do. | Do.                                      | Stinks of sulphuric acid hydrogen, becomes<br>opalescent on exposure, much suspended<br>matter.                                                                     | 3-20 81-60                  | Do.                    |
| Aug. 7.   | 75 & 76, South Colinga St.                                              | O   | Foul state.                              | Yellow color, smells slightly, contains sus-<br>pended matter.                                                                                                      | 2-36 159-75                 | Do.                    |
| "         | 10, Baranosee Ghose's St.,<br>Singhec Bagan.                            | F   | Cholera death in<br>neighbourhood.       | Almost colorless, faint unpleasant smell, and<br>suspended matter, much animal life.                                                                                | 2-68 142-00                 | Do.                    |
| "         | 28, Neogipukur East Lane.                                               | N   | Do.                                      | Water of a yellowish color, faint unpleasant<br>smell, much animal life.                                                                                            | 2-64 276-90                 | Do.                    |
| Oct. 9.   | 10 & 12, Elliot's Road.                                                 | O   | Do.                                      | Yellowish color, stinks, opalescent, contains<br>animal life.                                                                                                       | 4-29 71-00                  | Do.                    |
| "         | 6, Hill's Lane.                                                         | O   | Complaint.                               | Yellowish color, smells slightly, slightly opa-<br>lescent, animal life.                                                                                            | 3-95 142-00                 | Do.                    |
| "         | 62, Machooa Bazar Street.                                               | I   | Cholera death in<br>neighbourhood.       | Greenish white color, stinks badly, full<br>of suspended matter and animal matter.                                                                                  | 4-40 213-00                 | Do.                    |
| "         | 27, Musjeedbarry Street.                                                | C   | Filthy state.                            | Yellowish green color, stinks, some suspended<br>matter, animal life.                                                                                               | 2-59 266-25                 | Do.                    |
| "         | 38, Nilmoney Mitter's St.                                               | C   | Complaint.                               | Greenish brown color, stinks, suspended mat-<br>ter, animal life.                                                                                                   | 9-00 301-75                 | Do.                    |
| Nov. 2.   | 7, Sookoa's St., Bye-Lane.                                              | D   | Cholera death in<br>neighbourhood.       | Yellowish green color, slight smell, slightly<br>opalescent, small quantity suspended matter,<br>full of animal life.                                               | 3-40 185-25                 | Do.                    |
| "         | 11, Carey's Church Lane.                                                | I   | On Tank<br>Committee's re-<br>port.      | Brownish white color, unpleasant smell,<br>slightly opalescent, small quantity suspend-<br>ed matter, full of animal life.                                          | 12-00 185-25                | Do.                    |

Nos. 19  
4 and 96  
filled up.No. 74,  
dewatered  
Filled up.

Filled up.

Filled up.

Filled up.

*Tank Waters, 1877—Concluded.*

| Date.    | Locality.                                         | Section. | Reason why water was submitted to analysis. | Description.                                                                                                          | Total Ammonia parts per million. | Ant. of Cholerae parts per million. | Whether condemned for domestic purposes or not. | What was done to the Tank. |
|----------|---------------------------------------------------|----------|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------|-------------------------------------|-------------------------------------------------|----------------------------|
| Nov. 8.  | Colvin Bustec Tank.                               | Q        | Cholera death in neighbourhood.             | Greenish white color, stinks, opalescent, full of green suspended matter and animal life.                             | 13.00                            | 195.25                              | Condemned.                                      |                            |
| " 10.    | 9, Shampuker Street.                              | A        | Do.                                         | Greenish color; slight smell, slightly opalescent, full of green suspended matter and animal life.                    | 9.84                             | 181.05                              | Do.                                             |                            |
| " 11.    | 85, Maehooa Bazar Street.                         | D        | Do.                                         | Yellowish brown color, slight smell, opalescent, full animal life.                                                    | 11.30                            | 159.75                              | Do.                                             |                            |
| " 12.    | 6, Emambang 2nd Lane.                             | J        | Complaint.                                  | Green color, faint smell, much suspended matter, and animal life.                                                     | 3.00                             | 113.60                              | Do.                                             |                            |
| " 13.    | 75, Jaun Bazar Street.                            | N        | Cholera in neighbourhood.                   | Greenish yellow color, stinks, rather opalescent, small quantity of suspended matter, full of animal life.            | 2.76                             | 202.35                              | Do.                                             |                            |
| Dec. 10. | 46, Kally Prosad Dutt's St.                       | C        | Do.                                         | Dark green brown color, on being kept a few days stinks horribly, full of green suspended matter, and animal life.    | 28.56                            | 205.90                              | Do.                                             | No. 54, Filled up.         |
| " 11.    | 104, Upper Circular Road.                         | C        | Do.                                         | Whitish brown color, when kept a few days has a very bad smell, full of green suspended matter, contains animal life. | 23.52                            | 262.70                              | Do.                                             |                            |
| "        | 12, Nuzur Nuzubullah's Lane.                      | O        | On the report of Tank Committee.            | Greenish white color, has unpleasant smell, moderate amount of suspended matter, much animal life.                    | 8.40                             | 181.05                              | Do.                                             |                            |
| " 18.    | 18, Harepara Lane, and 15, N eogripker West Lane. | N        | Filthy state.                               | Green color, stinks most horribly, much suspended matter, full of animal life.                                        | 11.16                            | 244.95                              | Do.                                             | Filled up.                 |

## Tank Waters, 1878.

| Date.    | Locality.                      | Section. | Reason why water was submitted to analysis. | Description.                                                                                        | Total Ammonia parts per million. | Chlorine parts per million. | Whether condemned for domestic purposes or not. | What was done to the Tank. |
|----------|--------------------------------|----------|---------------------------------------------|-----------------------------------------------------------------------------------------------------|----------------------------------|-----------------------------|-------------------------------------------------|----------------------------|
| Jan. 2.  | 54, Raja Rajbulub Street.      | A        | Cholera death in neighbourhood.             | Deep yellowish color, very unpleasant smell, full of suspended matter and animal life.              | 21.30                            | 475.70                      | Condemned.                                      |                            |
| "        | 3, Fukeer Chand Mitter's Lane. | D        | Do.                                         | Yellowish green color, unpleasant smell, little suspended matter, contains animal life.             | 3.46                             | 92.30                       | Do.                                             |                            |
| "        | 129, Cornwallis Street.        | C        | Do.                                         | Bright green color, stinks, much suspended matter, much animal life.                                | 21.06                            | 280.45                      | Do.                                             | No. 30.                    |
| "        | 4, Fukeer Chand Mitter's Lane. | D        | Do.                                         | Water yellowish color, some suspended matter.                                                       | 12.00                            | 149.10                      | Do.                                             | Filled up.                 |
| "        | 21, Do. Do.                    | D        | Do.                                         | Yellowish green color, unpleasant smell, slightly opalescent, little suspended matter, animal life. | 4.70                             | 127.80                      | Do.                                             |                            |
| "        | 81, Shampookur Street.         | A        | Do.                                         | Yellow color, slight smell, little suspended matter, much animal life.                              | 2.72                             | 142.00                      | Do.                                             |                            |
| "        | 27, Noyau Chunder Dutt's Lane. | C        | Do.                                         | Yellow, stinks, small quantity suspended matter, no visible animal life.                            | 1.47                             | 124.25                      | Do.                                             |                            |
| "        | Karbala tank water.            | C        | Do.                                         | Has a brown color, unpleasant smell, contains suspended matter, animal life.                        | 1.49                             | 276.90                      | Do.                                             |                            |
| Feb. 27. | 162, Bow Bazar.                | I        | Do.                                         | Yellow brown color, stinks, opalescent, much suspended matter, no life.                             | 40.66                            | 266.25                      | Do.                                             |                            |
| "        | 1, Nemoo Gosain's Lane.        | B        | Do.                                         | Brown color, stinks badly of sulphuretted hydrogen, opalescent, much suspended matter, animal life. | 23.20                            | 479.25                      | Do.                                             |                            |
| Mar. 5.  | Jinghu Bagan.                  | J        | Do.                                         | Green yellow color, stinks horribly of sulphuretted hydrogen, opalescent, much suspended matter.    | 11.50                            | 408.25                      | Do.                                             |                            |
| "        | 2, Manicktollah Street.        | J        | Do.                                         | Brownish color, stinks, very opalescent, much suspended matter, animal life.                        | 38.74                            | 461.50                      | Do.                                             |                            |

*Tank Waters, 1878—Continued.*

| Date.     | Locality.                                 | Section. | Reason why water was submitted to analysis. | Description.                                                                                               | Total Ammonia parts per million. | Chlorine parts per million. | Whether condemned for domestic purposes or not. | What was done to the tank. |
|-----------|-------------------------------------------|----------|---------------------------------------------|------------------------------------------------------------------------------------------------------------|----------------------------------|-----------------------------|-------------------------------------------------|----------------------------|
| Mar. 11.  | 222, Cornwallis Street.                   | J        | Cholera death in neighbourhood.             | Greenish color, stinks, very opalescent, animal life.                                                      | 3.52                             | 218.50                      | Do.                                             |                            |
| "         | 26, Prossunno Coomar Tagore's Street.     | E        | Do.                                         | Bright green color, stinks horribly, very opalescent, full of green suspended matter, full of animal life. | 17.00                            | 319.50                      | Do.                                             |                            |
| " 12.     | 22, Honro Lall Mitter's Street.           | A        | Do.                                         | Brownish color, bad smell, very opalescent, small quantity suspended matter, animal life.                  | 7.68                             | 301.75                      | Do.                                             |                            |
| " 13.     | 45, Shampoookur Lane.                     | A        | Complaint.                                  | Yellowish white color, stinks, large quantity suspended matter, visible animal life.                       | 3.02                             | 230.75                      | Do.                                             |                            |
| "         | 54, Old Boytuckhanah Bazar Street.        | I        | Cholera death in neighbourhood.             | Brown color, stinks, much suspended matter, much animal life.                                              | 42.66                            | 355.00                      | Do.                                             |                            |
| " 26.     | Minzapore Public Tank.                    | I        | Do.                                         | Greenish color, faint smell, small quantity suspended matter, animal life.                                 | 1.31                             | 102.95                      | Do.                                             |                            |
| "         | Badoobagan Tank, 83, Upper Circular Road. | D        | Do.                                         | Greenish color, stinks, green suspended matter in large quantity, animal matter in quantity.               | 2.16                             | 220.10                      | Do.                                             |                            |
| April 27. | Dharumtollah Public Tank.                 | M        |                                             |                                                                                                            | 0.80                             | 24.80                       |                                                 |                            |
| May 10.   | Wellesley Street.                         | M        |                                             | Yellow color, slight smell, small quantity suspended matter.                                               | 0.34                             | 147.68                      |                                                 |                            |
| "         | Palmer's Bridge.                          | R        |                                             | Yellowish brown, slight smell of sulphuretted hydrogen, much suspended matter.                             | 0.17                             | 2378.5                      | Do.                                             |                            |

Tank Waters, 1879.

| Date.    | Locality.                             | Section. | Reason why water was submitted to analysis. | Description.                                                                                      | Total Ammonia parts per million of water. | Chlorine parts per million of water. | Whether condemned for domestic purposes or not. | What was done to the tank. |
|----------|---------------------------------------|----------|---------------------------------------------|---------------------------------------------------------------------------------------------------|-------------------------------------------|--------------------------------------|-------------------------------------------------|----------------------------|
| Jan. 22. | 82, Upper Circular Road.              | N        | Cholera death in neighbourhood.             | Blackish green color, very bad smell, suspended matter, contains animal life.                     | 2.68                                      | 248.50                               | Condemned.                                      |                            |
| " 22.    | 83, Upper Circular Road.              | N        | Do.                                         | Yellow color, stinks badly, much suspended matter, contains animal life.                          | 9.00                                      | 213.00                               | Do.                                             |                            |
| June 20. | Rawdon Street.                        | Q        |                                             | Yellowish color, slight odour, small quantity of suspended matter, animal life in small quantity. | 4.20                                      | 269.80                               | Do.                                             |                            |
| July 4.  | 36, Goorooprosad Chaudry's Lane.      | D        | Do.                                         | Blackish color, stinks abominably, much suspended matter.                                         | 1.98                                      | 209.45                               | Do.                                             |                            |
| " 5.     | 22, Durga Churn Mukherjee's Street.   | A        | Do.                                         | Brownish color, stinks badly, much suspended matter.                                              | 3.72                                      | 213.00                               | Do.                                             |                            |
| " 7.     | 4, Brindabun Mullick's Lane.          | D        | Do.                                         | Brownish color, bad smell, opalescent, small quantity of suspended matter.                        | 7.20                                      | 223.65                               | Do.                                             |                            |
| Oct. 10. | 5, Peary Mohun Paul's Lane.           | H        | Complaint.                                  | Brownish black color, unpleasant smell, very opalescent, large quantity of suspended matter.      | 92.40                                     | 177.50                               | Do.                                             |                            |
| " 11.    | 10 and 11, Jorapukur Lane.            | F        | Cholera.                                    | Blackish brown color, stinks badly, very opalescent, large quantity of suspended matter.          | 77.60                                     | 177.50                               | Do.                                             |                            |
| " 14.    | 160, Gokul Mitter's Lane, Baug Bazar. | A        | Complaint.                                  | Brown color, stinks abominably, very opalescent, large quantity of suspended matter.              | 11.52                                     | 248.50                               | Do.                                             |                            |
| 1880.    |                                       |          |                                             |                                                                                                   |                                           |                                      |                                                 |                            |
| Jan. 24. | No. 19, Goa Bagan Street.             | C        | Cholera.                                    | Grey color, slight odour, much suspended matter, much animal life.                                | 13.86                                     | 319.50                               | Do.                                             | Filled up.                 |

*Tank Waters, 1880—Continued.*

| Date.    | Locality.                                    | Section. | Reason why water was submitted to analysis. | Description.                                                                                  | Total Ammonia parts per million of water. | Chlorine parts per million of water. | Whether condemned for domestic purposes or not. | What was done to the tank. |
|----------|----------------------------------------------|----------|---------------------------------------------|-----------------------------------------------------------------------------------------------|-------------------------------------------|--------------------------------------|-------------------------------------------------|----------------------------|
| Jan. 24. | 32, Elliott's Road.                          | O        | Prevalence of Swelling fever.               | Grey color, unpleasant odour, much suspended matter, much animal life.                        | 15.20                                     | 195.25                               | Condemned.                                      |                            |
| " 26.    | 31, Elliott's Road.                          | O        | Do.                                         | Green color, slight odour, much green suspended matter, animal life.                          | 4.00                                      | 159.75                               | Do.                                             |                            |
| " 28.    | 35, Elliott's Road.                          | O        | Do.                                         | Green color, stinks abominably, much suspended matter, animal life.                           | 6.00                                      | 142.00                               | Do.                                             |                            |
| " 29.    | 11, Mohendra Gossain's Lane.                 | F        | Complaint.                                  | Bright yellow color, unpleasant smell, suspended matter, much animal life.                    | 23.20                                     | 337.25                               | Do.                                             |                            |
| " 30.    | Radhanath Bose's Lane.                       | C        | Do.                                         | Green color, unpleasant smell, suspended matter, much animal life.                            | 6.30                                      | 355.00                               | Do.                                             |                            |
| May 29.  | 31, Bachoo Chatterjea's Street.              | D        | Do.                                         | Green color, stinks badly, very turbid, suspended matter, animal life.                        | 8.00                                      | 401.15                               | Do.                                             |                            |
| July 5.  | South of Park Street old Cemetery.           |          |                                             | Slight yellow color, no smell, almost clear and transparent, small quantity of animal life.   | 0.16                                      | 255.60                               |                                                 |                            |
| " 6.     | Binju Tank, south of Cathedral.              |          |                                             | Greyish color, no smell, rather turbid, small quantity of animal life.                        | 0.09                                      | 13.84                                |                                                 |                            |
| " 7.     | Elliott's Tank, north of Cathedral.          |          |                                             | Slight greyish color, no smell, rather turbid, small quantity of animal life.                 | 0.10                                      | 8.16                                 |                                                 |                            |
| " 8.     | General's Tank opposite Bengal Club.         |          |                                             | Grey color, no smell, rather turbid, small quantity of animal life.                           | 0.10                                      | 32.66                                |                                                 |                            |
| " 9.     | Monohar Dass's Tank opposite Lindsay Street. |          |                                             | Almost colorless, no smell, almost clear and transparent, very small quantity of animal life. | 0.07                                      | 16.68                                |                                                 |                            |
| " 10.    | Tank opposite Esplanade.                     |          |                                             | Almost colorless, no smell, almost transparent, small quantity of animal life.                | 0.11                                      | 24.14                                |                                                 |                            |

| Date.    | Locality.                   | Section. | Reason why water was submitted to analysis. | Description.                                                                          | Total Ammonia parts per million. | Amt. of Chlorine parts per million. | Whether condemned for domestic purposes or not. | What was done to the well. |
|----------|-----------------------------|----------|---------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------|-------------------------------------|-------------------------------------------------|----------------------------|
| May 8.   | 5, Jorabagan.               | E        | Cholera death in neighbourhood.             | Greenish black color, stinks horribly, slightly opalescent, full of suspended matter. | 1.68                             | 177.50                              | Condemned.                                      |                            |
| "        | 1, Horo Lall Doss's Lane.   | E        | Filthy state.                               | Slight brownish color, no smell, little suspended matter.                             | 0.80                             | 248.50                              | Do.                                             |                            |
| "        | 16, Burrabazar Moylaputti.  | G        | Do.                                         | Almost colorless, no suspended matter.                                                | 0.40                             | 213.00                              | Do.                                             |                            |
| "        | Jaumbazar Bustee.           | M        |                                             | Yellowish color, no smell, traces of suspended matter.                                | 8.20                             | 514.75                              | Do.                                             |                            |
| "        | 24, Jorabagan Street.       | E        | Filthy state.                               | Almost colorless, faint smell, small amount of suspended matter.                      | 0.62                             | 621.25                              | Do.                                             |                            |
| "        | 6, Jorabagan Street.        | E        | Do.                                         | Brownish color, faint smell, small amount of suspended matter.                        | 0.50                             | 248.50                              | Do.                                             |                            |
| "        | 7, Horo Lall Doss's Bustee. | E        | Do.                                         | Brownish color, nasty smell, opalescent, suspended matter.                            | 1.76                             | 142.00                              | Do.                                             |                            |
| "        | 9, Shama Bye's Gully.       | E        | Do.                                         | Slight yellowish color, faint smell, small amount of suspended matter.                | 0.90                             | 426.00                              | Do.                                             |                            |
| "        | 30, Burtollah Street.       | E        | Do.                                         | Almost colorless, faint smell, small amount of suspended matter.                      | 0.50                             | 39.50                               | Do.                                             |                            |
| "        | 9, Burrabazar Baneaputti.   | G        | Do.                                         | Brownish color, faint smell, suspended matter.                                        | 0.40                             | 177.50                              | Do.                                             |                            |
| "        | 145, " Hookaputti.          | G        |                                             | Yellowish color, faint smell, much suspended matter.                                  | 0.30                             | 710.00                              | Do.                                             |                            |
| "        | 3, Hanspookur Gully.        | E        | Filthy state.                               | Strong yellowish brown color, faint smell, much suspended matter.                     | 4.15                             | 307.70                              | Do.                                             |                            |
| "        | 159, Machooa Bazar Street.  | E        |                                             | Yellowish color, faint unpleasant smell, little suspended matter.                     | 2.40                             | 390.50                              | Do.                                             |                            |
| Aug. 10. | 145, Burra Bazar.           | G        | Filthy state.                               | Almost colorless, faint unpleasant smell, suspended matter.                           | 3.68                             | 791.65                              | Do.                                             |                            |

*Well Waters, 1877—Continued.*

| Date.    | Locality.                     | Section. | Reason why water was submitted to analysis. | Description.                                                                                        | Total Ammonia parts per million. | Amt. of Chlorine parts per million. | Whether endemic for domestic purposes or not. | What was done to the well. |
|----------|-------------------------------|----------|---------------------------------------------|-----------------------------------------------------------------------------------------------------|----------------------------------|-------------------------------------|-----------------------------------------------|----------------------------|
| Aug. 10. | 24, Jorabagan Street.         | E        | Cholera death in neighbourhood.             | Yellowish green color, faint unpleasant smell, suspended matter, animal life distinct.              | 2.84                             | 265.25                              | Condemned.                                    |                            |
| "        | 3, Hanspookur Lane.           | E        |                                             | Almost colorless, faint smell, small quantity suspended matter.                                     | 1.42                             | 390.50                              | Do.                                           |                            |
| "        | 6, Jorabagan Street.          | E        | Cholera death.                              | Yellowish color, faint unpleasant smell, small quantity suspended matter, distinct animal life.     | 3.76                             | 159.75                              | Do.                                           |                            |
| "        | 30, Burtolah Street.          | E        |                                             | Colorless, faint unpleasant smell, large quantity of suspended matter, distinct animal life.        | 2.73                             | 319.50                              | Do.                                           |                            |
| "        | 9, Shama Bay's Lane.          | E        |                                             | Almost colorless, faint unpleasant smell, small quantity suspended matter.                          | 2.64                             | 408.50                              | Do.                                           |                            |
| "        | 24, Bustee Joraban Street.    | E        |                                             | Brown color, stinks badly, very opalescent, much suspended matter, distinct animal life.            | 17.40                            | 159.75                              | Do.                                           |                            |
| "        | 1, Horo Lall Doss's Lane.     | E        |                                             | Almost colorless, faint smell, small quantity of suspended matter.                                  | 3.95                             | 177.50                              | Do.                                           |                            |
| "        | 16, Burra Bazar Moydappetty.  | G        |                                             | Colorless, faint unpleasant smell, little suspended matter.                                         | 2.83                             | 177.50                              | Do.                                           |                            |
| "        | 5, Jorabagan Street.          | E        | Cholera death.                              | Whitish yellow color, smells unpleasantly, opalescent, suspended matter, and traces of animal life. | 15.80                            | 88.75                               | Do.                                           |                            |
| "        | 9, Burrabazar Baneappetty.    | G        |                                             | Almost colorless, faint unpleasant smell, suspended matter, animal life.                            | 3.28                             | 195.25                              | Do.                                           |                            |
| "        | Bustee Horo Lall Doss's Lane. | E        |                                             | Yellow color, decided unpleasant smell, suspended matter.                                           | 4.32                             | 248.50                              | Do.                                           |                            |
| "        | 136, Serpentine Lane.         | K        |                                             | Yellow color, unpleasant smell, little suspended matter, much animal life.                          | 6.40                             | 621.25                              | Do.                                           |                            |

| Date.    | Locality.                       | Section. | Reason why water was submitted to analysis. | Description.                                                                                                                                   | Total Ammonia parts per million. | Chlorine parts per million. | Whether condemned for domestic purposes or not. | What was done to the well. |
|----------|---------------------------------|----------|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|-----------------------------|-------------------------------------------------|----------------------------|
| Jan. 28. | Doorga Churn Mitter's Street.   | C        | Cholera death in neighbourhood.             | Almost colorless, but in long cylinder appears yellowish, faint unpleasant smell, small quantity suspended matter, no animal life perceptible. | 1.40                             | 88.75                       | Condemned.                                      |                            |
| " 30.    | 13-A, Nattur Bagan.             | B        | Do.                                         | Almost black, unpleasant smell, excessively turbid, animal life.                                                                               | 51.50                            | 84.35                       | Do.                                             |                            |
| Feb. 7.  | 13-B, Nattur Bagan.             | B        | Do.                                         | Slight brownish tinge, slight smell, small quantity suspended matter, no visible animal life.                                                  | 3.30                             | 639.00                      | Do.                                             |                            |
| "        | 14, Smith's Lane.               | N        | Do.                                         | Yellow color, slight smell, some suspended matter, small traces of animal life.                                                                | 3.30                             | 479.25                      | Do.                                             |                            |
| "        | 30, Noyau Chaund Dutt's Street. | C        | Do.                                         | Yellow color, unpleasant smell, small quantity suspended matter, distinct animal life.                                                         | 1.92                             | 152.65                      | Do.                                             |                            |
| " 15.    | 10, Ram Kanto Bose's Lane.      | A        | Do.                                         | Yellowish color, unpleasant smell, moderate amount suspended matter, no visible animal life.                                                   | 12.80                            | 582.20                      | Do.                                             |                            |
| " 19.    | Railway Tank, Scaldah.          |          | Do.                                         | Almost colorless, slight smell, small quantity suspended matter, no visible animal life.                                                       | 0.80                             | 452.60                      | Do.                                             |                            |
| " 20.    | 128-J, Bow Bazar Street.        | K        | Do.                                         | Almost colorless, no smell, very small quantity suspended matter, no visible animal life.                                                      | 0.60                             | 450.85                      | Do.                                             |                            |
| " 22.    | 20, Bamutollah Street.          | B        | Do.                                         | Yellow color, unpleasant smell, much suspended matter, animal life.                                                                            | 48.00                            | 816.50                      | Do.                                             |                            |
| " 25.    | 34, Serang's Lane.              | N        | Do.                                         | Almost colorless, slight smell, small quantity suspended matter, no visible animal life.                                                       | 0.94                             | 603.50                      | Do.                                             |                            |
| " 28.    | 1-D, Nemoo Gawsat's Lane.       | B        | Do.                                         | Yellow color, unpleasant smell, much suspended matter, no visible animal life.                                                                 | 17.52                            | 514.75                      | Do.                                             | Filled up.                 |

*Well Waters, 1878—Continued.*

| Date,    | Locality,                            | Section. | Reason why water was submitted to analysis. | Description.                                                                                           | Total Ammonia parts per million. | Chlorine parts per million. | Whether condemned for domestic purposes or not. | What was done to the well. |
|----------|--------------------------------------|----------|---------------------------------------------|--------------------------------------------------------------------------------------------------------|----------------------------------|-----------------------------|-------------------------------------------------|----------------------------|
| Feb. 28. | 13-J, Patwai Bagan.                  | I        | Cholera death in neighbourhood.             | Yellowish color, slight smell, small quantity of suspended matter, no visible animal life.             | 0.94                             | 603.50                      | Condemned.                                      |                            |
| "        | 21, Nathu Bagan.                     | B        | Do.                                         | Brownish color, unpleasant smell, slightly opalescent, small quantity suspended matter.                | 41.06                            | 532.50                      | Do.                                             |                            |
| "        | 1, Nemoo Gosain's Lane.              | B        | Do.                                         | Brownish color; stinks, suspended matter, and much animal life.                                        | 6.96                             | 390.50                      | Do.                                             |                            |
| Mar. 4.  | 71, Dhurumtollah Street.             | B        | Do.                                         | Yellow color, slight smell, small quantity suspended matter; no animal life.                           | 3.36                             | 319.50                      | Do.                                             |                            |
| "        | 9, Boloram Mozoomdar's Street.       | B        | Do.                                         | Black color, horrible stench of sulphuretted hydrogen, very opalescent, much suspended matter.         | 11.17                            | 492.00                      | Do.                                             |                            |
| "        | 168, Cotton Street.                  | E        | Do.                                         | Slight yellowish tinge, slight smell, little suspended matter.                                         | 0.20                             | 195.25                      |                                                 |                            |
| "        | 113, Dhurumtollah Street.            | E        | Do.                                         | No smell, small quantity suspended matter, no visible animal life.                                     | 2.50                             | 53.25                       | Do.                                             |                            |
| "        | 82-5, Burtollah Street.              | E        | Do.                                         | Full yellow color; slight smell, much suspended matter; distinct animal life visible under microscope. | 222.00                           | 781.00                      | Do.                                             |                            |
| "        | 27, Bonomally Sircar's Street.       | B        | Do.                                         | Almost colorless, very slight smell, little suspended matter, distinct animal life under microscope.   | 18.60                            | 319.50                      | Do.                                             |                            |
| "        | 23-9, Durponaryan's Lane.            | E        | Do.                                         | Almost colorless, very slight smell, much suspended matter; no visible animal life.                    | 14.80                            | 514.75                      | Do.                                             |                            |
| "        | 17-22, Durponaryan's Tagor's Street. | E        | Do.                                         | Slight yellowish color, very slight smell, little suspended matter; no animal life.                    | 2.00                             | 284.00                      | Do.                                             |                            |
| "        | 3, Antony Bagan Lane.                | I        | Do.                                         | Yellowish color, no smell, little suspended matter.                                                    | 9.48                             | 230.75                      | Do.                                             |                            |

| Mar. | No. | Address                           | Cholera death in neighbourhood. | Water supply description                                                              | 1-92   | 71-00  | Con-<br>demned.<br>Do. |
|------|-----|-----------------------------------|---------------------------------|---------------------------------------------------------------------------------------|--------|--------|------------------------|
| 5,   | 25, | Baranosee Ghose's Street.         | Do.                             | Greyish white color, stinks badly, very opalescent, much suspended matter.            | 219-00 | 1384-5 | Do.                    |
| "    | 6,  | 7-a, Bysack's Lane.               | Do.                             | Deep brown color, unpleasant smell, opalescent.                                       | 35-74  | 727-75 | Do.                    |
| "    | "   | 124, Maniektollah Street.         | Do.                             | Yellow color, stinks badly, little suspended matter, no animal life.                  | 5-24   | 213-00 | Do.                    |
| "    | 8,  | 21, Maahoo Pal's Street.          | Do.                             | Almost clear, transparent and colorless, no smell, no visible animal life.            | 9-96   | 319-50 | Do.                    |
| "    | 11, | 6, Ashutosh Dey's Lane.           | Do.                             | Colorless, slight smell, little suspended matter, no visible animal life.             | 68-00  | 550-25 | Do.                    |
| "    | "   | 5, Suri's Lane.                   | Do.                             | Blackish color, stinks badly, very opalescent, full of suspended matter, animal life. | 8-52   | 426-00 | Do.                    |
| "    | "   | 12, Nilmony Mitter's Lane.        | Do.                             | Almost colorless, very slight smell, little suspended matter, no animal life.         | 0-46   | 126025 | Do.                    |
| "    | 12, | 82-17, Burtollah Street.          | Do.                             | Almost colorless, slight smell, small quantity suspended matter.                      | 3-31   | 727-75 | Do.                    |
| "    | "   | 14-C, Goomgur Lane.               | Do.                             | Yellowish color, nasty smell, little suspended matter.                                | 5-68   | 177-50 | Do.                    |
| "    | "   | 222, Cornwallis Street.           | Do.                             | Yellowish color, very unpleasant smell, little suspended matter, animal life.         | 0-60   | 35-50  | Do.                    |
| "    | "   | 1, Ram Chunder Banerjee's Lane.   | Do.                             | Almost colorless and transparent, very little suspended matter.                       | 5-04   | 337-25 | Do.                    |
| "    | 13, | 22, Free School Street.           | Do.                             | Greenish yellow color, unpleasant smell, much suspended matter.                       | 5-04   | 319-50 | Do.                    |
| "    | "   | 15, Nilmony Mitter's Lane.        | Do.                             | White color, slightly opalescent, little suspended matter, animal life.               | 22-40  | 1029-5 | Do.                    |
| "    | "   | 135, Maahooa Bazar Street.        | Do.                             | Yellowish green color, slight smell, much suspended matter, animal life.              | 3-62   | 532-50 | Do.                    |
| "    | "   | 54, Old Boytuekhana Bazar Street. | Do.                             | Almost colorless, no smell, little suspended matter, no visible animal life.          |        |        |                        |

*Well Waters, 1878—Concluded.*

| Date.    | Locality.                                     | Section. | Reason why water was submitted to analysis. | Description.                                                                                       | Total Ammonia parts per million. | Chlorine parts per million. | Whether condemned for domestic purposes or not. | What was done to the well. |
|----------|-----------------------------------------------|----------|---------------------------------------------|----------------------------------------------------------------------------------------------------|----------------------------------|-----------------------------|-------------------------------------------------|----------------------------|
| July 12. | 27, Zig Zag Lane.                             | J        | Complaint.                                  | Brownish color, faint smell, much suspended matter, animal life.                                   | 0.10                             | 85.20                       | Condemned.                                      |                            |
| " 15.    | 48-2-2, Bulloram Dey's St.                    | F        | Complaint.                                  | Deep yellow brown color, unpleasant smell, large quantity of suspended matter, animal life.        | 7.20                             | 426.00                      | Do.                                             |                            |
| Sep. 23. | Gangaram Bariak's Well, 4, Dysack Bagan Lane. | F        | For improving Govala Bustee.                | Deep yellow brown color, slight smell, small quantity of suspended matter, no visible animal life. | 45.12                            | 869.75                      | Do.                                             |                            |
| " 24.    | Jogendra Nath Matee, 4, Bysack Bagan Lane.    | F        | For improving Govala Bustee.                | Yellow brown color, unpleasant smell, small quantity of suspended matter, visible animal life.     | 46.80                            | 852.00                      | Do.                                             |                            |
| Dec. 16. | 19, Durjeepara Street.                        | C        | Cholera in neighbourhood. Complaint.        | Almost colorless, no smell, small quantity of suspended matter, no visible animal life.            | 3.07                             | 213.00                      | Do.                                             |                            |
| " 17.    | 1, Outram Street.                             | O        | Complaint.                                  | Slight color, stinks on keeping, considerable quantity of suspended matter.                        | 4.52                             | 17.75                       | Do.                                             |                            |
| " 18.    | 4, Nursing's Lane.                            | I        | Cholera in neighbourhood.                   | Yellow color, faint unpleasant smell, no suspended matter.                                         | 7.28                             | 301.75                      | Do.                                             |                            |
| " 19.    | 340, Upper Chitpore Road.                     | B        | Do.                                         | Yellow color, slight unpleasant smell on keeping, small quantity of suspended matter.              | 1.17                             | 213.00                      | Do.                                             |                            |

| Date.    | Locality.                        | Section. | Reason why water was submitted to analysis.            | Description.                                                                            | Total Ammonia parts per million. | Chlorine parts per million of water. | Whether condemned for domestic purposes or not. | What was done to the well. |
|----------|----------------------------------|----------|--------------------------------------------------------|-----------------------------------------------------------------------------------------|----------------------------------|--------------------------------------|-------------------------------------------------|----------------------------|
| Jan. 10. | 14-2-89, Machooa Bazar Street.   | H        | On the receipt of objection from the owner to dewater. | Almost colorless, no smell, small quantity suspended matter, animal life.               | 0.33                             | 639.00                               | Condemned.                                      |                            |
| " 15.    | 69, Sitanarain Ghosh's Street.   | I        | Do.                                                    | Yellow color, no smell, opalescent, contains suspended matter.                          | 12.60                            | 372.75                               | Do.                                             |                            |
| June 17. | 29, E. Gopee Kristo Paul's Lane. | B        | Do.                                                    | Bright yellow color, unpleasant smell, small quantity suspended matter, no animal life. | 7.92                             | 301.75                               | Do.                                             |                            |
| 1880.    |                                  |          |                                                        |                                                                                         |                                  |                                      |                                                 |                            |
| Jan. 23. | 6, Brindabun Mullik's Lane.      | D        | Complaint.                                             | Black color, stinks abominably, large quantity of suspended matter, animal life.        | 64.00                            | 514.75                               | Do.                                             |                            |

Taking the results obtained by the Total Ammonia Test, and judged by the standards which have been put forward by Prof. Wanklyn, and the additional somewhat rough ones suggested by myself, it will be seen, as might be expected, that no single tank or well water was of extraordinary organic purity, and that there were only seven tank waters included under the head of "safe" waters, five of which were from tanks on the maidan. Of dirty waters there were 26 out of the 200 or 13 per cent.; of waters considerably contaminated with sewage matter 64 were found, or 32 per cent.; of dilute sewages there were 32, or 16 per cent.; and of real genuine sewages 71 were found or  $35\frac{1}{2}$  per cent., that is rather more than one third of the whole number.

In the following table these results are separated into the two classes of tank and well waters, and it will be seen that the impurity of both descriptions of waters is nearly equal when judged by this test.

|                                                     | Sewages more than<br>10 parts of total<br>ammonia. | Dilute Sewages from<br>10 to 5 parts of<br>total ammonia. | Waters contaminat-<br>ed with consider-<br>able quantities of<br>sewage, from 5-1<br>parts of total<br>ammonia. | Dirty waters from<br>1 to 0.1 parts of<br>total ammonia. | Safe waters from<br>0.1 to 0.05 parts<br>of total ammonia. | Very pure waters<br>less than 0.05 parts<br>of total ammonia. | Total. |
|-----------------------------------------------------|----------------------------------------------------|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|------------------------------------------------------------|---------------------------------------------------------------|--------|
| Tank waters, .....                                  | 52                                                 | 19                                                        | 36                                                                                                              | 10                                                       | 7                                                          | 0                                                             | 124    |
| Percentage, .....                                   | 42                                                 | 15                                                        | 30                                                                                                              | 7                                                        | 6                                                          | 0                                                             | 100    |
| Well waters, .. ...                                 | 19                                                 | 13                                                        | 28                                                                                                              | 16                                                       | 0                                                          | 0                                                             | 76     |
| Percentage, .....                                   | 25                                                 | 17                                                        | 37                                                                                                              | 21                                                       | 0                                                          | 0                                                             | 100    |
| Percentage of both<br>well and tank<br>water, ..... | $35\frac{1}{2}$                                    | 16                                                        | 32                                                                                                              | 13                                                       | $3\frac{1}{2}$                                             | 0                                                             | 100    |

In considering the quantities of chlorine present, notice must be taken of the fact that in a well water the amount of chlorine will be relatively greater than that of the total ammonia derived from the organic matter, because in the filtration of the water through the soil to reach the well, all the insoluble portions of the organic matter present in the sewage, etc., will be stopped, whilst the chlorides will readily pass through in solution. Again in the filtration of contaminated water through layers of earth or soil, a certain proportion of the organic matter will be oxidized and converted into inorganic compounds such as nitrates, which will not yield any ammonia on distillation with alkaline potassium permanganate. Thus we may expect, that a larger proportion of the well waters will be condemned by the chlorine process than would be condemned by the total ammonia test.

The following table will show the classification of the tank and well waters according to the amounts of chlorine.

|                                           | Sewages containing more than 250 parts of chlorine per million. | Dilute sewages containing from 250 to 150 parts of chlorine per million. | Waters contaminated with considerable quantities of sewage containing from 150 to 100 parts of chlorine per million. | Dirty waters containing from 100 to 50 parts of chlorine per million. | Moderately safe waters containing from 50 to 20 parts of chloro. per million. | Good waters less than 20 parts of chlorine per million. | Total. |
|-------------------------------------------|-----------------------------------------------------------------|--------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|-------------------------------------------------------------------------------|---------------------------------------------------------|--------|
| Tank waters, ...                          | 56                                                              | 38                                                                       | 14                                                                                                                   | 6                                                                     | 7                                                                             | 3                                                       | 124    |
| Percentage, ...                           | 45                                                              | 30                                                                       | 11                                                                                                                   | 5                                                                     | 6                                                                             | 3                                                       | 100    |
| Well waters, ...                          | 49                                                              | 18                                                                       | 1                                                                                                                    | 5                                                                     | 2                                                                             | 1                                                       | 76     |
| Percentage, ...                           | 64                                                              | 24                                                                       | 1                                                                                                                    | 7                                                                     | 3                                                                             | 1                                                       | 100    |
| Percentage of well and tank waters, ..... | 52½                                                             | 28                                                                       | 7½                                                                                                                   | 5½                                                                    | 4½                                                                            | 2                                                       | 100    |

It would of course be quite permissible to consider waters which have been condemned by *either* of these two methods to be sewages, dilute sewages or unfit for domestic use, etc., but on inspection of the tables it will be seen, that as a general rule a water which is condemned by the total ammonia test is also condemned by the amount of chlorine present.

The results, however, are sufficiently startling, if we only take the mean of the results of the two determinations; and at the very lowest estimate it must be said, that of the 200 samples of Calcutta tank and well waters examined by me, forty-four per cent. were true sewages, twenty-two per cent. were dilute sewages, twenty per cent. of the waters were contaminated with considerable quantities of sewage, nine per cent. were "dirty waters," and about four or five per cent. only were moderately safe waters. These last consisted principally of the well kept tanks on the maidan, and two or three others in the southern part of the town.

In the next table I have grouped the well and tank waters according to the sections of the town to which they belong; in this table I have given, first the name of each section and its population per acre according to the census of 1876, then the total number of waters analysed from each section, with their classification according to the plan before adopted. There is also given the average composition of all the waters analysed in each section. It will be strikingly seen from this table, how much more impure the tanks and wells of the northern divisions are, than those of the southern sections of the town.

| NAME OF SECTION.       | Sectional letter. | Population per acre by Census of 1876. | No. of waters analysed. | No. classed as Sewages. | No. classed as Dilute Sewages. | No. classed as waters containing considerable quantities of sewage. | No. classed as Dirty waters. | No. classed as Moderately Safe waters. | No. classed as Good waters. | AVERAGE COMPOSITION OF ALL WATERS. |                             |
|------------------------|-------------------|----------------------------------------|-------------------------|-------------------------|--------------------------------|---------------------------------------------------------------------|------------------------------|----------------------------------------|-----------------------------|------------------------------------|-----------------------------|
|                        |                   |                                        |                         |                         |                                |                                                                     |                              |                                        |                             | Total ammonia parts per million.   | Chlorine parts per million. |
|                        |                   |                                        |                         |                         |                                |                                                                     |                              |                                        |                             | <b>A. Tank Waters.</b>             |                             |
| Shampooer, ...         | ... A             | 75                                     | 10                      | 4                       | 1                              | 5                                                                   | 0                            | 0                                      | 0                           | 8.86                               | 339.0                       |
| Koomartooly, ...       | ... B             | 163                                    | 4                       | 3                       | 1                              | 0                                                                   | 0                            | 0                                      | 0                           | 12.60                              | 377.2                       |
| Burtolla, ...          | ... C             | 84                                     | 21                      | 15                      | 2                              | 4                                                                   | 0                            | 0                                      | 0                           | 14.62                              | 367.7                       |
| Sookea's Street, ...   | ... D             | 87                                     | 14                      | 5                       | 2                              | 6                                                                   | 1                            | 0                                      | 0                           | 6.48                               | 215.3                       |
| Jorabagan, ...         | ... E             | 152                                    | 1                       | 1                       | 0                              | 0                                                                   | 0                            | 0                                      | 0                           | 17.00                              | 319.5                       |
| Jorasanko, ...         | ... F             | 137                                    | 6                       | 4                       | 1                              | 1                                                                   | 0                            | 0                                      | 0                           | 26.21                              | 295.8                       |
| Burra Bazar, ...       | ... G             | 108                                    | 2                       | 1                       | 0                              | 0                                                                   | 1                            | 0                                      | 0                           | 4.24                               | 191.6                       |
| Colootollah, ...       | ... H             | 214                                    | 1                       | 1                       | 0                              | 0                                                                   | 0                            | 0                                      | 0                           | 92.40                              | 177.5                       |
| Mooheeparra, ...       | ... I             | 141                                    | 2                       | 1                       | 1                              | 0                                                                   | 0                            | 0                                      | 0                           | 8.20                               | 199.1                       |
| Bow Bazar, ...         | ... J             | 156                                    | 4                       | 2                       | 0                              | 2                                                                   | 0                            | 0                                      | 0                           | 21.93                              | 209.5                       |
| Puddopooker, ...       | ... K             | 119                                    | 13                      | 11                      | 2                              | 0                                                                   | 0                            | 0                                      | 0                           | 51.77                              | 307.2                       |
| Waterloo Street, ...   | ... L             | 27                                     | 0                       | 0                       | 0                              | 0                                                                   | 0                            | 0                                      | 0                           |                                    |                             |
| Fenwick Bazar, ...     | ... M             | 135                                    | 3                       | 1                       | 0                              | 0                                                                   | 2                            | 0                                      | 0                           | 4.96                               | 164.0                       |
| Taltollah, ...         | ... N             | 124                                    | 14                      | 7                       | 3                              | 4                                                                   | 0                            | 0                                      | 0                           | 23.70                              | 241.9                       |
| Colinga, ...           | ... O             | 72                                     | 10                      | 1                       | 2                              | 6                                                                   | 1                            | 0                                      | 0                           | 5.13                               | 164.0                       |
| Park Street, ...       | ... P             | 23                                     | 0                       | 0                       | 0                              | 0                                                                   | 0                            | 0                                      | 0                           |                                    |                             |
| Bamun Bustee, ...      | ... Q             | 30                                     | 3                       | 1                       | 1                              | 0                                                                   | 1                            | 0                                      | 0                           | 7.17                               | 162.1                       |
| Hastings, ...          | ... R             | 86                                     | 3                       | 0                       | 0                              | 0                                                                   | 0                            | 2                                      | 1                           | 0.09                               | 53.0                        |
| Maidan, ...            | ... ...           | ...                                    | 5                       | 0                       | 0                              | 0                                                                   | 0                            | 2                                      | 3                           | 0.09                               | 19.1                        |
| <b>B. Well Waters.</b> |                   |                                        |                         |                         |                                |                                                                     |                              |                                        |                             |                                    |                             |
| Shampooer, ...         | ... A             | 75                                     | 1                       | 1                       | 0                              | 0                                                                   | 0                            | 0                                      | 0                           | 12.80                              | 582.2                       |
| Koomartooly, ...       | ... B             | 163                                    | 12                      | 8                       | 3                              | 1                                                                   | 0                            | 0                                      | 0                           | 17.90                              | 466.1                       |
| Burtolla, ...          | ... C             | 84                                     | 5                       | 1                       | 1                              | 3                                                                   | 0                            | 0                                      | 0                           | 3.99                               | 240.0                       |
| Sookea's Street, ...   | ... D             | 87                                     | 2                       | 2                       | 0                              | 0                                                                   | 0                            | 0                                      | 0                           | 49.87                              | 621.2                       |
| Jorabagan, ...         | ... E             | 152                                    | 25                      | 5                       | 2                              | 16                                                                  | 2                            | 0                                      | 0                           | 21.17                              | 371.7                       |
| Jorasanko, ...         | ... F             | 137                                    | 7                       | 5                       | 1                              | 1                                                                   | 0                            | 0                                      | 0                           | 19.87                              | 535.0                       |
| Burra Bazar, ...       | ... G             | 108                                    | 6                       | 0                       | 1                              | 3                                                                   | 2                            | 0                                      | 0                           | 1.82                               | 410.8                       |
| Colootollah, ...       | ... H             | 214                                    | 1                       | 0                       | 0                              | 1                                                                   | 0                            | 0                                      | 0                           | 0.33                               | 639.0                       |
| Mooheeparra, ...       | ... I             | 141                                    | 7                       | 2                       | 2                              | 2                                                                   | 0                            | 1                                      | 0                           | 5.58                               | 299.4                       |
| Bow Bazar, ...         | ... J             | 156                                    | 2                       | 0                       | 1                              | 0                                                                   | 1                            | 0                                      | 0                           | 1.71                               | 406.5                       |
| Puddapooker, ...       | ... K             | 119                                    | 4                       | 2                       | 0                              | 2                                                                   | 0                            | 0                                      | 0                           | 18.95                              | 518.7                       |
| Fenwick Bazar, ...     | ... M             | 135                                    | 2                       | 1                       | 1                              | 0                                                                   | 0                            | 0                                      | 0                           | 6.62                               | 426.0                       |
| Taltollah, ...         | ... N             | 124                                    | 2                       | 0                       | 1                              | 1                                                                   | 0                            | 0                                      | 0                           | 2.12                               | 541.4                       |

In classifying these waters I have not separately considered the two numbers I obtained by analysis for the total ammonia and chlorine, but have decided on the character of each water from the amounts of both these substances, and this table would therefore show the exact character which I have attached to the waters which I have analysed.

I scarcely think that it is necessary to criticise in detail the numbers which I have obtained in these analyses. In some instances the results of analyses showed that the tank and well waters are considerably more impure than the very concentrated Calcutta sewage, which was collected at the Pumping Station on December 18th, 1876. I have indeed never read in any work or research of such horribly filthy waters as these are, and they are waters which are now, or have been formerly used for domestic purposes by many of the poorer inhabitants of Calcutta.

Taking the numbers given in the foregoing tables, it may be said as a general result of the whole of these analyses, that an average Calcutta tank or well water contains 16·2 parts of total ammonia and 320·6 parts of chlorine per million of water. This it will be remembered from one of the previous tables, is if anything rather more impure than ordinary English sewage as obtained and analysed by Prof. Wanklyn. In the table referred to Prof. Wanklyn found in a sample of sewage 17·10 parts of Total Ammonia and 141·4 parts of Chlorine. We may also say that the average Calcutta tank or well water contains more than 400 times as much organic nitrogenous matter as is usually present in the hydrant water.

I have, however, no wish to enlarge to any extent on this decidedly nauseous topic, but perhaps the most striking condemnation of the well and tank waters of Calcutta, and which will appeal to every inhabitant, whether scientific or otherwise, is to say, that a good average quality of Calcutta tank or shallow well water may be made, by mixing six parts of our present hydrant water with from one to two parts of the most concentrated Calcutta sewage. This artificial tank or well water will be of about the average composition; it will also be so far as can be judged, equally healthy for potable and domestic purposes, and as for its taste, odour, etc., it will probably be rather superior to the general run of Calcutta tank and well waters.

So far as I can ascertain this was the kind of water which was commonly used for drinking and domestic purposes in Calcutta in former days, and which may to a certain extent be still used by the poorer inhabitants of the northern quarter of the town.

*The present water supply, i. e., the Hydrant water.*

I need scarcely mention that our present hydrant water consists of the Hooghly water pumped from the river at Paltah; it is there collected in

settling tanks, and after subsidence it is filtered through sand and then supplied to Calcutta. As I have made some remarks as to the quantity of the former water supply of Calcutta, this paper would not be complete if I did not refer to the quantity of our present supply. From the Report of the Municipality for the year 1879, I find that as the average for the whole year, 7,464,159 gallons of filtered water were daily supplied to the town. According to Mr. Beverley's Census of 1876, the number of inhabitants was 429,535, and each inhabitant would therefore receive 17.4 gallons of filtered water daily. But in addition to the filtered water, there is an unfiltered supply pumped up at Chandpal Ghat which is widely distributed through the town, where it is I believe used for such purposes as watering the roads and streets, flushing latrines and sewers, filling reserved tanks, etc. The daily unfiltered supply was on the average of the whole year, 1,091,866 gallons, and therefore the total daily supply in Calcutta for the past year was 8,556,025 gallons, equivalent to 19.92 gallons per head, or practically there were 20 gallons of water available for domestic and sanitary purposes for each inhabitant. This though perhaps not an abundant supply is a fairly liberal one, and is very much larger than the quantity of the old supply from tanks and wells. It is, however, not equal to the quantity allowed in most European towns, for as pointed out in a former part of this paper the average daily water supply of English towns is at least 25 gallons per head of population. In this country, however, it would appear that a more liberal supply would be required than in a European climate, and it has therefore been proposed to double the present amount of filtered water, in which case Calcutta would receive a daily supply of 16,000,000 gallons equivalent to 37.2 gallons per head. If this proposal is carried out, the supply of filtered water will be most abundant, and it will be amply sufficient for every possible want of the town so long as it keeps to its present dimensions.

The quality of the hydrant water as I mentioned before has been determined for four years, month by month, by Dr. Frankland's process of analysis. This is certainly the most elaborate and complete method discovered, and it is believed to show the quality of a water, not only as regards its present actual constituents, but also to indicate to a certain extent, what its previous history has been. In this process it may be stated the following operations are performed: first the amount of total solids dissolved in the water is estimated, then the amounts of carbon and nitrogen present in the organic matter are determined (these are called organic carbon and organic nitrogen in the following tables); next the amount of free ammonia present (if any) is determined, and the amount of nitrogen contained in the form of nitrates or nitrites is estimated; the amount of chlorine present as chlorides is also determined, and finally the hardness of the water, temporary, permanent and total is estimated. Of these deter-

minations the second, third, fourth and fifth are the most important from a hygienic point of view. Thus the amounts of organic carbon and nitrogen represent the organic matter existing as such in the water, at the time of analysis. The ammonia may to a certain extent be due to the original ammonia we find in rain water, but more generally it may have been produced by the introduction of sewage matter into the water. The nitrates and nitrites present in water are derived from the oxidation of nitrogenous organic matter; this oxidation may have taken place either in the water itself, or in the soil on which the rain water fell. These last constituents are to be looked on with suspicion unless the water is derived from a deep well, when it may contain considerable quantities of these substances without giving rise to any alarm. It is not that nitrates in themselves are injurious in any way, but their occurrence in any quantity in river or shallow well waters shows, that the water must have been either contaminated with some nitrogenous organic matter in a state of decomposition, or in some circumstances where decomposing nitrogenous organic matter had been previously present. It is pointed out that it must be more or less dangerous to drink water that has thus been contaminated with organic matter or with nitrates derived from organic matter, for it is possible if not probable that in such a water the most noxious of all its constituents would entirely escape oxidation or any kind of change. The reason for this opinion is very clearly expressed in one of Dr. Frankland's papers on potable water. In the Journal of the Chemical Society, March 1868, at page 31 of his Memoir, he says—"There is also another aspect in which the previous sewage contamination of a water (*i. e.*, the presence of large quantities of nitrates etc.) assumes a high degree of importance; if the shell of an egg were broken, and its contents beaten up with water, and thrown into the Thames at Oxford, the albumen would probably be entirely converted into mineral compounds before it reached Teddington, but no such destruction of the nitrogenous organic matter would ensue, if the egg were carried down the stream unbroken for the same distance; the egg would even retain its vitality under circumstances which would break up and destroy dead or unorganised organic matter. Now excrementitious matters certainly, sometimes, if not always, contain the germs or ova of organized beings, and as many of these can doubtless retain their vitality for a long time in water, it follows that they can resist the oxidizing influences which destroy the excrementitious matters associated with them. Hence great previous sewage contamination in a water means great risk of the presence of these germs, which, on account of their sparseness and minute size, utterly elude the most delicate determinations of chemical analysis." A considerable number of chemists have put forward the statement, that a river water which has

been contaminated with sewage matters will entirely purify itself in a flow of a few miles, and will thus again become fit for potable and domestic purposes. The weight of the evidence appears however to disprove this statement, and further experiments made by Dr. Frankland have shown that this oxidation of sewage matter when present in running water is a process of extreme slowness. Thus in the report of the Rivers Pollution Commissioners, he writes :

“Assuming, however, that if the polluted water had been constantly exposed to the air, a portion at least of the oxygen used would have been replaced, and assuming further that the oxidation proceeded during 168 hours at the maximum rate observed, then at the end of that time, only 62·3 per cent. of the sewage would be oxidized.

“It is thus evident that so far from sewage mixed with 20 times its volume of water being oxidized during a flow of 10 or 12 miles, scarcely two-thirds of it would be so destroyed in a flow of 168 miles, at the rate of one mile per hour, or after the lapse of a week. But even this result is arrived at by a series of assumptions which are all greatly in favour of the efficiency of the oxidizing process. Thus, for instance, it is assumed that 62·3 per cent. of sewage is thoroughly oxidized, and converted into inoffensive inorganic matter, but the experiments showed that, in fact, no sewage matter whatever was converted or destroyed even after the lapse of a week, since the amount of carbonic acid dissolved in the water remained constant during the whole period of the experiment, whilst, if the sewage had been converted into inorganic compounds, the carbonic acid, as one of these compounds, must have increased in quantity.

“Thus, whether we examine the organic pollution of a river at different points of its flow, or the rate of disappearance of the organic matter of sewage when the latter is mixed with fresh water, and violently agitated in contact with air, or finally, the rate at which dissolved oxygen disappears in water polluted with 5 per cent. of sewage, we are led in each case to the inevitable conclusion, that the oxidation of the organic matter in sewage proceeds with extreme slowness, even when the sewage is mixed with a large volume of unpolluted water, and that it is impossible to say how far such water must flow before the sewage matter becomes thoroughly oxidized. It will be safe to infer, however, from the above results, that there is no river in the United Kingdom long enough to effect the destruction of sewage by oxidation.”

Thus Dr. Frankland is of opinion that a river water once largely contaminated with sewage or organic matter can never of itself become sufficiently pure again to be a safe water supply. To this point I shall again have occasion to refer, when speaking of the proposed sources of the new supply.

From these remarks it will be seen that in judging of the quality of a potable water by Frankland's process of analysis, we pay the greatest amount of attention to the amounts of ammonia and of organic carbon and nitrogen, as representing organic matter actually present, whilst we depend upon the amount of nitrates (and to a considerable extent also on the amount of chlorides as explained in the previous part of this paper) to indicate organic contamination which has become oxidized. The amounts of total solids and of Hardness although important from a manufacturer's point of view, do not seem to have any marked action on the health of persons drinking such water, except when such constituents are present in very large quantities.

Dr. Frankland has unfortunately not fixed upon any very definite standard as to the amounts of the above substances which may be present in water and yet not render it dangerous, and in fact it is almost impossible to draw any hard and fast rule; but so far as can be ascertained from his writings, Dr. Frankland appears to think that a supply which contains 0.10 parts of organic carbon and nitrogen in every hundred thousand parts of water is of "great organic purity," whilst one containing 0.30 parts of the same substances in the same volume should be considered a water of "fair organic purity." If the quantity is above this a water would be of doubtful purity, and if in still larger quantities the water would be recognized as impure.

In order to give an idea of the quantities of these various substances present in the water supplies of many of the large towns in England, and to show the average composition of different samples of water from various sources, I append a table giving the results by this method of analysis of the London water supply from the rivers Thames and Lea, and from the deep wells in the chalk, also the results of the Edinburgh, Glasgow, Liverpool, Manchester and Dublin water supplies, and the average composition derived from the analysis of a large number of samples of rain water, upland surface water, spring water, and sea water. Most of these numbers are taken from the various reports of the Royal Commissioners who were appointed to investigate the Pollution of Rivers in England, but some of the numbers come from the article on Water Analysis given in "Sutton's Volumetric Analysis."

*See Table, page 120.*

Having thus settled our standards for comparison, we can now discuss the present water supply of Calcutta. The results obtained by the analysis of the Hydrant water are given in the following table; the numbers shown for each month are the averages for the past four years, and at the foot of the table, the general average for the whole of the four years is appended.

*See Table, page 121.*

*Results of Analysis expressed in parts per 100,000.*

|                                                  | Total solid Impurity. | Organic Carbon. | Organic Nitrogen. | Ammonia. | Nitrogen as Nitrates and Nitrates. | Total Combined Nitrogen. | Chlorine. | HARDNESS.  |            |        | REMARKS. |
|--------------------------------------------------|-----------------------|-----------------|-------------------|----------|------------------------------------|--------------------------|-----------|------------|------------|--------|----------|
|                                                  |                       |                 |                   |          |                                    |                          |           | Temporary. | Permanent. | Total. |          |
| <i>London Water supply, average for 7 years.</i> |                       |                 |                   |          |                                    |                          |           |            |            |        |          |
| From the Thames, ...                             | 27.26                 | .201            | .033              | .001     | .204                               | .238                     | 1.77      | ..         | ..         | 21.20  |          |
| From the Lea, ...                                | 27.79                 | .135            | .024              | .000     | .199                               | .223                     | 1.79      | ..         | ..         | 21.30  |          |
| From the Deep-wells in the Chalk, ...            | 40.26                 | .047            | .012              | .000     | .421                               | .433                     | 2.43      | ..         | ..         | 28.70  |          |
| Edinburgh water supply, ...                      | 14.10                 | .203            | .042              | .000     | None.                              | .042                     | 0.89      | 4.40       | 4.80       | 9.20   |          |
| Glasgow water supply from Loch Katrine, ...      | 2.40                  | .185            | .022              | .001     | Do.                                | .023                     | 0.85      | 0.00       | 0.90       | 0.90   |          |
| Liverpool water supply, ...                      | 9.66                  | .210            | .029              | .002     | Do.                                | .031                     | 1.53      | 0.30       | 3.70       | 4.00   |          |
| Manchester do., ...                              | 7.00                  | .132            | .031              | .002     | Do.                                | .033                     | 0.90      | 0.00       | 2.70       | 2.70   |          |
| Dublin do., ...                                  | 6.34                  | .238            | .024              | .001     | Do.                                | .025                     | 1.24      | 0.00       | 2.97       | 2.97   |          |
| Switzerland the Rhine above Schaffhausen, ...    | 15.80                 | .108            | .012              | .003     | Do.                                | .015                     | 0.20      | 3.99       | 6.77       | 10.76  |          |
| London Sewage, ...                               | 64.50                 | 4.386           | 2.434             | 5.557    | Do.                                | 7.060                    | 10.37     | ..         | ..         | ..     |          |
| <i>Average composition of UNPOLLUTED WATER.</i>  |                       |                 |                   |          |                                    |                          |           |            |            |        |          |
| Rain water                                       | 2.95                  | .070            | .015              | .024     | .003                               | .042                     | 0.22      | ..         | ..         | ..     | .80      |
| Upland surface water 195                         | 9.67                  | .322            | .032              | .002     | .009                               | .043                     | 1.13      | 1.50       | 4.30       | 5.80   |          |
| Deep well water 157                              | 43.78                 | .061            | .018              | .010     | .495                               | .523                     | 5.11      | 15.80      | 9.20       | 25.00  |          |
| Spring water 198                                 | 28.20                 | .056            | .013              | .001     | .383                               | .397                     | 2.49      | 11.00      | 7.50       | 18.50  |          |
| Sea water 23                                     | 3898.7                | .278            | .165              | .005     | .033                               | .203                     | 1975.6    | 48.90      | 748.00     | 796.90 |          |

## CALCUTTA HYDRANT WATER.

AVERAGE RESULTS FROM THE ANALYSIS OF FOUR YEARS.  
*Results of Analysis expressed in parts per 100,000.*

|                             | Total solid Impurity. | Organic Carbon. | Organic Nitrogen. | Ammonia. | Nitrogen as Nitrates and Nitrites. | Total Combined Nitrogen. | Chlorine. | HARDNESS.  |            |        | REMARKS. |
|-----------------------------|-----------------------|-----------------|-------------------|----------|------------------------------------|--------------------------|-----------|------------|------------|--------|----------|
|                             |                       |                 |                   |          |                                    |                          |           | Temporary. | Permanent. | Total. |          |
| Average for 1st of January, | 21.57                 | .131            | .037              | None.    | .016                               | .053                     | 0.87      | 3.72       | 2.97       | 6.69   |          |
| Do. February                | 21.79                 | .179            | .058              | Do.      | .035                               | .033                     | 1.00      | 3.56       | 2.92       | 6.48   |          |
| Do. March                   | 22.37                 | .114            | .063              | Do.      | .048                               | .111                     | 1.20      | 3.64       | 2.97       | 6.61   |          |
| Do. April, ...              | 21.68                 | .124            | .046              | Do.      | .034                               | .080                     | 1.32      | 3.07       | 2.72       | 5.79   |          |
| Do. May, ...                | 21.23                 | .120            | .045              | Do.      | .030                               | .075                     | 1.37      | 3.08       | 3.16       | 6.24   |          |
| Do. June, ...               | 19.43                 | .155            | .037              | Do.      | .017                               | .054                     | 1.37      | 2.44       | 3.79       | 6.23   |          |
| Do. July, ...               | 13.04                 | .093            | .044              | Do.      | .049                               | .093                     | 0.85      | 1.65       | 2.83       | 4.48   |          |
| Do. August,                 | 12.07                 | .081            | .047              | Do.      | .055                               | .102                     | 0.67      | 0.93       | 2.64       | 3.57   |          |
| Do. September,              | 11.36                 | .104            | .049              | Do.      | .046                               | .095                     | 0.58      | 1.34       | 3.00       | 4.34   |          |
| Do. October,                | 11.30                 | .099            | .050              | Do.      | .027                               | .077                     | 0.61      | 1.39       | 3.32       | 4.71   |          |
| Do. November,               | 12.27                 | .118            | .054              | Do.      | .021                               | .075                     | 0.73      | 2.15       | 2.92       | 5.07   |          |
| Do. December,               | 19.44                 | .090            | .042              | Do.      | .025                               | .067                     | 0.88      | 2.55       | 2.93       | 5.48   |          |
| Sums, ...                   | 207.55                | 1.408           | .572              | Do.      | .403                               | .975                     | 11.45     | 29.52      | 36.17      | 65.69  |          |
| Average for year            | 17.30                 | .117            | .047              | Do.      | .034                               | .081                     | 0.95      | 2.46       | 3.02       | 5.48   |          |

Taking the numbers representing the general average for the year and comparing them with the standards which I have suggested from Dr. Frankland's works, we find that the Calcutta water falls just outside the class of waters of "great organic purity," but that it is well within the class of waters of "fair organic purity."

Comparing again the numbers with those given in the previous table we find that the Calcutta Hydrant water though not so pure as the London waters derived from the deep wells in the Chalk, is certainly purer than the waters derived from the Thames, and perhaps also from the Lea. It is also decidedly more free from impurity than the water supplies of Edinburgh, Liverpool and Dublin, but taking all the constituents into consideration, it is not so pure as the Glasgow or Manchester supplies, or as the Rhine water above Schaffhausen. Comparing the Hydrant water with the average composition of *unpolluted* upland surface water as given by Dr. Frankland, we find that it is scarcely so pure as unpolluted water should be, and we are therefore compelled to admit that the Hooghly water has been slightly contaminated before it reaches Pultah. The amount of contamination is, however, not very great and as pointed out before, the Calcutta water falls well within the class of waters of medium purity. That the Calcutta water must be contaminated to a certain extent will be I think obvious to any one who is acquainted with the customs of the inhabitants of India, and more particularly of the inhabitants of villages and towns on the banks of the rivers. This contamination is a drawback to the complete safety of our water supply, for as pointed out previously, Dr. Frankland is of opinion, that a water once contaminated is always dangerous, and that the self-purification of a river which is so strongly insisted upon by certain persons is exceedingly slight. It does not however at present appear to be possible to cut off these sources of contamination, and the Hydrant water though good is not a perfect supply. Every effort however should be made to keep this previous contamination down to the lowest possible point, and it is to be hoped when systems of drainage are being introduced into the up-country towns, that the sewage from them will not be allowed to find its way into our river. Speaking generally the sewage from any one town should not be allowed to find its way into a river which is used as a source of water supply for other towns lower down.

It is not my intention to criticise these average numbers in detail, but it will suffice to say that from the absence of ammonia and from the smallness of the amounts of organic carbon and nitrogen, and of nitrates and nitrites, and also of chlorine, it is clearly evident that the contamination of the Calcutta water is really much smaller than might have been expected under the circumstances, and we may rest assured that our water supply is of fairly good quality, better in fact than that received by the majority of large towns in Europe.

In considering the results of the analysis of the Calcutta water month by month, we find that its composition varies considerably at different parts of the year. A close inspection of the table will show that apparently there are two distinct causes at work in modifying the composition of the water. The first prominent cause, and the one which has by far the greater influence, is to be found in the commencement, and during the continuance of the rainy season; the second and smaller cause appears to be the melting of the Himalayan snows by the burning sun of March, April, May and June. These changes are most clearly noticed in the column of Total Solid Impurity, and here we read that starting in January the amounts of total solids gradually increase up to March, when 22·37 parts are present in every hundred thousand parts of water; in April and May the quantities steadily and gradually diminish, the numbers being 21·68 and 21·23 respectively; this decrease continues until June 1st when there are only 19·43 parts of solid impurity present. These numbers of course correspond with the gradual and increasing diluting effect due to the admixture of pure snow water with the ordinary river water. In the middle of June, however, the rainy season usually commences, and there is a sudden decrease in the solids owing to the diluting action of the enormous volumes of rain water, and we find only 13·04 parts on July 1st; from this time there is a slight but steady decrease until October, when the water contains the smallest amount of solids present at any time of the year; the average for October 1st showing 11·30 parts. After the complete cessation of the rains (after November 1st) there is again a sudden rise in the total solids, and on December 1st, 19·44 parts are present. Some of the other columns of figures show a somewhat similar change, but in the case of the organic matter the change is not very marked. In the amount of nitrates present in the water, there appear to be two distinct maximum quantities during the year, one in March at the time of greatest concentration of the water as before mentioned, and the second at the commencement of the rains. This second maximum is readily accounted for when we consider, that the first effect of the rains will be to dissolve out the nitrates which have been accumulating in the soil of the drier parts of the country during the hot season; the amount of nitrates, however, it will be seen, steadily decreases towards the end of the rains, and this to a certain extent confirms the explanation.

Indeed during the first weeks or even days of the rainy season, the composition of our water supply is undergoing very rapid change, owing to the diluting action of the rain, and to the fact that the first showers of rain will wash out considerable quantities of soluble organic matter, nitrates etc., from the soil; afterwards, however, the rain water will run off comparatively pure. We shall therefore expect that the first action of the rain

will be to decrease the total solids, and to increase the amounts of organic impurity and of nitrates, and that afterwards all the constituents will decrease in quantity.

That such is the case may be seen by the following analyses made on June 1st, 23rd and 26th and July 1st of last year. Each of the analyses shows the gradual dilution of the water by the heavy falls of rain in the districts from which our supply is collected, and the increase of organic matter and of nitrates due to the washing out of the substances from the soil by the first showers of rain.

### HOOGLHY WATER.

*Results of Analysis expressed in parts per 100,000.*

| Number of Sample. | Date of collection of Sample. | Total solid Impurity. | Organic Carbon. | Organic Nitrogen. | Ammonia. | Nitrogen as Nitrates and Nitrites. | Total Combined Nitrogen. | Chlorine. | HARDNESS.  |            |        |
|-------------------|-------------------------------|-----------------------|-----------------|-------------------|----------|------------------------------------|--------------------------|-----------|------------|------------|--------|
|                   |                               |                       |                 |                   |          |                                    |                          |           | Temporary. | Permanent. | Total. |
| 1                 | June 1st, 1879,               | 19.56                 | 0.130           | 0.052             | .000     | Traces only.                       | 0.052                    | 1.32      | 4.24       | 2.45       | 6.79   |
| 2                 | June 23rd, ,,                 | 17.08                 | 0.148           | 0.099             | .001     | .023                               | 0.123                    | 0.923     | 3.46       | 3.25       | 6.71   |
| 3                 | June 26th, ,,                 | 16.68                 | 0.138           | 0.075             | .002     | .053                               | 0.130                    | 0.852     | 3.33       | 3.38       | 6.71   |
| 4                 | July 1st, ,,                  | 12.48                 | 0.113           | 0.093             | .000     | .039                               | 0.132                    | 0.89      | 0.72       | 4.57       | 5.29   |

### *Extension of the Present Water Supply.*

As pointed out previously it is now proposed to double the supply of filtered water for Calcutta, and recently a proposal has been urged on the Corporation to collect the new supply of water at Cossipore or Dukhinsahar instead of as at present at Pultah. As I was consulted on this subject and gave a strong recommendation that the water should not be taken from any place near to Calcutta, but that the present source at Pultah should still be used, I may perhaps be allowed to give the substance of my arguments against the two proposed sources of supply at Cossipore and at Dukhinsahar.

My opinions on this point are to a great extent founded on some previous analyses of the river water taken at various points near to Calcutta, which were made by Dr. Maenamara and Mr. Waldie, when the Calcutta supply was first being introduced, but in addition I have myself made a few analyses which have confirmed me in my conclusions.

The usual time for pumping up the water from the river into the settling tanks is at five hours' ebb; this is of course done so as to avoid the possibility of taking in any tidal water and as far as possible to secure only the true river water. The proposals for taking the water for these two places appeared then to resolve themselves into two questions.

(a) Whether at five hours of ebb the water off Cossipore, *at all seasons of the year* can be relied on as a safe source of water-supply.

(b) Whether at five hours of ebb, the water at a distance of two or three miles above Cossipore, *at all seasons of the year*, can be relied on as a safe source of water-supply. For I think it will be generally admitted, if at either place, at any one season of the year, the quality of the water cannot be relied on, this would be equivalent to a condemnation of the proposed place of supply.

Before proceeding to deal with the actual results of the analyses which have been previously made by the two gentlemen abovementioned, it will be well to take a general review of the conditions of our river from which the water-supply is to be derived. The river, as is well known, is a tidal one to a considerable distance above its mouth, and it appears certain that the tidal water does not at any season of the year, or under any ordinary circumstances, reach higher than Chinsurah. I have already shown in a previous part of this paper that the true river water, as it has been delivered of late years in Calcutta, is a tolerably pure and reliable supply, and that there has never been the slightest suspicion of any appreciable admixture of tidal water with the natural river water, in the hydrant water now supplied from Pultah. This of course, is because the water is collected at a considerable distance up the river, and that it is taken at five hours' ebb.

The tidal water however, in flowing up past Calcutta undoubtedly, must become contaminated with a variety of impurities. It may be true that a large proportion, or perhaps nearly the whole of the sewage, as collected in the drains of this town, is now carried to the Salt Water Lakes, but no one, knowing the habits of the lower orders of the natives of this country, will believe, that this represents the sum total of the sewage. In all probability, there is a large amount of filth of various kinds, which finds its way direct into the river. Again, on the banks of the river numerous factories have now sprung up, and it will be quite unlike the usual experience in England if these factories, unrestrained by Acts of Parliament, do not also send a large amount of filth, refuse, &c., into the running stream beside them. I am not aware what sanitary arrangements are made on the Howrah side of the river, but it has always appeared to me, that a large amount of drainage reaches the river from that source.

Also it must be remembered that Calcutta is a large shipping port ; thus on the average I believe there are about 2,000 vessels annually arriving and departing from the port, aggregating nearly two and a half millions of tons ; to these must be added the very large numbers of country boats, dinghis, &c., which line the shores and which help to carry on the great and increasing trade of Calcutta. Omitting the actual business operations carried on, it must be admitted, that the crews of these vessels will add a not inconsiderable amount of sewage contamination to the river water. The tidal water, in flowing past Calcutta, must of necessity then carry with it all such contamination, and will in that state be probably, if not certainly, unfit for drinking, or even for domestic purposes.

I think it cannot be disputed that, in selecting a site from which to collect water for *drinking and domestic* purposes, it will be essential, that at all seasons of the year, at the ordinary time of collection, (five hours' ebb) there shall be practically no admixture of tidal water with river water proper ; for it is evident, that the tidal water will always be contaminated with various kinds of organic matter.

The two questions which I suggested previously, thus become limited to the consideration of whether at Cossipore, or at two or three miles above it, the water at five hours' ebb is free from contamination with tidal water at *all* seasons of the year. It would be bad enough to supply brackish tidal water for drinking purposes, but far worse to supply tidal water, which had collected all sorts of filth and abomination on its way up.

Having suggested what it appears necessary to prove, we can now pass on to the consideration of the analyses which have been made on this point. Most of these analyses were made from 12 to 18 years since, when comparatively little attention had been given to the subject of water analysis, and an important part of the method of analysis then employed has been since shown to be eminently untrustworthy and unreliable. The suitability of a water for domestic purposes is (as pointed out previously) believed to depend principally on its freedom from organic contamination, I am sorry to say that the methods for the determination of organic matter in water, used in the old analyses under notice, have been since shown to give at the best but very rough indications, which do not at all represent the absolute amounts of organic matter present. Though these methods of analysis failed to give thoroughly reliable information, yet I do not think it too much to assume that, to a certain extent, they gave information as to comparative purity of samples of the same variety of water, and valuable information may thus be extracted from them. By this I do not mean to say that the exact *proportional* freedom of the water from organic matter will be represented by the figures given in these analyses,

but I do think that they may indicate that certain samples are less pure than others, and so on. For the purpose of a simple comparison, these results will be almost as useful as absolute statements, for we may work on the basis, that the good quality of our Hydrant water has been satisfactorily demonstrated.

In passing I may mention that Mr. Waldie disputes the correctness of Dr. Maenamara's results as to amount of organic matter present in the water, but it would be quite as easy for me, with a knowledge of the progress of the last ten years, to dispute the correctness of Mr. Waldie's results, so that in both cases, the results of the old analyses as to organic matter are to be accepted as comparative statements, rather than actual truths. It must be clearly understood, however, that I have no wish to under-rate the value of the work done by Dr. Maenamara and by Mr. Waldie; far from it, I believe that the results criticized are as accurate and reliable as could be obtained by the processes then known, and in those portions of the work, where the methods of analysis have not been changed, I think we may rely, with certainty, on the accuracy of the results given.

In the face of the above facts, I may be pardoned, if in considering these old analyses I draw more particular attention to the determination of the inorganic substances present, where the methods of analysis have scarcely changed, and refer less to the determinations of the organic substances present in the water.

In tidal water, that is water of which a part at least has been derived from the sea, sodium chloride, or common salt, is a prominent ingredient. In the table given on p. 120, it will be seen that sea water contains no less than 1975.6 parts of chlorine per hundred thousand of water; this substance, on the other hand, is present in very minute quantities in the true river water, and hence we have a crucial test to apply, in order to determine the presence or absence of tidal water in the samples in question. It may here also be well to remark that the process of analysis for the determination of chlorine in waters has not changed since the period when the analyses by Dr. Maenamara and Mr. Waldie were made, and therefore we may entirely rely on the accuracy of the results given as to the amounts of this constituent present in the samples of water analysed.

In the following table I quote four sets of analyses made by Dr. Maenamara of water collected, *at low water in each case*, from three different points in the river, namely, at Chinsurah, Pultah and off Cossipore, (one mile above Baug Bazar Bridge). For the sake of comparison I have added to the table some of the numbers obtained in the regular analysis of water for the year 1878.

ANALYSES OF WATER TAKEN IN THE MIDDLE OF STREAM SIX FEET  
FROM SURFACE.

*Results expressed in parts per 100,000 of water.*

| CONSTITUENT.   |                                              | LOW WATER.             | LOW WATER.          | LOW WATER.         | LOW WATER.             |
|----------------|----------------------------------------------|------------------------|---------------------|--------------------|------------------------|
|                |                                              | 17th December<br>1861. | 15th March<br>1862. | 12th June<br>1862. | 8th September<br>1862. |
| Chinsurah.     | Total solid residue from filtered water .... | 26.6                   | 27.9                | ..                 | 12.9                   |
|                | Organic matter .....                         | 6.0                    | 5.6                 | ..                 | 2.6                    |
|                | Insoluble earthy salts .....                 | 16.9                   | 19.9                | ..                 | 8.0                    |
|                | Soluble salts .....                          | 3.6                    | 1.9                 | ..                 | 1.5                    |
|                | Sodium chloride .....                        | ..                     | 1.1                 | ..                 | 0.8                    |
| Pultah.        | Total solid residue from filtered water .... | 23.1                   | 27.3                | 26.3               | 14.6                   |
|                | Organic matter .....                         | 6.0                    | 5.6                 | 5.0                | 2.1                    |
|                | Insoluble earthy salts .....                 | 14.1                   | 19.0                | 17.0               | 8.7                    |
|                | Soluble salts .....                          | 2.7                    | 1.7                 | 3.6                | 2.0                    |
|                | Sodium chloride .....                        | ..                     | 1.1                 | 3.6                | 0.9                    |
| Cossipore.     | Total solid residue from filtered water .... | 24.6                   | 34.7                | 97.1               | 13.3                   |
|                | Organic matter .....                         | 5.0                    | 5.6                 | 11.9               | 2.1                    |
|                | Insoluble earthy salts .....                 | 16.7                   | 19.3                | 16.4               | 9.0                    |
|                | Soluble salts .....                          | 2.6                    | 8.9                 | 67.6               | 1.3                    |
|                | Sodium chloride .....                        | ..                     | 7.6                 | 55.7               | ..                     |
| Hydrant water. |                                              | 1st December<br>1878.  | 1st March<br>1878.  | 1st June<br>1878.  | 1st September<br>1878. |
|                | Total solid residue .....                    | 16.80                  | 24.34               | 15.16              | 11.12                  |
|                | Carbon and nitrogen of organic matter ..     | 0.158                  | 0.164               | 0.111              | 0.124                  |
|                | Sodium chloride .....                        | 1.01                   | 1.87                | 1.70               | 0.79                   |

An examination of this table and of the numbers given in previous parts of this paper shows clearly that the pure river water, *i. e.*, the present

hydrant water never contains more than two or at the outside three parts of sodium chloride per 100,000 of water. This is proved by Dr. Maenamara's analyses of the water at Chinsurah and Pultah, and also by the numbers obtained weekly and monthly by myself.

When however the analyses of Cossipore water are considered, it will be seen that, whilst at low water in September and December, its composition is very similar to that of pure river water collected higher up : in Mareh and more particularly in June, there are very striking differences. Thus on June 12th 1862 whilst at Pultah, there were only 26 parts of solid impurity and 3·6 parts of sodium chloride or salt in every 100,000 parts of water, at Cossipore (one mile above Baug Bazar Bridge) on the same day, and *at low water*, in the same volume there were no less than 97·1 parts of solid impurity, of which 55·7 parts were sodium chloride. This clearly indicates that on this occasion, there was a very large admixture of tidal water with the river water. Dr. Maenamara's results, as to the amount of organic matter, also appear to show that in June, there was much more present in the Cossipore water than in that collected at Pultah, and this is really what would be expected to be the case. The ratio of the organic matter shown in the two instances is greater than 2 to 1, and I think that this difference must indicate that the water at Cossipore did contain an excess of organic matter over that contained at Pultah. The *absolute* amounts of organic matter were, we now know, very much smaller than the numbers given in the table, but we can probably rely, to a certain extent, on the *relative* correctness of the numbers given.

There appears then to be no escape from the conclusion which Dr. Maenamara draws in his criticism of these results when he says—"the water (at Cossipore) during Mareh, April, May and June is largely intermixed with the saline matters of the sea water and the sewerage of Calcutta, and during that time is unfit for human consumption."

As before pointed out the sewage contamination would be very much less at the present time than it was then, but I have tried to prove that we cannot have an admixture of tidal water without at the same time having organic and sewage contamination. I have no doubt that during the rains when a powerful stream is running down, the water at Cossipore may be nearly as pure as that at Pultah, but I think that Dr. Maenamara's analyses alone prove that, during the hot weather months, the water at Cossipore is by no means pure enough to be selected as a water-supply.

Turning now to the analyses made by Mr. Waldie, it appears to me that they essentially confirm the results given by Dr. Maenamara. The water tested by Mr. Waldie was taken usually from the river at Burrannagur, which is said to be two miles above Cossipore. Here on June 11th, 1866 at 11·5 A. M., (*at low water*) 30·7 parts of solid matter, of which 14·5 parts

were sodium chloride, were found; again on May 1866, two hours before the commencement of tide, there were 21·50 parts of salt present; on May 2nd 1866, there were 15·50 parts of salt at ebb-tide, and on June 1st 1866 at nearly low water, 16·50 parts of sodium chloride were found; these numbers being the quantities present in 100,000 parts of water.

With regard to organic matter also Mr. Waldie's results, though showing much less organic matter than Dr. Macnamara's analyses, to a great extent confirm his statements, and prove that as a rule, there is a larger amount of organic matter in the water collected at ebb-tide off Burrnanagur, than in the water collected at higher points of the river. The numbers above quoted show unmistakably that at *two miles above Cossipore* during the hot season, there is a decided admixture of tidal water and probably of sewage contamination with the pure river water, and that this is the case even with samples collected at low water.

The opinion of Dr. Macnamara as to the suitability of Cossipore water for drinking purposes, has already been given. I will now quote Mr. Waldie's remark in his general summary of results—"Can the supply be safely taken from the river at Cossipore? We can scarcely answer in the affirmative."

In conclusion, then, I may say that, so far as can be ascertained from the old analyses by Dr. Macnamara and Mr. Waldie, and from my own results, it is my opinion—

That during the rainy season, and whilst the river is in *full* stream, the water collected two miles above Cossipore, or perhaps even at Cossipore, could probably be used as a fairly safe water-supply.

That during the hot weather months, if the water is collected two miles above Cossipore, even at five hours' ebb, there will frequently, if not always, be contamination with tidal water to an extent, which unfits it for a safe water-supply, and the water will be contaminated to a still greater degree if collected at Cossipore.

That this tidal contamination would involve also organic contamination to a considerable extent, and that, as pointed out in a previous part of this paper, such organic or sewage contamination cannot become oxidized or destroyed during the flow of the water, nor can the water be purified by the ordinary processes of settling, filtration through sand etc. so as to render it a safe supply for domestic purposes. Such water therefore would be eminently unsafe for potable purposes and should be at once condemned.

That unless contrary evidence is furnished, the proposed new sources of supply are too near to the mouth of the river and to Calcutta, and consequently that it is strongly desirable that the extension of the water supply should be carried out on the same principle as formerly, and that the water should always be collected at Pultah, and not at the other points which have been suggested.

IX.—*On the Zoological Position of the Bharal, or Blue-Sheep, of Tibet.*—By R. LYDEKKER, B. A.

(Received Jan. 4th;—Read Feb. 4th, 1880.)

The Bharal or Blue-Sheep of the Tibetan region is one of those animals which are peculiarly interesting, and at the same time peculiarly puzzling, to the naturalist, on account of its presenting affinities to two distinct groups of animals, whereby the determination of its position in the zoological scale is a matter of some considerably difficulty.

As I shall show below, the bharal presents points of resemblance both to the sheep and the goats, and this intermediate character of the animal seems to have been the cause of considerable diversity of opinion among naturalists, as to what genus the animal should be referred. The late Mr. Bryan Hodgson, in the *Society's Journal*,\* proposed the generic name *Pseudois* for the bharal. Mr. Hodgson, however, together with the late Mr. Blyth, thought that there were two species of the genus, to which were given the names *P. nahura* and *P. barhal*. The latter writer, however, according to the late Dr. Jerdon, seems finally to have come to the conclusion, that there was only one species of the genus, known as *P. nahura*. The late Dr. Gray, and, I believe, all subsequent writers, have adopted the view of there being but one species of bharal. Hodgson's generic distinction was adopted by Dr. Gray.† The late Mr. H. N. Turner,‡ however, and Mr. W. T. Blanford,§ class the bharal in the genus *Ovis*, though the last named writer does not give his reasons for so doing.

In the present paper, I shall notice certain points in the osteology of this animal, which indicate its close relationship to the goats, and which, I venture to think, are sufficient to confirm its generic distinction from *Ovis*.

Mr. Hodgson, in his above quoted paper, first pointed out that the bharal differed from all the true sheep in having no "eye-pits," but did not point out that the absence of these "eye-pits" was a character common to the bharal and the goats.||

The so-called "eye-pits" are the depressions which occur in the lachrymal bones of many ruminants for the gland known as the "larmier." In all the true sheep, the lachrymal bone has a very considerable larmial depression, and the greater part of the outer surface of that bone is placed

\* J. A. S. B., Vol. xvi, p. 702.

† Cat. of Mammalia in Brit. Mus. Pt. iii, p. 177, 1852.

‡ "Scientific Results of 2nd Yarkund Mission," Mammalia, p. 85, Calcutta, 1874.

§ Pro. Zool. Soc. Lon. 1850, p. 176.

|| I exclude the genus *Nemorhaedus* from the goats.

more or less nearly at right angles to the surface of the frontals ; the suture connecting the lachrymal with the maxilla is placed in advance of the suture between the maxilla and the malar. In the goats, the outer surface of the lachrymal has no larmial depression, and the greater part of such surface is continuous with the plane of the frontals ; the lachrymo-maxillary and malo-maxillary sutures are in one oblique line. In the bharal, there is likewise no larmial depression on the lachrymal and the outer surface of this bone slopes gradually away from the plane of the frontals ; while the lachrymo-maxillary suture is only slightly in advance of the malo-maxillary suture. In the form and relations of the lachrymal, therefore, the bharal is decidedly much nearer to the goats than to the sheep.

The next most important caprine character presented by the bharal skull, is in the basioccipital. In the true goats this bone is oblong in shape, with a pair of tubercles at the posterior and anterior extremities ; of these, the posterior pair are considerably the larger and more prominent, but both are situated on the same antero-posterior line. In the true sheep, on the other hand, the basioccipital is always considerably wider in front than behind, while the anterior pair of tubercles are much larger than the posterior, and are placed wider apart. The basioccipital of the bharal agrees exactly with the basioccipital of the goats, and is, consequently, widely different from this part in the sheep.

In the form of its lower jaw, the bharal agrees with the sheep, and differs from the goats.

In the structure of its horns, the bharal again presents caprine affinities. In the true sheep the horns are always thrown into parallel transverse wrinkles extending completely round the horns ; the colour of the horns is light brown, or greenish brown, and the direction of the extremity of the first curve is always downwards and forwards.

In the goats, on the other hand, the horns are never thrown into coarse and parallel transverse wrinkles, but are marked by finer striæ, and may or may not carry knobs anteriorly. Their colour is dark blackish brown : they are always more or less angulated ; and the extremity of the first curve is directed backwards and upwards.

In the bharal, the structure and colour of the horns is the same as in the goats ; the extremities of the horns are directed backwards and upwards ; their angulation is less marked than in the goats. The horns of the bharal are indeed directed more outwards than those of the goats, and in this respect they present some points of resemblance to the sheep ; the upward twist of their extremities, however, shows an approximation to the curved horn of the Markhoor and is quite different from the curve of any sheep's horn.

The profile of many goats, like the Ibex, is markedly concave; in others, however, as the Thar, it is nearly straight; the profile is also nearly straight in the sheep and bharal, and we cannot, therefore, draw any classificatory inference from this character.

In other cranial characters, there do not seem to be any well marked distinctions between sheep and goats. It, therefore, seems pretty evident that as far as cranial characters go, the bharal is undoubtedly much more closely related to the goats than to the sheep.

The bharal is, however, externally distinguished from the goats, by the absence of any odour or any trace of a beard or mane in the males. There are feet-pits (interdigital pores) in all the feet of the bharal, in which respect it agrees with the sheep, and differs from the goats, in which these pits are either absent (*Hemitragus*), or present only in the fore feet (*Capra*). The tail, according to Mr. Hodgson, is unlike that of the sheep.

From the above comparisons it will be seen that in the osteological characters of the head, the bharal is nearer the goats than the sheep, while in its external characters it is nearer to the sheep. The cranial characters pointed out above appear to me to be of such importance as to preclude classing the bharal in the genus *Ovis*, and I accordingly think that Mr. Hodgson's genus *Pseudois* should be retained for its reception. The animal most certainly forms a very closely connecting link between the genera *Capra* and *Ovis*, and it seems to be very difficult to say to which it is most nearly related.

X.—*Description of a new Species of Diurnal Lepidoptera belonging to the Genus Hebomoia.*—By J. WOOD-MASON.

The beautiful insect described below has been recently received by the Indian Museum from the Andaman Islands, where it was obtained by Mr. A. de Roepstorff, after whom I have named it.

HEBOMOIA ROEPSTORFII, n. sp.

♂. Differs from *H. glaucippe*, the only species of the genus with which I have been able to compare it, *on the upper side*, in having the apical orange patch of the fore-wing larger, extended into the cell, and less broadly bordered with black, both internally and externally; the submarginal black spots smaller and completely isolated from the black of the outer margin; the fore-wing at the posterior angle tinged, and the hind-wing externally broadly bordered, with bright sulphur-yellow, which colour is shaded off into the cream-colour of the rest of both wings; and the outer margin of the hind-wing narrowly edged with black, which gradually broadens from the anal to the anterior angle and extends inwards in points at the veins:—and, *on the under side*, in having the brown mottling of the fore-wing arranged in the form of a tolerably conspicuous band coincident with the macular band of the upper side; and the ground-colour of the hind-wing, as also that of the mottled portion of the fore-wing, of a rich golden-luteous colour.

Expanse 3·5 inches.

HAB. S. Andaman.

The place of this species would seem to be between *H. vossii*, (Maitland) and *H. sulphurea*, Wallace.

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No. 1, (issued June 10th, 1879). *On new species of the Genus Plectopylis of the Family Helicidæ.*—By LIEUT.-COLONEL GODWIN-AUSTEN. *On the Operations for obtaining the Discharges of the large Rivers in Upper Assam, during Season 1877-78.*—By LIEUT. H. J. HARMAN. *Hemiptera from Upper Tenasserim.*—By W. L. DISTANT. *Communicated by J. WOOD-MASON.* *On the Diurnal Variation of Rainfall Frequency at Calcutta.*—By H. F. BLANFORD. *Record of the Occurrence of Earthquakes in Assam during 1878.*—Communicated by the CHIEF COMMISSIONER OF ASSAM. *On some experiments made at H. M.'s Mint in Calcutta on coining Silver into Rupees.*—By COL. J. F. TENNANT. (With three Plates and seven Woodcuts).

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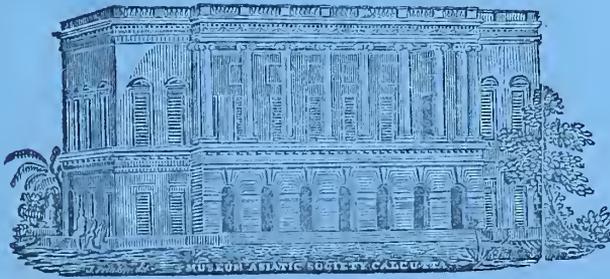
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THE NATURAL HISTORY SECRETARY.



“The bounds of its investigation will be the geographical limits of Asia: and within these limits its inquiries will be extended to whatever is performed by man or produced by nature.”—SIR WILLIAM JONES.

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# JOURNAL

OF THE

## ASIATIC SOCIETY OF BENGAL.



Part II.—PHYSICAL SCIENCE.

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No. III.—1880.

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XI.—*Notes on the Dentition of Rhinoceros.*—By R. LYDEKKER, B. A.

(Received March 9th ;—Read June 2nd, 1880.)

(With Plate VII.)

A recent examination of the dentition of the fine series of skulls of *Rhinoceros indicus* contained in the collection of the Indian Museum, has brought to my notice several very interesting facts in regard to the development and serial homology of certain of the teeth of that and other species which I have thought of sufficient importance to be put on record, whence the following notes have been penned. My remarks will mainly refer to the dentition of *Rhinoceros indicus*, but some points relating to that of other species of the genus will be incidentally referred to in the course of the paper.

To illustrate my subject, I have had lithographed (through the courtesy of Mr. J. Wood-Mason) the left upper dentition of two adolescent skulls of *R. indicus*, from the collection of the Indian Museum, each of which is remarkable for an abnormality. The dentition exhibited in fig. 1 of the accompanying plate belongs to a young animal, and comprises two incisors ( $i.^1, i.^2$ ), the milk-molar series ( $m.m.^1$  to  $m.m.^4$ ), and the true molars ( $m.^1$  to  $m.^3$ ), the last of which is still in its alveolus. The second specimen (fig. 2) belongs to a somewhat older animal, and exhibits the alveolus of an incisor ( $i.^1$ ), two premolars ( $p.m.^1, p.m.^2$ ), two milk-molars ( $m.m.^3, m.m.^4$ ), and the three true molars ( $m.^1$  to  $m.^3$ ), the last of this series, in this instance also, not having yet cut the gum. The grounds on which these teeth are assigned to their respective serial positions will be found in the sequel.

The true molars ( $m.^1$ ,  $m.^2$ ,  $m.^3$ ) in all species of *Rhinoceros*, whether living or extinct, are invariably three in number, corresponding with the typical mammalian series, and, therefore, require no further notice on this occasion. In advance of the first of the three true molars, there occur, in all young skulls of *Rhinoceros*, four teeth in serial apposition, but in older skulls there may be only three. It is to these anterior teeth of the milk-molar and premolar series (the one or the other present, according to the age of the animal) to which I now desire to draw attention.

An examination of the skull of which the left dentition is drawn in fig. 1, shows that, of the four teeth ( $m.m.^1$ ,  $m.m.^2$ ,  $m.m.^3$ ,  $m.m.^4$ ) in advance of the first true molar ( $m.^1$ ), the three last ( $m.m.^2$ ,  $m.m.^3$ ,  $m.m.^4$ ) have their fangs and bases absorbed away by the germs of other teeth, which are succeeding them from above: there can, therefore, be no doubt that these three teeth are the three last milk-molars of the typical series. This is also shown by the last tooth of the anterior series ( $m.m.^4$ ) being more worn than the first of the true molar series ( $m.^1$ ): if the tooth preceding the latter were a premolar, it would be the less worn of the two. The first tooth of the whole series ( $m.m.^1$ ) shows, however, no signs of being about to be replaced by a vertically succeeding premolar. I have carefully examined another skull of the same age, in which the alveoli of the teeth have been opened, and I can find there no trace of a replacing premolar above the first of the seven teeth of the molar series. Were this tooth to be replaced by a premolar, such replacement would take place before that of the tooth next in the series. Several other adolescent skulls of *R. indicus* which I have examined show no trace of the replacement of the anterior tooth, and it may, therefore, be considered to be proved that in many instances no such replacement ever takes place.

From the development of the tooth in question with the milk-molar series (though it sometimes appears rather later than the next tooth), there would seem to be no doubt that it is the first of that series, and I shall show below that such is undoubtedly the case. From the fact of this tooth having in most instances no vertical successor and persisting for a considerable time during the period of use of the permanent dentition, it is not unfrequently referred to as the first premolar, and though, as I shall show, such a nomenclature is altogether inaccurate, yet it has a certain amount of convenience which may justify its conditional use.

The dentition drawn in fig. 2 also exhibits four teeth in front of the first true molar ( $m.^1$ ), but they are not all homologous with those in the preceding specimen. The two teeth ( $m.m.^3$ ,  $m.m.^4$ ) in advance of the first true molar ( $m.^1$ ) in fig. 2 are more worn than the former, and will consequently be the third and fourth milk-molars, or the homologues of the corresponding teeth in fig. 1. The first and second teeth ( $p.m.^1$ ,  $p.m.^2$ ),

however, in fig. 2 are still in germ, and as being totally unworn must be of a later development than the third and fourth milk-molars: consequently, the former must be the first and second premolars, which have replaced the first and second milk-molars. In this instance, therefore, the first milk-molar, which, as we have seen, is normally persistent, has been replaced by a vertically succeeding premolar, from which replacement there can be no question as to the correctness of the serial position assigned to the former tooth. The replacing premolar (fig. 2, *p.m.*<sup>1</sup>) is of considerably larger size and more complex structure than the replaced milk-molar (fig. 1, *m.m.*<sup>1</sup>).

In the lower jaws of all the skulls of *R. indicus* which have come under my notice, I cannot find any instance of the vertical replacement of the first milk-molar, which generally persists until the permanent dentition is well in wear, and subsequently falls out at a comparatively early period. Neither can I find any instance of the replacement of the first milk-molar of either jaw in *R. sumatrensis* (*sumatranus*) or *R. javanicus* (*sondaicus*).

The formula of the molar dentition of *R. indicus*, taking into account the abnormal form, may be written as follows:—*m.m.*  $\frac{4-4}{4-4}$  *p.m.*  $\frac{(3.4)-(3.4)}{3-3}$   
*m.*  $\frac{3-3}{3-3}$ ; the adult molar dentition of the normal form, *m.m.*  $\frac{1-1}{1-1}$  *p.m.*  $\frac{3-3}{3-3}$   
*m.*  $\frac{3-3}{3-3}$ ; and of the abnormal form, *m.m.*  $\frac{0-0}{1-1}$  *p.m.*  $\frac{4-4}{3-3}$  *m.*  $\frac{3-3}{3-3}$ .

The succession and homology of the anterior tooth of the molar series appears to have given rise to a certain amount of confusion among naturalists. Thus Professor Huxley when treating of the dentition of the genus *Rhinoceros*, observes:\* “Of the four milk-molars, the first, as in the Horse, is smaller than the others, and is not replaced;” two pages back in the same work, however, the Professor gives the formula of the premolars as  $\frac{4-4}{4-4}$ , which would imply either that the first tooth of the molar series is replaced, or else that it is reckoned as a premolar, in which case there would be only three milk-molars.† Professor Owen appears to have come to a conclusion totally opposite to that of Professor Huxley, and seems to consider that the first milk-molar is always replaced. Thus on page 592 of his ‘Odontography’ the Professor observes that “the first of the

\* ‘Anatomy of Vertebrated Animals,’ p. 362.

† In a work explanatory of the homology of the teeth, as is Professor Huxley’s, there can be no doubt that this homology should be given with the most strict accuracy. In descriptive zoology and palæontology, however, it will still be convenient, in referring to the dentition of the genus *Rhinoceros*, to count the first milk-molar, when persistent, as a premolar, in order to avoid introducing another term into the dental series. The same conventional arrangement may be adopted in regard to the permanent and milk-incisors, referred to below.

*permanent* series of seven molar teeth is very small in both jaws, and is soon shed;” and again on page 599, “the first milk-molar soon yields place to the first premolar.” The above given instances of the dentition of *R. indicus* show that this view cannot be normally correct: the difference in the form of the first upper milk-molar (*m.m.*<sup>1</sup>) and the first premolar (*p.m.*<sup>1</sup>) shows, in cases where the former tooth persists, that it cannot be a premolar which has supplanted a milk-molar *in utero*, as might otherwise be the explanation according to Professor Owen’s views.

I now come to the consideration of the non-molar dentition, and shall first treat of the teeth of the upper and secondly of the lower jaw.

According to Professor Owen,\* there is developed in the fœtal skull of *R. indicus*, immediately behind the maxillo-premaxillary suture, a very small tooth, which, from its position must be the milk-canine: this tooth disappears at an extremely early age, and no permanent successor is ever developed. I can find no record of an upper canine ever having been observed in the fœtus of any other species of the genus, and no permanent upper canine occurs in any species.

In a very young skull of *R. indicus*, figured by Cuvier,† there appear in the premaxilla the alveoli of two teeth, which must be those of the first and second milk-incisors. Two, indeed, appear to be the normal number of upper milk-incisors developed in the genus, though Professor Huxley‡ speaks of there being three on either side in some species.§

Normally, in *R. indicus* there is only one permanent incisor developed, succeeding the first (innermost) milk-incisor; the former tooth is easily recognized by its lateral elongation. Occasionally, however, as in the skull of which the left upper dentition is represented in fig. 1, a second upper incisor (*i.*<sup>2</sup>) is developed, replacing the second milk-incisor. In the figured specimen, the two incisors (*i.*<sup>1</sup>, *i.*<sup>2</sup>) are still in the condition of germs just protruding from their alveoli; from the condition of wear of the molar series it is quite evident that the two incisors belong to the second series, which is also shown by the characteristic form of the innermost (*i.*<sup>1</sup>); the second incisor (*i.*<sup>2</sup>) is not lengthened laterally like the first. In the right premaxilla of the same skull, only the first incisor is developed. Another instance of the development of the second incisor of one side of the upper jaw is afforded by the skull belonging to a mounted skeleton of an old individual of *R. indicus* in the Indian Museum, in which all the teeth of the permanent series are much worn. In the right premaxilla of that skull

\* ‘Odontography,’ p. 592.

† ‘Ossemens fossiles,’ Ed. 1836. Atlas, pl. xliii, fig. 3.

‡ Loc. cit. p. 362.

§ I am not aware which species is referred to.

there occur two large and well-worn permanent incisors not differing to such an extent in size as do those of the figured specimen. No trace of a second incisor is to be found in the left premaxilla, and I cannot, indeed, find any instance of the development of the two upper incisors of both sides in the same individual of *R. indicus*. The occasional development on one side only of the second permanent incisor in the last-named species, would seem to be a pretty clear indication that it is descended from an ancestor in which two pairs of upper incisors were normally present. It seems, indeed, that, when teeth normally absent do present themselves, they usually appear only on one side, as in the instance of the lower jaw of a tiger with an extra premolar, described by myself in a former volume of the Society's Journal.\*

In all species of the genus, the normal number of permanent upper incisors (if any are present) appears to be one only on either side, and I have not come across any instance of the abnormal development of the second upper incisor in any species but *R. indicus*. It may not improbably be, however, that such abnormal development may occur in other species.

It has, indeed, been stated on the authority of the late Dr. Falconer† that the extinct Indian *R. sivalensis* was furnished with three pairs of upper (and lower) permanent incisors; none of the numerous specimens of the skull of this species figured in the 'Fauna Antiqua Sivalensis,' however, exhibit any incisors at all, and we have, therefore, no tangible evidence whatever to support the new genus *Zalabis* lately proposed by Professor Cope‡ for the reception of this species on the ground of the unusual number of incisors with which it was provided.

Turning now to the lower jaw, we shall find that there is some considerable difficulty in arriving at a satisfactory conclusion as to the homologies of the teeth in advance of the molar series.

In *R. indicus*, there normally exist in the young animal an inner pair of very small conical teeth, and an outer pair of larger teeth. The outer pair are succeeded from below by a pair of much larger triangular and pointed teeth, which, therefore, evidently belong to the permanent series. Normally, I believe, the inner pair are not succeeded by permanent teeth, as I can find no trace of such in most lower jaws; in the lower jaw of the skull drawn in fig. 1, however, there occurs, a little above and internal to the middle pair of teeth, a second pair of small teeth, which are less protruded from the jaw, and which, I think, certainly belong to the second dentition.

\* Vol. xlvii, pt. ii, pl. 2.

† Owen, loc. cit. p. 589.

‡ Bul. U. S. Geol. Geog. Surv. Vol. v, p. 229.

We may, therefore, say that in *R. indicus* there are always developed in the symphysis of the mandible two pairs of milk-teeth, and always one, and occasionally two pairs of permanent teeth. When the middle pair of milk-teeth are not replaced, they remain during the permanent dentition, as in the analogous case of the first upper milk-molar.

It now remains to consider the serial position of the teeth in question. With regard to the middle pair of teeth, there can be no question but that they are incisors, and probably the first of that series. With regard to the homology of the larger outer pair of teeth, two views are entertained. By the older writers, this pair of teeth were unhesitatingly classed as incisors; a view adopted both by Prof. Huxley and by Prof. Owen. Latterly, however, some writers, among whom may be mentioned Professors Cope\* and Gaudry,† have come to the conclusion that this outer pair of teeth are really canines, apparently from their resemblance to the undoubted canines of certain genera of extinct Mammals. To distinguish between a canine and an incisor tooth in the lower jaws of animals in which the incisors are reduced and no upper canine is present, is indeed a matter of extreme difficulty, and I do not desire on the present occasion to enter into the reasons either for or against the innovation. I provisionally, however, adopt the old nomenclature.‡ With this view of the homology of the teeth in question, the anterior milk dentition of *R. indicus* may be formulated as follows:— $c. \frac{1-1}{0-0} i. \frac{2-2}{2-2}$ , the adult dentition will be normally  $c. \frac{0-0}{0-0}$   $m.i. \frac{0-0}{1-1} i. \frac{1-1}{1-1}$ , or abnormally  $c. \frac{0-0}{0-0} i. \frac{2-2}{2-2}$ .

In treating of the milk dentition of *Rhinoceros*, Professor Huxley§ remarks of the two pairs of lower incisors that “it seems probable that only one pair, in any case, are permanent teeth.” I have shown that occasionally in *R. indicus* both pairs may be replaced by permanent teeth, and I now proceed to show that such is at all events sometimes the case in another species. In a lower jaw of *R. javanicus* figured by De Blainville,|| there are the germs of two incisors on each side in *alveolo*, below protruded incisors; the former, therefore, are clearly permanent teeth. I have no means of knowing whether this replacement is abnormal or normal. In

\* Loc. cit.

† ‘Les Enchainements du Monde Animal: Mammifères Tertiaries,’ p. 50, et seq.

‡ I may perhaps observe that there seems to be some discrepancy in M. Gaudry’s nomenclature, since on page 58 of his work quoted above, he speaks of there being two pairs of small incisors in the lower jaw of *R. bicornis (africanus)*, and yet does not produce any evidence to show that these teeth are not the homologues of the two pair of teeth in the mandible of *R. indicus*, which are reckoned as incisors and canines.

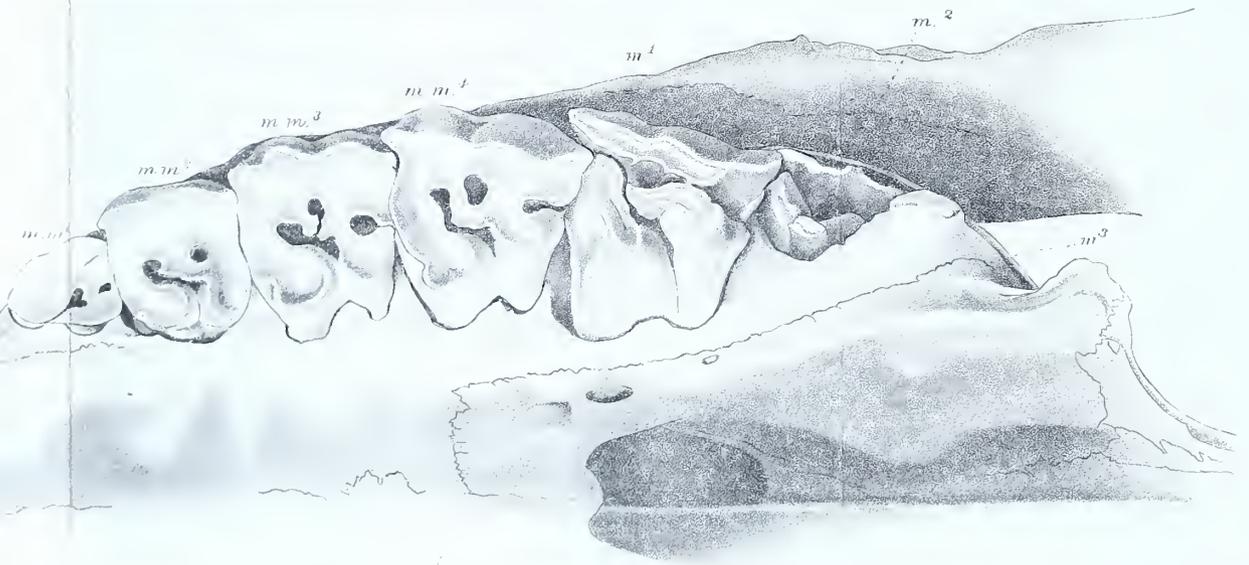
§ Loc. cit. p. 362.

|| ‘Osteographie,’ Atlas, Rhinoceros, pl. viii.





2



1

Abnormal Dentition of  
RHINOCEROS INDICUS

*R. sumatrensis*, there is in the adult state no median pair of lower incisors,\* and it is, therefore, probable that permanent middle lower incisors are never developed in this species.†

In the living African species of *Rhinoceros*, in the extinct Indian *R. deccanensis*, and other extinct species, no permanent incisors, in either jaw, were ever developed, and in the adult the symphysis of the mandible and the premaxillæ are consequently edentulous. It has been said that three pair of lower incisors were developed in *R. sivalensis*, but none of the lower jaws of the genus figured in the 'Fauna Ant. Siv.' show more than two pairs of these teeth, and none are present in the specimen referred to *R. sivalensis*.

From the foregoing brief notes it will be gathered that the dental system of the genus *Rhinoceros* presents very considerable differences in different species, and occasionally in different individuals of the same species. These differences are mainly due to the varying extent to which specialization has operated in the genus, and to the occasional development by 'reversion' of teeth normally absent.

The genus *Rhinoceros* (using the term in its original comprehensive sense) is indeed one of those in which the dental system may be said to be in a condition of change, and this variability in the matter of the development or suppression of certain teeth in species and individuals, appears to me to render the splitting up of the old genus into a number of new genera or subgenera (except in the case of *Acerotherium*) a very questionable measure. The relative prominence or insignificance of the anterior teeth may be traced in a graduated scale from one species to another as has been most ably done by M. Gaudry in his invaluable work already quoted in this paper.

#### EXPLANATION OF PLATE VII.

Fig. 1. The left upper dentition of an immature specimen of *R. indicus*, showing the germs of two permanent incisors ( $i^1, i^2$ ), four milk-molars ( $m.m.^1, m.m.^2, m.m.^3, m.m.^4$ ), first and second true molars ( $m.^1, m.^2$ ), and the alveolus of the third ( $m.^3$ ). (The animal to which this skull belonged was killed by Mr. W. T. Blanford.)

Fig. 2. The left upper dentition of a somewhat older individual of the same species, showing the alveolus of the first permanent incisor ( $i^1$ ), the first and second premolars ( $p.m.^1, p.m.^2$ ), the third and fourth milk-molars ( $m.m.^3, m.m.^4$ ), the first and second true molars ( $m.^1, m.^2$ ), and the alveolus of the third ( $m.^3$ ).

Both specimens are drawn one half the natural size.

\* Professor Copo (loc. cit. p. 229) is in error when he gives two pairs of mandibular teeth to this species.

† I should doubt if the lower jaw drawn in fig. 15 of plate 138 of Owen's 'Odontography' as of *R. sumatrensis* belongs to that species.

XII.—*On a Species of Trochalopterus from Travancore.*

By W. T. BLANFORD, F. R. S.

(Received Sept. 2nd;—Read November 3rd, 1880.)

A very interesting series of bird-skins obtained in Southern Travancore has recently been brought to England by Mr. F. W. Bourdillon. Collections previously made by the same gentleman in the locality named have been described by Mr. Hume in *Stray Feathers*, Vol. IV, p. 351, and Vol. VII, p. 33. One of the species noticed in the second paper is *Trochalopterus fairbanki*, a bird originally obtained by Mr. S. Fairbank on the Palni hills, about 100 miles north of the range, east of Trevandrum, on which Mr. Bourdillon's skins were collected. Mr. Hume, l. c. p. 37, points out some differences between the Travancore and Palni forms, but remarks that he has not a sufficient series to determine whether these differences are constant.

In the collection now brought are three skins of the Travancore *Trochalopterus*, and on comparing them with the original type of *T. fairbanki* in the British Museum, I find, besides the differences noticed by Mr. Hume, a few other distinctions, sufficient, I think, to justify a separate title being bestowed on the Travancore bird. The following is a full description of the latter.

## TROCHALOPTERUM MERIDIONALE, sp. nov.

*T. Trochaloptero fairbanki peraffine, sed dorso grisescente, abdomine medio albo, supercilio albo haud post oculum producto, regione postoculari grisea nec fusca, rostroque robustiore distinguendum: pileo brunneo, dorso griseo-olivaceo, postice olivaceo, coloribus transeuntibus; supercilio brevi albo, loris brunneis, cum pileo concoloribus; capitis lateribus cum regione parotica pallide rufescenti-griseis, colli lateribus cinereis; reetricibus remigibusque brunneis, illis remigibusque secundariis ultimis subobsolete transfasciatis; mento, gula, atque pectore albescenti-griseis, conspicue fusco-striatis, media gula fere alba; abdomine medio albido, lateribus cum pennis subcaudalibus tetricibusque inferioribus alarum ferrugineis, tibiis olivaceis; rostro nigro, pedibus fuscis, iridibus saturate rufis.*

Long. tota exempli masculini 9, alæ 3·5, caudæ 3·6, tarsi 1·45, rostri a fronte 0·8, ejusdem a rictu 1, culminis 0·9 poll. Angl.

HAB. In summis montibus provinciæ Travancore, ad extremitatem meridionalem peninsulæ Indiæ.

Head and hair-brown, the feathers rather pale-shafted, the colour passing gradually into that of the back, which is greyish olive, becoming greener on the rump; a very short white supercilium, only extending from

the base of the bill to above the middle of the eye; lores the same colour as the crown; sides of head, including the ear-coverts, grey, with a slight rufescent tinge; sides of neck purer grey; wing and tail-feathers brown with olivaceous margins, all the tail-feathers and the last (proximal) secondary quill-feathers with faintly marked narrow transverse bars on the upper surface; chin, throat, and breast pale grey, with conspicuous dusky striæ, the central portion of each feather being much darker than the edges; the middle of the throat is very pale, almost white, middle of abdomen white, lateral portions and flanks with the under tail-coverts and under wing-coverts ferruginous; thigh-coverts olivaceous. Irides dark red,\* bill black, legs dusky.

The three specimens were all shot at an elevation of 4000 feet. Two are from Mynall, one from the Travancore and Tinnevely boundary. Two are males; of the third, the sex has not been ascertained. The differences in measurement are trifling: the wing is 3·4 to 3·55 inches; tail, 3·4 to 3·65; tarsus, 1·4 to 1·45; culmen, 0·9 to 0·95. The length is given by Mr. Bourdillon from  $8\frac{1}{2}$  to  $9\frac{1}{2}$  inches in different specimens.

*T. meridionale* is distinguished from *T. fairbanki* by (1) the much shorter white superciliary stripe terminating above the eye, whereas, in *T. fairbanki*, it extends back above the ear-coverts; (2) by there being no brown band behind the eye, the feathers immediately behind the eye being rufescent grey like the cheeks in *T. meridionale*, whilst they are brown like the lores and the crown in *T. fairbanki*; (3) by the back and upper parts generally being much greyer and by the brown colour of the crown passing gradually into the olivaceous tinge of the back and not being separated by a distinct margin; (4) by the tail-feathers being browner and more distinctly transversely barred above; (5) by the striation on the throat and breast being more strongly marked; (6) by the middle of the abdomen being white instead of ferruginous†; and (7) by the rather stouter bill. I consider the differences marked 1, 2, and 3 characteristic; the others taken alone would scarcely justify the separation of the two forms.

From *T. jerdoni* the present species may be known by the absence of a black chin‡, by the flanks and under tail-coverts being rufous instead of

\* Noted by Mr. Bourdillon, as also are the dimensions taken in the flesh. The length above quoted is from these measurements.

† This may not be constant; I have an indistinct recollection of having seen a specimen of *T. fairbanki* with the middle of the abdomen whitish, but I am not sure.

‡ With reference to this distinction between *T. jerdoni* and the two Southern forms *T. fairbanki* and *T. meridionale*, it is as well to note that the presence of a black chin in the former is mentioned by Blyth in his original description J. A. S. B., 1851, xx, p. 522. I call attention to this distinction, as Mr. Hume has overlooked it in his note on the species (Stray Feathers, vii, p. 36).

olivaceous, and the middle of the abdomen white instead of rufous. It is greatly to be regretted that *T. jerdoni* has never been collected again, so far as can be judged by published accounts, since Jerdon first procured it.

XIII.—*On a new Species of Papilio from South India, with Remarks on the Species allied thereto.*—By J. WOOD-MASON, *Officiating Superintendent, Indian Museum, and Professor of Comparative Anatomy and Zoology, Medical College, Calcutta.*

(Received Oct. 16th;—Read Nov. 3rd, 1880.)

(With Plates VIII and IX.)

In December last, the Indian Museum received from Mr. F. W. Bourdillon of Trevandrum, a small collection of diurnal Lepidoptera, amongst which was a much worn and tattered example of a female insect evidently closely allied to the North Indian *P. Castor* and to the Burmese *P. Mahadeva*, with the same sex of the latter of which it turned out on examination to agree in having the discal markings of the hind-wing confined to the median region of the organ, where they form a transverse band of lanceolate spots, instead of being diffused over the whole disk and extending into the cell, as in the former.

About a month ago, a few species of butterflies were received from Mr. G. H. Kearney of the Berkodee Coffee Estate, Koppa Anche, Mysore, and amongst them is a fine specimen of the male, which proves that the species is, as the above-mentioned female specimen had already indicated, more nearly related to *P. Mahadeva* than to *P. Castor*, and enables me to describe it.

PAPILIO DRAVIDARUM, n. sp., Pl. VIII, Fig. 1, ♂.

Allied to *P. Castor* and to *P. Mahadeva*,† but more closely so to the latter, with which it agrees in the form of the wings in both sexes.

Sexes alike, having not only the same form of wings but also the same general type of coloration as the females of the two described species; the male differing from the female only in the darker and richer tints of its upper surface.

♂. UPPERSIDE rich fuscous of a much lighter shade than in *P. Castor*, or even than in *P. Mahadeva*, and more densely powdered with fulvous scales than in either. *Anterior wing* with the basal area of a richer and darker shade of brown than the rest of the organ; with four distinct longitudinal lines of fulvous scales in the cell, at the extremity of which is a minute but distinct cream-coloured speck; with the outer portion beyond

\* Moore, P. Z. S. 1878, p. 840, pl. li, fig. 1.

the cell very densely covered with fulvous scales between the veins; with a marginal row of ochraceous-white spots placed at the incisures; and with a submarginal series of nine conical or sublanceolate ochraceous ones; each series decreasing at either end and paling towards the costal margin. *Posterior wing* with the anterior third of its surface devoid of fulvous scales; with the incisures of the outer margin very narrowly edged with ochraceous-white; with a sub-marginal series of seven strongly and angularly curved lunules or arrow-shaped spots, the four posterior of which are ochraceous-white, and the three apical ones cream-coloured; and with a discal band of seven externally-dentate lanceolate cream-coloured spots all irrorated with fuscous scales except the anterior two; with the cell and the parts of the wing-membrane external and internal to it tolerably thickly sprinkled with fulvous scales. The wing-membrane being in *both wings* devoid of fulvous scales in the intervals between the sub-marginal and incisural markings presents the appearance of having a sub-marginal row of dark blotches. *UNDERSIDE* less richly and deeply coloured, with the markings, especially the spot at the end of the cell, all slightly larger and white, with the exception of the discal series of the hind-wing, which are tinged with cream-colour at their inner points; and with the fulvous scales similarly though not quite so thickly distributed over the fore-wing, but evenly sprinkled over the whole of the hind-wing. Body lighter-coloured than in *P. Castor*, but marked in identically the same manner.

Length of fore-wing 2·2; whence expanse = 4·5 inches.

*HAB.* Koppa Anche, Kadur District, Mysore, S. India, at about 2,500 feet elevation. Obtained by Mr. G. H. Kearney.

♀. Marked above and below, spot for spot, as in the male, but lighter and less richly coloured, with the spot at the end of cell larger and apparently more distinctly visible on the upper side, and with all the markings (except the sub-marginal series of the underside of the hind-wing, which are white) straw-coloured.

Length of fore-wing 2·3; whence expanse = 4·7 inches.

*HAB.* Trevandrum. Obtained by Mr. F. W. Bourdillon.

In the male of *P. Davidarum*, there are visible upon the upper surface of the fore-wing a spot at the end of the cell, a sub-marginal row of conical or sub-lanceolate spots, and a marginal row of incisural spots; and upon that of the hind-wing a discal row of lanceolate spots, a sub-marginal series of lunules, and incisural spots as in the fore-wing.

In the male of the darker-coloured *P. Mahadeva*, the incisural spots of the fore-wing alone remain, but the hind-wing retains its three series of spots, which, however, are all smaller and apparently less clouded with dark scales than in the preceding species.

In the fuscous-black male of *P. Castor*, the fore-wing may be said to be uniform black, the incisural spots, which alone remain, being so reduced

in size as to be barely visible, being, in fact, mere specks confined to the fringe; the hind-wing has lost all but the incisural specks (which are similarly confined to the fringe) and the first three or four spots of the discal series, which together form a large and conspicuous cream-coloured blotch divided by the veins: *P. Castor* may, in fact, be described as a rich dead-black insect with a conspicuous cream-coloured blotch near the outer angle of each hind-wing.

In *P. Castor*, then, the sexes are, as regards colour and markings, as strongly differentiated from one another as in any species with which I am acquainted; they also differ to some extent in form, the male having the fore-wing narrower, with the external margin obviously emarginate, and the hind-wing also narrower and produced, with the same margin more deeply incised and lobed than in the female, both pairs of whose wings in form more or less closely\* resemble those of both sexes in the other two species.

In *P. Mahadeva*, the sexes are also tolerably well, though not so conspicuously, differentiated in point of colour and markings as in *P. Castor*, but not at all in form, the wings being of the same shape in both sexes.

In *P. Dravidarum*, the sexes agree perfectly both in form of wings and markings, differing very slightly in colour only; so that but little sexual differentiation has here taken place.

The female of *P. Dravidarum* is scarcely distinguishable, as far as one can tell from a description alone, from that of *P. Mahadeva*, the only differences that I can make out being that in the latter "the fore-wings have very small and less distinct sub-marginal white spots, and no spot at the end of the cell." From that of *P. Castor*, however, it is readily distinguished by having, as I have already pointed out, the discal markings of the hind-wing in the form of a transverse band of short lanceolate spots.

At the meeting of the Linnean Society of London held on the 18th March last, a paper by Prof. Westwood, on a supposed polymorphic butterfly from India, was read. In this memoir the following conclusions are said (*vide abstract in 'Nature' Vol. XXI, p. 531, April 1st, 1880*) to have been arrived at by the author:—(1) "That *Papilio Castor* is the male of a species whose females have not yet been discovered; (2) that the typical *P. Pollux* are females of which the males with rounded hind-wings having a diffused row of markings has yet to be discovered; and (3) that the coloured figures given by the author represent the two sexes of a dimorphic form of the species."

\* The females present an inconspicuous dimorphism, some having retained the primordial form of hind-wing, while others have the outer margin of this wing toothed as in the male (*vide infra*).

With regard to the last of these conclusions I cannot speak, because neither the paintings nor the specimens in question are accessible to me ; but, having spoken above as if the opposite sex of *P. Castor* were perfectly well-known to naturalists, while, according to Prof. Westwood, it is still undiscovered, I ought perhaps to say a few words about the material on which my remarks are based.

*Papilio Castor* is restricted in its distribution to the slopes and valleys of the hill-ranges of North Eastern India and to the parts of the plains in immediate contiguity with them ; its place being taken elsewhere, as in Southern India, by the new species described in the preceding pages, and, in Burmah, by *P. Mahadeva*. The Indian Museum possesses specimens from the Southern slopes of the Khasi Hills (Silhet), from the Sikkim Hills (Darjiling), Cherra Punji in the Khasi Hills, and the Naga Hills ; and three males were taken by Lieut.-Col. Godwin-Austen during the Dafla Expedition ; in these last, in a large male from Cherra Punji, and in two specimens of the same sex from the Naga Hills the upper surface is dark brown of a much lighter tint than in nine males recently received from Sikkim (2) and Silhet (7), which are all brown-black of so dark a shade as to appear quite black except when a strong light falls upon them when their colour appears brownish ; in fact, the brown of the former is to that of the latter series of specimens what dark green is to the colour known as "invisible-green." In the large Cherra Punji specimen, the short tooth, or rudimentary tail, into which the third branch (*d.*<sup>3</sup>, pl. ix, fig. 1) of the median vein of the hind-wing is usually produced, does not extend beyond the line of the other lobes of the outer margin, and one of the three dwarfed winter specimens\* captured by Col. Austen approaches it in this respect ; moreover, one of the Silhet specimens has this tooth smaller in one wing than in the other, so that this, like secondary sexual characters in general, is subject to variation. It is possibly to difference of station, but probably to long exposure to the vicissitudes of the Calcutta climate, and to the applications of benzine and other noxious substances to which they were subjected before I took over charge of the collection of Lepidoptera, that these brown specimens owe their lighter coloration. However this may be, it may confidently be asserted that it would be impossible for the most inveterate species-maker to discover any character by which to separate them as a distinct species or race from the fresh and consequently dark Sikkim and Silhet specimens. So much for the males.

Of the nine females in the collection referred by me to *P. Castor*, seven being perfect can readily be divided into two sets according to the form of the outer margin of the hind-wing—three (one from Assam, one

\* The insect figured by Westwood (*Arcana Entom.* vol. ii, pl. 80, fig. 2) seems to have been a similarly dwarfed and faded individual.

from Cherra Punji,\* and a large one from Silhet) having the third branch (*d.*<sup>3</sup>, pl. viii, fig. 2) of the median vein not produced and the outer margin of the wing consequently 'rounder,' being, in fact, typical *P. Pollux*—and four (two from Silhet† and two from Sikkim‡) having that veinlet produced into a small tooth (*d.*<sup>3</sup>, pl. ix, fig. 2) as in the male. I consider that these two different forms are both females of *P. Castor*, and that the slight differences they present are explained on the supposition, warranted by numerous analogous facts in nature, that the secondary sexual characters acquired by the male have been partially transmitted to some females but not to others (*P. Pollux*), which have retained the primordial rounded form of wing.°

The fact that the discoidal markings of the hind-wing in the two Silhet females with toothed wings are lighter and more distinctly cream-coloured than in any of the females with rounded wings; that the malformed specimen from the same locality (which certainly belongs to the form with toothed hind-wings) has these markings in the fourth, fifth, and sixth interspaces, those, that is to say, corresponding to the ones forming the principal part of the blotch in the male, of almost as rich and pure a colour as in that sex; and that one of the two former has the spot at the end of the cell and the submarginal markings of both fore-wings obsolete and is thus still further approximated to the male; do certainly seem to me to tell rather for than against the above supposition.

The *Helenus*-group of Papilios, to which *Papilio Castor* and its allies

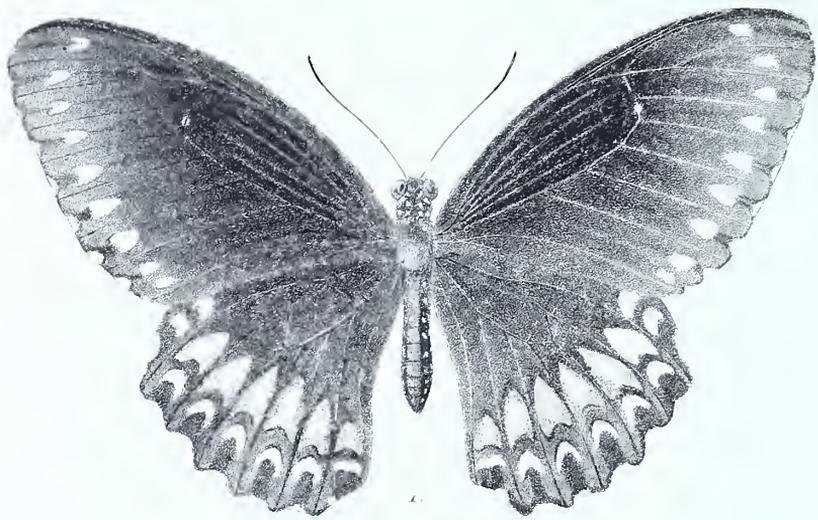
\* There is another specimen from Cherra Punji, the largest of all in the collection, with the outer margins of its hind wings so ragged that it is impossible to be quite sure to which form it belongs, though, from its close agreement in other respects with Westwood's figure in the 'Arcana' as well as with the other insect from the same locality, I should say it is a typical *P. Pollux*.

† There is a third specimen from Silhet in the collection, taken at the same time and place as the other two, but it unfortunately has the hind-wings symmetrically malformed at their outer margins, the third lobule on each side being short and angulated and the fourth being somewhat longer than usual and also angulated. This malformation is interesting as showing in the same specimen the instability of this character, the strong tendency to the assumption of the male form of wing exhibited in the lengthening of the lobule next in order, and the unmistakable 'reversion' to the rounded form of wing in the suppression of the rudimentary tail.

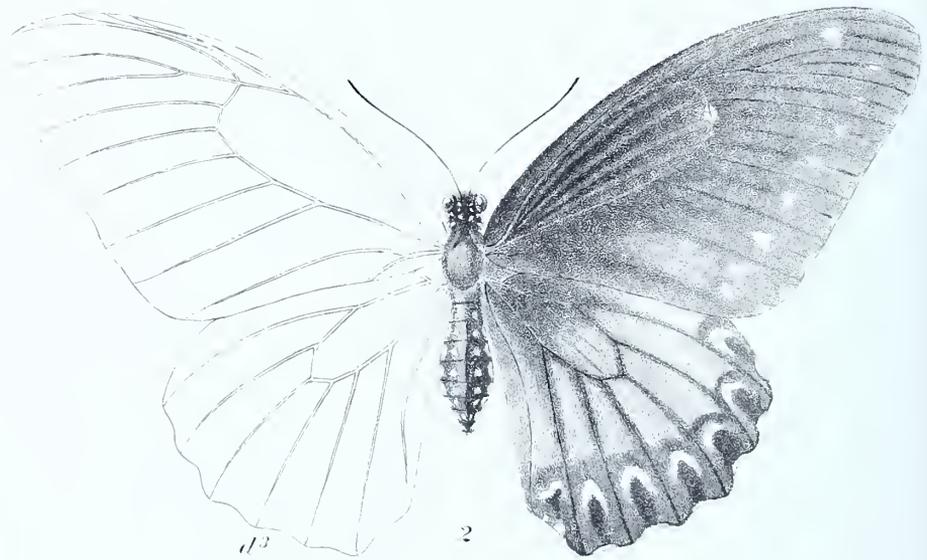
It should be mentioned that a gynandromorphous example of the form of female described by Prof. Westwood as *P. Pollux* has been figured and described as *P. Castor* by G. Semper in Wien. Entom. Monatschr. 1863, Band vii, p. 281, Taf. 19. In this specimen both the wings of the left side are truly female, but on the opposite side the posterior portion of the fore-wing from the first discoidal veinlet to the inner margin on the upper side only, and the anterior portion of the hind-wing from the costal margin to the second branch of the sub-costal on both sides, exhibit the masculine livery not unmingled with female characters (*Conf.* Westwood in Thes. Ent. Oxon. p. 187).

‡ The two Sikkim specimens have the tooth less developed and the discal markings of the hind-wings exactly like those of the other form (*P. Pollux*).





1

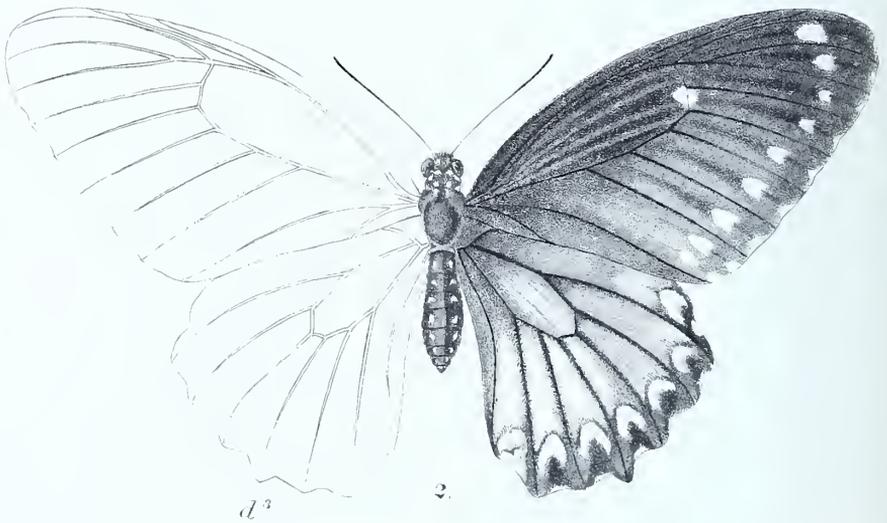
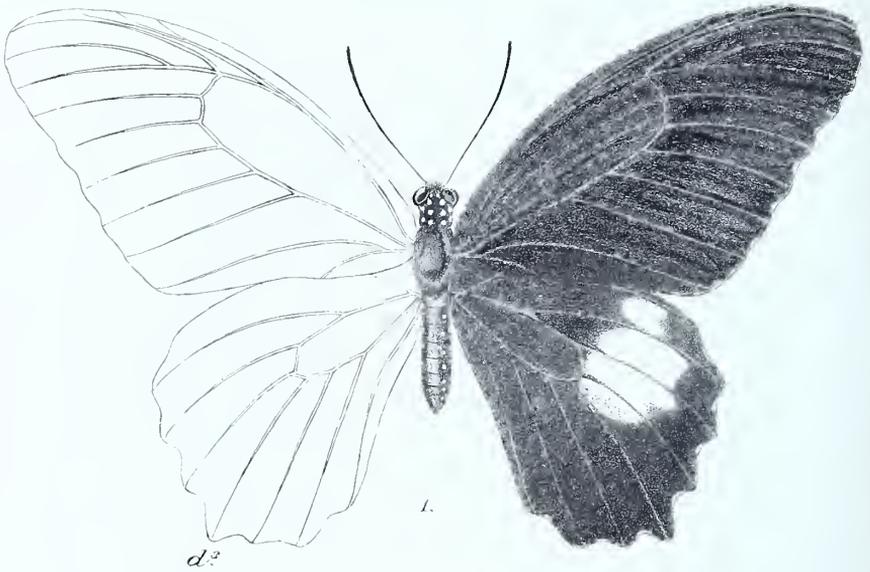


1/3

2

1 PAPILIO DRAVIDANUM. ♂  
2 PAPILIO CASTOR. ♀





PAPILIO CASTOR, ♂♀.

unquestionably belong, taken as a whole, presents us with a remarkable series of gradations in the amount of difference between the sexes, comprising as it does : one species (*P. Dravidarum*) in which the sexes closely resemble one another in the form of the wings and in colour and markings, and there is only an incipient sexual differentiation : another (*P. Mahadeva*) in which, while agreeing in structure, they differ to a considerable extent in markings and colour, and the secondary sexual characters of the male are much more pronounced : another (*P. Castor*) in which they differ from one another to such a remarkable extent that no lesser an authority than Prof. Westwood originally described them under different names and still maintains their distinctness, and Mr. Wallace\* placed them in different groups of the genus ; the male having acquired the most pronounced secondary sexual characters (including rudimentary tails), which have been partially transmitted to some females but not to others ; and the two forms of female having retained, one of them the form of wings, and both the general style of colouring, characteristic of both sexes in the first-named species : and, finally, others (*P. Helenus*, *P. Chaon*, etc.) in which the male has perfectly transmitted to the opposite sex all the secondary sexual characters (including the long tails) that he had acquired, the female only differing from him in such trifling points as the lighter coloration of the outer half of both wings and the dingier shade of her upper surface generally.

From these and other facts, we are, I think, entitled to infer the probable descent of all the members of this group from an ancestor with tailless, rounded wings in both sexes, closely resembling *P. Dravidarum*, but with diffused discal markings in the hind-wings and probably also in the fore-wings ; the conspicuous wing-blotches of *P. Helenus*, *P. Castor*, etc., having apparently resulted from the concentration, so to speak, of such diffused colouring in the direction of the breadth of the wing, just as have the discal bands of short spots in *P. Dravidarum* and *P. Mahadeva* from a similar process of modification in the opposite direction.

If his conclusions are correctly reported, Prof. Westwood's drawings must represent a species different from either of those alluded to herein, and I look forward with much interest to the appearance of his paper.

## EXPLANATION OF THE PLATES.

## Plate VIII.

Fig. 1. *Papilio Dravidarum*, W.-M., ♂.

Fig. 2. *Papilio Castor*, Westw. ♀ 2nd Form (*P. Pollux*, Westw.), from Silhet.

## Plate IX.

Fig. 1. *Papilio Castor*, Westw. ♂, from Silhet.

Fig. 2. — — — ♀ 1st Form, from Silhet.

*d*.<sup>3</sup> = third branch of the median vein.

\* In his well-known memoir 'On the Phenomena of Variation and Geographical Distribution as illustrated by the *Papilionidae* of the Malayan Region' in Trans. Linn. Soc. Lond., vol. xxv, pp. 33, 34.

XIV.—*Description of the Female of Hebomoia Roepstorffii.*  
By J. WOOD-MASON.

(Received October 27;—Read November 3rd, 1880.)

HEBOMOIA ROEPSTORFFII.

*H. Roepstorffii*, Wood-Mason, *antea*, p. 134, ♂.

♀. **UPPERSIDE.** *Fore-wing* with the orange patch devoid of amethystine gloss, externally more broadly bordered with fuscous (which at each veinlet gives off inwards an angular process the extremity of which is continued on as a very narrow edging to each side of the veinlet), but internally much less distinctly so than in the male; with the cell more clouded with dark scales; and with the sulphur-colour at the inner angle more diffused. *Hind-wing* with a marginal row of large subtriangular fuscous spots placed upon the veinlets from the first subcostal to the first median (the two last obsolete), decreasing from the second in the direction of the anal angle, and connected together at the extreme margin of the wing by a narrow edging of the same colour, which extends to the anal angle; with a submarginal series of six roundish spots, similarly decreasing from the first, and alternating with those of the marginal series, each being placed upon a fold, the first and largest on the fold between the costa and the first branch of the subcostal, and the last on that between the first and second median veinlets; and with the sulphur-colour around the four intermediate submarginal spots stained with orange. **UNDERSIDE** of *both wings* paler.

Length of fore-wing 1·7; whence expanse = 3·5 inches.

HAB. South Andaman.

Described from a specimen in the collection of Captain G. F. L. Marshall, R. E., who courteously offered me the loan of the insect for description as soon as he had seen the description of the male published in the last number of this Journal.

In Captain Marshall's specimen of the male the submarginal spots of the fore-wing are obsolete.



XV.—*Notes on and Drawings of the Animals of various Indian Land Mollusca (Pulmonifera).*—By LIEUT.-COL. H. H. GODWIN-AUSTEN, F. R. S., F. Z. S., &c.

(Received July 15th;—Read Nov. 3rd, 1880.)

(With Plates X and XI.)

Previous to his appointment to the Yarkand Mission, Dr. F. Stoliczka had been working for some years at the animals of the Indian land Mollusca, and had enriched this Journal with many valuable papers. Among the numerous MSS. he left behind him in Calcutta, there were found, after his death, some very excellent drawings that had been made under his superintendance from the living animals; they had been drawn on scattered sheets of paper, and remarks on the colour and other characters of the soft parts had been made in pencil on the margins, which were fast becoming illegible. I, therefore, with the concurrence of Dr. J. Anderson, pasted these interesting drawings into a scrap-book\* and copied into it, as well as I was able to decipher them, the names, localities, and remarks noted.

As it may be some years before many of these species are obtained again by any naturalist with the means or talent to correctly draw them, I have thought that lithographed copies published in this Journal would not only be preserving, but in a measure carrying out the work of so good an observer, and would be of use to those in India who are interested in the land-shells of the country. There is an immense amount of work to be done in this particular branch of Natural History. We know as yet very little of the relationship of the many species, especially among the *Zonitidæ* (Semper); the anatomy of most of them has never been examined, and, until this is done, or at least more careful descriptions and sketches of the outward form of the animals are made, our attempts at a satisfactory classification must fail.

I have to each species figured given Stoliczka's remarks and identifications in full, and added a few notes extracted from my field-book wherever I could do so, and I also distinguish a few identifications by Messrs. W. T. Blanford and Geoffrey Nevill.

The plates that will be given contain species of the family *Zonitidæ* variously assigned to the genera *Ariophanta*, *Hemiplecta*,† *Rhysota*, *Xesta*, and *Rotula*; and one plate has been required for the *Helicidæ* of such very different genera as *Plectopylis*, *Fruticicola*, &c.; those of the genus *Macrochlamys*, I have also copied, but as I am engaged on a paper treating of this group more in detail, which I propose to send to the Zoological Society of London, the plate will I hope appear in the Journal of that Society.

\* In the Library of the Indian Museum, Calcutta.

† *Oxytes*.

## Genus ARIOPHANTA, Des Moulins.

Bull. Soc. Bord. III, p. 227, (Nov. 1829).

With plate giving three figures of shell and two of the animal from life; type *lævipes*, Müller, Bombay.

The description by Albers (Die Heliceen, p. 62, 1860) is as follows: "Testa sinistrorsa, umbilicata, tenuis, diaphana; anfractus ultimus angulatus vel carinatus; apertura obliqua, lunaris, peristoma simplex, acutum, margine columellari reflexo"; in the sub-genus, thus defined by shell alone, this writer places the following species:—

|                                                                    |          |
|--------------------------------------------------------------------|----------|
| <i>himalayana</i> , Lea = <i>interrupta</i> , Bs.                  | Bengal.  |
| <i>lævipes</i> , Müll.                                             | Bombay.  |
| <i>retrorsa</i> , Gould ( <i>Hemiplecta</i> , Sect. E of Theobald) | Tavoy.   |
| <i>janus</i> , Chemn.                                              | Malacca. |
| <i>rumphii</i> , v. d. Busch.                                      | Java.    |

Adams adds to these:—

|                                                     |          |
|-----------------------------------------------------|----------|
| <i>ryssolemma</i> , Albers (? <i>Thyreus</i> , Bs.) | Java ?   |
| <i>trifasciata</i> , Chemn, = <i>lævipes</i> , var. | Malabar. |

and he figures *lævipes*, quoting M. E. Gray, Fig. Moll. Anim. pl. 288, fig. 7, which is a trace of Des Moulins' original drawing (l. c.).

Mr. Geoffrey Nevill, in his Hand-List of Shells in the Indian Museum Calcutta, adds to the above:—

|                                                                                   |               |
|-----------------------------------------------------------------------------------|---------------|
| <i>laidlayana</i> , Bs.                                                           | Lower Bengal. |
| <i>kadapaensis</i> , Nevill,                                                      | Madras.       |
| = <i>nicobarica</i> , Chemn. re-named, as it is not found in the Nicobar Islands. |               |
| <i>cysis</i> , Bs.                                                                | Nilgiris.     |
| <i>thyreus</i> , Bs.                                                              | Nilgiris.     |
| <i>intumescens</i> , W. T. Blf.                                                   | Bombay.       |
| <i>immerita</i> , W. T. Blf. (in coll. Beddome)                                   | South Canara. |
| near <i>interrupta</i> .                                                          |               |
| <i>cambojensis</i> , Reeve                                                        | Siam.         |
| <i>regalis</i> , Bs.                                                              | Borneo.       |

= *vittata*, Adams and Reeve, (*vide* Adams. Gen. Moll. pl. lxxix, fig. 5, as *Nanina*).

|                                                        |         |
|--------------------------------------------------------|---------|
| <i>bajadera</i> , Pfr. = <i>ammonia</i> , Valenciennes | Bombay. |
|--------------------------------------------------------|---------|

Mr. William Theobald (Cat. Land and Freshwater Shells of Brit. India) includes—

|                                            |                                   |
|--------------------------------------------|-----------------------------------|
| <i>auris</i> , Pfr. (? <i>cysis</i> , Bs.) | Kundah Hills, Madras.             |
| <i>cyclotrema</i> , Bs.                    | Sumcysar Hills, North of Tirhoot. |

a true *Helix* belonging to the *delibrata*-group.

*foveola* for *foveata*, Pfr.

Java.

Mr. Edgar Smith agrees with me, on a comparison of the species in the British Museum, that this is *rumphi*, Mus. Cuming.

*saccata*, Pfr.

Tavoy.

and this is only the young of *retrorsa*, Mus. Cum.

Dr. C. Semper (Reis. Arch. Philip. p. 50, 1870), on the character of the horn above the tail-gland and foot, places one sinistral species (*rumphi*, v. d. Busch.) and the following dextral shells in the sub-genus:—

*martini*, Pfr.

Sumatra.

*nemorensis*, Müll.

*javanica*, Lamark

Java.

*raregutata*, Mouss. (*Xesta*)

Adenare, near Timor.

*striata*, Gray (*Nanina*)

Singapur.

*atrofusca*, Albers.

Singapur.

It is very unlikely that these last six species from the islands of the Malay Archipelago have any very close relationship to the typical sinistral Bombay species *levipes*, although the tail-gland does assimilate, and it would be better to keep them, as well as all the other species from the same region, separate for the present, as nothing is yet known of the anatomy of the Indian species. Only those purely Indian forms which I distinguish by antique type can be with certainty placed in this sub-genus.

Pfeiffer has also, besides typical forms and others (Zeits. 1855):—

*ammonia*, Valenciennes, (sp. in Brit. Mus.)

Habitat ?

*regalis*, Bs., (I do not consider should be included.)

Borneo.

*sannio*, Pfr.

Habitat ?

*ampullarioides*, Reeve (Mus. Taylor = *cysis*.)

Nilgiris.

*linstedti*, Pfr. (Mus. Cum.)

Malacea.

is closely allied to *rumphi*, but it is sharper keeled, and, if the latter should prove a true *Ariophanta*, it should also be included.

Des Moulins founded his genus on the animal of a specimen which had been sent to him alive from the island of Elephanta, Bombay, by M. Théophile Laterrade in March 1829. The mollusk lived some short time and two drawings of it were made. Previous to this the shell only had been described by Müller.

To M. Des Moulins, therefore, belongs all the credit of first noticing and distinguishing the very distinct and large group of Asiatic Helices possessing a mucous pore at the extremity of the foot, and for which group so characterized he proposed the title PHEREPORÆ, placing the Bombay shell in his sub-genus *Ariophanta*.

Dr. J. E. Gray four years afterwards, on the similar characters of another but very distinct species, created the genus *Nanina*, for Asiatic

Helices of this type, and his genus was adopted by Adams and others, although Thos. Hutton first, and Benson afterwards, had pointed out the distinction in the sub-genus *Macrochlamys*; I do not, therefore, see how in fairness and by all rules of nomenclature Mr. Gray's title can be adopted, as it has been, for the whole group (Indian and Malayan) of these Eastern Helices provided with a mucous pore which Des Moulins described so well and so accurately; the latter saw at once the important differences such an organ implied in the general anatomy of the animal and understood its great value in classification, and he shewed also its affinity in this respect to *Arion* by the title he gave it (*vide*, pp. 230, 235, where he gives in full the description of the animal, his remarks on which are well worthy of perusal).

H. (ARIOPHANTA) *LÆVIPES*, Müll., var. *TRIFASCIATA*, Chemn.

Pl. X, Fig. 3, 3a.

*H. lævipes*, Müller, Hist. Verm. 2, p. 22, no. 222.

„ ——— Gmelin, Syst. Nat. p. 3616, no. 13.

„ ——— Chemnitz, Conch. 9, t. 108, fig. 915, 916.

„ ——— sub-genus, *Helicelle*, 2<sup>me</sup> group Aplostomes, 3<sup>me</sup> Sect. rubannées.

„ ——— Férussac, Hist. Moll. pl. xcii, fig. 3 à 6.

„ ——— Férussac, Tabl. Syst. p. 41, no. 229.

Sub-genus *Ariophanta*, Des Moulins, var. *a.* all white, without bands, from Island of Elephanta; var. *b, c.* banded, from the same locality (only this banded var. *trifasciata* figured in the Conch. Ind. pl. cxxxii, fig. 4.)

The figures are taken from No. 57a and 57b of the MSS. drawings representing specimens from Bombay.

ARIOPHANTA *INTERRUPTA*, Bs., Pl. X, Fig. 1, 1a.

*Helix interrupta*, Bs. Zool. Jour. Vol. V, p. 461, (1834), from Sikrigalli and on the Jellinghy river (tributary of the Ganges).

= *Himalayana*, Lca.

These figures have been reproduced from No. 44 in MSS. in Ind. Mus. Library; the specimens from which the original drawings were made were obtained in the Botanical Gardens, Calcutta.

Benson's description of this last in above Journal applies to *H. lævipes*, but in his description of the animal, he says the excrements are "voided from an opening in the terminal and posterior part of the foot instead of from the *foramen commune*" he must here evidently be mistaking the mucous gland for the anal orifice, although on the previous page (460), describing the genus *Nanina*, he shews that they are distinct openings.

*H.* ——— Conch. Ind. Hanley, fig. 3, plate xxvii. Specimens from Faqirabunda, Jessore District, are thus described in my note-book—"The animal being of a pink colour the same tint is given to the shell, while black mottlings shew through the body whorl. The head is dark-coloured up to a well defined black line (extending from posterior part of the neck to below the oral tentacles), thence light-coloured with a pink tinge, which

is more intense near the extremity of the foot The mucous gland has the form of a long slit with a very small lobe above."

HELIX (ARIOPHANTA) LAIDLAYANA, Bs., Pl. X, Fig. 2.

Ann. Nat. Hist. Ser. 2, Vol. 18, (1856) p. 253.

The figure is a copy of fig. 30 of MSS. drawing of a specimen from Manbhum.

*Helix laidlayana*, Bs. Hanley, Coneh. Ind. Pl. lviii, fig. 3, 4, 5 : figure 4, from Cuttaek would appear to be a different species from fig. 3, Orissa, which agrees with the original description, fig. 5.

H. (ARIOPHANTA) INTUMESCENS, W. T. Blf. Pl. X, Fig. 4.

J. A. S. B. 1866, p. 33, type from Mahableswar, Western Ghats of Hindustan.

The figure is from fig. 17 of MSS. drawings and bears the following remark "*N. Canarica* from Fairbank" [Stoliezka].

Mr. Blanford writing of the animal and comparing it with *bajadera* says—"The animals also shew a difference in colour, that of *intumescens* is uniformly, so far as I have seen, dark cinerous, while that of *bajadera* is much lighter, but very variable. The latter shell is found mostly on shrubs, the former on the ground, and while *intumescens* has as yet only been found at Mahableswar 4,500 feet above the sea, *bajadera* (which is rare at Mahableswar) abounds on the equally or nearly equally high hills of Singhur and Poorundhur, and along the summit of the Western Ghats at about 2000 feet. It abounds at Khandalla at the top of the Bore Ghat."

Genus HEMIPLECTA, Albers.

Die Heliceen, p. 60, (1850).

Founded on the shell alone ; type *humpfreysiana*, Lea, from Singapur.

"Testa supra granulosa vel decussatim striata ; subtus polita, anfractus ultimus plus minusve angulatus vel carinatus."

Albers gives for the distribution of the species of this group the large islands of the Malay Archipelago, Java and the Philippines, New Ireland, &c. ; only one species *labiata* (= *monticola*, Hutton) being from India, and that not agreeing with the description, the last whorl being well rounded. The two characters given would embrace a vast number of species having a much wider geographical range, and I should be inclined to restrict it to the Malay region and not to include any of the Indian forms, until other characters in common can be found after examination of the animals.

To Albers' list, Adams added, it is difficult to say why, several other species, among them *ligulata*, *semirugata*, and *tranquebarica*, shells widely differing in their very globose form from the generic description. Semper does not follow Albers, but places many of the species under

*Rhysota*, on the character of the odontophore; these I have marked with an asterisk.

Albers refers the following species to *Hemiplecta*:—

|                                                                                                                                                                                                                                                   |                          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| * <i>bullæ</i> , Pfr. ( <i>Rhysota</i> , Albers)                                                                                                                                                                                                  | Luzon.                   |
| <i>fulvida</i> , Pfr.                                                                                                                                                                                                                             | Mindanao.                |
| <i>biamensis</i> , Mouss.                                                                                                                                                                                                                         | Java.                    |
| <i>halata</i> , Mouss.                                                                                                                                                                                                                            | Java.                    |
| <i>rufa</i> , Less.                                                                                                                                                                                                                               | New Ireland.             |
| <i>xanthotricha</i> , Pfr.                                                                                                                                                                                                                        | Guimares Is. and Negros. |
| * <i>setigera</i> , Sow.                                                                                                                                                                                                                          | Luzon.                   |
| * <i>gummata</i> , Sow.                                                                                                                                                                                                                           | Luzon.                   |
| <i>thcodori</i> , Phil.                                                                                                                                                                                                                           | Mergui.                  |
| <i>bataviana</i> , v. d. Buseh.                                                                                                                                                                                                                   | Java.                    |
| <i>centralis</i> , Mouss.                                                                                                                                                                                                                         | Java.                    |
| <i>cuvieriana</i> , Lea                                                                                                                                                                                                                           | Luzon.                   |
| <i>novæ-hiberniæ</i> , Quoy.                                                                                                                                                                                                                      | New Ireland.             |
| <i>humphreysiana</i> , Sea                                                                                                                                                                                                                        | Singapur.                |
| — var. <i>gemina</i> , v. d. Busch.                                                                                                                                                                                                               | Java.                    |
| ? <i>labiata</i> , Pfr.                                                                                                                                                                                                                           | Landour.                 |
| <i>semigranosa</i> , Sow.                                                                                                                                                                                                                         | Philippines.             |
| <i>panayensis</i> , Brod.                                                                                                                                                                                                                         | Panay, do.               |
| * <i>semiglobosa</i> , Pfr.                                                                                                                                                                                                                       | Samar, do.               |
| Adams gives some others, three of which are Indian:—                                                                                                                                                                                              |                          |
| <i>blainvilliana</i> , Lea.                                                                                                                                                                                                                       |                          |
| <i>conoidalis</i> , Adams and Reeve                                                                                                                                                                                                               | Mindoro.                 |
| <i>densa</i> , Adams and Reeve                                                                                                                                                                                                                    | Philippines.             |
| ? <i>ligulata</i> , Férus.                                                                                                                                                                                                                        | Bengal.                  |
| <i>limaënsis</i> , Mouss.                                                                                                                                                                                                                         |                          |
| <i>lurida</i> , Gould                                                                                                                                                                                                                             | Feejee.                  |
| <i>rubricata</i> , Gould                                                                                                                                                                                                                          | Feejee.                  |
| <i>rufescens</i> , Gratel.                                                                                                                                                                                                                        | Madagascar?              |
| ? <i>semirugata</i> , Beck.                                                                                                                                                                                                                       | Bengal.                  |
| <i>steursii</i> , Shuttl.                                                                                                                                                                                                                         | Amboina.                 |
| ? <i>tranquebaricha</i> , Fabr.                                                                                                                                                                                                                   | India.                   |
| <i>velutina</i> , Sow. = <i>xanthotricha</i> , Pfr.                                                                                                                                                                                               | Philippines.             |
| Theobald has included a large number of Indian species in this subgenus, with forms so varied he subdivided it into 5 sections; he does not give the characters, but notes the typical species in each ( <i>vide</i> Suppl. Index, Conch. India). |                          |
| Nevill in his Hand-List makes it much more circumscribed and admits                                                                                                                                                                               |                          |
| <i>distineta</i> , Pfr.                                                                                                                                                                                                                           | Saigon.                  |
| <i>neptunus</i> , Pfr.                                                                                                                                                                                                                            | Cambodia.                |

|                                 |              |
|---------------------------------|--------------|
| * <i>cymatium</i> , Bs.         | Penang.      |
| <i>sylvicola</i> , W. Blf. MSS. | Naga Hills.  |
| <i>basileus</i> , Bs.           | Annamullys.  |
| <i>beddomci</i> , Blf.          | Travaneore.  |
| <i>basilсса</i> , Bs.           | Annamullys.  |
| ? <i>undosa</i> , W. Blf.       | Mandalay.    |
| <i>chenui</i> , Pfr.            | Ceylon.      |
| † <i>oxytes</i> , Bs.           | Khasi Hills. |
| † <i>cycloplax</i> , Bs.        | Do.          |
| ? † <i>castor</i> , Theobald    | Do.          |
| ? † <i>pollux</i> , Theobald    | Do.          |
| ? † <i>blanfordi</i> , Theobald | Darjiling.   |
| <i>orobia</i> , Bs.             | Do.          |

## Genus OXYTES, Pfeiffer.

Zeits. 1855, p. 188 [Without description.]

1. *Nanina oxytes*, Bs. (type.)2. *thyreus*, Bs.is a true *Ariophanta*.3. *avus*, Pfr. ?

sinistral and it is difficult to understand on what grounds it is placed here.

4. *pallasiana*, Pfr. ?This sub-genus would be the same as *Hemiplecta* (Sec. D) of Theobald (l. e. p. 22): who places therein:—*basilсса*, Bs.

Travaneore.

this should not be included. I do not recognize any resemblance even in form of the shell.

*blanfordi*, Theob.

Darjiling.

*castor*, Theob.

Khasi.

— var. *a. cherraensis*, W. Blf.

Do.

*cycloplax*, Bs.

Darjiling.

*oxytes*, Bs.

Khasi.

*pollux*, Theob.

Khasi.

HEMIPLECTA OROBIA, Bs., Pl. XI, Figs. 1 and 1a.

No locality given.

HELIX (HEMIPLECTA ?) LIGULATA, Fér., Pl. XI, Fig. 3.

No locality given.

Vide Nevill's Hand-List (1878), p. 50, No. 284, as *Xesta*? his notes on the animal are taken from this drawing. Madras ranging to Bhagulpur and Patna. (H. H. G.-A.)

\* Placed in *Rhysota* by Stoliczka, J. A. S. B. 1878, p. 11.† Sub-genus *Oxytes*, Pfr. (see further on) forms a very recognizable group.

HELIX (OXYTES) OXYTES, Benson, Pl. XI, Fig. 2.

"No projection above the gland which is rather small; sole broadly margined, and with a double line," (W. T. B.) Nevill's Hand-List (1878) p. 47, No. 261.

I would call attention in this drawing to the close contiguity of the base of the eye-tentacles.

HELIX (OXYTES) POLLUX?, Theobald, Pl. XI, Fig. 4.

"Cherra Poonjee from Godwin-Austen" [Stoliczka].

"Animal of a pale light yellowish ochre. Head rather darker, eye pedicels long and rather thick at the base. Extremity of foot and under part of it very pale, short, flat and rounded, the mucous gland has a very small lobe above it.

"I found this shell very abundant on the limestone in the forest below Nongkulang in the West Khasi Hills, and it ranges westward to the Garo Hills following the band of the Nummulitic rocks. The very peculiar thick shape and drooping form of the tentacles is to be noted in the drawing, their bases adjacent as in *H. oxytes*." (H. H. G.-A.)

"A small lobe above the mucous pore; margins of mantle not produced over the edge of the shell, sole of foot narrowly margined." (W. T. B.) Nevill's Hand-List, p. 48, No. 264.

#### EXPLANATION OF THE PLATES.

##### Plate X.

- Fig. 1, 1a. *Helix (Ariophanta) interrupta*, Bs.  
 Fig. 2. ——— ——— *laidlayana*, Bs.  
 Fig. 3. ——— ——— *lavipes*, Müller, var. *trifasciata*.  
 Fig. 4. ——— ——— *intumescens*, W. T. Blf.

##### Plate XI.

- Fig. 1, 1a. *Hemiplecta orobia*, Benson.  
 Fig. 2. *Helix (Oxytes) oxytes*, Benson.  
 Fig. 3. *Helix (Hemiplecta?) ligulata*, Fér.  
 Fig. 4. *Helix (Oxytes) pollux?*, Theob.



Fig. 1.



Fig 1<sup>a</sup>

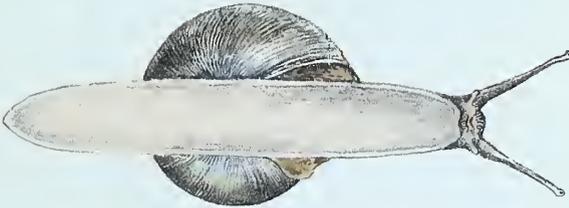


Fig 2.

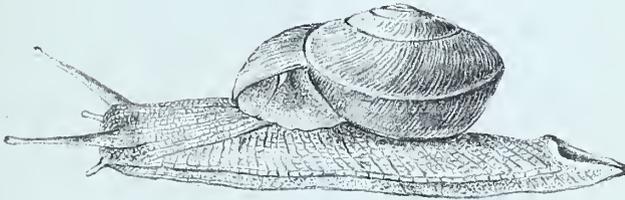
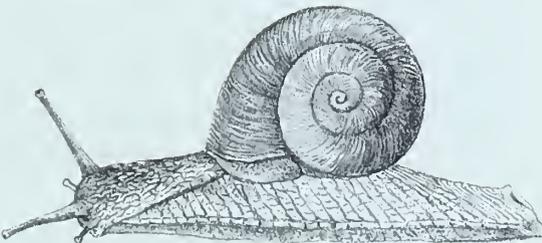


Fig 3.



Fig 4



INDIAN ARIOPHANTA.



Fig. 1.



Fig. 1<sup>a</sup>

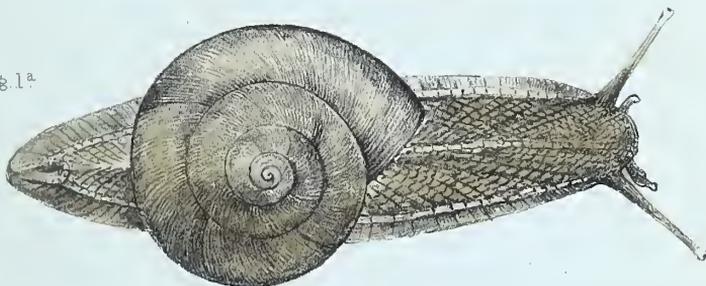


Fig. 2.

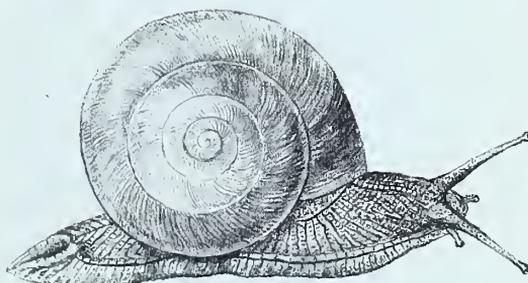
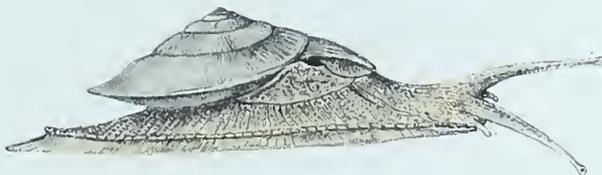


Fig. 3



Fig. 4.



INDIAN HEMIPLECTA.



XVI.—*New Species of Brackish-water Mollusks.*

By GEOFFREY NEVILL, C. M. Z. S.

(Received November 1st;—Read December 1880.)

## Subfamily BYTHINIINÆ, Trosehel [emend.].

Gebiss der Schnecken, I, 1857, as Group "Bythiniæ"; emend. Stimpson, 1865, and Clessin, Malak. Blät. 1880, as subfamily of the Rissoideæ.

## STENOXYRA WOODMASONIANA, n. sp.

*T. parva, imperforata, ovato-acuta, solida, crassa, pallide viridula, polita, nitida, (sub lente) obsolete submalleata; spira aculeiformis, subconca, producta, apice peracutissimo; anfr. 6, haud convexi, ultimus pertumidus, medio subangulatus, basi applanatus, antice ad aperturam abrupte et valide deflectus; apertura percontracta, perfecte rotundata, marginibus continuis, valide incrassatis.*

Long.  $3\frac{1}{2}$ , diam. vix 2 mill.

HAB. Port Canning.

This interesting form is easily recognized by the very acute and concavely-excavated spire, the subangulate last whorl, flattened round the umbilical region; it is not spirally pitted, as in most species of the genus, but appears obsoletely malleated or indented under a powerful lens.

This is one of Mr. Wood-Mason's interesting discoveries from the still imperfectly explored brackish-water Sunderbunds (embouchure of the rivers Hooghly, &c.).

Type Indian Museum, Calcutta; also in coll. Dohrn, Beddome, Theobald, Blanford, and Hungerford.

## STENOXYRA HUNGERFORDIANA, n. sp.

*T. parva, imperforata, ovato-clongata, solidiuscula, viridula, vix nitida, (sub lente) lineis impressis ac dense punctulatis confertim cingulata; spira paululum clongata, ovato-concava, apice obtuso, sutura profunda ac obsoleta marginata; anfr. 4, convexi, ultimus compressus ovuliformis, antice subapplanatus, valde descendens; apertura perpusilla, suboblique rotundato-ovata, superne leviter angulata, sulco profundiori ab anfractu ventrali separata, peristomate obtuso.*

Long.  $2\frac{1}{2}$ , diam.  $1\frac{1}{2}$  mill.

HAB. Andaman Islands.

This is one of the most distinct and interesting species of the genus as yet discovered: the few imperforate whorls, with markedly obtuse apex; the distinct, though minute, close punctulation; the unusually convex whorls, with the remarkable long, compressed, slightly flattened, and egg-shaped last whorl are all good characters. The suture is very distinct and, on the last whorl, distinctly marginate below. The operculum is normal.

Type Indian Museum, Calcutta; also in coll. Dohrn, Warneford, Theobald, Blanford, and Hungerford.

STENOETHYRA BLANFORDIANA, n. sp.

*T. minima, superficie rimata, subventricoso-ovata, vix solidiuscula, nitida, laevis, pallide cornea, subpellucida; spira subacuta, apice minuto, subobtusio; anfr. 4½, convexi, ultimus magnus, subsolutus, tumido-ventricosus, subbiangulatus, antice subapplanatus; apertura subovalis, paululum postice retrorsa, peristomate continuo, superne angulato. Operculum ovale, superne leviter acuminatum, vix crassiusculum, subtranslucidum, spirale, apice subcentrali, interne testaceo-costatum.*

Long.  $3\frac{1}{10}$ , diam.  $2\frac{1}{10}$  mill.

HAB. Chilka-lake (type); also Port Canning and Madras.

I am indebted to Mr. Wood-Mason for a careful examination of the operculum of this small form: "it is oval, subtransparent, spiral, of few whorls, with the apex almost central, on the inner side three ridges, one semicircular and two short ones with a slight S-curve, for the attachment of the animal."

The species is somewhat variable, especially as regards size and the greater or less distinctness of the angulation of the last whorl. Specimens from Port Canning agree better with the above-described typical form than do those from Madras.

I have named this species in honour of its first discoverer, Mr. H. F. Blanford. It appears to be abundant at Port Canning, Chilka Lake, and Town of Madras; living with it there occurs another form, nearer *St. minima*, Sow. (but I think distinct), with more produced spire than *St. blanfordiana*, less tumid last whorl, without any trace of biangulation, with the aperture rounder, and not angled above; there is yet another still smaller decollate form from Port Canning, probably also a distinct species.

Type Indian Museum, Calcutta; also in coll. Hungerford, Theobald, Beddome, Blanford, and Dohrn.

Subfamily HYDROBIINÆ, *Troschel* [emend.].

Gebiss der Schnecken, I, 1857, as Group "Hydrobiae"; emend. Stimpson, 1865.

## HYDROBIA (BELGRANDIA) MILIACEA, n. sp.

*T. minuta*, vix rimata, conico-elongatula, solida, parum nitida, albido-viridula, lævigata; spira paululum producta, apice minuto, acutiusculo; anfr. 5, convexiusculi, ultimis duobus rapide accrescentibus, ultimo basi subplanulato, ad aperturam gibbositate erassa circumscripto; apertura ovato-rotundata, intus inerassata, peristoma continuum, valide inerassatum, margine externo areuato, basi sinuato, margine columellari subangulatim contorto, subreflexo. Operculum sat profunde immersum, tenue, pellucidum, vitreum.

Long. vix  $2\frac{3}{4}$ , diam.  $1\frac{3}{4}$  mill.

HAB. Port Canning.

Var. *minor*; long. 2, diam.  $1\frac{1}{4}$  mill.

HAB. Port Canning.

Found in great abundance in brackish-water ponds, associated with *Valvata* (?) *microscopica*, Nev., new species of *Bythinia*, *Martesia*, *Teredo* (?), *Pharella*, *Theora*, *Stenothyra blanfordiana*, &c. From the last-named, the remarkable callosity behind the outer lip, besides many other characters above reorded, at once distinguishes it.

This interesting shell is the first extra European species described of the genus (?) *Belgrandia*, Bourg.

Type Indian Museum, Calcutta; also in coll. Beddome, Theobald, Hungerford, Joly, Dohrn, and Blandford.

## Subfamily ASSIMINEINÆ, [emend.].

Group Lithoglyphi, Tröschel, Gebiss der Schnecken, I, 1857 [pars].

Fam. Assiminidae, H. and A. Adams, Genera Moll. 1858.

Fam. Assimineidae, Clessin, 1880.

Section of sub-fam. Pomatiopsinae, Stoliezka, Gast. I, 1868.

## ASSIMINEA SINENSIS, n. sp.

*T. imperforata*, ovato-conica, solidula, nitida, subglabra, castanco-fusca, linea impressa infra suturam subobsolete notata; spira producta, conica, apice subacuto; anfr.  $7\frac{1}{2}$ , subplaniusculi, ultimus compressus, vix convexiusculus, carina nulla munitus; apertura parva, subverticalis, marginibus callo subobsolete junctis, margine externo tenui, margine columellari areuato, inerassato, saturate castanco-fuseo, inferne subangulato.

Long. 5, diam. 3 mill.

HAB. Hongkong.

I am indebted for this, as for many other novelties, to Surgeon-Major R. Hungerford.

Type Indian Museum, Calcutta; also in coll. Hungerford.

ASSIMINEA PEASEANA, H. Nevill, MSS.

*T. peranguste perforata, ovato-conica, notabiliter tenuis, glabra, nitida, vivide straminea, ad suturam fascia livida (plus minusve subobsolete) marginata; spira convexo-conica, producta, apice acuto; anfr. 7, convexiusculi, ultimus rotundatus, inferne convexus, circa perforationem haud carinatus; peristoma perregulariter rotundatum, ad basin haud angulatum; margo columellaris late dilatatus, subduplex, castaneo vivide tinctus; apertura subrotundata, marginibus callo subobsolete castaneo junctis.*

Long.  $5\frac{3}{4}$ , diam.  $3\frac{1}{2}$  mil.

HAB. Lake Negombo, Ceylon.

Named in manuscript by my brother, in honour of the late Harper Pease of Honolulu; it is a very distinct species, easily distinguished from *Ass. subconica*, *Ass. marginata*, &c., by its thin texture, peculiar coloration, absence of any trace of sculpture, rounded margins of the aperture, &c. Specimens of rather larger size than that of which the measurements are above recorded occasionally occur.

Type Indian Museum, Calcutta; also in coll. H. Nevill and H. Dohrn.

ASSIMINEA BIFASCIATA, n. sp.

*T. imperforata, ovato-conica, solida, vix glabriuscula, subnitida, sordide viridula, fasciis binis fuscis et subobsoletis cincta; spira moderate producta, convexo-conica, apice subacuto; anfr.  $6\frac{1}{2}$ , convexiusculi, ultimus tumide ventricosus, ad peripheriam subangulatus; apertura ampla, subverticalis, marginibus callo pervalido fusco-limbato junctis, margine columellari fere recto, valide incrassato, sordide fusco, inferne subrotundato.*

Long.  $5\frac{1}{2}$ , diam.  $3\frac{1}{2}$  mill.

HAB. Brackish-water lagoon, Port Natal.

A common species, quite distinct from the three forms described by Krauss.

Type Indian Museum, Calcutta.

ASSIMINEA DOHRNIANA, n. sp.

*T. parva, solidiuscula, ovata, fusco-viridescens, anguste umbilicata, lacvigata, sutura lineari, haud marginata; spira curta, apice perobtusio; anfr. 4, rotundato-convexi ac tumidi, ultimus inflatus, subtus convexus, basi prope regionem umbilicalem subexcavate depressus; apertura subverticalis, ovato-pyriformis, dimidiam totius longitudinis aequans, intus pallide*

*viridescens*; *margo columellaris superne valide intortus, reflexus, inconspicue fulvo tinctus, inferne vix rotundatus.*

Long. 3, diam.  $2\frac{1}{2}$  mill.

HAB. Hongkong.

The short spire, with obtuse apex, the depression of the last whorl round the narrow umbilicus, the bent columella, and the thick somewhat eroded texture, of a greenish colour unusual in the genus, are the best characteristics of this small species, for which I am indebted to my friend Surgeon-Major R. Hungerford; I have named it after my esteemed correspondent Dr. Henry Dohrn of Stettin.

Type Indian Museum, Calcutta; also in coll. Dohrn and Hungerford.

ASSIMINEA WOODMASONIANA, n. sp.

*T. imperforata (vel ad regionem umbilicalem minutissime perforata), carina parva ac subobsoleta circumscripta, lanceolata, conica, solidiuscula, nitida, subglabra, dilicte castanea, prope suturam pallide rubido fasciata ac linea impressa marginata; spira conico-elongata, anfractum ultimum fere aequans, apice perminuto, acutissimo; anfr.  $7\frac{1}{2}$ , vix convexiusculi, regulariter crescentes, ultimus subcompressus, obscure subangulatus; apertura parva, subverticalis, ovata, marginibus callo tenui junctis, margine columellari pallide castaneo, paululum incrassato, subrecto, inferne subangulato.*

Long. 4, diam.  $2\frac{1}{2}$  mill.

HAB. Port Canning, near Calcutta.

I have named this pretty and very distinct species after my friend Mr. J. Wood-Mason, to whose very successful researches in the Sunderbunds the Museum is indebted for so many interesting mollusks, as I have already pointed out in my Catalogue, Fasc. E. p. 22, when describing the operculum of *Larina burmana*. The small, almost obsolete, keel round the very minute perforation (which is sometimes completely covered) is very characteristic.

Mr. Wood-Mason has favoured me with the following extract from his note-book on the animal of this species—"Eyes large, intensely black, situated on the upper side and near the extremity of the peduncle; animal transparent, above very slightly greyish, between the tentacles reddish, which are so transparent that the eye-spots can be seen very nearly as well from the under side."

Type Indian Museum, Calcutta; also in coll. Beddome, Hungerford, Blanford, Dohrn, Theobald, and Joly.

ASSIMINEA BEDDOMEANA, n. sp.

*T. depresso-turbinata, quoad formam species generis Colloniæ quodammodo memorans, peculiariter obscure sed profunde umbilicata, de-*

*presso-conoidea, solida, crassiuscula, nitida, subglabra, ad basim (sub lente) striis incrementi subobsoletis munita, saturatissime fulvo-livida, infra suturam albo fasciata, fascia prope aperturam plus minusve evanescente; sutura vix distincta, linea obscure impressa et subobsoleta notata; spira obtuse depresso-conoidea, apice minutissimo; anfr. 5, ultimus subtus perglobose ventricosus, ad peripheriam obsolete subsubangulatus, infra subplanulatus, circa umbilicum callo lato pallide fusco et obscure albo-limbato munitus; apertura ampla, subrotundata, intus incrassata, marginibus callo albido prope aperturam valido ac distincto (interdum subobsoleto) junctis; columella pernotabiliter et valide incrassata, inferne abrupte retrorsa, triangulari-linguiformis, applanata ac excavate rugosa, superne in umbilicum abrupte desinens. Operculum tenue ac corneum; anfr. 3 (sub lente vix distinguendi) in umbonem subcentralem ac prominentem desinentes.*

Alt. 3, diam.  $3\frac{1}{5}$  mill.

HAB. Port Canning.

The most remarkable and abnormal species of the genus as yet described. The animal is that of a typical *Assimineæ*, both the late Dr. Stoliczka and myself having examined numerous specimens. The Museum is indebted for its extensive series of this and the following species to Mr. Wood-Mason.

Type Indian Museum, Calcutta; also in coll. Dohrn, Hungerford, Blanford, Theobald, Joly, and Beddome.

#### ASSIMINEA THEOBALDIANA, n. sp.

*T. parva, anguste umbilicata, ovato-conica, solidiuscula, vix nitida, corneo-fulvida, sub lente spiraliter minutissime confertimque sulcata, striis incrementi plus minusve obsolete decussata; spira conica, vix producta, apice acuto; anfr.  $6\frac{1}{2}$ , convexi, supremi sublaeves, cæteri infra suturam distincte angulati, superne sublaeves, inferne spiraliter confertimque sulcati, oblique subgranulati decussati, ultimus globose subrotundatus, in medio striis decussantibus plus minusve subobsoletis, prope umbilicum distinctioribus, notatus; apertura sat ampla, subverticalis, marginibus callo nitido junctis, margine columellari supra leviter contorto, infra rotundato.*

Long.  $4\frac{1}{3}$ , diam. 3 mill.

HAB. Port Canning.

In old specimens, the last two or three whorls have a pitted appearance, as in many species of *Stenothyra*; in younger ones, the two antepenultimate whorls have a beautiful granulose appearance under the lens. The oblique and decussating striae are always obsolete on the last whorl,

except near the umbilicus and in the interstices of the spiral sulcations; the narrow smooth ledge below the suture, on the last two or three whorls, formed by an abrupt cessation of the sculpture, is very peculiar and characteristic. I need scarcely say that I have named this remarkable species after my friend Mr. William Theobald of the Geological Survey of India.

Type Indian Museum, Calcutta; also in coll. Theobald, Hungerford, Beddome, Blanford, Dohrn, and Joly.

ASSIMINEA MICROSCULPTA, n. sp.

*T. parva, vix perforata, cylindrico-conica, solidiuscula, vix nitida, fulvo-cinerea, spiraliter distincte sulcata, striis longitudinalibus obliquis ac flexuosis decussata, apice acuto; anfr. 5½, gradato-cylindrici, supremi laeves, 2das spiraliter sulcatus, 3tuus et 4tus insigne equaliterque decussati (quasi gemmulati), ultimus subbiangulatus, supra peripheriam angulatus, striis decussantibus paululum subobsoletis notatus, sculptura infra evanescente; apertura subverticalis, parva, marginibus callo indistincto junctis, margine columellari haud contorto, leviter rotundato.*

Long.  $2\frac{3}{4}$ , diam.  $1\frac{3}{4}$  mill.

HAB. Port Canning.

Type Indian Museum, Calcutta; also in coll. Dohrn, Joly, Hungerford, Theobald, Blanford, and Beddome.

It presents some resemblance to the preceding species in the sculpture, which in *Ass. microsculpta*, however, is much more strongly developed, the difference in young specimens being especially marked. The shape is quite different, the whorls being cylindrically-gradated, instead of convexly-swollen, &c.

ASSIMINEA HUNGERFORDIANA, n. sp.

*T. imperforata, ovato-conica, solida, nitida, glabra, polita, omnino laete castanea, sutura subindistincta; spira brevis, apice vix acuto; anfr. 6, subtumide convexiusculi, ultimus magnus, regulariter ovuliformis, infra suturam linea impressa subobsoleta notatus; apertura verticalis, marginibus callo castaneo junctis, margine externo tenui, margine columellari incrassato, recto, paululum retrorso, ad basim subabrupte angulato.*

Long. 4, diam.  $2\frac{1}{2}$  mill.

HAB. Mouth of the Rangoon River.

I have much pleasure in naming this beautiful and very distinct species after its discoverer, Surgeon-Major R. Hungerford, who has lately been most successful in collecting and dredging Mollusca both at Hongkong and the Philippine Islands. The rich chocolate, or chesnut, colour of the

species is very characteristic; there is a slight tendency on the upper portions of the whorls to be of a darker and duller shade; the indistinct suture, short but produced spire, large and regularly egg-shaped last whorl, straight and slightly twisted columella, forming an angle at its base, are all well-marked characters. Under a very powerful lens, striæ of growth are discernible, which become more developed behind the outer lip.

Type Indian Museum, Calcutta; also in coll. Hungerford.

ASSIMINEA TEMPLEANA, n. sp.

*T. imperforata, ovato-conica, persolida, crassa, nitida, laevis, fusco-cornea, sutura distincta, haud marginata; spira conica breviter producta, apice acuto; anfr. 5½, convexiusculi, rapide crescentes, ultimus magnus, tumide ventricosus, ad peripheriam subangulatus, basi subapplanatus; apertura sat magna, marginibus callo acuto valido et albo junctis, margine externo regulariter convexo-rotundato, columellari subrotundato, duplici ac valide reflexo, regionem umbilicalem tegente, supra distincte transversimque unisulcato.*

Long.  $3\frac{3}{4}$ , diam.  $2\frac{1}{2}$  mill.

HAB. Nicobar Islands.

I have named this interesting small species after Lieutenant R. C. Temple, who has presented the Museum with many valuable shells from the Andamans, Ferozepore, and other places. It is eminently characterized by the remarkable callously-reflected, duplex columella, transversely notched or sulcated above.

XVII.—*On some Experiments instituted to supply all the Lines terminating at the Calcutta Telegraph Office with Currents tapped from the Main-Current produced by a Dynamo-electric Machine.\**

—By LOUIS SCHWENDLER, M. Inst. C. E.

*Introduction.*—On the 5th November 1879, I had the honour to read a short paper before this Society entitled,† “On a simple Method of using an insignificant Fraction of the Main-Current produced by a Dynamo-Electric Machine for Telegraphic Purposes.”

In the present paper, I wish to record some more experiments on the same subject. As stated in my former paper, the dynamo-electric machine, during this first experiment, was placed at the store-yard, and was driven by the steam engine of that place. The telegraph current was conveyed to the Calcutta Telegraph Office by the store-yard line, which is about 4 miles in length. This first trial proved so successful that I ventured to propose a larger trial to supply *all* the lines entering the Calcutta Telegraph Office with signalling currents derived in this manner. But I could not then execute the new trial, as in the first place there were no proper driving arrangements at the store-yard (the erection of these would have cost money), and in the second place the dynamo-electric machine at my disposal had, by an accident, been temporarily spoiled. It was thought advisable, therefore, to postpone the suggested trial on a larger scale until the electric light arrangements at Howrah‡ should be completed, when an easy opportunity would offer itself for trying different dynamo-electric machines for the purpose. Besides, telegraph lines being already up between the Howrah Railway Station and the Calcutta Telegraph Office, no additional expense would need to be incurred.

*New trial on a larger scale.*—The preliminary trial was instituted on the 28th August, the final one on Sunday the 29th August 1880.

In the accompanying diagram, *M* is the dynamo-electric machine which produces the main current to be made use of for any required purpose; the negative pole of the dynamo-electric machine is connected

\* The results given in this paper are taken from my report submitted to the Director General of Telegraphs in India on the 7th September 1880.

† J. A. S. B., Vol. xlix, part ii, 1880, and Phil. Mag. Ne. 52, Suppl., December 1879.

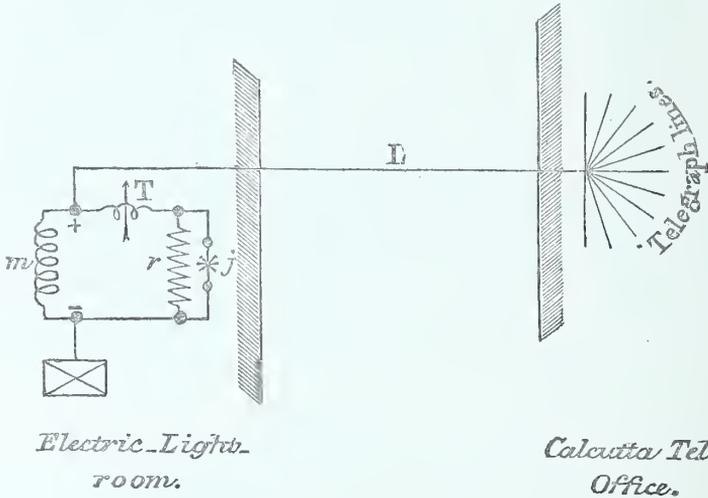
‡ Mr. Bradferd Leslie, Agent of the East Indian Railway Company, gave me permission to use the electric light arrangements at Howrah for the purpose. He also kindly permitted the use of the telegraph line connecting his office at Calcutta with the Railway Station at Howrah. This line was required to give orders during the experiment.

permanently to earth. The earth consists of 3 copper plates\* joined parallel and offering a parallel resistance of 1.67 ohms.†

$T$  is a tangent galvanometer for measuring the main current. In this case it was the tangent galvanometer employed in my electric light experiments in London in 1878. The resistance of the copper ring of this instrument is *nil*. Taking the late Mr. Brough's value for  $H$ , the horizontal component of the Earth's magnetic intensity at Calcutta to be  $H = 0.37158$  dynes, the formula for calculating the currents  $c$  from the deflections observed by this tangent galvanometer, is:—

$$c = 47330 \text{ tang } a \text{ (milli-oersted).}$$

$r$  is a coil of iron wire (No. 24 i. w. g., 0.21" diameter) offering a resistance of 1.517 ohms at 85° F. The wire is coiled on a large wooden drum and serves as the constant resistance by which from time to time the efficiency of the dynamo-electric machines at Howrah can be gauged.



$J$  represents an electric light, in this case produced by a large Serrin-lamp.

In the following experiments, either  $r$  or  $J$  was used as the external resistance for closing the poles of the dynamo-electric machine to produce the *main* current; but *never* the *two* joined parallel.

$L$  is the telegraph line from the dynamo-electric machine to the Calcutta Telegraph Office. This line is 1.75 miles in length and consists, from the electric light room to the Howrah Railway Station, of Hooper's india-rubber cable core, from the Howrah Station to the Kirk, of No. 6

\* The three single earths measured gave : 7.7, 3.1, and 6.9 B. A. U.

† The dimensions are 4' × 2' and  $\frac{1}{16}$ ".

i. w. g., and thence to the Calcutta Telegraph Office it is American compound wire of the same resistance as iron wire of No. 27 i. w. g.

At the Calcutta Telegraph Office, the *battery wire*\* could at a moment's notice be connected with the key of each instrument, after throwing off the copper of the signalling battery in ordinary use. The telegraph lines terminating at the Calcutta Office were therefore all connected *parallel* to the battery wire, as is indicated in the foregoing diagram.

In order to enable me to directly compare the signalling current sent into the lines by batteries and by a dynamo-electric machine, each line is as tested for *sent current* at Calcutta, and for *received current* at the out-station.

*Preliminary trial on 28th August 1880.*—The line used for tapping the signalling current was No. 5, Calcutta to Allahabad, 577 miles in length, worked *direct* and having a real conduction resistance of about 3075 ohms. (taken from the August 1880 tests). The resistance of the relay at Allahabad equals 492 ohms.

*1st Experiment.*—This consisted in taking the *sent current* at Calcutta and the *received current* at Allahabad as produced by a battery of 60 minotti-cells connected up in series. This is the usual signalling battery during the monsoon.

*2nd Experiment.*—The main current in this experiment was produced by dynamo-electric machine A† through the resistance  $r$ . The resistance in circuit was not measured, but may be taken to be as follows:—

$$\begin{array}{rcl}
 m = 0.652 & \left. \vphantom{m} \right\} & \text{internal.} \\
 r = 1.517 & \left. \vphantom{r} \right\} & \text{ohms at } 85^{\circ} \text{ F.} \\
 \text{Leading wire to tangent galv. } l = 0.026 & \left. \vphantom{l} \right\} & \text{external.} \\
 & & \left. \vphantom{m} \right\} = 1.543 \\
 \hline
 \text{Total,} & & 2.195 \text{ ohms.}
 \end{array}$$

The main current gave a mean deflection of  $37.9^{\circ}$ ;  $\frac{\text{max.}}{\text{min.}} = \frac{39}{36.2}$ ; mean speed of engine 60.3 revolutions per minute;  $\frac{\text{max.}}{\text{min.}} = \frac{62}{58.5}$ . The variation of the current corresponds with the variation of the speed.

*3rd Experiment.*—The main current in this experiment was produced by dynamo-electric machine E.‡ through the resistance  $r$ . This experi-

\* The Telegraph line conveying the current produced by the dynamo-electric machine to the Telegraph Office may be called most appropriately the *battery wire*.

† This is a Siemens' dynamo-electric machine called *medium size* (see my *précis* of report on the electric light experiments in London).

‡ This is a Siemens' medium machine altered according to my specification (See *précis* of report on the electric light experiments in London).

ment was made in order to see whether A or E machine would suit the circumstances best.

The resistance in circuit was not measured, but may be taken to be the same as given for A. The main current gave a mean deflection of  $30.6^\circ$ ;  $\frac{\text{max.}}{\text{min.}} = \frac{33.7}{27.0}$ ; mean speed of engine = 59.9 revolutions per minute;  $\frac{\text{max.}}{\text{min.}} = \frac{66}{54}$ . The variation of the current corresponds with that of the speed.

The results of the preliminary trial are given in the following table:—

| No. of Experiment. | Mode of producing the current. | Speed of engine per minute. |                                   | Mean speed per minute of dynamo-electric machine. | Mean of main current in millioersteds. | Current in millioersteds. |                       |
|--------------------|--------------------------------|-----------------------------|-----------------------------------|---------------------------------------------------|----------------------------------------|---------------------------|-----------------------|
|                    |                                | Mean.                       | $\frac{\text{Max.}}{\text{Min.}}$ |                                                   |                                        | Sent at Calcutta.         | Received at Allahabad |
| 1                  | 60 Minotti                     | ...                         | ...                               | ...                                               | 9.8                                    | 9.8                       | 5.1                   |
| 2                  | Dyn. el. machine A.            | 60.37*                      | $\frac{62^1}{58.5^1}$             | 783                                               | 36,846                                 | 14.5                      | 7.7                   |
| 3                  | Dyn. el. machine E.            | 59.9 <sup>6</sup>           | $\frac{66^1}{54^1}$               | 641                                               | 27,991                                 | 9.4                       | 6.6                   |

The three experiments were made in the order given. Nos. 2 and 3 were made from 11 to 11.44 hours, during which time messages were sent. The insulation of the battery wire L was variable from 71,000 to 95,000 ohms absolute.

From Experiments 2 and 3, it will be seen that A machine produces a larger main current than E, which is due to the higher speed of A; further, that the *sent current* tapped from the main current of A is larger than the *sent current* tapped from that of E, just as it ought to be. In fact, if the line during the two experiments had kept constant, and if also  $r$  had kept constant ( $r$  increases considerably by heating), the proportion of the two *main currents* would have been the same as that of the two *sent currents*, and this is very nearly the case.† No. 3 Experiment with E machine gives about the same result as No. 1 Experiment with battery. To produce the

\* The small numbers in the form of exponents mean the number of observations made.

$$\dagger \frac{A}{E} \text{ main currents} = 1.32.$$

$$\frac{A}{E} \text{ sent currents} = 1.55.$$

main current by A is therefore more advantageous than to produce it by E. Hence I employed A in the final trial.

*The final trial on Sunday 29th August 1880.*—The battery wire, before the trial began, was tested for insulation, and gave an absolute insulation greater than 1  $\Omega$  ohm. The main current, as already mentioned, was produced by dynamo-electric machine A; *i. e.*, from 8.45 to 11.5 hours through the wire coil of resistance  $r$ , and from 11.5 to 11.32 hours through the arc of an electric lamp producing the light J. The light of the lamp was not measured, but may have been equal to about 6,000 standard candles.\* The first line was connected to the battery wire at 8.45 hours; the last line at 10.53 hours. The whole trial was completed at 11.32 hours.

The change from  $r$  to lamp (J) was made in so short a time that none of the out-stations noticed it. Messages were sent and received in the usual regular style.

Mr. C. B. P. Gordon, the Superintendent of the Bengal Division, attended at the Signal Office.

At the beginning of the experiments, the resistances in circuit were measured.

$$\begin{array}{l}
 \text{Internal resistance of dynamo-electric} \\
 \text{machine A} \\
 \text{Wire coil} \\
 \text{Leading wire to tangent galvanometer}
 \end{array}
 \left. \begin{array}{l}
 m = 0.652 \text{ internal} \\
 r = 1.517 \\
 l = 0.026
 \end{array} \right\} 1.543 \text{ external} \left. \vphantom{\begin{array}{l} m \\ r \\ l \end{array}} \right\} \text{ohms at } 85^\circ \text{ F.}$$

After the experiments were over, these resistances were not measured again; however, on account of the very considerable heating by the strong main current, they must, we know, *all* have increased considerably.

When  $r$  closed the poles of the dynamo-electric machine (8.45 to 11.5 hours) the mean speed of the engine was 60<sup>13</sup> revolutions per minute;  $\frac{\text{max.}}{\text{min.}} = \frac{64'}{56'}$ ; while the mean deflection of the main-current was 37.87<sup>68</sup>;  $\frac{\text{max.}}{\text{min.}} = \frac{40.25^1}{35.0^1}$ .

When the lamp was in circuit (from 11.5 to 11.32 hours), the mean speed of the engine was again 60<sup>13</sup>;  $\frac{\text{max.}}{\text{min.}} = \frac{61}{59}$ ; while the mean deflection of the main-current was 44<sup>17</sup>,  $\frac{\text{max.}}{\text{min.}} = \frac{46^2}{42^1}$ .

In the following table all the results are given:—

\* When measured under 45° with the horizon.

Table shewing the Sent and Received Currents and other particulars.

| 1                  | 2                                            | 3                                              | 4                                                    | 5                           |                 | 7                               | 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------|----------------------------------------------|------------------------------------------------|------------------------------------------------------|-----------------------------|-----------------|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    |                                              |                                                |                                                      | Currents in millioerstedts. |                 |                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| No. of Experiment. | Number and name of line and length in miles. | Real conduction resistance of line in b. a. u. | Resistance of Relay at receiving station in b. a. u. | Sent at                     | Received        | Mode of producing the currents. | Remarks.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                    |                                              |                                                |                                                      | Calcutta.                   | at out-station. |                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| I                  | No. 1<br>Jubbulpore<br>738                   | 4,412                                          | 905                                                  | 6·18                        | 4·00            | 100 cells                       | The several lines were connected to the battery wire in the order given in this table. The first line, Jubbulpore No. 1, was connected at 8·45 hours; the last line No. 3, Agra, at 10·53 hours. Before the actual experiments began, <i>i. e.</i> , before 8·45 hours, all the lines were tested for <i>sent currents</i> at Calcutta, and <i>received currents</i> at the out-stations, when the usual signalling battery was on. Directly after each line had been connected to the battery wire of the dynamo - electric machine, the <i>sent currents</i> at Calcutta and the <i>received currents</i> at outstations were taken. |
|                    |                                              |                                                |                                                      | 9·81                        | 7·60            | Dyn.-el. m. A                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                    |                                              |                                                |                                                      | 5·89                        | 4·45            | 100 cells                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| II                 | No. 4<br>Jubbulpore<br>803                   | 5,795                                          | 406                                                  | 7·07                        | 3·60            | 60 cells                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                    |                                              |                                                |                                                      | 10·23                       | 4·71            | Dyn.-cl. m. A                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                    |                                              |                                                |                                                      | 7·41                        | 3·50            | 60 cells                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| III                | No. 5<br>Allahabad<br>577                    | 3,075                                          | 492                                                  | 9·81                        | 6·50            | 60 cells                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                    |                                              |                                                |                                                      | 13·79                       | 8·57            | Dyn.-el. m. A                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                    |                                              |                                                |                                                      | 9·41                        | 5·08            | 60 cells                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| IV                 | No. 6<br>Sahibgunge<br>225                   | 2,000                                          | 506                                                  | 7·14                        | 4·09            | 20 cells                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                    |                                              |                                                |                                                      | 21·65                       | 11·40           | Dyn.-cl. m. A                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                    |                                              |                                                |                                                      | 6·63                        | 4·23            | 20 cells                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| V                  | No. 7<br>Cuttack<br>400                      | 2,800                                          | 953                                                  | 6·63                        | 3·00            | 35 cells                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                    |                                              |                                                |                                                      | 11·00                       | 6·00            | Dyn.-el. m. A                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                    |                                              |                                                |                                                      | 6·63                        | 3·38            | 35 cells                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| VI                 | No. 8<br>Coconada<br>800                     | 7,000                                          | 3,711                                                | 4·00                        | 3·60            | 119 cells                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                    |                                              |                                                |                                                      | 8·15                        | 7·20            | Dyn.-el. m. A                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                    |                                              |                                                |                                                      | 4·00                        | 2·01            | 119 cells                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| VII                | No. 9<br>Akyab<br>560                        | 3,460                                          | 3,470                                                | 7·69                        | 4·00            | 120 cells                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                    |                                              |                                                |                                                      | 6·77                        | 3·90            | Dyn.-el. m. A                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                    |                                              |                                                |                                                      | 6·18                        | 5·35            | 120 cells                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| VIII               | No. 11<br>Dhubri                             | ...                                            | 1,427                                                | 6·40                        | 5·00            | 40 cells                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                    |                                              |                                                |                                                      | 11·78                       | 11·45           | Dyn.-el. m. A                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                    |                                              |                                                |                                                      | 6·42                        | 5·73            | 40 cells                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| IX                 | No. 10<br>Akyab<br>561                       | 4,400                                          | ...                                                  | 15·39                       | 3·10            | 80 cells                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                    |                                              |                                                |                                                      | 15·39                       | 3·90            | Dyn.-cl. m. A                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                    |                                              |                                                |                                                      | 17·43                       | 3·30            | 80 cells                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| X                  | No. 2<br>Agra<br>915                         | 6,700                                          | 829                                                  | 15·39                       | 6·40            | 195 cells                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                    |                                              |                                                |                                                      | 7·14                        | 3·90            | Dyn.-cl. m. A                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                    |                                              |                                                |                                                      | 14·52                       | 6·15            | 195 cells                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| XI                 | No. 3<br>Agra<br>850                         | 5,800                                          | 1,959                                                | 13·54                       | 3·25            | 100 cells                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                    |                                              |                                                |                                                      | 13·38                       | 3·10            | Dyn.-cl. m. A                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                    |                                              |                                                |                                                      | 9·41                        | 4·14            | 100 cells.                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

After the dynamo-current was stopped at 11:32 hours, and the batteries had been connected up again, the *sent currents* at Calcutta and the *received currents* at outstations were again ascertained. Hence columns 5 and 6 contain 3 readings of *sent* and *received currents* for each line; first, with battery, secondly, with the dynamo-electric machine, and, thirdly, with the battery again. All the readings of the currents tapped from the main current of the dynamo-electric machine were taken between 8:45 and 10:53 hours, when the iron wire coil of resistance  $r$  was connected to the poles of the dynamo-electric machine. From 11:5 to 11:32 hours, when the lamp was substituted for  $r$ , no current readings at Calcutta and the outstations were taken.

The main current of the dynamo-electric machine, when  $r$  was in circuit, was 36,801 m. ö; when the lamp was in circuit, 45,706 m. ö.\* From this it does not follow, however, that the tapped currents in the second case were larger than in the first, because it would also depend on the resistance offered by the arc, which is not known. The resistance of the arc, as more current was produced with the same speed of the dynamo-electric machine, must naturally have been smaller than  $r = 1.517$  b. a. u. (iron wire coil), especially as there is an e. m. f. in the arc opposite to the e. m. f. of the dynamo-electric machine.

To produce 36,801 milli-oersteds through an external resistance of about 1.543 b. a. u., a total energy is consumed by the dynamo-electric machine of about 27,000  $\Omega$  ergs per second (representing about 3 h. p. per second).

*Conclusions.*—These experiments shew that it is perfectly possible and practicable to tap from the main current produced by a dynamo-electric machine *all* the signalling currents required at the Calcutta Telegraph Office. These currents were for the 11 lines connected up = 129.1 m. ö, if all keys were simultaneously and permanently sending. This represents only 0.35 % of the main current (36,801 m. ö) with  $r$  in circuit, and .28 % of the main current (45,706 m. ö) with lamp in circuit. Further it will be clear that such a small variation of the main-current could not influence the regularity of any work done by that main-current.

Further, it will be seen that in all the experiments the sent currents tapped from the main current of the dynamo-electric machine were considerably larger than when produced by the large batteries at present in use. Experiments IX and X only form an exception. However, I think these exceptions are in both cases due to errors of observation, because the battery readings in Experiment IX do not all agree. The dynamo-current readings in No. X must be wrong, because in No. XI, for a total circuit resistance of 7759 units, the sent current is 13.38 m. ö,

\* Calcutta by the formula:  $e = 47330$  to (m. ö").

while in No. X, for a total circuit resistance of 65·29, the sent current is only 7·14. The error of observation is therefore obvious.

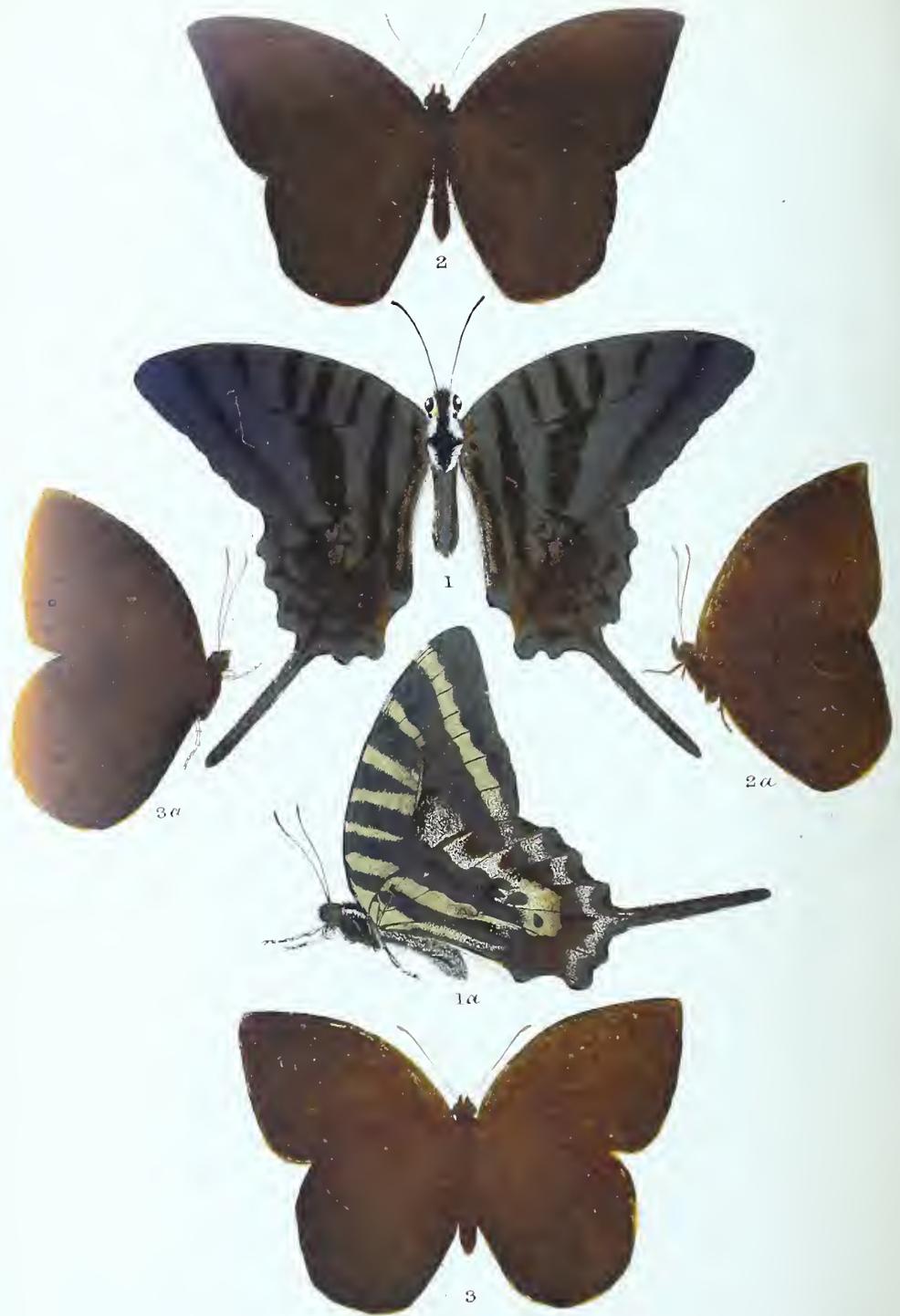
That with such strong received currents as are produced when the dynamo-electric machine is used, the lines should work well, is not to be wondered at. But it was also confirmed by the outstations having to adjust their relays much more unsensitively.

Supposing now that we had useful work *day* and *night* for the strong main current, and that on the whole the new method could be always depended upon, I believe these experiments have proved that the signalling currents required in telegraph stations could be had for *nothing*, and that the method would be quite practicable.

The useful work for the main current at night would most conveniently take the shape of an electric light to illuminate very efficiently the Signal Office. The electric light, besides being more powerful, would possess the additional advantage of being produced by at least 50 times less heat than if the same light were obtained by combustion. This is no doubt a great advantage in a hot climate. During the daytime, I would use the main current for pulling punkhas, lifting messages, or, more generally, for working a pneumatic system of sending and receiving messages, &c., &c. If Calcutta had the good fortune to possess a colder climate, it might be suggested that the heat developed in the coil of wire should be used for warming rooms. It would then only be necessary to lead the wire along the walls, in a manner similar to that in which hot water pipes often are for heating rooms; the electric method being only far more economical. The heat given up by the wire, after dynamic equilibrium of the system has been established, is quite regular, and the method is obviously exceedingly clean and very convenient for domestic purposes. The wire attained its constant temperature of 93° C. after the current had acted for about half an hour, the air of the room having a temperature of 30° C.

The heat given out by the wire is by no means small. For instance, in our case, the average current working through a resistance  $r = 1\cdot543$  b. a. u. was 36801 milli-oersteds. This represents work done at a rate of 20473  $\Omega$  ergs per second, and supposing the wire has obtained its constant temperature, this whole energy is developed into heat emitted by the wire into space at a rate of  $\frac{20473}{42} = 488$  gramme-degree-centigrade per second. This is equal to the heat produced by an ordinary German stove consuming 6lbs of coals per hour; supposing that the loss of heat when coals are burnt under a steam-boiler is four times as great as when they are burnt in a German stove. It appears, therefore, that the heat developed by the wire would be sufficient to keep a moderately sized and ordinarily ventilated room at a comfortable temperature even when situated in the highest latitudes.





XVIII.—*On the Lepidopterous Genus Æmona, with the Description of a new Species.*—By J. WOOD-MASON.

(With Part of Plate VI).

Several years ago, three plain pale-fulvous butterflies of moderate size were forwarded to the Indian Museum by Mr. S. E. Peal of Sibsagar, Assam. All three are of the male sex, and they agree so remarkably closely in size and colour as to have been taken for specimens of one and the same species. On examination, however, I find that, though superficially so similar to one another, they differ in structure and represent two distinct but closely-allied species, one of them being a male (hitherto undescribed) of *Æmona Amathusia*, and the other two, males of an undescribed form belonging to the same genus. For the benefit of naturalists in India to whom the costly works in which they occur are inaccessible, I have extracted the original descriptions of the two described species.

The genus *Æmona* was established by W. C. Hewitson in 1868 for the reception of an insect from Northern India which he had previously described under the name of *Clerome Amathusia*. Hewitson appears to have had some misgivings as to the propriety of this step, but, as will be seen from the following amended diagnosis, the genus is at least as distinct from *Clerome* as this is from *Thaumantis*, or as *Zeuxidia* from *Amathusia*.

Genus ÆMONA, Hewitson.

*Head* small. *Antennæ* rather short. *Anterior wing* acutely pointed and produced, or sharply angulated, at the apex; its inner margin straight in both sexes, not being lobed at the base in the male as it is in *Clerome* and less distinctly in *Thaumantis*; the costal vein reaching to the end of the fifth seventh of the length of the anterior margin; the subcostal 4-branched, the first branch given off just before the end of the cell, and, after running free for nearly the same distance beyond that point as it originates before it, completely coalescing with the costal, but again becoming free just before this last-named vein turns off to the anterior margin, the three remaining branches free. *Posterior wing* more elongated than, and not quite so rounded as, in *Clerome*; without the pencil of erectile setæ which, in the males of *Clerome* and *Thaumantis*, arises from the wing-membrane of the discoidal cell close to the subcostal vein and lies obliquely across a patch of elevated and crowded scales on the other side of this vein, the male scent-fans, if such are really present in this genus, being situated in a different part of the wing, *viz.*, in the anal region,

where a line of setæ running along the anterior side of the submedian vein ends in a curled whisk which, when at rest, lies in a slight groove or fold of the wing-membrane.

Plain and delicate butterflies of a pale fulvous colour inconspicuously or obsoletely ocellated on the underside.

In the form of the hind-wings and in the position of the male scent-fans *Æmona* agrees with *Xanthotænia*, and in its pointed fore-wings with *Zeuxidia*, *Euispe*, and *Discophora*, but it differs from these and from all the other Indian genera of *Morphinæ* in the relations of the costal and subcostal veins to one another, and in other respects.

(a.) *Fore-wing produced and pointed at apex with its outer margin concave-sinuous.*

1. *ÆMONA AMATHUSIA.* Pl. VI, Figs. 3, 4, ♂.

*Clerome Amathusia*, Hewitson, Trans. Entom. Soc. Lond. ser. 3, vol. iv, 1867, p. 566, ♀.

*Æmona Amathusia*, Id., Exot. Butt. vol. iv, 1868, *Zeux.* et *Æm.* pl. i, fig. 3—4, ♀.

♀. “UPPERSIDE rufous-brown, the bands of the underside seen through. *Anterior wing* crossed beyond the middle by a band of orange-yellow: the apex dark brown. *Posterior wing* with some arcuate spots near the apex.

“UPPERSIDE rufous, tinted with darker colour. *Both wings* crossed at the middle by a common rufous-brown band: both with a band of minute rufous ocelli some of which are pupilled with white: both with a submarginal band rufous. *Anterior wing* with a pale rufous band near the base and a spot of the same colour at the end of the cell. *Posterior wing* with a dark rufous band near the base.

“Expanse  $3\frac{2}{10}$  inches

“HAB. Northern India.”

The female is only known to me from Hewitson’s description and figures.

♂. Lighter-coloured than the female. UPPERSIDE pale fulvous, the strigæ or bands of the underside showing through. *Anterior wing* darker at the base and at the tip, between which darker parts the colour is very pale yellowish-fulvous. *Posterior wing* of the same shade as the base of the anterior one to within a short distance of the margin, whence it is paler, and with an indistinct submarginal series of arcuate marks extending from the apical to the anal angle. UNDERSIDE uniform pale fulvous; the strigæ as in the female; the ocelli (one, the second and largest, perfect, the remaining five rudimentary) of the posterior wing also as in the female, but in the anterior wing only the one between the first and second median veinlet and faint traces of that between the first median veinlet and the submedian vein are present; the thin submarginal brown line more obviously engraved than in the female.

Length of anterior wing 1.4; whence expanse = 2.9 inches.

HAB. Naga Hills (*S. E. Peal*). A single specimen.

## 2. *ÆMONA LENA*.

*Æ. lena*, Atkinson, Proc. Zool. Soc. Lond. 1871, p. 215, pl. xii, fig. 1, ♂.

♂. "UPPERSIDE. *Fore wing* pale brownish grey, crossed by a dark brown band, interrupted by the nervures from before the apex to near the posterior margin at two-thirds of its length from the base, beyond the band darker, with a slightly marked and incomplete submarginal line, before which is a series of five pale lanceolate blotches between the nervures directed towards the outer margin. All the nervures tinged with yellow and more or less dark-bordered. *Hind wing*: anterior portion from base to outer margin pale, posterior portion bright yellow, crossed by a submarginal series of three dark-bordered white blotches, and a fourth fainter blotch between the nervures, forming a short interrupted band from near the apex to the second median nervure. The submedian nervure fringed from its origin to near its extremity with long yellowish hairs, longest and most conspicuous towards its extremity.

"UNDERSIDE. *Both wings* crossed by a dark ferruginous band with sharply defined outer edge from the costa of the fore-wing near the apex to near the extremity of the submedian nervure of the hind-wing, and having a faintly traced submarginal line, before which is a series of blind white-centred ocelli. The cell of the fore-wing crossed near its middle by a curved ferruginous band. *Hind-wing* crossed by a ferruginous band near the base.

"*Antennæ* ferruginous; *palpi* and *legs* tawny yellow.

"Expanse of wings  $3\frac{1}{2}$  inches.

"HAB. Yunan." Moolai, Upper Tennasserim 3,000—6,000 ft. (*Moore*).

Atkinson does not give the sex of the specimen described and figured by him, but, as the two specimens in the Indian Museum obtained at the same time are males and agree perfectly in size and markings with his figure, he may be presumed to have described a male. In a specimen of the male recently received from the upper Thoungyeen forests, British Burmah, by Captain G. F. L. Marshall, the three white spots on the anterior half of the hind-wing are larger, forming a band divided by the veins.

(β.) *Fore-wing* sharply angulated at the apex with its outer margin arched.

## 3. *ÆMONA PEALII*. Pl. VI, Figs. 5, 6, ♂.

*Æ. Pealii*, Wood-Mason, Proc. Asiatic Soc. Bengal, July 1880, p. 123.

♂. Closely allied to *Æm. Amathusia*. UPPERSIDE coloured and marked in the same manner, but with the ocelli as well as the strigæ of

the underside showing through. *Anterior wing* with the apex angulated but not produced, the outer margin arched instead of concave-sinuuous, and the inner angle not so broadly rounded. *Posterior wing* darker-coloured and also paling towards the outer margin, but with the submarginal series of arcuate marks smaller and less distinct. **UNDERSIDE** coloured and marked in much the same manner, but with more perfectly formed and more numerous ocelli; the anterior wing having three (the first between the submedian vein and the first median veinlet, the second the largest and best defined) perfect ocelli and two or three rudimentary ones following them, and the posterior wing, one rudimentary (close to the submedian vein) and six (the first in the same interspace with the rudimentary one, and the second the largest of all) perfect ones; each ocellus dark brown encircled by a very fine line of the colour of the strigæ and pupilled with iridescent silvery-white; the thin submarginal brown line rather more deeply engraved.

Length of anterior wing 1.35; whence expanse = 2.8 inches.

HAB. Sibsagar, Assam (*S. E. Peal*). Two specimens.



XIX.—*Description of a new Papilio from the Andaman Islands.*—

By J. WOOD-MASON.

(With Part of Plate VI.)

PAPILIO LÆSTRYGONUM. Pl. VI. Figs. 1, 2, ♂.

*P. Laestrygonum*, Wood-Mason, Proc. Asiatic Soc. Bengal, June, 1880, p. 102.

♂. Wings above cretaceous-white, the anterior ones black at the insertion, scarcely tinged with greenish at the base, with five black bands commencing at the anterior margin and cutting the cell, the first basal, extending to the inner margin, the second rather broader, also extending to the inner margin, and emitting a short conical process at the origin of the first median veinlet, the third scarcely broader, extending to the median vein, the fourth narrower, triangular, reaching or all but reaching the median vein, the fifth much the broadest of all, triangular, divided anteriorly into two forks by a curved narrow decreasing and interrupted band of the ground-colour running from the costal vein to the third median veinlet, extending to the inner margin, separated from the black outer marginal band by a band of the ground-colour divided by the black veins and very slightly if at all narrowing from the anterior margin up to the second median veinlet, whence it gradually decreases in width and distinctness to the inner

angle ; all these black bands connected at the anterior margin, and the first, second, and fifth of them at the inner margin also, by a very narrow edging of black.

Posterior wings with two black bands commencing and connected at the anterior margin and coinciding with bands of the underside, one basal, extending to the end of the first half of the first median veinlet, and the other discal, extending a short distance into the space between the 2nd and 3rd median veinlets ; with a small black spot near the end of the cell scarcely distinct from the discal band ; with four discal spots immediately beyond the cell running nearly parallel with the band, the first and largest transversely elongated and coinciding with a spot on the underside, the rest smaller than the corresponding ones on the underside, which latter are consequently seen through the wing-membrane beyond the margins of the former ; with a black spot succeeded by one of luteous at the anal angle ; with a marginal and submarginal series of black lunules coalescent in the anterior third but more distinct in the posterior two-thirds of the wing, where the two series are more or less separated from one another by ashy-grey scales continuous with the ashy patch occupying the outer third of the wing and extending also along so as to obscure the ultra-cellular part of the basal black band ; with the discal band and spots more or less irrorated and obscured with ashy-grey scales so that the disk of the wing appears mottled with black and grey ; and with the black tails, as also the incisures, margined with eretaceous-white.

Wings below pure white, anterior ones marked as above, with the ground-colour at the base and between the black bands as far as the median vein and its second branch yellowish ; with the band of ground-colour separating the fifth black band from the black outer border distinct, and not decreasing but on the contrary rather increasing in breadth, to the inner angle ; and with the curved line dividing the fifth black band into two forks more distinct and less discontinuous.

Posterior wings, from the base up to the median vein and the discal black band, yellowish, with three black bands, one narrow running from the insertion along the inner margin close to the abdominal fold, and two broader commencing and connected at the anterior margin and cutting the cell, one of these latter basal, extending nearly to the end of the basal half of the first median veinlet, and the other discal, some distance into the space between the 2nd and 3rd median veinlets, the two first of the three bands connected together at their outer extremities and with two largish coalescent black spots in the anal region ; with a small black spot near the extremity of the cell, and six of the same colour immediately beyond it disposed in a line which runs straight from the costal vein as far as the cell, but then curves

abruptly inwards, the first of these spots transversely elongated, extending from vein to vein, and connected with the second, which is roundish and itself connected with the discal band, the third oval, about one-third the size of the second, and touching the discocellular veinlet, the fourth twice the size of the third, in contact with the median vein and its two last branches, the fifth rather smaller than the third, the sixth crescentic and connected with the two above-mentioned large spots in the anal region; with six large diffused luteous blotches externally margined with black, and increasing in size and depth of colour from the anterior to the inner margin; with the ground-colour between these blotches and the discal black spots pure white; with an increasing series of six marginal lunules, between which and the wavy black margins of the luteous blotches the ground-colour is white in the anterior and grey or greyish-white in the posterior portion of the wings; and with the incisures and the tails margined with lutescent.

Head black with two white frontal bands; collar with a luteous spot on each side; thorax above jet-black ornamented at the sides with long grey setæ, below eretaeous-white; abdomen eretaeous-white with a tapering dorsal black band and two lateral fuscous ones.

Length of anterior wing 1·7; whence expanse = 3·5 inches.

HAB. South Andaman. Two specimens, both males, obtained by Mr. A. R. de Roepstorff.

To mark its close relationship to *P. Antiphates*, I have called the species *P. Laestrygonum* after the mythical people over whom Antiphates is supposed to have reigned. It differs from its nearest ally in having the upperside much blacker (the bands of the forewing being broader, and the first, second, and fifth of them with the marginal one extending to the inner margin where they are all connected together by a very narrow black edging, and the disk of the hindwing mottled as it were by black and grey) and a much greater extent of grey and more highly developed marginal and submarginal lunules on the hind-wing; in the abdomen being dorsally banded with black and the thorax ornamented with grey setæ, &c.

*P. S.*—On the 17th Nov., after the above had been sent to press, the fourth part of M. Oberthür's work entitled 'Études d' Entomologie' was received in the Indian Museum, and in it I find the same species described and figured under the name of *P. Epaminondas*; but, as it seems to me not quite certain whether this name was actually published before mine, I have left it to M. Oberthür to effect the change of names that will become necessary if the fourth part of his work should really have been issued to the public before June, 1880.

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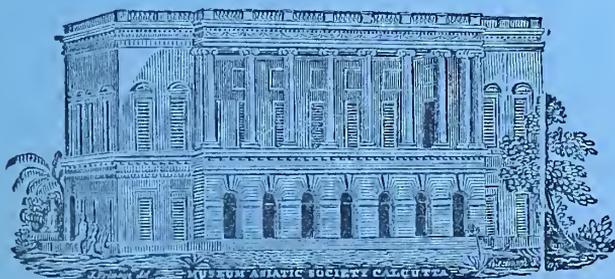
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“The bounds of its investigation will be the geographical limits of Asia: and within these limits its inquiries will be extended to whatever is performed by man or produced by nature.”—SIR WILLIAM JONES.

\* \* \* *Communications should be sent under cover to the Secretaries, Asiat. Soc., to whom all orders for the work are to be addressed in India; or, in London, care of Messrs. Trübner and Co., 57 & 59, Ludgate Hill.*

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Plate VI, illustrative of articles in the preceding number, is issued herewith.

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# JOURNAL

OF THE

## ASIATIC SOCIETY OF BENGAL.



Part II.—PHYSICAL SCIENCE.

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No. IV.—1880.

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XX.—*Contributions to Indian Malacology, No. XII. Descriptions of new Land and Freshwater Shells from Southern and Western India, Burmah, the Andaman Islands, &c.*—By W. T. BLANFORD, F. R. S.

(Received Nov. 20th;—Read December 1st, 1880.)

(With Plates II and III.)

More than ten years have elapsed since the last number of these 'Contributions' was published.\* The time that I have been able to devote to Zoology in the interim has been occupied with other subjects, and several forms of Indian land-shells that have been in my possession for years have remained undescribed. Of a number of these, I had drawings made some years ago, and several of the figures that accompany the present paper were included in a plate prepared for publication as long since as 1871, but never lithographed.

These ten years have seen so many additions to the literature of Indian land and freshwater shells that the whole aspect of the study has been changed. Foremost in importance are the late Dr. Stoliezka's papers in this Journal† on the anatomy of several forms of *Helicidæ*. The untimely death of Dr. Stoliezka, one of the most able and energetic workers who ever devoted his attention to Indian Mollusca, has prevented the design he had formed of publishing a monograph of Indian *Cyclostomacea*

\* J. A. S. B., 1870, xxxix, pt. 2, pp. 9—25.

† Vol. xl, 1871, pt. 2, pp. 143, 217, and xlii, 1873, pt. 2, p. 11.

from being carried out. A considerable number of drawings had been made for the work, in the preparation of which I had agreed to join, but of these drawings the most important, those representing the anatomy of the various genera, are not, I fear, sufficiently clear for publication in their present form, and notes to explain them are wanting. Some of the most useful of Dr. Stoliczka's anatomical studies, those on the structure of various *Helicidae*, have, however, I am much pleased to say, been continued by Colonel Godwin-Austen with important results.

The same decade has seen the completion of a series of illustrations, many of them well executed, of Indian land and freshwater shells, the 'Conchologia Indica' of Hanley and Theobald. The work is mainly due to Mr. Hanley, upon whom the whole of the editorial labour has fallen, Mr. Theobald having been absent in India during the publication. Whilst it is impossible to avoid regretting that more complete illustrations of most of the species have not been given, and that some additional details have not been furnished in the accompanying letterpress,\* it is unquestionable that the plates are a valuable contribution to the knowledge of Indian Mollusca.

Two other rather important works on Indian land and freshwater shells have been issued since the completion of the 'Conchologia Indica.' One of these is Mr. Theobald's 'Catalogue of the Land and Freshwater Shells of British India'†, the other, Mr. G. Nevill's 'Hand-list of the Mollusca in the Indian Museum, Calcutta', Part I.‡ The value and accuracy of the first-named work are unfortunately seriously diminished by the great number of misprints, errors, and omissions, partly due to the author's absence from Calcutta when the list was printed. Five quarto pages in small print are filled with additions and corrections; this list, however, is not only far from being exhaustive, but contains some additions to the catalogue of mistakes.§ The 'Notes on the 'Conchologia Indica,'' p. 50, contain some important corrections of localities cited in that work.

\* One most important omission might yet perhaps be rectified. A large number of the figures are from types, or from typical examples, and, in such cases, if the figure is correct, there can be no question as to the determination of the species. But many of the figures are from shells that, although doubtless in general correctly identified, are not the specimens originally described, nor even in all cases from the same locality. A list of the figures taken from actual types would be useful in cases of disputed identity.

† Calcutta, 1876, published by Thacker, Spink and Co.

‡ Calcutta, 1878.

§ To justify my criticism of my friend Mr. Theobald's 'Catalogue', I will give two instances of the errors it contains. At p. 15, the genus *Omphalotropis* (with two species *O. disterrina*, B. and *O. aurentiaca*, Desh., is placed in the family *Rissoiidae*, subfamily *Pomatiopsinae*. At p. 43, the same genus *Omphalotropis* (with but one species *O. disterrina*, B.) is repeated as a member of the family *Helicinidae*, subfamily *Hydroceninae*.

Mr. Nevill's 'Hand-list of the Mollusca in the Indian Museum' is especially important for the large number of localities given. In some few instances (as in all such lists), some names will be found to require revision, and one or two instances will be given in the present paper. I have already\* expressed my reasons for dissenting in some respects from the classification adopted. But it would be unfair to convey the impression that mistakes are numerous, indeed, considering that Mr. Nevill had not the advantage of correcting the proof-sheets himself, errors, so far as I have examined the work critically, appear singularly few in number, and in many points the classification adopted for the *Helicidae* of India is a considerable improvement on anything that had previously been published. At the same time, there is, I believe, very much more to be done before these puzzling shells are properly arranged.†

In the various works just mentioned, some species are quoted by names given by me, at various times, in manuscript, but never published. Of these forms I have given descriptions in the following pages. In several instances, the shells have been figured in the 'Conchologia Indica.' One form thus figured (*Spiraculum mastersi*), I have already described in this Journal (vol. xlvii, 1877, pt. 2, p. 313), and two other species (*Cremnoconchus fairbanki* and *Corbicula iravadica*) represented in the same work require explanation. To facilitate reference, this is given below under the name of each shell.

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This mistake is not corrected in the long list of 'Addenda et Corrigenda.' To shew how grave the error is, it is only necessary to mention that the *Rissoiidae* are as distinct from the *Helicinidae* in organization as are the *Littorinidae* from the *Neritidae*, and that *Omphalotropis* has been clearly proved to belong to neither, but to the *Cyclostomidæ* (See Ann. Mag. & Nat. Hist. May, 1865, ser. 4, vol. iii, p. 341). Moreover, the Indian locality of *Omphalotropis aurantiaca* had been shewn to be erroneous by Hanley in the 'Conchologia Indica.' The error was long since suggested by Benson (Ann. & Mag. Nat. Hist. Sept. 1851, ser. 2, vol. viii, p. 194).

The other error that I shall notice occurs in the 'Addenda et Corrigenda' and runs thus:—"Page 15, add *AEMELLA HYDRIA*, Godwin-Austen. North East Bengal." The reference quoted is 'Minutes of the Trustees, Imperial Museum,' Calcutta, vol. vii, p. 162. Now the minutes quoted are not published, but merely printed for record, and the notices contained in them of additions to the Museum are mere lists of the names that happen to be attached to specimens, inserted without any attempt at verification. Precisely the same is the case in the 'Register' at the British Museum. Had Mr. Theobald looked at the specimens, or had he made any enquiry about the shell, he would, I think, have easily learned that no such name as '*Aemella hydria*' was ever published, and that the shell so-called, was, if I am not mistaken, *Tricola montana*.

\* Proc. A. S. B., 1879, p. 55.

† For instance, I cannot help doubting whether any of the numerous forms referred by Mr. Nevill to *Microcystis* are really congeneric with *H. ornatella* the type of the genus.

Of the remaining species here described, the majority have been collected by Colonel Beddome in the hill-tracts of Southern India. Some of these were sent to me as long as 9 or 10 years ago, others have been received more recently. I feel that I owe many apologies to Col. Beddome and to the other gentlemen, Dr. Anderson, Col. Evezard, and Col. Godwin-Austen, who have kindly entrusted me with the description of their discoveries, for leaving these so long unnoticed.

The plates accompanying the present paper are unfortunately deficient in many respects. Several species are not represented, and some of the representations given are far from being good. The original drawings were, in all cases, excellent, but some of them may, after being kept for several years, have become indistinct in parts, and as the lithographer had not the shells for comparison, he may have misunderstood the details. The larger shells represented in plate iii. are fairly well delineated, but several of the small forms in plate ii. are more or less faulty.

The importance of a careful study of the anatomy in the different forms of *Helicidae* has already been mentioned. Very much remains to be done before anything like a correct classification of the family can be practicable. That all the forms referred to *Nanina* (a name which has no claim to recognition) must be separated from *Helix* is clear enough; the animals belong to different subfamilies at least, but it is by no means certain how many real generic groups there are in the so-called *Nanina*. I suspect that *Macrochlamys*, very possibly with some of the forms referred by Stoliczka to *Rotula*,\* will have to be separated generically from another group comprising the sections known as *Hemiplecta* and *Ariophanta*, which are very closely allied to each other, and which are probably congeneric with *Xesta* and several other forms. For the present, I have simply referred the species described to the sections to which they appear to belong, as Stoliczka did, but I am by no means prepared to follow him in accepting such sections as of generic rank. The difficulty is to determine what generic name or names should be adopted. *Nanina* is utterly bad; it offends every law; the name had been used previously by Risso;† the type is the same as that of Benson's genus *Macrochlamys*; and the term is objectionable on account of its signification. All this has been pointed out by Martens,‡ but still he and others employ the name because it has crept into use. Now, in such difficult matters as these generic terms, unless rules are strictly attended to, utter confusion must result, and undoubtedly it has resulted. When, however, a search is made for a better founded term than *Nanina*, endless difficulties are encountered. The ear-

\* These appear, however, to deserve distinction from true *Rotula*, see after.

† See Stoliczka, J. A. S. B., 1871, xl, pt. 2, p. 47.

‡ Albers Heliceen, 2<sup>te</sup> Ausgabe, p. 46, where the synonymy is fully discussed.

liest name is *Helicarion* of Ferussac (1822), but it is far from clear that this is not generically distinct from both *Maerochlamys* and *Ariophanta*. The next term is *Stenopus* of Guilding (1828), applied to a West Indian shell. This genus is evidently closely allied to the so-called *Nanina*: the only distinction pointed out by H. and A. Adams\* is that the sole in *Stenopus* is narrower than the sides of the foot, but this does not hold good universally.† A better difference is probably the position of the genital orifice, which appears to be, in *Stenopus*, some distance behind the head, as in *Zonites*, and not just behind the right tentacle, as in '*Nanina*.' After *Stenopus* follow *Maerochlamys* of Benson (1832) and *Ariophanta* of Desmoulins (1833), the first founded on *H. indiae* (Benson *nee*. Pfr.), believed by many authors to be the same as *H. vitrinoides*, the second founded on *H. laevipes*. The name *Nanina* was given in 1834. My impression is that *Helicarion*, *Maerochlamys*, and *Ariophanta* will have to be accepted as genera, *Nanina* being merely a synonym of *Maerochlamys*.

I must apologize for taking up space by repeating what has been often written before, but it is only right to explain why I now describe as *Hemiplecta*, *Euplecta*, &c. shells allied to others formerly in these 'Contributions' called *Nanina*.

#### 1. ARIOPHANTA IMMERITA. Plate III, Fig. 4, 4a.

*Nanina (Ariophanta) immerita*, W. Blanf., J. A. S. B., 1870, xxxix. pt. 2, p. 17.

*Helix immerita*, Pfr., Mon. Hel. vii. p. 128; Hanley & Theobald, Conch. Ind. pl. cl, fig. 7.

This shell was originally described from an immature specimen, and the same was figured in the 'Conchologia Indica.' Subsequently, Col. Beddome obtained an adult shell from the same locality, South Canara. Of this example a figure is now given. The species only differs in sculpture from *A. interrupta*, which is found in various parts of Bengal‡ and Orissa, and has been procured by Col. Beddome as far south as the Golcondah range of hills in Vizagapatam. The two forms replace each other in the eastern and western parts of the Indian peninsula, precisely as do their allies *A. laevipes* and *A. laidlayana*.

#### 2. OXYTES SYLVICOLA, sp. nov.

*Testa perforata, depressa, earinata, solidula, olcoso-micans, epidermide crassiuscula obtecta fulva vel luteo-fusca, striis obliquis incrementi*

\* Gen. Rec. Mollusca, ii, p. 221.

† *E. g.* in *Maerochlamys*, some forms of which at least have the central tract narrower than the lateral.

‡ Amongst the localities given in the 'Hand-list of Mollusca in the Indian Museum,' part i. p. 19, is Singhar. This cannot be Singhgarh near Poona, in the Deccan.

*atque lineis impressis minutis spiralibus subdistantibus superne decussata (nucleo sublævigata), subtus lævior sed distincte decussato-striata. Spira parvam elevatam depresso-conoideam, fere convexam, apicem obtusum, suturam lineari, antice vix impressam. Anfr. 5½, sensim acereseentes, primi planulati, ultimi convexiusculi, ultimus haud descendens, subtus convexus, modice inflatus, sed infra carinam, nisi juxta aperturam, leviter compressus. Apertura obliqua, angulata-lunaris, intus livido-albida; peristoma acutum, intus subincrassato-labiatum, marginibus callo tenui junctis, columellari curvato, breviter reflexo. Diam. maj. 32, min. 29, axis 17 mm. Apert. 16½ mm. lata, 13½ oblique alta.*

HAB. In montibus 'Burai Range' dietis, ad alt. 3000-4000 pedum, in provincia 'North Cachar' Bengalie orientalis (H. H. Godwin-Austen).

Shell perforate, depressed, carinate, not very thin, having a greasy lustre, and a thick epidermis, tawny or yellowish brown, marked with oblique raised striæ of growth decussated by fine subdistant spiral impressed lines above (the nucleus almost smooth), and with fainter radiating striæ and concentric impressed lines below. Spire but little raised, almost convex, depressedly conoid, apex obtuse, suture linear at first, but slightly impressed near the mouth. Whorls 5½, gradually increasing, the inner nearly flat above, the outer slightly convex; the last not descending, convex and moderately swollen below, but slightly compressed just below the keel, except near the mouth. Aperture oblique, angulately lunate, a little broader than high, pale livid within. Peristome sharp, with a slightly thickened lip inside, the margins joined by a thin callus, columellar margin curved, reflected for a short distance at the perforation. Major diameter 1.26 inches, minor 1.14, axis 0.69, breadth of aperture 0.65, height (measured obliquely) 0.53.

There is a very remarkable resemblance between this shell and that described by me as *Nanina koondaensis* (J. A. S. B., 1870, xxxix, pt. 2, p. 16, pl. iii, fig. 12), yet I am by no means sure that both belong to the same section or subgeneric group. *N. koondaensis* is an ally of *N. indica* (Pfr.) and *N. shiplayi*, shells doubtless nearly allied to *Hemipleeta*, and very possibly belonging to that subgenus, but hitherto referred to *Rotula*,\* or to other sections. *O. sylvicola* is larger, more solid, and covered with a distinct epidermis, and the sculpture is less granulate above, the spiral impressed lines being more distant.

I have seen but one specimen of *O. sylvicola*, for which I am indebted to Col. Godwin-Austen. It is figured here. Other specimens, I learn, are larger.

\* Stoliczka, J. A. S. B., 1871, xl, pt. 2, 231.

## 3. HEMIPLECTA TINOSTOMA, sp. nov., Plate III, Fig. 1.

*Testa anguste umbilicata, convexo-depressa, confertim striis spiralibus minutis lincisque incrementi decussata; fulva, lineâ pallidâ angustâ supra peripheriam, alterâ fuscâ infra, cincta; subtus pallidior, lævior, nitidula. Spira convexa, apice obtuso, suturâ primum lincari, anticc impressâ. Anfr. 5, planiusculi, sensim accrescentes; ultimus convexior, anticc latior subascendens, ad peripheriam angulatus, subtus convexus, aperturam versus planulatus. Apertura obliqua, multo latior quam alta, lunato-oblonga, intus albescens, fusiâ peripherali albidâ conspicuâ; peristomatis marginibus subparallelis, callo tenui junctis, basali albo, recto, crassiusculo, longe obliquo, ad umbilicum subreflexo, supero arcuato, leviter inflexo. Diam. maj. 50, min. 39, axis 21 mm.; apert. 28 mm. lata, 18 oblique alta.*

HAB. In montibus 'Tinnevely Ghats' dictis Indiæ meridionalis, ad latus orientale provinciæ Travancore (*H. Beddome*).

Shell narrowly umbilicate, convexly depressed, closely decussated with fine spiral striæ and lines of growth, smoother beneath, yellowish brown above, paler below, surrounded by a narrow pale line just above the periphery and a dark line below. Spire convex, apex obtuse; suture at first flat, becoming impressed towards the mouth. Whorls 5, the first nearly flat; the last convex above, becoming more so towards the aperture, where it is rather broader and rises a little; below, the shell is convex, but flattened near the mouth, and the greater breadth of the last whorl near the aperture is more conspicuous than above. Aperture oblique, much wider than high, brownish livid, with a whitish enamel within, the pale peripheral band being conspicuous; peristome slightly sinuate, the upper and lower margins nearly parallel, the former slightly inflexed, the latter oblique, straight, white, and somewhat thicker than the other margins. Major diameter 2 inches, minor 1.55, axis 0.85; breadth of aperture 1.1, height (measured obliquely) 0.72.

This shell somewhat resembles *H. basilessa* and *H. beddomei*, but differs from both in the peculiar form of the aperture and the great flattening of the last whorl beneath. The fine, decussated, almost granulate sculpture of the present species, and the less rapid increase of the last whorls would serve to distinguish it from either of the forms named, even if the peculiar shape of the aperture proved to be an individual peculiarity—not a very probable supposition, as there is a faint approach to the same change of form in the last whorl in *H. basilessa*.

But a single specimen has been procured by Col. H. Beddome, and entrusted to me for description. This shell was obtained on the Tinnevely Ghats, between Tinnevely and Travancore, at a spot east of Papanassam, and at an elevation of 5000 feet.

## 4. HEMIPLECTA ENISA, sp. nov., Plate III, Fig. 2, 2a.

*Testa anguste umbilicata, depressa, subcarinata, fulvo-castanea, subtile pallidior; fasciâ exiguâ peripherali albidâ circumdata, confertim striis incrementi lineisque minutis spiralibus subgranulatis decussata, circa umbilicum lævior. Spira depresso-convexa, apice obtuso, suturâ primam lineari, antice impressâ. Anfr.  $4\frac{1}{2}$ , planiusculi, sensim accrescentes: ultimus superne magis convexus, ad peripheriam subangulatus, antice latior, subtile convexus, juxta aperturam paululo compressus. Apertura obliqua, latior quam alta, lunato-oblonga, supra peripheriam subangulata, intus pallide livida, fasciâ peripherali albescente conspicuâ; peristomatis marginibus subparallelis, callo tenui granulato junctis, supero externoque arcuatis, hand inflexis vel incrassatis, basali albo, recto, obtuso, longe obliquo, ad umbilicum subreflexo. Diam. maj.  $42\frac{1}{2}$ , min. 36, axis 20 mm.; apertura 23 lata, 17 oblique alta.*

HAB. In montibus 'Aghastyamullay' dictis, inter provincias Tinnevelly atque Travancore, in Indiâ meridionali (*H. Beddome*).

Shell narrowly umbilicate, depressed, subcarinate, yellowish chestnut, paler and dull yellow below around the umbilicus, surrounded by a narrow pale band, which is only well marked near the mouth; the sculpture is fine and subgranulate, formed by decussating striæ of growth and fine spiral lines, the latter disappearing below near the umbilicus. Spire depressedly convex, apex obtuse; suture linear, and not impressed, except in the anterior half of the last whorl. Whorls  $4\frac{1}{2}$ , all except the last flat, gradually increasing; the last whorl more convex above, especially towards the mouth, where it is slightly broader, subangulate at the periphery, convex below, but a little compressed close to the mouth. Aperture oblique, broader than high, lunately semioval, subangulate at the upper portion of the outer edge, pale livid within, with the narrow whitish band along the blunt keel very conspicuous. The peristome is not thickened, except very slightly along the basal margin, which is white, oblique, and straight for a considerable distance, being very slightly reflected at the umbilicus; the other margins are regularly convex, the upper and lower margins being subparallel; the callus connecting the free margins of the aperture is thin, but granular. Major diameter 1.72 inches, minor 1.4, axis 0.8; aperture 0.95 inch broad, 0.68 high (measured obliquely).

Col. Beddome has sent to me two specimens of this shell, one adult, the other not quite fully grown. The species is near *H. tinostoma*, but is considerably smaller, and the peculiar flattening and compression of the last whorl, near the mouth, is far less, the aperture being, in consequence, not nearly so broad in proportion to the height. Another allied form, also

from Travancore, is *H. basilessa*; but this is a thicker shell, with broader whorls and rather a thick lip to the aperture; the sculpture, too, is different. None of the remaining species of *Heuplecta* occurring in the Malabar province have the mouth compressed.

5. *XESTINA\** *ALBATA*, sp. nov., Pl. III, Fig. 3, 3a, 3b.

*Testa angustissime atque subobtecte umbilicata, depresso-globosa, solidiuscula, rugoso-striata, lineis impressis distantibus spiralibus superne circumdata, albida, eburnea. Spira depresso-conica, apice obtuso, sutura impressa. Anfr. 5½, convexiusculi, sensim accrescentes, primi translucentes, sublævigati; ultimus primum, nec antice, ad peripheriam subangulatus, aperturam versus latior, vix descendens, subtus subinflatus. Apertura obliqua, late lunaris; peristomate superne simplici, extus subtusque subreflexo, juxta umbilicum reflexo atque subincrassato, margine basali arcuato. Diam. maj. 29, min. 23½, axis 17½ mm.; apert. intus 15 lata, 14 oblique alta.*

HAB. Ad Papanassam, in montibus ad latus occidentale provinciæ Tinnevelly, Indiæ meridionalis (*H. Beddome*).

Shell very narrowly and subobtectly umbilicate, depressedly globose, subangulate at the periphery, rather solid, ivory-white, the surface wrinkled, forming a coarse oblique striation across the whorls, with fine spiral distant impressed lines on the upper surface only of the two last whorls. Spire depressedly conical, apex obtuse, suture impressed. Whorls 5½, slightly convex, regularly increasing, the first almost smooth and translucent; the last whorl at first subangulate at the periphery, the angulation disappearing some distance behind the mouth, the lower portion inflated near the aperture, which is oblique and broadly lunate. Peristome simple above, subreflected on the outer and basal margins, rather thicker and turned back near the umbilicus, which it partly covers; the basal margin is curved forwards. Major diameter 1.5 inch, minor 0.95 axis 0.7; breadth of aperture inside 0.6, height (measured obliquely) 0.56.

This form is allied to *X. maderaspatana* (*Helix maderaspatana*, auct.), but it is thicker, much more coarsely sculptured, and white in colour. The peristome too is slightly reflected. There is some resemblance also to *X. belangeri* in form, but the mouth is somewhat differently shaped, and the sculpture of *X. albata* is coarser. *X. belangeri* appears to be a near ally of *X. tranquebarica*, *semirugata*, and *bombayana*, forms differing in shape, but so variable and so closely allied that it is very doubtful whether they really merit distinction. All of these forms have a horny shell differing from the ivory-white substance of the species now described.

\* Pfeiffer, J. B. Jahrbuch d. Mal. Ges. v, p. 257.

But a single specimen has been sent by Col. Beddome. I think I have seen the same, or a very similar form, from either the Pulneys or some other range of Southern India; but I cannot find specimens in my collection.

#### 6. EUPLECTA VIDUA. Plate II, Fig. 5.

*Helix vidua*, W. Bl., MSS.; Hanley, *Conchologia Indica*, pl. cxxx. figs. 2, 3.

*Nanina climacterica*, Bens., var. *vidua*, Nevill, *Hand-list Mollusca, Indian Museum*, Calcutta, pt. i. p. 30.

*Testa imperforata, conoideo-depressa, superne oblique confertim atque arcuatim filiformi-costulata, subtus lævigata, polita, radiatim striatula, superne pallide cornea, subtus pallidior. Spira depresso-conica, lateribus subrectis, apice acutiusculo, suturâ impressâ. Anfr. 8, convexi, arcti, lente accrescentes; ultimus superne ad peripheriam angulatus, antice vix descendens, subtus convexus. Apertura obliqua, lunaris, latior quam alta. Peristoma obtusum, leviter sinuatum, intus vix albo-labiatum, margine basali arcuato, columellari vix reflexo. Diam. maj. 17, min. 15½, axis 9½, mm.*

HAB. In montibus Garo Khasi et Naga dietis, vallem Assamensem meridiem versus contingens (*Masters, Godwin-Austen*).

*Varietas minor, depresso-turbinata, spirâ conicâ. Diam. maj. 14, min. 12½, axis 9 mm. (Pl. II, Fig. 2.)*

HAB. Cum præcedente.

Shell imperforate, conoidly depressed, above ornamented with oblique, close, and arcuate fine hair-like costulation, smooth and marked with radiating striæ below; pale horny, paler beneath. Spire depressedly conical, the sides nearly straight, apex rather sharp, suture impressed. Whorls 8, convex, narrow, slowly increasing in size, the last angulate above at the periphery, scarcely descending towards the mouth, convex below. Aperture oblique, lunate, broader than high. Peristome not sharp, slightly wavy, with a very slight white thickening inside, the basal margin curved forward, the columellar scarcely reflected. Major diameter 0·67, minor 0·62, axis 0·38 inch.

The above is the typical form; but there is a smaller variety, depressedly turbinate in shape, with the spire conical, measuring 0·55 inch in its major diameter and 0·36 in height. This form passes by insensible gradations into the type.

The shell represented in the 'Conchologia Indica' is intermediate between the two varieties here described and figured; the apex in the 'Conchologia' figure is more prominent and blunt than in the specimens now before me. These were procured from the Naga hills, south of Gola Ghat, Assam, by Mr. Masters in 1859; other specimens were subsequently

found on the Garo, Khasi, and Naga hills by Colonel Godwin-Austen. The shells from the Khasi hills have the filiform costulation on the upper surface finer and less regular than those from the Assam side of the Naga hills. In Khasi shells 2, 3, or 4 ribs occur at nearly regular intervals, and then a rib appears to be omitted; this is not the case with those from upper Assam.

The species scarcely differs from *E. ornaticissima*, found on the other side of the Brahmaputra valley at the base of the Sikkim hills, except in being imperforate. *E. climacterica*, of which Mr. Nevill considers the present shell a variety, is always sharply keeled at the periphery. The two forms may pass into each other, but I have never seen any intermediate links; and as they differ from each other much more than *E. vidua* does from *E. ornaticissima*, or *E. climacterica* from *E. austeni*, it is better to have distinctive names for them.

I am indebted to Col. Godwin-Austen for the following note on the animal of *E. vidua* observed at Cherra Poonjee, Khasi hills.

“Animal of a neutral grey tint about the neck and eye-tentacles, which are rather long and fine, the oral tentacles are also of a dark tinge. Extremity of foot truncated, with mucous gland. Body long and thin. No tongue-like processes to the mantle observed.”

The genus *Euplecta* was proposed by Semper\* for two Ceylonese shells *Helix subopaca* and *H. layardi*. The latter of these is referred by both Theobald† and Nevill‡ to *Situla*, a position which is scarcely tenable, for the animal of *H. layardi* is destitute of shell-lobes, whilst these are present in *Situla*§; and the odontophores are very different, neither the shape nor number of the teeth being similar. At the same time, I am rather doubtful whether *H. layardi* should not be placed in a separate section from *H. subopaca* on account of differences both in the shell and odontophore. The last-named species, however, is, I think, to be accepted as type. It is greatly to be regretted that Semper should have adopted so loose and uncertain a proceeding as to name two distinct forms as types of one genus. In such a case, the only plan is to take the first-named—in this case, *H. subopaca*—as the type of *Euplecta*.

The genus is thus defined by its author in German:—*On the mantle edge only neck-lobes are present, the left is divided into two separate lap-pets (as in many Heliccs). Above the caudal gland there is a short horn. The shell entirely exterior, ribbed or striated above, smooth below. On the*

\* Reisen im Archipel der Philippinen, 2te theil, Wis. Res. vol. iii, p. 14.

† Cat. p. 20.

‡ Hand-list, p. 34.

§ See, for description of the animal and odontophore of *Situla* (or *Conulema*, which is the same), Stoliczka, J. A. S. B., 1871, vol. xl, pt. 2, p. 236.

*genital organs a cylindrical female supplementary gland (Anhangsdrüse) with a cartilaginous point (analogous to the dart?); on the vas deferens (Samenleiter) a closed appendage, in which calcareous concretions are formed, and a flagellum.*

The odontophore is not noticed in the generic description. In *E. subopaca*, the number of teeth in each cross-row is about 100, central tooth tricuspid, the neighbouring laterals 12 in number distinctly bicuspid, from the 13th to the 24th almost without a trace of the little lateral point, which, however, reappears in the outer laterals. *Euplecta* belongs to Semper's subdivision *Ceratophora* with a horn-like lobe above the caudal gland, and the sole of the foot divided into a central and two lateral regions as in *Macrochlamys* (and *Stenopus*).

In the characters of both shell and animal, so far as we know the latter, there is a remarkable resemblance between *E. subopaca* and *E. vidua*. The connection between *E. vidua* and *E. climacterica* has already been noticed, and in the latter the odontophore (of which Col. Godwin-Austen has kindly furnished me with notes and drawings) agrees very closely with that of *E. subopaca*. The following is a description of the teeth in *E. climacterica* :—

“Median tooth tricuspid, the central point very long, the lateral cusps very small. The first 14 laterals are long and broad with a single short small cusp on the lower outer margin, the 25 outermost are long narrow, curvilinear, bicuspid, the outer point the shorter, being less than half as long as the inner. Jaw slightly curved, the front edge a little convex.”

The number of teeth in a row is apparently 79. A sketch shews that the form of both central tooth and laterals is very similar to that in *E. subopaca*.

*Euplecta* is by Semper classed apart from *Rotula*. The animal of the type of this latter genus (*H. detecta*, from Bourbon) is still unknown. Semper has described the anatomy of two very different species, and there is no proof that they are congeneric. It is also extremely doubtful whether, of the forms referred to *Rotula* by Stoliczka,\* any belong really to the section; and I am disposed to believe that Nevill was right in removing them in his 'Hand-list,' where, however,† he simply classes them in *Nanina* without specifying any subgeneric group. Judging, it is true, chiefly from the shells, I should class the following Indian and Burmese species in *Euplecta* :—

*Helix ponsa*,‡ Benson; from Burma.

\* J. A. S. B., 1871, xl, pt. 2, p. 231; 1873, xlii, pt. 2, p. 14.

† l. c. pp. 28, 29, 30, &c.

‡ I find this short note on specimens of this species obtained in upper Burma in 1861 :—Animal of the *vitrioides* type, but the projecting lobe (*i. e.*, that above the caudal gland) is small.

*Nanina sikrigallensis*, Nevill; Bengal, Behar (Hand-list, p. 28).

*Helix climacterica*, Benson; Assam hills, Burma.

*Euplecta vidua*, Assam hills.

*Nanina austeni*, W. Bl.; Garo hills, Assam.

*N. falcata*, W. Bl.; Garo hills, Assam.

*Helix ornatissima*, Benson; base of Himalayas, Sikkim and Nipal.

*Helix serrula* also probably belongs to the same genus. About *H. anceps* and its near ally, *H. arata*, I am more doubtful; for there are shell-lobes to the mantle in the former, and the teeth of the odontophore differ in several particulars.\*

As regards *H. indica* (Pfr. nec Benson), *H. shiplayi*, and *H. aceducta*, I cannot now find the notes I made many years since on the animals, but I believe they belong to the forms allied to *Ariophanta*, in which the foot is broad with the sole undivided, and there is no projecting lobe above the caudal gland. The shells present much resemblance to the type of Albers' section *Thalassia*. *H. tugurium* and *H. camura* from Sikkim are still more like *H. subrugata* from Australia, the type of *Thalassia*.

#### 7. SESARA ? INGRAMI.

*Helix ingrami*, Blanford, Hanley, Conchologia Indica, pl. lx. figs. 9, 10.

*Rotula dipledon*, Bs., partim, Theobald, Cat. Land & Freshwater Shells Brit. Ind. p. 21.

*Nanina* (*Sesara* ?) *dipledon*, Bs., partim, Nevill, Handlist Moll. Ind. Mus. pt. i. p. 53.

*Testa imperforata, trochiformis, tenuis, diaphana, pallide cornea, minutissime atque confertissime granulatum decussato-striata. Spira subconica, lateribus convexiusculi, apice obtuso, suturá parum impressá, lineá filiformi marginatá. Anfr. 6½, regulariter accrescentes, vix convexiusculi, superiores lævigati; ultimus acute carinatus, non descendens, et supra et infra carinam compressus, basi extus decussato-striatus, atque, præsertim antice, aperturam versus, planulatus, intus convexiusculus atque lævigatus, striis medium versus evanescentibus, regione umbilicali impressá. Apertura diagonalis, incurvo-triangularis, intus tridentatus, dentibus lamelliformibus omnibus basalibus, duobus in peristomate, uno majori falcato intrante, extus convexo, in medio margine basali, alio minori obliquo subcolumellari, tertio profundo, incurvo, transversim post majorem posito. Peristoma album, modice incrassatum, margine basali sinistrorsum arcuato, dextrorsum subangulatim sinuato, columellari vix reflexo. Diam. maj. 6½, min. vix 6, alt. 4½.*

HAB. In montibus 'Yoma' dictis, Pegu ab Arakan secernentibus, haud procul a vico Tongoop.

\* Stoliczka, J. A. S. B., 1871, xl, pt. 2, pp. 234, 236.

Shell imperforate, trochiform, thin, translucent, pale horny, very minutely and closely striated both obliquely and spirally, so as to be covered, except on the upper whorls, with fine almost granular decussated sculpture. Spire nearly conical, with the sides slightly convex; apex obtuse; suture very little impressed, and with a filiform line above, the continuation of the keel on the last whorl. Whorls  $6\frac{1}{2}$ , increasing regularly, nearly flat, only a little convex, the uppermost quite smooth, the sculpture growing stronger on the lower whorls; the last whorl sharply keeled, not descending, compressed both above and below the keel, with the outer portion of the base flat, especially towards the mouth, and decussated, the inner portion moderately convex and smooth, the sculpture gradually disappearing towards the middle; umbilical region impressed. Aperture diagonal, triangular with the sides curved, with three lamelliform teeth inside, all palatal, and in the basal margin: the largest is in the middle of the margin, and is much curved, with its convex side outwards; it begins by forming a kind of thickening to the lip, and then curves away into the interior of the whorl; the second is smaller, oblique, and situated near to the columellar margin; the third is at some distance within the aperture, it is curved, and placed transversely behind the first. Peristome white, somewhat thickened, the basal margin curved forwards near the umbilical region, and angularly curved back near the periphery of the shell; columellar margin scarcely reflected. Major diameter 0.25, minor 0.23, height 0.18 inch.

In the figure in the 'Conchologia Indica,' the internal tooth is not shown, although all the teeth are clearly seen through the semi-transparent base of the shell.

The caudal pore in the animal is very small, and furnished with a lobe in front of it, but the tail is not truncated abruptly as in *Macrochlamys*. This is the only note I can find on the soft parts.

This shell was named in MS. in the year 1861, and a specimen transmitted to Mr. Benson, who, however, doubted whether it could be distinguished from the Khasi-hill form described by him as *Helix diplodon*. The typical specimen of the latter must, I think, have been in poor condition, for it was described as "*laevigata, parum striatula*", whereas fresh specimens exhibit nearly the same fine subgranulate decussating striation as *S. ? ingrami*, and Mr. Benson very probably, and very justly, thought that fresh specimens might agree with the Arakan shell in other characters. Subsequently, fresh specimens of *S. ? diplodon* were obtained from the original locality by Colonel Godwin-Austen; and I find that they differ from *S. ? ingrami* not only in being minutely perforate, a character to which by itself I should attach little or no importance, but also in having but two teeth in the aperture instead of three, the internal transverse tooth of *S. ? ingrami* being deficient in *S. ? diplodon*, whilst the other teeth are

differently shaped. The sculpture is somewhat finer in *S. ? diplodon*, and the basal margin of the aperture is subangulately concave, without the curving forwards due to the transverse portion of the larger tooth in *S. ingrami*. The last character is well shown in the 'Conchologia' figure.

8. *MACROCHLAMYS ? PLATYCHLAMYS*, sp. nov., Plate II, Fig. 9.

*Testa perforata, conoideo-depressa, pertenuis, nitida, lævigata, sub lente obsolete striatula, fulvo-cornea. Spira parum elevata, apice obtuso, saturâ levi aliquando marginatâ. Anfr. 5, vix convexiusculi, regulariter accrescentes; ultimus non descendens, peripheriâ rotundatus, subtus convexus. Apertura obliqua, lunaris, latior quam alta. Peristoma tenue, simplex, leviter sinuatum, marginibus remotis, callo tenuissimo junctis, columellari brevissime verticali, peranguste reflexo. Diam. maj. 11, min. 9½, axis 5½.*

*Animal pallio maximo indutum, duos lobos latos linguiformes emittente, qui spiram testæ omnino circumtegent.*

HAB. Ad Bombay.

Shell perforate, conoidly depressed, very thin, smooth, and polished, obsolete striated beneath the lens, fulvous horny in colour. Spire subconical, but little raised, apex obtuse; suture smooth, scarcely impressed, sometimes marginate. Whorls 5, very slightly convex, regularly increasing in size, the last not descending, rounded at the periphery, convex below. Aperture oblique, lunate, broader than high. Peristome thin, simple, slightly curved when viewed from the side; margins distant and united by a thin callus; the columellar border vertical for a very short distance, slightly reflexed. Major diameter 0·44, minor 0·38, axis 0·22 inch.

This shell belongs to the group of thin, more or less depressed forms allied to the type usually known as *M. vitrinoides* (*M. indicus*, Benson). It appears, so far as I can see, to be undescribed, as is also, I believe, an allied form of darker colour, and with a subangulate periphery, occurring at Trichinopoly and elsewhere in the neighbourhood of the Coromandel coast south of Madras.

The animal of *M. platychlamys* is chiefly distinguished by the peculiarly broad shell-lobes, which, instead of being narrow and attenuate towards the ends, as in most allied species, are broad and flat, so as sometimes to cover the whole spire, and usually to conceal all except a narrow band. These lobes somewhat resemble those in the genus *Helicarion*. The lobe above the caudal gland is very much smaller than it usually is in *Macrochlamys* and rounded, not horn-shaped.

This shell is common in the island of Bombay and neighbouring lowlands on the west coast of India, and I have seen a form from the hills of

the Wynaad in Southern India that appears undistinguishable. I have also several specimens of a *Macrochlamys* from the ancient town of Champaur, near Broach, that may very possibly be a variety of *M. platychlamys*. The specimens are larger than the Bombay types, an adult measuring 16 mm. by 14 in its two diameters, and some individuals attain even greater dimensions; the mouth too is rather more convex beneath, but otherwise the two forms agree very closely.

The figure gives the idea of a rather thick shell, and the form of the mouth is incorrect, being too convex below and, consequently, too high in comparison with the breadth.

### 9. MACROCHLAMYS TENUICULA. Pl. II, Fig. 8.

*Macrochlamys tenuicula*, H. Ad., P. Z. S. 1868, p. 14, pl. iv, fig. 9.

*Helix tenuicula*, Pfr., Mon. Hel. vii. p. 94.—Hanley, Conch. Ind. pl. lxxxix, figs. 7, 10.

*Macrochlamys effulgens*, W. Bl., MSS.—Theobald, Cat. Land and Freshwater Shells of British India, p. 18.

*Nanina (Macrochlamys) effulgens*, Nevill, Hand-list Mollusca, Indian Museum, Calcutta, part i. p. 26.

*Nanina (Microcystis?) tenuicula*, Nevill, ib. p. 36.

*Testa aperte perforata, turbinata, tenuis, flavo-vel fulvo-cornea, laevigata, nitida, diaphana, oblique striatula, sub lente lineis impressis confertis minutis in anfractibus superioribus subtilissime decussata. Spira subconica, lateribus convexiusculis, apice obtuso, suturá leviter impressá. Anfr. 5½-6, convexiusculi, regulariter crescentes, ultimus non descendens, ad peripheriam obsolete subangulatus, angulo omnino antice evanescente, sed in testis junioribus validiore, subtus convexus, radiatim striatulus. Apertura obliqua, ovato-lunaris, latior quam alta. Peristoma tenue, rectum, marginibus subconniventibus, columellari subverticali, breviter reflexo. Diam. maj. 9, min. 8½, axis 6 mm.*

HAB. Ad Bombay et in terris vicinis, necnon in montibus 'Western Ghats' seu 'Syhadri' dictis.

Shell openly perforate, turbinate, thin, yellow or fulvous horny, smooth, polished, transparent, obliquely striated, and under the lens finely decussated on the upper whorls with minute, close, impressed spiral lines. Spire subconical, the sides a little convex, apex obtuse, suture slightly impressed. Whorls 5½-6, rather convex, regularly increasing, the last not descending, obsoletely subangulate at the periphery (in immature shells distinctly angulate), the angle disappearing near the mouth, convex below and radiately striated. Aperture oblique, ovately lunate, broader than high. Peristome thin, straight, the margins approaching each other slightly, columellar

margin subvertical, reflected for a short distance. Major diameter 0·36, minor 0·33, axis 0·24 inch. The foot of the animal is very long and narrow, and there are the usual pointed shell-lobes to the mantle. The colour of the body is almost black.

The shell described by the late Mr. H. Adams as *Macrochlamys tenuicula* appears to me almost certainly to be the immature form of a species common in Bombay. This form I have had for many years; and I formerly distributed specimens under the MSS. name of *Helix effulgens*, a name which has unfortunately got into print. The adult shell has never been described; but the specimen figured in the 'Conchologia Indica' must have been nearly full-grown. Mr. Adams's original types were said to be from Sattara. It is probable they came from the Western Ghats in the Sattara district; but the species may extend to the damper portions of the Deccan plateau.

The figures herewith given are very unsatisfactory; the left-hand figure is quite inaccurate. This, however, is of less importance, as the shell is very fairly represented in the 'Conchologia Indica.'

#### 10. MACROCHLAMYS? PLICIFERA.

*Nanina plicatula*, W. Bl., J. A. S. B., 1870, xxxix, pt. 2, p. 13, pl. iii, fig. 7. *nee* *N. plicatula*, Mart., Nachrichtsbl. mal. Gesellsch., 1869, i, p. 149.

*Helix plicatula*, Hanley, Conch. Ind., p. 14, pl. xxviii, fig. 1.

*Macrochlamys plicatula*, Theobald, Cat. Land and Freshwater Shells Brit. Ind., p. 19.

*Nanina*, n. sp., Nevill, Hand-list Moll. Ind. Mus. Calcutta, p. 27.

I am indebted to Mr. Nevill for calling attention to the fact that the name I gave to this shell was pre-occupied. I propose to change the specific title to *plicifera*.

#### 11. MACROCHLAMYS? WYNNEL, sp. nov., Plate III, Fig. 5, 5a.

*Testa perforata, subturbinato-depressa, striatula, nitida, albido-cornea, diaphana, fasciâ rufâ supra peripheriam circumdata. Spira depresso-conica, apice obtuso, suturâ leviter impressâ, fasciâ rufâ intus marginatâ. Anfr. 5½, lente acerescentes, ultimus peripheriâ rotundatus, subtus modico convexus, aperturam versus vix descendens. Apertura late lunaris, obliqua, diagonalis; peristoma tenue, intus haud inerassatum, margine basali subrecto obtuso, columellari reflexo. Diam. maj. 19, min. 17½, axis 9½ mm. (ex icone). In exemplo minore diam. maj. 13½, min. 12¾, axis 7½ mm. apert. 7 lata, 6 oblique alta.*

HAB. Ad Mari (Murrec) in montibus Himalayanis occidentalibus inferioribus haud procul a flumine Jhelun (*A. B. Wylene*).

Var. *major, depressa, anfractibus 6, spirá convexá, parum elevatá*: diam. *maj.*  $21\frac{1}{2}$ , *min.*  $19\frac{1}{2}$ , *axis* 10 mm., *apert.*  $11\frac{1}{2}$  *lata, 10 oblique alta.*

Hab. Etiam ad Mari.

Shell perforate, subturbinately depressed, faintly striated, polished white, translucent, surrounded by a narrow rufous band above the periphery. Spire depressedly conical, apex obtuse, suture slightly impressed, and with a rufous margin inside. Whorls  $5\frac{1}{2}$ , increasing slowly and regularly, the last rounded at the periphery, moderately convex beneath, scarcely descending towards the mouth. Aperture broadly lunate, oblique, diagonal; peristome thin, not thickened inside, basal margin almost straight, columellar reflected. Major diameter 0·76, minor 0·7, axis 0·37 inch (taken from the figure). A smaller specimen measures:—major diam. 0·54, minor 0·5, axis 0·3, breadth of aperture 0·27, height (obliquely measured) 0·23 inch.

There is a larger variety, more depressed, with the spire convex and six whorls. It may possibly be a distinguishable form, but I think not. A specimen measures:—major diameter 0·85, minor 0·78, axis 0·42, breadth of aperture 0·45, height (obliquely measured) 0·4.

I greatly question whether this form is really a *Macrochlamys*, and cannot help suggesting the possibility of its belonging to a different sub-generic group, or even to *Zonites*. However, it is associated at Mari with a true *Macrochlamys* (*M. prona*\*) and two or three species of *Helicarion*; so it is evident that a few of these tropical types extend to this extreme north-western portion of the Himalayan range, where, however, the majority of the mollusea consist of *Bulimini* of the *Petraeus* section.

The specimen of *M. wyneei* from which the accompanying figure was taken has been mislaid or lost, and the description is drawn up from a smaller individual. I have named the shell after Mr. A. B. Wynne of the Geological Survey of India, to whom I am indebted for several mollusea from the neighbourhood of Mari.

I have been in some doubt as to whether this might not be a form of the shell described by Prof. v. Martens as *Nanina jacquemonti* (Malak. Bl. xvi. 1869, p. 75; Pfr. Nov. Conch. iv. p. 48, pl. xviii, figs. 6-8); but, in the first place, it can scarcely, I think, be the species figured by Jacquemont (Voyage dans l'Inde, Atlas, pl. xvi. fig. 2), and, secondly, *N. jacquemonti* is described as having "*peristoma obtusum, intus incrassatum, margine...basali leviter arcuato,*" none of which can apply to the present species. Pfeiffer's figure in the 'Novitates' shows a very much less oblique mouth than is found in *Macrochlamys? wyneei*. Now, I have another species from Mari, which agrees admirably with Marten's description in these re-

\* Nevill, 'Scientific Results of the Second Yarkand Mission,' Mollusca, p. 17.

spects, and which resembles Jaquemont's figure also, but it wants the red band round the periphery shown in Pfeiffer's figure. It is just possible that two species are included by Martens. The true *N. jaquemonti* is probably a *Bensonia*.

## 12. PUPA (PUPISOMA) EVEZARDI.

"*Pupa (Pupisoma) evezardi*, Blanford," Nevill, Hand-list Moll. Ind. Mus. Calcutta, pt. i. p. 192.

? "*Pupa evezardi*, Blanford MS.," Hanley, Conch. Ind. p. 41. pl. ci, figs. 5, 6.—Theob. Cat. Land & Freshwater Shells Brit. Ind. p. 30.—Pfr. Mon. Hel. viii. p. 415.

*Testa imperforata, vix subrimata, conoidco-ovata, tenuis, cornea, lineis elevatis irregularibus filiformibus obliquis ornata. Spira subtus subcylindracea, superne conoidea, lateribus convexis, apice obtuso, suturâ impressâ. Anfr. 4½, convexi, regulariter crescentes, ultimus parum major, periphæria atque basi rotundatus, haud antice descendens. Apertura diagonalis, truncato-rotunda, edentula; peristoma tenue, rectum, expansiusculum, marginibus convergentibus, columellari verticali, ad basin subtorto, adnato-reflexo, regionem umbilicalem tegente. Long. 2⅔, diam. fere 2, long. ap. 1 mm.*

HAB. In cortice arborum ad Khandalla inter Bombay et Poona (*G. Evezard*).

Shell imperforate, with scarcely even a trace of rimation in the umbilical region, conoidly ovate, thin, horny, with raised hair-like oblique lines, rather irregularly disposed, on all the whorls. Spire nearly cylindrical below, conoidal above, the sides convex, apex blunt, suture impressed. Whorls  $4\frac{1}{2}$ , convex, increasing in size regularly; the last but little larger than the penultimate, rounded at the periphery and below, not descending in front. Aperture diagonal, nearly circular, but truncated above, without teeth; peristome thin, all in one plane, slightly expanded, margins converging; columellar vertical above, slightly twisted below, reflected and united to the whorl so as completely to cover the umbilicus. Length 0.11, diameter 0.08, length of aperture 0.04 inch.

If the form represented by Hanley in the 'Conchologia Indica' be precisely the same as that described above, I am inclined to question the locality given, "Singhur," or, as Mr. Theobald prefers writing it, "Synghar," presumably Sinhgarh, near Poona. The original specimens were found by Colonel Evezard at Karkalla, near Khandalla, at the head of the Bor-ghat; and I suspect that Hanley's figure was taken from one of them. There are two or three allied forms found in the Syhadri range and the Nilgiris, forms that do not appear hitherto to have been described.

The subgenus *Pupisoma* was proposed by Stoliczka\* for the Moulmein

\* J. A. S. B., 1873, vol. xlii. pt. 2, p. 32.

*P. lignicola*,\* a form very closely resembling *P. evezardi*, but rather shorter and less ovate. It is by no means improbable that intermediate varieties may be found; indeed, so much do I doubt whether the two are really worthy of distinction that I should not have described the present species if the name had not already crept into print.

Mr. Nevill, in his Hand-list *l. e.*, has referred the *Helix oreula* of Benson to the same section of *Pupa* as *P. lignicola*; and in this he is, I think, unquestionably right.

### 13. SUCCINEA COLLINA.

“*S. collina*, Blanford, MS.,” Hanley, Coneh. Ind. p. 30, pl. lxxviii. figs. 8, 9, 10; Theobald, Cat. Land and Freshwater Shells Brit. Ind. p. 31; Pfr., Mon. Hel. viii. p. 558; Nevill, Hand-list Moll. Ind. Mus. pt. i. p. 212.

*Testa conico-ovata, tenuiuseula, parum nitida, distincte atque flexuose striata, virideseenti-cornea. Spira scalaris, apicē acutiusecula, suturâ valde impressâ. Anfr. vix 3, perconvexi, ultimus  $\frac{3}{4}$  longitudinis subæquans. Apertura ovata, obliqua; peristoma tenue, margine dextro medioeriter arcuato; columella arcuata, recedens, callosa. Long. 17, diam. 10, alt. (v. diam. min.) 6 mm., apertura 13 mm. longa, vix 9 lata.*

HAB. Saxis rupibusque adhærens prope Mahabaleshwar ad summos montes ‘Syhadri’ seu ‘Western Ghats’ dictos Indiæ occidentalis.

Var. *aurantiaca v. rufo-cornea*; habitat in colle ‘Torna’ dicto, inter Mahabaleshwar atque urbem Poona.

Shell conically ovate, rather thin, but little polished, distinctly and flexuously striated, greenish horny in colour. Spire step-like, apex rather pointed, suture much impressed. Whorls scarcely 3, very convex, the last about  $\frac{3}{4}$  of the length. Aperture oval, oblique; peristome thin, the right margin moderately curved forwards; the columella arcuate, receding, and covered with a thin callus. Length 0·76, diameter 0·4, height (when laid mouth downwards) 0·24 inch; length of aperture 0·52, breadth 0·36 inch. The largest shell I possess measures 20 mm. in length (0·8 inch). A rufous variety occurs at Torna Hill, near Sinhgarh, west of Poona.

This is a rock-inhabiting species,† found on cliffs and large blocks of basalt at Mahabaleshwar and Torna, and is allied to *S. girnarica*, a larger and thicker form, rather differently shaped, found by Mr. Theobald

\* J. A. S. B., 1871, vol. xl. pt. 2, p. 171.

† It is rather difficult to understand why *Succinea* should be placed amongst freshwater shells in the ‘Conchologia Indica.’ Most of the Indian forms are found either on trees (often on palms) or on rocks, and generally at a distance from water. *Lithotis* and *Camptonyx* are also, I think, incorrectly classed as freshwater shells, both being found on basaltic cliffs.

on the basaltic rocks of Girnar Hill, in Kattywar. The animal of *S. collina* bears a considerable external resemblance to that of the subgenus *Lithotis*, which has a similar habitat.

The figures in the 'Conehologia Indiae' give a fair idea of the species, but the spire in fig. 8 is rather too large.

#### 14. STREPTAXIS COMPRESSUS, sp. nov., Plate II, Fig. 13.

"*S. compressus*, Wl. Bl.," Theobald, Cat. Land and Freshwater Shells Brit. Ind. p. 33.

*Testa subaperte sed non pervie umbilicata, valde depresso-ovata, cereo-albida, diaphana, nitida, vix striatula. Spira vix convexa, fere plana, suturâ parum impressâ. Anfr. 4½, penultimus postice compressus, obtuse sed prominenter carinatus; ultimus valde eccentricus, antrorsum devians, subtus planulatus politusque, circa umbilicum, præsertim antice, angulato-coarctatus, pone aperturam fossiculis impressis constrictus. Apertura diagonalis, semiovalis, laminâ unâ validâ subbifidâ intrante parietali, dente uno duplici columellari, tribus palatalibus in margine dextro, coarctata. Peristoma incrassatum, undique sublata expansum, postice juxta angulum mediocriter sinuatum, marginibus callo lamellifero junctis. Diam. maj. 6½, min. 3¾, alt. vix 3; ap. long. 2½, lat. 2 mm.*

HAB. In montibus 'Sivagiri' dictis (Tinnevely) Indiæ meridionalis (H. Beddome).

*Varietas anfractibus quinque, superne et in umbilico confertim filiformi-striata, laminâ parietali duplici, in montibus habitat prope urbem Cumbum. Exempli majoris diam. maj. 6½, minoris 5½, diam. min. 4 et 3½, alt. 2¾ et 2½.*

Shell rather openly but not perviously umbilicated, depressed, oval, yellowish white, translucent, glossy, scarcely striated. Spire almost flat, suture but little impressed. Whorls  $4\frac{1}{2}$ , the penultimate compressed and prominently but bluntly keeled posteriorly; the last very eccentric, flattened and smooth below, and angulately compressed around the umbilicus, and especially near the mouth, where there are indentations corresponding to the teeth inside. Aperture diagonal, semioval, and furnished with five teeth, one strong re-entering bifid plait on the parietal callus uniting the margins of the peristome, one large double tooth on the columellar side, three palatal teeth on the right side. Peristome thickened and expanded, curved back near the posterior angle. Major diam. 0.25, minor 0.15, height 0.11 inch.

A variety from the Cumbum hills has distinct but very fine close filiform raised lines on the upper surface and inside the umbilicus, and the

parietal lamina is double. Some specimens are rather smaller than the type. It is doubtful whether these differences justify a separate name.

15. *STREPTAXIS PERSONATUS*, sp. nov., Plate II, Fig. 10.

"*S. personatus*, Wl. Bl.," Theobald, Cat. Land and Freshwater Shells Brit. Ind. p. 33.

*Testa umbilicata, depressa, spheroidico-ovata, lævigata, nitidula, diaphana, cerco-albida. Spira depressa, apice vix exserto, suturâ impressâ. Anfr. 5, convexi, penultimus postice rotundatus, vix ultra ultimum (a basi spectatus) projiciens; ultimus eccentricus, antrorsum devians, subtus convexus, circum umbilicum compressus, post aperturam fossiculis impressis constrictus. Apertura obliqua, fere semiovalis, laminâ unâ validâ flexuosâ intrante parietali, dentibusque 5, tribus in margine columellari, duobus in dextro, harum uno inferiore majore laminæ parietali opposito, alio minore superiore, coarctata. Peristoma incrassatum continuum, fere solutum, album, undique late expansum, postice juxta angulum subprofunde retrosinuatam, margine parietali valido, concavo. Diam. maj. 5, min.  $3\frac{3}{4}$ , alt.  $2\frac{1}{2}$ .*

HAB. In montibus haud procul ab urbe Cumbum (Madura) Indiae meridionalis (*H. Beddome*).

N. B. *In nonnullis exemplis peristoma quadri-vel tridentatum nec quinquedentatum est, dente uno columellari et aliquando uno palatali carens.*

Shell umbilicated, depressed, spheroidally ovate, smooth, moderately polished, translucent, pale yellowish white. Spire depressed, the apex scarcely exserted, suture impressed. Whorls 5, convex, the penultimate rounded behind, scarcely projecting beyond the last when seen from below; the last eccentric, convex below, compressed around the umbilicus, and constricted by pits corresponding to the teeth inside, just behind the mouth. Aperture oblique, irregularly semioval, and furnished with one strong re-entering parietal lamina, curved inside, and with five teeth, three on the columellar margin, two on the right; of the latter the lower is larger and opposite to the parietal lamina, the smaller is above, nearer to the angle. Peristome thickened, continuous, almost free (the thick callus which unites the columellar and dextral margins projecting from the last whorl, in a hollow curve, the concavity corresponding to the parietal lamina); the outer margins expanded, the right margin deeply recurved close to the posterior angle. Major diameter 0·2, minor 0·15, height 0·1 inch.

In other specimens, rather worn, and with the peristome somewhat less developed, the teeth are rather smaller, the upper columellar tooth is wanting, and in one case the upper tooth on the right margin is also de-

ficient. All, however, are characterized by the great development of the parietal callus.

16. STREPTAXIS CONCINNUS, sp. nov., Plate II, Fig. 11.

*Testa umbilicata, depressa, globoso-ovata, striatula, nitidula, diaphana, cerreo-albida. Spira depresso-conica, parum exserta, apice obtusiusculo, suturá impressá. Anfr. 5, convexi, penultimus postice rotundatus, haud ultra ultimum (a basi spectatus) projiciens; ultimus inflatus, multo major, eccentricus, antrorsum devians, subtus convexus, lævigatus, politus, circum umbilicum praesertim antice compressus, post aperturam fossiculis impressis constrictus. Apertura obliqua, fere semiovalis, lamellis duobus intrantibus parietalibus, sinistrá longiore, intus tortá, dentibusque 5, duobus columellaribus, superiore minore juxta umbilicum, inferiore magno duplici, uno basali lamelliformi transverso, duobusque in margine dextro, inferiore subbifido, superiore minore, coarctata. Peristoma album expansum, ad angulum postice vix sinuatum, marginibus callo duas lamellas ferente junctis. Diam. maj.  $5\frac{3}{4}$ , min. 4, alt.  $3\frac{1}{4}$  mm.*

HAB. In montibus 'Balarangam' dictis (Mysore) Indiæ meridionalis (H. Biddome).

Shell umbilicated, depressed, globosely ovate, rather indistinctly striated, shining, translucent, pale yellowish white. Spire very low, scarcely exserted, apex blunt, suture impressed. Whorls 5, convex, the penultimate rounded behind, and not projecting, when viewed from below, beyond the lower whorl; the last whorl much larger than the others, eccentric, convex below, smooth and polished, compressed around the umbilicus, especially near the mouth, and constricted by indentations, corresponding to the teeth inside, just behind the lip. Aperture oblique, nearly semioval, and furnished with two plaits on the parietal side, that to the left (nearest to the umbilicus) longer than the other and bent inside; there are five teeth in the peristome, one on the columellar margin near the umbilicus, a second large and double nearer the base, one lamellar and transverse at the base, two inside the right margin, the lower being larger than the other and almost bifid inside. Peristome white, slightly expanded, scarcely sinuate near the angle, margins joined by a callus bearing the two parietal plaits. Major diameter 0.23, minor 0.2, height 0.13 inch.

This is the only known species from Southern India, so far as I am aware, in which, when the shell is viewed from below in the direction of the axis, the penultimate whorl does not project at all beyond the body-whorl. The transverse lamellar tooth at the base of the aperture is also peculiar.

17. *STREPTAXIS PRONUS*, sp. nov., Plate II, Fig. 12.

*Testa umbilicata, depresso-ovata, superne confertim atque arcuatim costulato-striata, nitidula, diaphana, cerco-allida. Spira depresso-conica, parum exserta, apice obtuso, suturâ parum impressâ. Anfr. 5½, superiores convexiusculi, penultimus postice rotundatus, longe ultra ultimum (a basi spectatus) projiciens; ultimus valde eccentricus, antrorsum devians, subtus subplanulatus, lævigatus, in umbilico striis filiformibus flexuosis ornatus, circum umbilicum compressus atque aperturam versus angulatus, juxta peristoma scrobiculis constrictus. Apertura obliqua, truncato-ovalis, lamellâ validâ parietali intrante flexuosâ, antice subbifidâ, dentibusque quatuor, uno columellari, alio basali, duobus in margine dextro, coarctata. Peristoma incrassatum, subcontinuum, album, expansum, marginibus callo crasso lamellifero junctis, dextro prope angulum sinuatum. Diam. maj. 6½, min. 4, alt. 3 mm.*

HAB. In montibus haud procul ab urbe Tinnevely Indiæ meridionalis (*H. Beddome*).

Shell umbilicated, depressedly ovate, closely and arcuately ornamented above with subcostulate striation, polished, translucent, pale yellowish white. Spire low, conical, but little exserted, apex obtuse, suture but little impressed. Whorls  $5\frac{1}{2}$ , the upper slightly convex, the penultimate rounded behind and projecting considerably beyond the lower whorl when viewed from below; last whorl very eccentric, somewhat flattened beneath, smooth, except within the umbilicus, where there are fine, irregularly flexuous filiform raised lines on the surface, compressed around the umbilicus and angulate near the aperture, where there are deep indentations corresponding to the teeth inside. Aperture oblique, truncate oval, furnished with a strong re-entering parietal plait, curved within and subbifid in front, and with four teeth—one columellar, one basal, and two (of which the upper is small) inside the right margin. Peristome thickened, subcontinuous, white, expanded, the margins joined by a thick callus projecting from the body-whorl and bearing the parietal lamella. Major diameter 0.26, minor 0.16, height 0.12 inch.

This shell resembles *S. compressus* in form, but it wants the angulation of the penultimate whorl. The peristome is much thickened, as in *S. personatus*.

The forms of *Ennea* and *Streptaxis* described in this paper are the principal that have been collected in the Southern Indian mountains by Colonel Beddome, from whom I have received specimens from various localities from time to time. All of the species of *Streptaxis* are somewhat variable, and, with a large collection from South India, it would

probably be found that many intermediate varieties occur. As a rule, the general form appears more constant than any other characters, and the teeth in the mouth vary considerably. The parietal lamellæ are peculiarly inconstant. Thus, the original type of *Streptaxis perrotteti*, the common species on the top of the Nilgiri hills, has two lamellæ\*; but I have a variety from Ootacamund in which the smaller of the two, that nearer to the angle of the mouth, is obsolete, and in other specimens from the same locality there is but a rudimentary representation of this plait. It was the form with a single lamella which was compared with *S. watsoni* when the latter was originally described (J. A. S. B., 1860, xxix, p. 127). The variation in the teeth of *Streptaxis* has already been noticed in these contributions J. A. S. B., 1861, xxx, p. 359.

The genus *Streptaxis* is abundantly represented on the various hill-groups of Southern India, especially on the higher elevations of the Syhádri, or Western-Ghat range. The most northern locality from which I possess a specimen is the hill-fort of Torna, near Sinharh, west of Poona, in the Bombay Presidency. The shell in question is weathered, and not in very good condition; it is a large form (that is, large compared to the minute species described in the preceding pages), measuring  $11\frac{1}{2}$  mm. by  $8\frac{1}{2}$ , and it is nearly allied to the Nilgiri *S. perrotteti*, and perhaps still more nearly to the Ceylon *S. cingalensis*.

18. ENNEA MACRODON, sp. nov., Plate II, Fig. 15.

*Testa flexuose rimata, subcylindrico-turrita, diaphana, nitidula, confertim capillacco-costulata, cerco-albida. Spira elongata, sursum parum attenuata, lateribus subrectis, apice obtuso, suturá impressá. Anfr. 7, convexi, duo superiores lævigati: ultimus aperturam versus subascendens. Apertura verticalis, oblique semiovalis, lamellá validá bicurvi intrante parietali, aliá columellari profundá, dentibusque tribus, uno tuberculiformi columellari, alio magno lamelliformi transverso basali latus dextrum versus, tertio minore in margine dextro, coarctata. Peristoma album, expansum, juxta anfractum penultimum sinuatum, marginibus callo lamellifero junctis. Long. 5, diam. vir 2, ap. long.  $1\frac{1}{2}$  mm.*

HAB. Apud Pykara in summos montes 'Nilgiri' dictos Indiæ meridionalis.

Shell flexuously rimate, subcylindrically turreted, translucent, polished, yellowish white, closely sculptured, except on the apical whorls, with fine hair-like vertical costulation. Spire turreted, elongate, diminishing very slowly in thickness upwards, the sides nearly straight, the apex blunt and rounded, the suture impressed. Whorls 7, convex, the first two smooth,

\* Petit, quoted by Pfeiffer, Mon. Hel. i. p. 9.

the last ascending very slightly near the aperture. Aperture vertical, semioval, obliquely truncated above, and very much contracted by teeth, consisting of a strong re-entering bifid parietal\* plait on the callus connecting the margins of the peristome, an internal re-entering columellar lamina, commencing at a distance within the mouth, and three teeth—one, more or less tubercular, on the left or columellar side, a second tubercular tooth on the right margin, opposite the parietal plait, and with it nearly cutting off the posterior corner of the aperture, and a third, broad, lamelliform, and transverse (parallel to the plane of the mouth) on the right side of the basal margin. Peristome white, expanded throughout, curved a little back near the angle, where it meets the penultimate whorl, the margins united by a callus bearing the parietal lamella. Length 0·21, diameter 0·075, length of aperture 0·05 inch.

I obtained several specimens of this shell near Pykara, on the Nilgiri hills of Southern India, in 1858, and for a long time supposed it to be *E. pirrici* of Pfeiffer,† but I noticed it as a distinct form when describing *E. sculpta* (J. A. S. B., 1869, xxxviii, pt. 2, p. 141), and mentioned some of its peculiarities. *E. macrodon* is distinguished not only from *E. pirrici*, but also from all other Indian species of the genus, by its strong basal transverse lamelliform tooth. This character serves to distinguish the two species at all ages; for in the present species, as in *E. sculpta*, *E. pirrici*, and, doubtless, in the two forms (*E. exilis* and *E. subcostulata*) described below, the apertural teeth, and especially the parietal lamella, are well developed in immature shells even before all the whorls are completed. *E. macrodon*, too, is only half the size of *E. pirrici*, and there appear to be several slight differences in form, sculpture, and dentition.

19. ENNEA SUBCOSTULATA, sp. nov., Plate II, Fig. 14 (*upper*).

*Testa arcuato-rimata, subcylindrico-turrita, diaphana, nitida, cereo-albida, confertim subobsoletè costulata. Spira parum attenuata, lateribus convexiusculis, apicè obtuso, suturâ impressâ. Anfr. 7½, convexiusculi, ultimus anticè breviter ascendens. Apertura verticalis, oblique semiovalis, lamellâ validâ intrante bicruri, flexuosâ, parietali juxta angulum, aliâ profundâ columellari, et quatuor dentibus, uno columellari, duobus basalibus, quarto dextrali plicæ parietali opposito, coarctata. Peristoma expansum, albidum, juxta anfractum penultimum sinuatum, marginibus callo lamellifero junctis. Long. diam. 2, ap. long. 1¼ mm.*

\* For the meaning of the terms palatal, parietal, and columellar, applied to teeth within the mouth, see Pfeiffer, Mon. Hel. ii, p. 300, note.

† It was quoted as that shell, J. A. S. B., 1860, xxix, p. 126, and 1861, xxx, p. 364.

HAB. In montibus 'Shevrai' vel 'Shevroy' dictis, haud procul ab urbe Salem, Indiæ meridionalis (*II. Beddome*).

Shell arcuately rimate, subcylindrically turreted, translucent yellowish, white, finely and somewhat indistinctly ribbed. Spire turreted, elongate, becoming rather smaller above, with the sides rather convex, the apex blunt, and the suture impressed. Whorls  $7\frac{1}{2}$ , moderately convex; the last whorl ascending slightly close to the mouth. Aperture vertical, semioval, obliquely truncated, with a strong re-entering parietal plait, bifid and flexuous within, near the posterior angle, a columellar lamina at a distance within the mouth, and four tubercular teeth—one columellar, two basal, and the fourth inside the right margin opposite to the parietal plait, so as partly to cut off the upper (posterior) portion of the mouth. Peristome white, expanded, except near the junction with the last whorl, where the edge is curved back somewhat; margins united by a callus, on which is the parietal plait. Length 0·22, diam. 0·075, length of aperture (including peristome) ·05 inch.

I have received from Col. Beddome three specimens of this species, two of which are evidently immature; the third I believe to be full-grown, but the peristome may perhaps be more fully expanded in older examples.

*E. subcostulata* is allied to *E. pirriei*, *E. sculpta*, *E. macrodon*, and their allies, but is distinguished from all by sculpture and the form of the teeth in the mouth. It was, I believe, this species which was erroneously quoted as *E. pirriei* from the Shevroy hills (J. A. S. B., 1861, xxx. p. 364).

20. ENNEA EXILIS, sp. nov., Plate II, Fig. 14 (*lower*).

*Testa rimata, subcylindrico-turrita, diaphana, lævigata, nitidula, albidocærea. Spira elongata, sursum vix attenuata, lateribus apicem versus convexis, apice obtuso, suturâ parum impressâ. Anfr. 6½-7, convexiusculi, ultimus antice subascendens. Apertura fere verticalis, oblique semiovalis, lamellâ validâ intrante biveruri parietali, aliâ profundâ columellari spirali, dentibusque quatuor, uno columellari, duobus basalibus quasi-junctis, quartoque minore in margine dextro, coaretata. Peristoma expansum, albidum, postice juxta angulum sinuatum, marginibus eallo lamellifero junctis. Long.  $4\frac{1}{2}$ , diam.  $1\frac{1}{2}$ , ap. long. 1 mm.*

HAB. In montibus 'Balarangam' dictis provinciæ Mysore in India meridionali (*II. Beddome*).

Shell rimate, subcylindrically turreted, translucent, smooth, polished, yellowish white. Spire turreted, elongate, diminishing very slowly indeed below, but more rapidly above, where the sides are convex, apex blunt,

suture slightly impressed. Whorls  $6\frac{1}{2}$ -7, slightly convex, the last whorl ascending very little near the mouth. Aperture nearly vertical, semioval, obliquely truncated, with a strong re-entering bifid palatal plait on the callus uniting the margins of the peristome, a spiral columellar lamina commencing at a distance within the mouth, and four tubercular teeth just inside the peristome\*—one columellar, two joined together at their base, at the lowest part of the aperture, and one, very small, inside the right margin and opposite to the large parietal plait. Peristome white, slightly expanded, except near the junction with the last whorl, where the margin is slightly curved back. Length 0.18, diameter 0.06, length of aperture 0.04 inch.

This form, of which I have received four specimens from Col. Beddome, is distinguished from its allies by being quite smooth. As in the case of some of the allied forms, it is not improbable that in old specimens the peristome may be more broadly expanded and the palatal teeth may become more or less obsolete.

21. ENNEA STENOSTOMA, Bedd. MS., Plate II, Fig. 17.

*Testa longe profundeque rimata, pupiformis, cylindraceo-ovata, solidula, lævigata (forsan aliquando oblique striata), impolita, haud nitida, albidula. Spira subcylindrica, lateribus convexiusculis, apice rotundato, obtuso, suturâ impressâ. Anfr.  $6\frac{1}{2}$ , convexi, quatuor penultimi subæquales; ultimus post aperturam valde compressus, haud ascendens, capillaceo-striatus, lateribus ambobus juxta peristoma scrobiculis impressis constrictus. Apertura verticalis, subaxialis, non lateralis, suboblunga, altior quam lata, marginibus lateralibus concaviusculis, basali convexo, dentibus valde coarctata, plicâ unâ validâ simplici intrante parietali juxta angulum, tuberculis duobus columellaribus, uno superiore profundo, alio majore inferiore in peristomate, duobus minoribus basalibus, uno dextrali, alio sinistrali, uno denique majore bifido in margine dextro, plicæ parietali opposito sed inferiore, munita. Peristoma album, reflexum, postice sinuatum, marginibus callo lamellifero junctis. Long.  $3\frac{1}{2}$ , diam.  $1\frac{1}{2}$ , ap. long.  $1\frac{1}{4}$  mm.*

HAB. In montibus 'Golconda' dictis, haud procul ab urbe Vizagapatam (H. Beddome).

Var. *minor, anfractibus  $5\frac{1}{2}$ ; long. 3, diam.  $1\frac{1}{2}$ , ap. long.  $1\frac{1}{2}$  mm.* (Pl. II, Fig. 16.)

HAB. In montibus haud procul ab urbe Karnul (Kurnool) Indiæ meridionalis, (H. Beddome).

\* None of the teeth are well represented in the figure.

Shell with a long deep groove at the base, pupiform or cylindrically ovate, rather thick, smooth (perhaps sometimes obliquely striated), dull, destitute of polish, whitish. Spire subcylindrical, with the sides slightly convex, the apex blunt and rounded, and the suture impressed. Whorls  $6\frac{1}{2}$ , convex, the four behind the last whorl subequal, the penultimate being scarcely smaller; the last strongly compressed behind the aperture, with raised hair-like lines of sculpture, not ascending, deeply indented on both sides. Aperture\* vertical, nearly in the axis of the shell, not lateral, nearly oblong in shape, higher than broad, both the right and left margins slightly concave, lower margin convex. Teeth in the mouth numerous, and consisting of the simple† strong re-entering parietal fold near the posterior angle, two columellar tubercles (the upper and smaller situated at some depth inside the mouth, the smaller and larger in front close to the lip), two small basal teeth right and left of the lowest portion of the mouth, and one large bifid tooth on the right margin nearly opposite to the parietal fold, but not very close to it, and rather inferior to it in position. Peristome white, expanded throughout, curved back near the posterior angle, the margins united by a thick callus, on which the parietal lamina is situated. Length 0·14, diameter 0·06, length of aperture 0·05 inch.

The typical form was obtained in the Goleonda hills near Vizagapatam, and the single specimen sent to me by Col. Beddome, from which the accompanying figure was taken, was broken after being drawn. The description is from a specimen in the British Museum.

A smaller variety with  $5\frac{1}{2}$  whorls, and measuring 0·12 inch in length, 0·06 in diameter, and 0·37 in length of aperture, was procured by the same naturalist in the hills near Kurnool.

I have received three specimens of this variety from Colonel Beddome, and there are others in the British Museum. All have the same dull weathered appearance, though they look fairly fresh; but on one there appear what may be traces of sculpture, apparently striae similar to the fine raised lines occurring on the last whorl near the aperture in all.

I am not acquainted with any species of *Ennea* nearly allied to this species. In form, the Sikkim and Khasi *E. stenopylis* shows some resemblance; but that shell is strongly costulate, and its curious aperture, with the posterior portion almost cut off and forming a semi-detached tube, shows the species to be merely an ovate form of the Himalayan and Burmese group, comprising *E. vara*, *E. blanfordiana*, and *E. cylindrelloidea*.

\* It is too broad in figure 17, and the shape is incorrect. The teeth, however, are nearly correct.

† Erroneously represented as double in fig. 17 on the accompanying plate.

## 22. ENNEA BEDDOMEI, sp. nov.

*Testa rimata, subcylindraceo-turrita, cereo-albida, nitida, confertim verticaliter costulata, costulis in anfraetu ultimo plus minusve obsolete. Spira elongata, sursum attenuata, apice obtuso, suturá impressá. Anfr. 6, convexi, ultimus antice ad aperturam vix ascendens. Apertura fere verticalis, semielliptica, lamellis duobus validis parietalibus, uná anteriore dextrali intrante intus tortá, aliá profundá sinistrali subcolumellari incurvá, dentibusque lamelliformibus minoribus duobus vel tribus profundis palatalibus coarctata. Peristoma albidum, expansum, postice juxta angulum leviter sinuatum, marginibus callo lamellifero junctis. Long.  $3\frac{2}{3}$ , diam.  $1\frac{1}{3}$ , ap. long.  $\frac{2}{3}$  mm.*

HAB. In montibus 'Sivagiri' dictis (Tinnevelley) Indiæ meridionalis (II. *Beddome*).

Shell rimate, subcylindrically turreted, pale yellowish white, polished, with close vertical ribbing on all the whorls, the ribs being more or less flattened and obsolete on the last. Spire elongate, becoming more slender above, apex blunt, suture impressed. Whorls 6, convex, the last scarcely ascending in front at the mouth. Aperture nearly vertical, semi-elliptical, with two strong re-entering parietal lamellæ—one of them in front to the right near the angle of the mouth, slightly twisted inside, the other to the left near the columellar margin, commencing at a distance within the mouth, and curved; there are also two or three small depressed lamelliform palatal teeth; but they are seen with difficulty from the front. Peristome white, expanded, the margins united by a callus bearing the parietal folds, the right margin curved back near the angle. Length 0.15, diam. 0.05, length of aperture 0.025 inch.

I have named this shell after the discoverer instead of adopting the term he had given to it in MS., as the latter might be objected to and changed. I have no specimen myself at present, but there are four in the British Museum. The form is peculiarly distinguished by the absence of any teeth in the peristome itself, although there are two or three at a little distance inside the aperture, and two folds on the callus joining the margins of the lip. In general form there is some resemblance to *E. exilis*.

## 23. ENNEA CANARICA, Beddome, MS.

*Testa rimata, turrita, albida, solidula, confertim verticaliter costata. Spira subregulariter attenuata, apice obtuso, suturá profundiusculá. Anfr.  $5\frac{1}{2}$ , convexi, infra saturam inflati, gradatim erescetes, ultimus antice vix ascendens. Apertura subrotunda, superne truneata, lamellá validá parietali intrante subtortá, partem posteriorem aperturæ fere discernente, aliáque*

*columellari profundâ, vix in fauce conspicuâ, coarctata; dentibus palatalibus in peristomate nullis. Peristoma continuum, longe adnatum, album, incrassato-patens, undique expansum, intus granulatum, margine columellari angulatim incisum, basali lato, dextrali intus juxta lamellam parietalem breviter projiciente, angulum versus leviter retro-sinuatam. Long.  $3\frac{3}{4}$ , diam. 2, ap. intus  $\frac{2}{3}$  mm. alta.*

HAB. In provincia 'South Canara' ad latus occidentale Indiæ meridionalis (*H. Beddome*).

Shell rimate, turreted, white (fresher specimens are probably yellowish white and polished), all the whorls ornamented with close vertical ribs. Spire almost regularly attenuate, apex blunt, suture rather deep. Whorls  $6\frac{1}{2}$ , convex, swollen, and projecting beneath the suture, increasing in size by degrees, the last not ascending near the mouth. Aperture nearly round, except above, with one strongly developed parietal lamella, commencing in the front and re-entering deeply, a little twisted within, and so large as almost to cut off the upper left or posterior portion of the aperture; another smaller, deep-seated columellar fold is scarcely discernible from the mouth; no palatal teeth. Peristome continuous, attached for a considerable distance to the last whorl, white, thickened, broadly expanded, granulate inside; the columellar margin with an angular incision, the basal margin broader than the others, right margin curved back near the angle, and having a blunt projecting tooth-like process inside, opposite the parietal fold. Length 0.15, diameter 0.08, length of aperture within 0.025 inch.

The above description is taken from the only specimen I have ever seen, which is in the British Museum. The shell is remarkable for its peculiarly shaped whorls, each of which is suddenly swollen below the suture, so as to give almost a step-like appearance to the spire. The rounded mouth, too, with the broadly expanded peristome is quite different from that of any other Indian form of the genus. Perhaps the Khasi-Hill *Ennea vara* is as closely connected as any of the South-Indian forms, though there is but little resemblance between it and the present species, except such as is due to both being strongly ribbed, and to the manner in which the posterior or upper right-hand corner of the mouth is almost isolated by the strong parietal lamella and a projection from the inner margin of the peristome.

#### 24. HELIX CALPIS.

Bens., Ann. & Mag. Nat. Hist. ser. 3, vol. iii, p. 268.—Pfr., Mon. Hel. v. p. 64.—Hanley, Conch. Ind. pl. xvi. fig. 8.

*Macrochlamys calpis*, Theobald, Cat. Land Freshwater Shells Brit. Ind. p. 19.

? *Nanina (Microcystis) calpis*, Nevill, Hand-list Moll. Ind. Mus. pt. i. p. 38.

This species was described from specimens collected by myself in 1856. I had but an imperfect knowledge of land mollusks at the time, or I should, I think, have seen at once, as I did some years afterwards, when re-examining my collections, that the shells were all young specimens of *Raphaulus (Streptaulus) blanfordi*. I had altogether a considerable number of specimens of the supposed *Helix calpis*; of these four were sent to England, and were examined by Mr. Benson; and it is manifest, from his description, that there was no difference between his examples and mine. In some of the latter I found the operculum still remaining.

In Mr. Nevill's Hand-list of Mollusca in the Indian Museum, Calcutta (*l. c.*), specimens of *Nanina calpis* from the Nága and Khási hills are included. *Streptaulus blanfordi* has been found in Sikkim, and in the Daffa hills, east of Bhutan; and I learn from Col. Godwin-Austen that he obtained a specimen from Brahmakúnd at the head of the Assam valley; but, as no example of the shell is known to have been found in the hill-ranges south of Assam, I think the specimens in the Indian Museum must be something different from the form described as *Helix calpis* by Mr. Benson.

25. SPIRACULUM TRAVANCORICUM, Beddome, MS., Plate III, Fig. 6.

*Testa late umbilicata, depresso-turbinata, in exemplo vetusto adhuc detecto lævis, albescens (junior forsan epidermide induta, colorataque). Spira elevata, depresso-conica, suturâ profundâ, apice acuto. Anfr. 4½, rotundati, ultimus cylindraceus, aperturam versus descendens atque breviter solutus, 3 mill. pone aperturam tubulo longiuseculo antrorsum directo, anfractuum penultimum tangente, munitus. Apertura diagonalis, circularis; peristoma duplex, internum breviter porrectum, superne sinistrorsum leviter sinuatum, externum expansum, atque, nisi ad marginem sinistrum, undulatum. Operculum extus fere planum, marginibus anfractuum exteriorum liberis, intus concavum. Diam. maj. 12½, min. 10½, axis 7, diam. apert. 5½ mill.*

HAB. In montibus Travancoricis haud procul a Tinnevelly (*H. Beddome*).

Shell broadly umbilicate, depressedly turbinate, and, in the single aged specimen found, decorticated, whitish and smooth throughout. Traces of a brown epidermis remain around the umbilicus, and younger specimens are probably brown in colour, and perhaps ornamented with coloured bands, like other species of the genus. Spire raised, depressedly conical, suture deep, apex acute. Whorls 4½, rounded; the last cylindrical, descending, and free near the aperture, and provided above, about three millimetres behind the mouth, with a rather elongate tube, which projects forward, and is in

contact with the penultimate whorl throughout. The tube appears broken at the end, and may have been even longer originally; the anterior termination in the specimen is in a line with the oblique peristome of the shell. Aperture diagonal, circular; peristome double, inner lip sharp, not projecting much, curved backwards near the penultimate whorl; outer peristome expanded, and wavy above externally and below, straight and somewhat narrower on the left margin. Operculum nearly flat externally, concave within; the outer margins of the whorls free and lamellar, except towards the middle; the circumference surrounded by several fine raised lines, the edges of the outermost whorls. Major diameter 0.5 inch, minor 0.42, axis 0.3, diameter of the mouth 0.23.

This species differs from all others of the genus by its higher spire, and by the combination of the mouth being free and the sutural tube being directed forwards and attached to the last whorl. The solitary specimen obtained was procured at a considerable elevation, 4000 or 5000 feet, in the hills between Travancore and Tinnevely, not far from Cape Comorin.

26. *CATAULUS COSTULATUS*, sp. nov., Plate III, Fig. 7.

*Testa subperforata, subovato-turrita, solida, subsinuate costulata, pallide straminea. Spira convexo-turrita, apice obtusiusculo, suturâ valde impressa. Anfr. 7½, convexi, ultimus arctius convolutus, antice porrectus fere solutus, carinâ basali validâ, compressâ, costulatâ, antice dilatatâ munitus; periomphalo medioeri, costulato. Apertura subcircularis, fere verticalis, canali ad latus sinistrum marginis basalis patente, ore subobliquo, subtus spectante. Peristoma album, incrassato-expansum, revolutum, postice dextrorsum atque antice sinistrorsum ad canalem basalem productum, margine columellari angustiore, cum anfractu penultimo breviter juncto. Long. 16, diam. (perist. incl.) 5, diam. min. 5½, apert. intus 3 mm.*

HAB. In montibus 'Tinnevely Ghats' dictis Indiæ meridionalis, (H. Beddome).

Shell subperforate, subovately turreted, solid, rather coarsely and sub-sinuately costulated, of a pale straw-colour. Spire turreted, with convex sides, apex rather obtuse, sutures well impressed. Whorls  $7\frac{1}{2}$ , convex, the last more closely wound than the penultimate, to which it is scarcely attached just behind the mouth; the basal keel compressed, costulate, dilated in front; the space inside the keel and around the umbilicus is of moderate size and ribbed. Aperture nearly circular and subvertical, with the opening of the basal canal on the left side of the base, and not quite in the same plane as the aperture, but turned rather downwards. Peristome white, thickened, expanded, and turned back, produced above to the right of the penultimate whorl and below around the canal, narrow on the columellar margin, and

only united for a short distance with the penultimate whorl. Length 0·65 inch, breadth (including the peristome) 0·25, minor diameter from front to back 0·23, width of aperture inside 0·13.

This species of *Catulus*, the third hitherto obtained from the hills of Southern India, is distinguished from all other known forms of the genus by its comparatively coarse ribbing across the whorls. In other respects, it closely approaches *C. calcadensis*, Bedd. (J. A. S. B., 1869, xxxviii. pt. 2, p. 137, pl. xvi. fig. 8), having a similarly shaped spire, aperture, and basal channel. I have only seen one specimen of *C. costulatus*; this differs from *C. calcadensis* not only in having stronger sculpture, but also in being rather shorter and in having one whorl less in the spire. The colour of *C. costulatus* also is paler than that of the Calcad shell, and the lip of the aperture is white.

Like the other Southern-Indian forms, *C. calcadensis*, *C. recurvatus*, and the species hereafter described, *C. costulatus* has the canal a little to the left of the lowest portion of the aperture, or nearer to the umbilicus than to the outer margin. In most Ceylonese species of the genus, the canal is nearly at the lowest portion of the mouth.\* I find that in *C. tortuosus* the position of the canal is precisely as in *C. calcadensis* and *C. costulatus* (in *C. recurvatus*, the sinistral position of the canal is much more marked).

#### 27. CATULUS ALBESCENS, sp. nov.

*Testa subperforata, subovato-turrita, tenuiscula, albido-cornea, subsinuate costulato-striata. Spira turrita, lateribus convexis, apice obtusiusculo, suturâ valde impressâ. Anfr. 7, convexi, ultimus arctius convolutus, antice porrectus, fere solutus, vix descendens, carinâ basali transversim striatâ, postice obsoletâ, antice validâ, juxta aperturam dilatatâ munitus; periomphalo medioeri, plicato-striato. Apertura subcircularis, fere verticalis, canali ad latus sinistrum marginis basalis patente, ore antice spectante. Peristoma album, incrassato-reflexum, postice et ad canaleni basalem productum, margine columellari angustiore, cum anfractu penultimo breviter junctum. Long. 13, diam. maj.  $5\frac{1}{2}$ , min.  $4\frac{1}{2}$ , apert. diam. intus vix 3 mm.*

HAB. In montibus Travancoricis haud procul ab urbe Trevandrum.

Shell subperforate, subovately turreted, rather thin, whitish horny, rather sinuately and costulately striated. Spire turreted, with the sides convex, apex obtuse, suture much impressed. Whorls 7, convex, the last more closely wound than the penultimate, to which it is but slightly attached just behind the mouth. Basal keel transversely striated, subobsolete on the body-whorl near the junction of the peristome, becoming stronger in

\* It is slightly to the left in *C. pyramidatus*, *C. eurytrema*, and *C. austenianus*; basal in the smaller forms, like *C. templemanni* and *C. layardi*.

front and dilated near the mouth; the space inside the keel and around the umbilicus is of moderate size and plicately striated. Aperture nearly circular and subvertical, with the opening of the basal canal to the left of the base, and in nearly the same plane as the aperture. Peristome white, thickened, expanded and turned back, produced slightly above to the right of the penultimate whorl, and to a greater extent below at the mouth of the canal; columellar margin a little narrower, joined for a short distance only to the penultimate whorl. Length 0·53, major diameter 0·22, minor 0·18; breadth of the aperture within 0·12 inch.

This is the smallest form yet obtained of the peculiar group of Southern-Indian *Catauli*. I received three specimens some years ago from Mr. Theobald, who supposed them to be *C. calcadensis*. Mr. Theobald, I believe, procured them from Mr. F. W. Bourdillon, who obtained them near Mynall, on the hills east of Trevandrum. This shell is, I think, mentioned as *Cataulus calcadensis* by Mr. Theobald in his description of Mr. Bourdillon's shells (J. A. S. B., 1876, xlv. p. 185). The present species, however, has one whorl less, and is a much smaller shell, with proportionately shorter whorls, the sculpture is less close and distinct, the colour whitish instead of golden brown, the basal keel less developed, and its opening is in the same plane as the aperture, instead of being turned downwards, &c. From *C. costulatus*, the present form is chiefly distinguished by its much finer sculpture and by the characters of the basal keel.

#### 28. CATAULUS CALCADENSIS.

The original specimens of this species described by me in 1869 (J. A. S. B., xxxviii. pt. 2, p. 137) were bleached and chalky. Subsequently, Col. Beddome, who discovered and named this very interesting form of *Cataulus*, procured fresh living specimens of a golden-brown colour, with the aperture of the same tint as the shell.\* The peristome in these specimens is not free from the last whorl. The operculum is normal, and precisely similar to that of Ceylonese species of the genus.

The specimens described by Mr. Theobald as *Hapalus travankoricus*† are, I am satisfied, immature shells, and I believe them to be the young of this, of *C. albescens*, or of some nearly allied species of *Cataulus*. Mr. Theobald states that the types of his supposed *Hapalus* differ from the young of *Cataulus calcadensis*, i. e., *C. albescens*, but he omits to point out the distinction. I had an opportunity of examining the types, which were

\* I have not seen specimens of the olive colour represented in the 'Conchologia India,' pl. evi, fig. 10.

† J. A. S. B. 1876, xlv. pt. 2, p. 186, pl. xiv. fig. 5. The name should, in any case, be Latinized as *travancoricus*. There is no such place as Travankor, the common English name Travancore being a corruption of the real name.

shown to me by Mr. Theobald, and I told him my views on the subject, but he did not agree with me.

I have recently examined the specimen of *C. tortuosus* (two in number) at the British Museum, and find the views I expressed several years since (J. A. S. B., 1869, xxxviii. pt. 2, p. 138) as to its alliance to *C. calcadensis* fully confirmed. In form, *C. tortuosus*, *C. calcadensis*, *C. costulatus*, and *C. albescens* are closely allied, all being much more ovate than any of the other species of the genus. The sculpture on *C. tortuosus* is much finer than on *C. calcadensis*, or even than on *C. albescens*. The discovery of two additional forms of this section of the genus in the hills of Southern India, and the absence of the genus from the collections hitherto made in the Nicobar Islands, tend to support the probability that *C. tortuosus* is also in reality a Southern-Indian form. Not a single *Cataulus* has hitherto been discovered in the Andaman Islands, in any of the countries to the east of the Bay of Bengal, or in the Malay Islands, so that the existence of the genus in the Nicobar Islands is extremely improbable.

29. REALIA (OMPHALOTROPIS) ANDERSONI, sp. nov., Plate II, Fig. 18.

*Testa perforata, ovato-conica, tenuiuscula, rufescenti-fulva, lævigata, parum nitida, oblique striatula. Spira conica, lateribus subrectis, apice acuto, suturâ leviter impressâ. Anfr. 7, planiusculi; ultimus ad peripheriam capillaceo-carinatus, subtus convexus, lævigatus, radiatim striatulus, carinâ circumumbilicari obtusâ, fere obsoletâ instructus. Apertura ovata, obliqua, fere diagonalis, spiram altitudine haud æquans. Peristoma obtusum, marginibus subconniventibus, callo tenui junctis, externo recto, basali expansiusculo, columellari subtus expanso, juxta perforationem emarginato, angulatim inciso. Operc.? Long. 7, diam. vix 5; ap. long.  $3\frac{1}{4}$ , lat.  $2\frac{3}{4}$  mm.*

HAB. In insulis Andamanicis (*J. Anderson*).

Shell perforate, ovately conical, thin, reddish brown in colour, smooth, not polished, obliquely striated. Spire conical, with sides nearly straight, apex acute, suture slightly impressed. Whorls 7, rather flat; the last with a hair-like keel at the periphery (the keel sometimes appearing on the upper whorls just above the suture), convex, smooth, and radiately striated below, and furnished with an obtuse, subobsolete keel around the umbilicus, the space inside the umbilical keel being smooth, not ribbed. Aperture ovate, oblique, nearly diagonal, a little shorter than the spire. Peristome obtuse, the margins approaching each other, and joined by a thin callus; outer edge straight, basal expanded, columellar expanded below, but emarginate and cut away into a re-centering angle near the perforation. Length 0·29, diameter 0·19; length of aperture 0·13, breadth 0·11 inch.

This species closely resembles *R. (O.) rubens* of Mauritius in form, but differs in sculpture, the shape of the whorls, &c. The umbilical keel is but faintly marked. Several specimens were procured about ten years ago by Dr. J. Anderson, Superintendent of the Indian Museum, to whom I am indebted for the types. They were obtained, I believe, at some distance from the coast.

30. *REALIA PALLIDA*, sp. nov., Plate II, Fig. 19.

*Testa perforata, ovato-conica, tenuis, albido-cornea, lævigata, nitidula, vix verticaliter striatula. Spira conica, apice acuto, suturâ impressâ. Anfr. 6, convexiusculi; ultimus ad peripheriam atque subtus rotundatus, circa perforationem radiatim striatus. Apertura fere verticalis, ovata, spiram altitudine hand æquans. Peristoma tenue, marginibus subconniventibus, callo tenui junctis, externo recto, columellari expansiusculo. Operc.? Long.  $4\frac{1}{4}$ , diam. 3; ap. long vix 2, lat.  $1\frac{1}{2}$  mm.*

HAB. In insulis Andamanicis cum præcedente (*J. Anderson*).

Shell perforate, ovately conical, thin, whitish horny, smooth, moderately polished, with faint subobsolete vertical striation. (There is also, beneath the lens, a faint indication of minute spiral striation, but I am not sure that this is not an individual peculiarity.) Spire conical, apex acute, suture impressed. Whorls 6, slightly convex, the last rounded at the periphery and below, radiately striated around the perforation. Aperture nearly vertical, ovate, shorter than spire. Peristome thin, margins approaching each other, joined by a thin callus; the outer lip simple, the columellar slightly expanded. Length 0·17, diameter 0·12, length of aperture 0·075, breadth 0·06 inch.

I have but a single specimen of this species, which wants both the keels of the last species, and differs besides in size, colour, and sculpture. The specimen is perhaps not quite adult, but there can, I think, be no question of its being a peculiar form.

Neither of the two species above described can be confounded with the globose *R. (O.) disterniua* (Benson, Ann. & Mag. N. H. Dec. 1863; Pfeif., Mon. Pneum. Suppl. ii. p. 178) with its costulate striation near the suture and inside the umbilicus, its rounded whorls, and its aperture equal in length to the spire. A glance at the figure of this shell in the 'Conchologia Indica,' pl. clxv. fig. 10, will suffice to show how different it is from either *R. andersoni* or *R. pallida*. Even if, as is possible, Benson's type was a young shell, it was manifestly a very distinct species, and the adult would probably resemble *Realia (Omphalotropis) globosa* of Mauritius in shape.

## 31. REALIA DECUSSATA, sp. nov.

*Testa perforata, ovato-conica, tenuiuscula, striis obliquis incrementi, aliisque spiralibus, minutis, sublente subtilissime decussata, in anfractibus superioribus, nisi duobus supremis, undique, atque in inferioribus et supra et infra euturam costulato-striata, pallide rufescenti-fulva, anfractu ultimo cingulo pallido circumdato. Spira conica, apice acuto, sutura impressâ. Anfr. 6, convexi; ultimus ad peripheriam rotundatus, subtus convexus, radiatim striatus, in umbilico costulato-striatus, lineâ impressâ basali in loco carinæ circum umbilicum instructus. Apertura obliqua, rotundato-ovata,  $\frac{3}{4}$  longitudinis subæquans. Peristoma tenue, marginibus subconniventibus, callo tenui junctis, externo basaliq̄ue rectis, columellari subtus expansiuseculo, juxta perforationem retrosinuato. Opere. ? Long.  $3\frac{3}{4}$ , diam.  $2\frac{3}{4}$ ; ap. long.  $1\frac{3}{4}$ , lat.  $1\frac{1}{2}$  mm.*

HAB. Cum præcedentibus in insulis Andamanicis (*J. Anderson*).

Shell perforate, ovately conical, rather thin, finely marked with oblique striæ of growth and minute decussating spiral lines (only visible beneath the lens), costulately striated on the upper whorls (except the two uppermost) and close to the suture on the lower whorls, pale rufescent brown, with a pale band round the body whorl. Spire conical, apex sharp, suture impressed. Whorls 6, convex; the last rounded at the periphery and below, radiately striated beneath, more strongly in the umbilicus, and having an impressed line at the base around the umbilicus in the place of a keel. Aperture oblique, oval, but little higher than broad, about  $\frac{3}{4}$  of the length. Peristome thin, the margins approaching each other and united by a thin callus; the outer and basal edges simple, columellar margin slightly expanded below, curved back into a shallow re-entering sinus close to the perforation. Length 0·15, diameter 0·11; length of aperture 0·07, breadth 0·06 inch.

This shell is distinguished by its fine decussated striation. I have but a single specimen, received from Dr. J. Anderson, with the others. Unfortunately no figure has been given, as I did not observe the distinction until after the accompanying plate had been drawn. Independently of sculpture, the species may be distinguished from *O. disterrina* by its less globose form, and by the absence of the keel around the periphery; from *R. andersoni* by its much smaller size, more rounded whorls, and by the absence of the keel; and from *R. pallida* by rounder whorls, by colour, and by its rather more turreted form.

There is thus evidence of four different forms of *Realia* in the Andaman Islands. The genus is absolutely unknown in either India or Burma, the species of *Omphalotropis* (*O. aurantiaca*) once reported from

Pondicherry being really from the island of Mauritius;\* and it is uncertain that the forms reported from Cochin China, Siam, and Singapore are not *Assiminea*. It is remarkable that the genus is almost entirely insular in its known distribution, and that it is especially common in the Mascarene Islands and in Polynesia.

32. PALUDOMUS TRAVANCORICA, *Beddome*, MS., Plate II, fig. 22.

*Testa imperforata, ovato-conica, solidula, epidermide fuscâ induta, sub epidermide albida, fasciis fusco-purpureis flexuosis verticalibus ornata, costis spiralibus subconfertis circumdata, interspatiis glabris, striis incrementi inconspicuis. Spira conica, subturrita, apice eroso, suturâ impressâ. Anfr. superst. 3, convexi, ultimus dimidium testæ superans. Apertura subverticalis, ovata, postice angulata, intus cærulescenti-albida, strigis flexuosis confertis conspicuis. Peristoma rectum, margine externo acuto, columellari basaliq̄ue albis, intus incrassatis, dilatatis. Operc. normale. Diam. maj. 16, min. 13½, alt. 23 mm. (apice non eroso ad 25); apert. 12 mm. longa, 9 lata.*

HAB. In Travancore (*H. Beddome*).

Shell imperforate, ovately conical, rather thick, covered with a dark-brown epidermis; beneath the epidermis white, with narrow vertical, very wavy dark purple stripes; all the whorls spirally ribbed, the ribs rather close together, with the interspaces smooth, the striæ of growth being inconspicuous. Spire conical, apex eroded (doubtless acute when perfect), suture impressed. Whorls remaining 3 (probably in the perfect shell 5 or 6), convex, the last exceeding half the length of the shell. Aperture nearly vertical, ovate, angulate at the posterior extremity, bluish white, with conspicuous, close, vertical, wavy, deep purple bands within; peristome in one plane, the external margin sharp, the columellar and basal margins white, thickened within, and dilated. Operculum normal. Major diameter 0.65 inch, minor 0.52, height (apex wanting) 0.9 (when perfect about an inch); aperture 0.5 high, 0.36 broad.

In a young specimen of *P. travancorica*, there appears to be a tendency to the development of minor parallel ribs between those forming the spiral sculpture, and the latter are rather closer together near the suture.

\* See Benson, A. M. N. H. Scpt. 1851, Ser. II, Vol. 8, p. 194.—Nevill, Handlist Moll. I. M. pt. i, p. 320. Hanley, Conch. Ind. Systematic list of Species, p. xiii, note 1, whilst pointing out that the species is not Indian, states that it occurs in the Isle of Bourbon. As he does not give his authority, the name of the island may have been inserted by mistake for that of Mauritius, but it is possible that the form occurs, like *O. rubens* and two or three other species, in both islands.

This fine and well-marked form of *Paludomus* was procured by Colonel Beddome in streams traversing the plains between Trevandrum and the foot of the Aghastyamali hill.

So far as I am aware, none of the forms of true *Paludomus* hitherto described from Southern India and Ceylon have the marked spiral sulcation of the present species. There is, however, a remarkable resemblance to the Ceylonese *Philopotamis sulcata*, the shell of which is only distinguished by wanting the conspicuous coloured bands within the peristome, although the operculum is very different. Perhaps the nearest ally of *P. travancorica* is the Burmese *P. regulata*; but that is a less conical form, and differs both in sculpture and coloration, as may be seen by comparing the figure of the present species with that of *P. regulata* in the 'Conchologia Indica' (pl. cviii. fig. 5). In form, *P. travancorica* has some resemblance to the common *P. tanjorica*\* (*Helix tanshaurica*, Gmelin, Syst. Nat. p. 3655).

### 33. BYTHINIA EVEZARDI.

*Testa anguste umbilicata, ovato-conica, solida, striis regularibus spiritaliter circumdata, albido-cornea, epidermide crassâ olivaceâ oblecta. Spira conica, apice eroso, suturâ valde impressâ. Anfr. superst. 3 (in testâ integrâ 4-5), conrevxi, ultimus dimidiam longitudinis subæquans, modice ventricosus, subtus circa umbilicum angulatim compressus, umbilico conico, intus lævigato. Apertura subverticalis ovata, antice atque postice subangulata; peristoma simplex, rectum, obtusum. Operculum normale. Long.  $3\frac{3}{4}$ , diam. maj.  $3\frac{1}{4}$ , min. 2 mm.; apert. intus fere 2 longa,  $1\frac{1}{3}$  lata.*

HAB. Ad Lanowlee (Lanaoli) juxta viam ferratum inter Bombay et Poona (*G. Evezard*).

Shell narrowly umbilicate, ovately conical, solid, surrounded by regular spiral impressed lines rather close together, whitish horny, covered with an olive epidermis. Spire conical, apex eroded, suture deeply impressed. Whorls remaining 3 (in a perfect shell about 4 to 5), rounded, the last about half the whole length, moderately ventricose, angulately compressed at the base around the umbilicus, which is conical and smooth inside. Aperture nearly vertical, oval, subangulate in front at the base and at the posterior extremity; peristome simple, straight, obtuse; operculum normal. Length 0.15, major diameter 0.13, minor 0.08 inch; aperture within 0.07 long, 0.05 broad.

This peculiar little species, distinguished by its distinct umbilicus from all other Indian forms, was obtained by Colonel G. Evezard at Lanaoli, a station on the railway from Bombay to Poona, situated a few miles east of Khandalla at the top of the Bor-ghat.

\* I think it is to be regretted that Gmelin's spelling should be adopted for this species, as the derivation of the name is thereby rendered obscure.

## 35. CREMNOCONCHUS FAIRBANKI.

"*Cremnoconchus fairbanki*, Blanford," Hanley, *Conch. Ind.* p. 58, pl. cxlvi, fig. 7.

I have described the species here attributed to me, and I greatly doubt my being responsible for the specific name, even in manuscript. I find amongst my collection a small box of *C. carinatus*, labelled *C. fairbanki*, but I cannot recollect whence the name was derived. The shell figured in the 'Conchologia Indica' resembles *C. carinatus* in form, but the angulation of the last whorl is not shewn, and the coloured bands represented are not, so far as I know, found in that species.

The shell figured in the same plate of the 'Conchologia Indica' (pl. cxlvi, fig. 10) as *C. carinatus*, is certainly not that species, but *C. conicus*, var. Some of the references in the letterpress, p. 58, to my descriptions and figures of *Cremnoconchus* (*J. A. S. B.* 1870, xxxix, pt. 2, pp. 10—12, pl. 3, figs. 3, 4, 5) are incorrect.

## 36. CORBICULA IRAVADICA.

"*Cor. iravadica*, Blanf. MSS." Hanley, *Conch. Ind.* p. 62, pl. clv, fig. 8.

*Testa fere æquilateralis, rhomboideo-ovata, ventricosa, solidiuscula, concentricè striata atque costulis subremotis, interdum plus minusve obsolete, ornata, epidermide olivaceâ induta, intus violacea: latere antico ante umbones prominentes subhorizontali, tunc fere regulariter convexo, postico declivi, oblique subtruncatulo, demum subangulato, margine ventrali modice arcuato; ligamento postice subito contracto. Lat. 10½ mm., long. 9, crass. 7. In alio exemplo long. 11½, lat. 8½, crass. 7.*

HAB. Ad Mandalay, urbem capitalem regni Avæ.

Shell nearly æquivalve, rhomboidally ovate, ventricose, thickish, concentrically striated and ornamented with ribs rather wide apart often more or less obsolete. The colour of the epidermis is olive, that of the shell inside violet. Anterior side nearly horizontal in front of the prominent umbones, then almost regularly convex, the posterior side slopes away gently at first, then sharply, almost as if truncated, and forms a rounded angle with the ventral margin, which is gently areuate. The ligament behind is suddenly contracted and compressed, the hindermost portion, about a quarter of the length being very much smaller than the rest.

Dimensions of one specimen:—length 0·42 inch, breadth from umbones to ventral margin 0·36, thickness 0·28; of another much longer shell, the same measurements are 0·46, 0·34, and 0·28 inch.

It is very possible that this may not be separable from some of the numerous other forms of the genus, but I can find none precisely agreeing. The form is more ventricose and the umbones more prominent than in most

Indian *Corbiculæ*. The genus, like *Unio*, appears to have been designed by a beneficent Providence for the amusement of species-makers. Many of the described local races in all probability pass more or less into each other.

## EXPLANATION OF THE PLATES.

## Plate II.

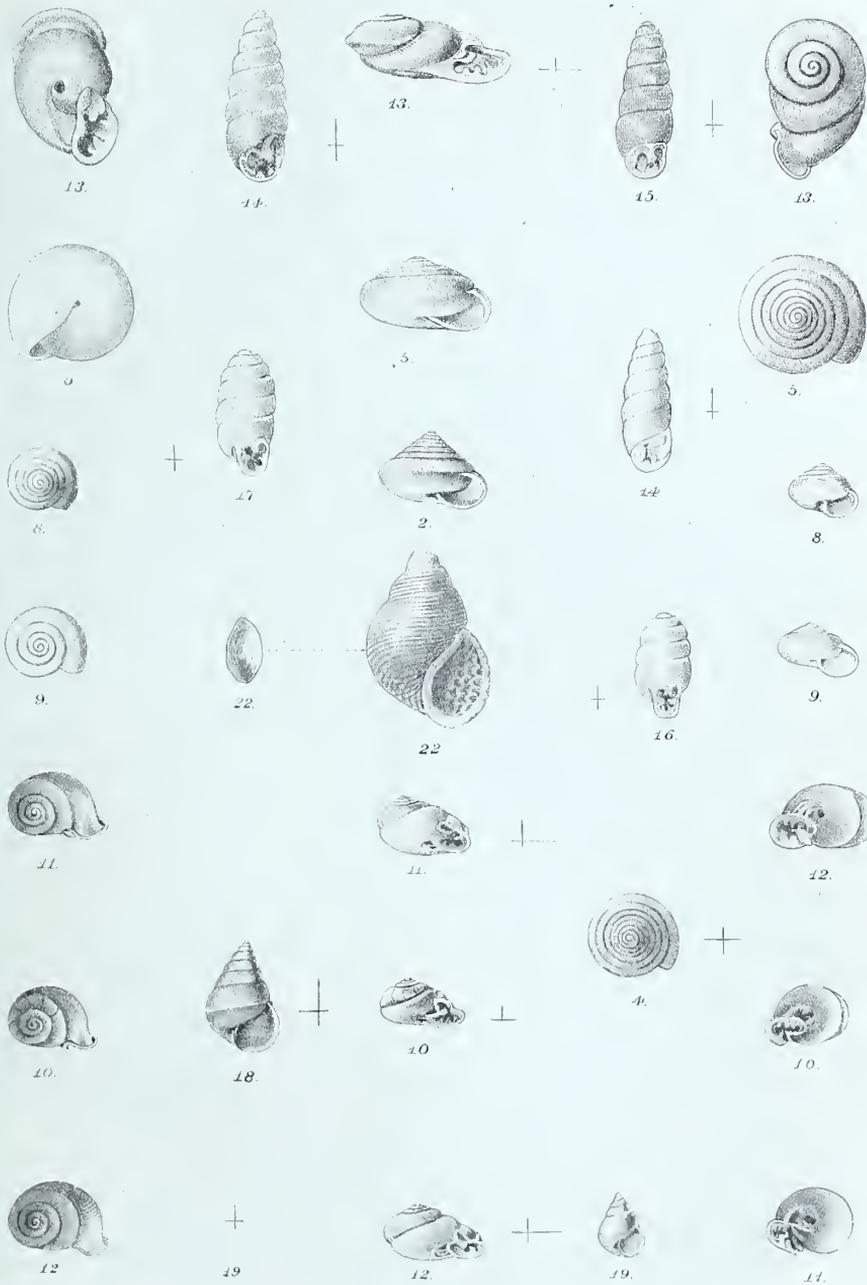
- Fig. 2. *Euplecta vidua*, var. *minor*, natural size.  
 „ 4. This shell has not been described, the type having been mislaid, and one figure, that shewing the shell from the mouth, omitted in the plate.  
 „ 5. *Euplecta vidua*, typical form, natural size.  
 „ 8. *Macrochlamys tenuicula*, two views, natural size. In the left hand figure one whorl too many is represented, and in the right hand figure the peristome is represented as thick instead of very thin.  
 „ 9. *Macrochlamys platychlamys*, two views, natural size. In the right hand view the lip should have been represented as very thin.  
 „ 10. *Streptaxis personatus*, three views, enlarged two diameters, fair.  
 „ 11. *Streptaxis concinnus*, three views, enlarged two diameters, teeth rather indistinct, otherwise good.  
 „ 12. *Streptaxis pronus*, three views, enlarged two diameters, teeth not correctly represented; see description.  
 „ 13. *Streptaxis compressus*, three views, enlarged four diameters; the teeth are incorrect, especially in the middle figure, where three are represented on the basal margin of the aperture instead of one only.  
 „ 14. (Upper figure) *Ennea subcostulata*, enlarged four diameters. The columellar tooth should be lower down.  
 „ 14. (Lower figure) *Ennea exilis*, enlarged four diameters. All the teeth are wrongly represented; see description.  
 „ 15. *Ennea macrondon*, enlarged four diameters. The teeth in the peristome are not distinct in the figure, and the large tooth inside the base is omitted altogether.  
 „ 16. *Ennea stenostoma*, var., enlarged four diameters. Teeth not correct, they should be precisely the same as in fig. 17.  
 „ 17. *Ennea stenostoma*, typical form, enlarged four diameters. The mouth too broad, it should be of the same shape as in fig. 16. The teeth are correct.  
 „ 18. *Realia (Omphalotropis) andersoni*, enlarged two diameters: fair figure.  
 „ 19. *Realia pallida*, enlarged two diameters, not good, the penultimate whorl is by far too large, and the suture wrongly drawn.  
 „ 22. *Paludomus travancorica*, natural size, good figure.

N. B. As already noticed in the text, several of the figures in this plate are unsatisfactory. In especial, the teeth in the aperture of some forms of *Ennea* and *Streptaxis* are by no means accurately represented. The plate having been twice lithographed, it appears hopeless at present to try to obtain greater accuracy. The general form of the shells is as a rule correct. The imperfection of the plate is partly due to its having been lithographed during the absence of the author of the present paper.

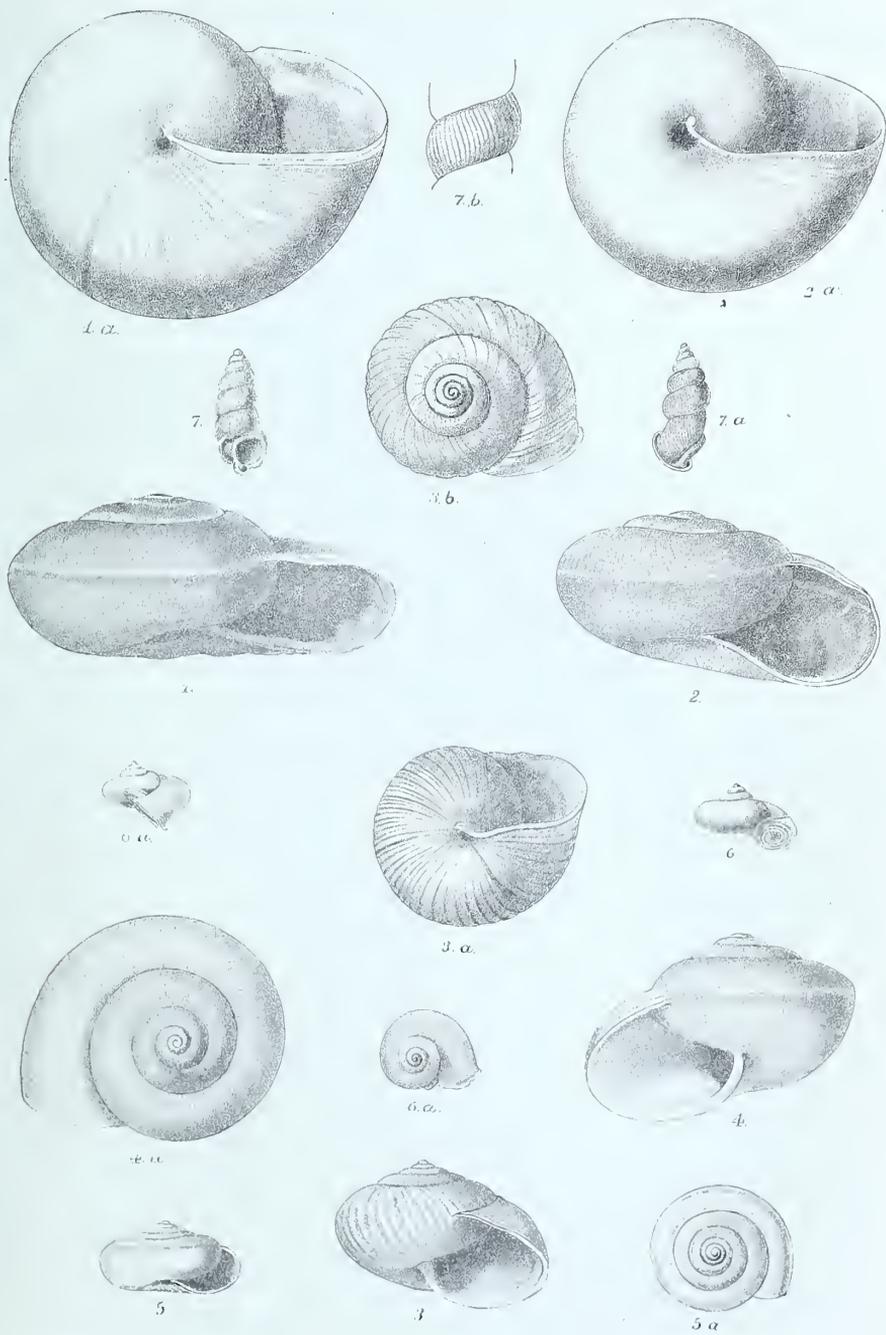
## Plate III.

- Fig. 1. *Hemiplecta tinostoma*.  
 „ 2. *Hemiplecta enisa*.  
 „ 3. *Xestina albata*.  
 „ 4. *Ariophanta immerita*.  
 „ 5. *Macrochlamys wynnei*.  
 „ 6. *Spiraculum travancoricum*.  
 „ 7. *Cataulus costulatus*.

N. B. The figures on this plate are all fairly good; all are of the natural size except 7b.









XXI.—*List of Diurnal Lepidoptera from Port Blair, Andaman Islands, with Descriptions of some new or little-known Species and of a new Species of Hestia from Burmah.*—By J. WOOD-MASON, Deputy Superintendent, Indian Museum, and L. DE NICÉVILLE.

(With Plate XIII.)

The first collection of Andamanese Lepidoptera of any importance was made by the native collector (Moti Ram) who accompanied Mr. Wood-Mason on his first visit to the Andaman Islands in the year 1872; and remained at Port Blair for some months after Mr. Wood-Mason's return to Calcutta, collecting insects in the immediate vicinity of the settlement. This collection was entrusted for determination and description in this Journal to the late Mr. W. S. Atkinson, who, however, only described in the 'Proceedings of the Zoological Society' two of the more obvious novelties, and eventually returned a few of the specimens to Mr. G. Nevill, who at that time had charge of the Museum collection of lepidopterous insects, and who placed them in the collection. These specimens are included in the present list.

Since 1872, numerous collections of Lepidoptera have been formed at Port Blair and at Kamorta in the Nicobars by the officers of the Port Blair establishment, and forwarded by them to England, where in 1877 Mr. F. Moore examined all the material that had been thus collected and drew up a complete list of "The Lepidopterous Fauna of the Andaman and Nicobar Islands," describing therein many new species and varieties both of butterflies and moths. In this list, 71 species of rhopaloceros Lepidoptera are recorded as inhabitants of the Andaman Islands. Since Mr. Moore's paper appeared, 4 new species and varieties of butterflies have been described by as many different authors, bringing up this number to 75. In the present list, 29 additional species, five of them described for the first time, are recorded, making a total of 104,—a number which might no doubt be largely increased by an experienced collector in a few weeks.

Several common species which occur everywhere in the neighbouring regions are not recorded, and these are all the more conspicuous by their absence from the circumstance that their supposed models are also absent; we allude to *Hypolimnas misippus*, *Elymnias undularis*, and the 2nd and 3rd forms of the female of *Papilio polytes*, which respectively mimic *Danais chrysippus*, *Danais plexippus*, *Papilio hector*, and *Papilio aristolochiae*. It is a curious fact that both in the Kulu valley and in the Simla district in the North-Western Himalayas, where *Papilio hector* and *P. aristolochiae* have never been found, the same forms of the female of *Papilio*

*polytes* are also absent: whether they are really absent from the Andaman Islands and the other regions mentioned, and, if so, whether they ceased to be developed or rather were exterminated as soon as the species spread into regions wherein neither of the forms which its females mimic exist, are interesting subjects for future enquiry.

Tribe PAPILIONES.

Family NYMPHALIDÆ.

Subfamily DANAINÆ.

No representative of the genus *Hestia* has been received from Mr. de Roepstorff, but we are indebted to Capt. G. F. L. Marshall, R. E., for the gift of a specimen which that gentleman had received from Colonel Cadell, Chief Commissioner of the Andamans and Nicobars, but which does not agree with Felder's figure and description of *Hestia agamarschana*, the only species of the genus hitherto recorded from those islands, either in the extent and relations of the black markings or in the shape and proportions of the wings; the former being larger, more or less coalescent generally, and completely run together at the outer margin so as to form a distinct black border to each wing, and the posterior pair of the latter being broadly rounded off at the extremity and consequently not presenting the peculiar egg-shaped outline so characteristic of these organs in all the hitherto described Indian *Hestias*, e. g., *H. Lynceus*, *H. Jasonia*, etc., with the latter of which Felder compares his species; the specimen apparently also differs from *H. agamarschana* in having the white of all the wings everywhere more or less clouded with minute black scales. *H. agamarschana*, it is true, to judge from Felder's figure of it, has the posterior wings a little less pointed, the anterior discal spots on the anterior ones obviously more elongated, with more black in the cell and behind it, and the markings generally larger than in *H. Jasonia*, and it is, as might have been expected, more closely related to the specimen obtained by Col. Cadell than to any other species; but, large series of specimens having shown us how extremely constant the different species or local races of *Hestia* are, we cannot unite the two, and we think that the differences they present are in all probability due to a difference of station, and that Helfer may have obtained the specimen that served Felder for type on a different island; all the lepidopterous insects of late years received from the Andamans having been obtained in the immediate vicinity of the settlement at Port Blair, in an area therefore which is a very small fractional part indeed of the Andaman group of islands, which extends through nearly four degrees of latitude. We, therefore, propose to describe the specimen as a new species under the name of

1. *HESTIA CADELLI*, n. sp., Pl. XIII, Fig. 1, ♂.

♂. Allied to *Hestia agamarschana*, Felder. Wings above pure subpellucid white clouded, especially on the outer halves, with minute black scales, and marked and veined with intense black; all the markings larger, more or less coalescent, and blurred or paler at the margins, the veins more broadly black-bordered, and the marginal spots completely run together so that the wings are all, especially the posterior ones, distinctly bordered externally with black.

Anterior wings relatively narrower and longer, being more than twice as long as broad, with the discoidal cell equal in length to the submedian vein, that is to say, to the inner margin, and all but as long as the outer margin measured in a straight line from the extremity of the submedian vein to that of the subcostal; with the anterior discal spots more elongated and more completely coalesced, the spot between the first and second median veinlets alone constantly free, and the large rounded one internal to it in the same cell coalescent with the enlarged extremity of the cellular mark (which fills the cell nearly to the level of the origin of the second median veinlet, and is divided at the base of the wing by three indistinct longitudinal clouded white streaks), and the large mark in front of the submedian vein larger, triangular, and united by a black streak to the discal black spot beyond it.

Posterior wings shorter and broader, with the outer margin more broadly rounded off, the cell and the interspaces beyond it broader, the spot in it larger, and all those around it free, though exhibiting a tendency to coalesce with the black margins of the veinlets.

Wings below dirty-white of a dull opalescent tinge, with fuscous-black markings and veins.

Length of fore-wing 2.45; extreme length of discoidal cell, 1.38; expanse 5 inches.

HAB. Port Blair, S. Andaman.

We have much pleasure in naming this species after Colonel Cadell, Chief Commissioner of the Andamans and Nicobars, who obtained it, and who has shown himself no less ready than his predecessors to help those who are engaged in working out the interesting fauna of the islands under his charge.

*Obs.* The specimens of *Hestia* which Hewitson, in his list of Butterflies from the Andamans (Ann. & Mag. Nat. Hist., ser. 4, vol. xiv, 1874, p. 356), considers to be specimens of *H. agamarschana* remarkable for their dark colour, doubtless belong here.

2. *DANAIS MELANOLEUCA*.

*Danais melanoleuca*, Moore, Proc. Zool. Soc. Lond. 1877, p. 581, pl. lviii, fig. 3.

Numerous specimens of both sexes (*A. de Roepstorff* and *Moti Ram*).

## 3. EUPLEA CORE.

*Papilio core*, Cramer, Pap. Exot. 1782, vol. iii, pl. 266, figs. E, F.

*Euplea core*, Butler, Journ. Linn. Soc. Lond., Zoology, 1878, vol. xiv, p. 301.

One female (*Moti Ram*) agreeing with Bengal specimens.

## 4. EUPLEA ANDAMANENSIS.

*Euplea andamanensis*, Atkinson, Proc. Zool. Soc. Lond. 1873, p. 736, pl. lxiii, fig. 2, ♂. Butler, op. cit. p. 300.

Numerous males and females (*A. de R.* and *Moti Ram*).

This is one of the species described from the collection made by *Moti Ram* in 1872.

## Subfamily SATYRINÆ.

## 5. LETHE EUROPA.

*Pap. europa*, Fabr. Syst. Entom. 1775, p. 500.

Males and females, all remarkably fine specimens.

## 6. MELANITIS LEDA.

Males and females (*A. de R.* and *Moti Ram*) and males of *M. ismene*, Cr.

## 7. MYCALESIS MINEUS, Linn.

„ DRUSIA, Cr.

„ BLASIIUS, Fabr.

Males and females (*A. de R.* and *Moti Ram*).

## 8. MYCALESIS OTREA.

*Pap. otreæ*, Cramer, Pap. Exot. 1782, vol. iv, pl. 314, figs. A, B.

— *francisca*, Id., *ibid.*, pl. 326, figs. E, F.

A female of one of the numerous varieties of this species.

## 8. MYCALESIS RADZA.

*M. radza*, Moore, Proc. Zool. Soc. Lond. 1877, p. 583, pl. lviii, fig. 2.

One male and two females.

## 9. ELYMNIAS COTTONIS.

*M. cottonis*, Hewitson, Ann. Mag. Nat. Hist. 1874, ser. 4, vol. xiv, p. 358, ♂ ♀.

Numerous males (*A. de R.* and *Moti Ram*); one female (*A. de R.*).

## Subfamily MORPHINÆ.

## 10. DISCOPHORA CELINDE.

*Pap. celinde*, Stoll, Pap. Exot. Suppl. 1790, pl. 37, figs. 1, 1 A.

One female.

## Subfamily NYMPHALINÆ.

## 11. CETHOSTIA NICOBARICA.

Felder, Verhand. zool.-bot. Gesellsch. Wien, 1862, vol. xii, p. 484; Novara Reise, Lep. p. 384, pl. xlvi, figs. 7, 8, ♂.—Moore, Proc. Zool. Soc. Lond. 1877, p. 583, ♀.

Two pairs (*Moti Ram*) and one male (*A. de R.*) agreeing perfectly with specimens from the Nicobars.

## 12. ATELLA ALCIPPE.

*Pap. alcippe*, Cramer, Pap. Exot. 1782, vol. iv, pl. 389, figs. G, H.

Numerous specimens, male and female (*A. de R.* and *Moti Ram*).

## 13. CIRRHOCYROA ANJIRA.

*C. anjira*, Moore, Proc. Zool. Soc. Lond. 1877, p. 584, ♂ ♀.

Males and females.

## 14. CYNTHIA EROTA.

*Pap. erota*, Fabr., Entom. Syst. 1793, vol. iii, p. 76.

Numerous males and females.

## 15. MESSARAS ERYMANTHIS, VAR. NICOBARICA.

Felder, Verh. zool.-bot. Gesellsch. Wien, 1862, vol. xii, p. 486.

Males and a female.

## 16. JUNONIA ÆNONE.

*Pap. ænone*, Linn., Cramer, Pap. Exot. 1775, vol. i, pl. 35, figs. A, B, C.

Numerous males and females (*A. de R.* and *Moti Ram*).

## 17. JUNONIA ALMANA.

*Pap. almana*, Linn., Cramer, Pap. Exot. 1775, vol. i, pl. 58, figs. F, G.

One pair.

## 18. JUNONIA ASTERIE.

*Pap. asterie*, Linn., Cramer, Pap. Exot. 1775, vol. i, pl. 58, figs. D, E.

Three males and two females.

## 19. DOLESCHALLIA BISALTIDE.

*Pap. bisaltide*, Cramer, Pap. Exot. 1779, vol. ii, pl. 102, figs. C, D.

Numerous fine specimens of both sexes. Specimens were also obtained by *Moti Ram* in 1872.

## 20. KALLIMA ALBOFASCIATA.

*K. albofasciata*, Moore, Proc. Zool. Soc. Lond. 1877, p. 584.

Male and female.

## 21. EURYTELA HORSFIELDII.

*Eurytela horsfieldii*, Boisduval, Faun. Ent. Madag, 1833, p. 54, ♂.

—— *stephensii*, Id., ibid. p. 55, ♀.

A single male.

## 22. CYRESTIS COCLES.

*Pap. cocles*, Fabr., Moore, Proc. Zool. Soc. London, 1878, p. 829.

? *Cyrestis formosa*, Felder, Reise Novara, Lep. p. 412, ♂.

A single male of this delicately tinted butterfly.

## 23. CYRESTIS THYODAMAS.

*Cyr. thyodamas*, Boisd. in Cuv. R. A. 1836, Ins., pl. 138, fig. 4. Doubl. Westw. and Hew. Gen. D. L., pl. 32, fig. 3.

*Amathusia ganescha*, Koll. in Hügel's Kaschmir, 1848, vol. iv, p. 430, pl. 7, figs. 3, 4.

One male.

## 24. HYPOLIMNAS BOLINA.

*Pap. bolina*, Linn., Clerk's Icones, pl. 21.—*Diadema bolina*, Wallace, Trans. Ent. Soc. Lond. 1869, p. 278.

Numerous male and females (*A. de R.* and *Moti Ram*).

## 25. HERONA MARATHUS, VAR. ANDAMANA.

*Herona marathus*, Westw. Doubl. and Hew. Gen. D. Lep. 1850, p. 293, pl. 41, fig. 3.

—— *andamana*, Moore, Proc. Zool. Soc. Lond. 1877, p. 585, ♂ ♀.

Two males and a female.

## 26. PARTHENOS GAMBRISIUS.

*Pap. gambrisius*, Fabr.

Numerous specimens of each sex (*A. de R.* and *Moti Ram*).

## 27. NEPTIS MANANDA.

*N. mananda*, Moore, Proc. Zool. Soc. Lond. 1877, p. 586, pl. lviii, fig. 4, ♀.

Two pairs (*A. de R.* and *Moti Ram*).

Seems very near to *N. khasiana*.

## 28. NEPTIS ANDAMANA.

*N. andamana*, Moore, Proc. Zool. Soc. Lond. 1877, p. 586, ♂ ♀.

Five males and a female (*A. de R.* and *Moti Ram*).

## 29. ATHYMA SELENOPHORA.

*Limenitis selenophora*, Koll. in Hügel's Kaschmir, 1818, vol. iv, p. 426, pl. vii, figs. 1, 2, ♂.

A female, the only one in the Museum, was obtained by Moti Ram in 1872.

## 30. SYMPHLEDRA TEUTA, var. TEUTOIDES.

*S. teutoides*, Moore, Proc. Zool. Soc. Lond. 1877, p. 586, ♂ ♀.

Males and females (*A. de R.* and *Moti Ram*).

## 31. TANAECIA CIBARITIS.

*Adolias cibaritis*, Hewitson, Ann. & Mag. Nat. Hist. 1874, ser. 4, vol. xiv, p. 358; Exot. Butt. vol. v, *Adolias*, pl. iv, figs. 12, 13, 15, ♂ ♀.

*Tanaëcia cibaritis*, Moore, Proc. Zool. Soc. Lond. 1877, p. 586.

Numerous males and females (*A. de R.* and *Moti Ram*).

## 32. TANAECIA ACONTIUS.

*Adolias acontius*, Hewitson, loc. cit. p. 357; Exot. Butt. vol. v, *Adolias*, pl. iv, fig. 11, ♀. *Tanaëcia acontius*, Moore, Proc. Zool. Soc. Lond. 1877, p. 586.

One female.

## 33. LIMENITIS PROCRIS, var. ANARTA.

*L. anarta*, Moore, Proc. Zool. Soc. Lond. 1877, p. 585.

One female.

## 34. NYMPHALIS ATHAMAS.

*Pap. athamas*, Drury, Ill. Exot. Entom. 1773, vol. i, pl. ii, fig. 4.

One female.

## Family ERYCINIDÆ.

## 35. ABISARA BIFASCIATA.

*A. bifasciata*, Moore, Proc. Zool. Soc. Lond. 1877, p. 587, pl. lviii, fig. 1, ♀.

Three females.

## Family LYCÆNIDÆ.

## 36. LAMPIDES ARDATES.

*Lycæna ardates*, Moore, Proc. Zool. Soc. Lond. 1874, p. 574, pl. lxxvii, fig. 1, ♂.

One female.

## 37. LAMPIDES ÆLIANUS.

*Hesp. ælianus*, Fabr., *Lycæna ælianus*, Horsfield, Cat. Lep. E. I. Co., 1829, p. 73.

One male.

## 38. LAMPIDES ELPIS.

*Polyomm. elpis*, Godt., Encyclo. Méth. Ins. vol. ix, p. 654.—*Lycaena elpis*, Horsfield, opcit. p. 76, pl. 1, fig. 4, ♀ ♂.

One female and one male (*A. de R.* and *Moti Ram*).

## 39. LAMPIDES PANDAVA.

*Lycaena pandava*, Horsfield, op. cit. p. 84, ♀.

One female.

## 40. LAMPIDES CONF. PACTOLUS.

♀. Wings above much as in *L. pactolus*, differing in having the dark fuscous outer border of the anterior wing spotless and that of the posterior wing very much less distinctly marked in the same manner, no discocellular mark in either wing, and the whole upperside apparently more clouded with smoky fuscous scales.

Wings beneath very pale fuscous, with a submarginal fascia composed of rhomboid spots and a marginal one of narrow oval spots fuscous of a rather darker shade than the ground, both margined and connected together by whitish, the latter of them developed, in the interval between the first and second median branches, into a conspicuous jet-black circular spot divided externally by a semicircle of pale blue metallic scales and encircled internally by luteous white, and into two minute ones, one on each side of the submedian vein, internally covered with blue scales.

Anterior wings with two small subcostal spots, a short discocellular fasciole, and a discal fascia strongly faulted at the second median veinlet so that the outer white margin of its posterior portion is in line with that of its anterior portion, and the inner white margin of its posterior portion in line with the discocellular veinlet.

Posterior wings with a similar discocellular fasciole, and complexly faulted and contorted discal and basal fasciæ; all the fasciæ in all the wings margined on both sides with fuscous of a very slightly deeper tint than the ground and with whitish.

Since the above description was written, we have discovered that five unnamed insects in the Museum from Cherrapunji in the Khasi Hills, the Sikkim Hills, and Sibsagar (*S. E. Peal*) in upper Assam are males of this species, and the following is a brief description of one of them:—

♂. Wings above semitranslucent palish fuscous with a light and tolerably brilliant amethystine lustre, edged with a darker anteciliary line.

Wings below much as in the female, with the macular submarginal fuscous fascia of all the wings broader, and the anal and subanal black spots rather larger and conspicuously encircled with fulvous internally.

Length of anterior wing ♀ ·72, ♂ ·58—·68; whence expanse = ♀ 1·5, ♂ 1·2—1·4 inches.

41. LAMPIDES PLUMBEOMICANS, n. sp.

Closely allied to the preceding, but much smaller; with three instead of two fasciæ on the underside of the anterior wings, with all the fasciæ relatively broader, and with those of the posterior wings much less complexly faulted and contorted.

♂. Wings above dark amethyst-purple with a dull greyish leaden metallic lustre, with a deep black anteciliary line and fuscous fringe.

Wings beneath pale fuscous of a purplish tinge, with a marginal and a submarginal fascia composed of suboval spots of a darker shade than the ground, both margined and connected by whitish, the latter of them bearing in the posterior wings subanal and anal black spots in every respect as in the preceding except that the luteous inner line is rather more distinct.

Anterior wings with a basal fascia, a discocellular fasciole, and a discal fascia faulted as in the preceding at the second median veinlet; with the fasciæ as also the fasciole commencing at the costal vein where they are all broken.

Posterior wings with corresponding fasciole and fasciæ, which latter are more or less faulted at every vein though much less contorted and consequently more easily traced than in the preceding; fasciæ and fascioles of both wings margined on both sides with fuscous of a rather deeper shade than the ground and with whitish.

♀. Wings above dull smoky.

Anterior wings with a pale discal patch which has a brilliant metallic pale bluish lustre in certain lights.

Posterior wings with a thin interrupted white line before the dark anteciliary one and a submarginal row of dark spots before it, spots and line increasing in size, breadth, and distinctness from the apical angle to the subanal region, the former obscurely encircled internally with smoky whitish.

Wings beneath lighter, with all the markings more pronounced, being margined with fuscous much darker than the ground and with pure white, and the marginal and submarginal macular fasciæ, especially conspicuous and coarse.

Length of anterior wing ♂ ·56, ♀ ·58, whence expanse = ♂ 1·12, ♀ 1·16 inches.

Two males and a female.

## 42. POLYOMMATUS SANGRA.

*P. sangra*, Moore, Proc. Zool. Soc. Lond. 1865, p. 772, pl. 41, fig. 8, ♂.

Innumerable males and females. The commonest 'blue' in Calcutta, being obtainable in any number wherever there is a patch of grass.

## 43. APHNEUS LOHITA, var. ZOILUS.

*A. zoilus*, Moore, Proc. Zool. Soc. Lond. 1877, p. 588, ♂.

♀. Larger than the male. UPSERSIDE smoky brown, marked obscurely with darker bands corresponding to those of the underside. UNDERSIDE with the intervals between the bands wider owing to the greater breadth of the wings. In all other respects as in the male.

Length of fore-wing  $\cdot 7$ ; whence expanse = 1.46 inches.

Males and one female.

## 44. HYPOLYCENA ERYLUS.

*H. erylus* (Godart), Hewitson, Ill. D. Lep. Lye. p. 49, pl. xxi, fig. 1 ♂, 2, 4 ♀.

*H. andamana*, Moore, Proc. Zool. Soc. Lond. 1877, p. 589, ♂ ♀.

Three males and a female. Absolutely indistinguishable from fresh Sikkim specimens.

## 45. SITHON SUGRIVA, var. ARECA.

*Amblypodia sugriva*, Horsfield, Cat. Lep. E. I. Co. 1829, p. 105, pl. i, figs. 10, 10a, ♂.

*Myrina sugriva*, Horsfield and Moore, Cat. Lep. E. I. Co. p. 51, pl. 1a, fig. 12, ♂.

*Myrina areca*, Felder, Verhand. zool.-bot. Gesellsch. Wien, 1862, vol. xii, p. 481, ♂.

♀. Smaller than the male. UPSERSIDE sepia-brown with a bronzy gloss, the spots and fasciæ of the underside scarcely showing through. Hindwing with a pure white patch divided by the brown veins, margined externally by a fine and sharp dark brown or black anteciliary line, and marked by a large circular black spot at the base of the tail on the anterior side and by another smaller lighter and less distinct one on the posterior side; with the caudal lobe blackish, and the tails black with pure white cilia. UNDERSIDE pure white marked as in the male with dark sepia-brown fasciæ and spots, but with the black caudal spots larger and the cilia of the posterior part of the hind-wing pure white like those of the tails.

Length of fore-wing  $\cdot 66$ ; whence expanse = 1.38 inches.

It differs from *S. phocides* ♀ (= *S. joleus* (Felder), Hew., Ill. D. Lep. Lye. pl. xiii, figs. 16, 17) in the far less extent of the white patch on the upperside of the hind-wing, and in the larger size and darker colour of the spots and fasciæ, as well as in the greater pureness of the white, of the underside generally.

One male and one female, the former differing from a specimen from the Indian continent (Sylhet) only in its rather darker and more distinctly marked underside. The lighter apical portion of the fore-wing in the male has a beautiful bronzy gloss changing to dark purple according to the incidence of the light. Both the insular and continental specimen, but especially the former, present slight traces of the blue marginal band so conspicuous in the hind-wings of Javan and Ceylonese examples, in the shape of a small patch of metallic green scales on the anterior caudal lobe.

The male of this species, with its velvety black upperside, rich dark brown underside, and elongated hind-wings produced into long robust buff tails, presents a strong contrast to the dull-coloured female with her pure dazzling white underside conspicuously spotted and banded with dark brown, broader wings, and comparatively short and feeble white and black tails.

*Sithon kamorta* is not the female of *S. sugriva*, var. *areca*, as Felder has suggested, but that of a distinct though closely-allied species peculiar to the Nicobars, whence the Museum has recently received a specimen of the true male differing from *S. kamorta* just in the same way as *S. sugriva* ♂ does from its female, which appears not to have been previously described.

#### 46. SITHON WESTERMANNII, var.

*Dipsas westermanni*, Felder, Reise Novara, Lep. p. 241, pl. xxx, figs. 21, 22, ♀, from Luzon.

A male and a female, the latter differing from the former in having the upperside smoke-brown instead of purplish fuscous, no discal pale patch in the fore-wing, the hind-wing devoid of blue, and the underside ochraceous-brown instead of dark fawn-colour with a vinous tinge. The male differs from the same sex of *S. westermanni*, in having less blue on the upper surface, and the anal spot completely encircled with grey scales.

A comparison of Andamanese with Philippine specimens would, we have no doubt, show that the former is just as much entitled to a name of its own as the latter. Both are merely insular races of the Indian continental *S. jangala*.

#### 47. SITHON TARPINA.

*Myrina tarpina*, Hewitson, Ill. D. Lep. Lyc. Suppl. 1877, p. 23, pl. (Suppl.) iii a, figs. 93, 94, ♀.

♂. UPPERSIDE rich deep metallic violet-blue, with the anterior margin of the fore-wing narrowly, and the external margin of both wings more broadly and decreasingly bordered with black. UNDERSIDE with about the basal two-thirds of both wings cœrulescent or virescent opaque dead white, the rich red-brown of the outer margins darker but similarly

banded and marked with white, and the orange spots smaller with a diffused patch of greyish white scales between them and two or three in front of them all somewhat confounded with the white marginal line.

Three specimens.

Length of forewing  $\cdot 84$ ; whence expanse = 1.78 inches.

#### 48. DEUDORIX EPIJARBAS.

*Dipsas epijarbas*, Moore, Cat. Lep. E. I. Co. 1857, vol. i, p. 32, ♂ ♀.

*Deudorix epijarbas*, Hew., Ill. D. Lep. Lyc. pl. vii, figs. 16, 18, ♂, 17, ♀.

Very numerous specimens of both sexes.

#### 49. DEUDORIX DIENECES.

*D. dienees*, Hewitson, Ill. D. Lep. Lyc. Suppl. 1878, p. 31, pl. v a, figs. 65, 67 ♂, 66 ♀.

Males and females.

The Museum possesses males from Silhet and Calcutta also.

#### 50. DEUDORIX ORSEIS.

*D. orseis*, Hewitson, Ill. D. Lep. Lyc. 1863, p. 23, ♂.

♀. UPPERSIDE lighter, with a distinct purple gloss which has a light steel-bluish tint at the base of all the wings. UNDERSIDE lighter, with all the markings more distinct.

Length of fore-wing  $\cdot 68$ ; whence expanse = 1.42 inches.

Two males and two females.

#### 51. DEUDORIX VARUNA.

*Thecla varuna*, Horsfield, Cat. Lep. E. I. Co. 1829, p. 91, ♂ ♀.

A single male.

#### 52. MYRINA ATYMNUS, var. PRABHA.

*Myrina prabha*, Moore, Proc. Zool. Soc. Lond. 1877, p. 589, pl. lviii, fig. 5, ♀.

Males and female.

#### 53. AMBLYPODIA NARADA, var. ERICHSONII.

*Amblypodia narada*, Horsfield, Cat. Lep. E. I. Co. 1829, p. 98, pl. 1, fig. 8, ♂ ♀.

———— *erichsonii*, Felder, Reise Novara, Lep. p. 218, ♀, from Luzon.

Two females.

#### 54. ARHOPALA CENTAURUS, var. CORUSCANS.

*Pap. centaurus*, Fabr. *Ambly. centaurus*, Horsf., Cat. Lep. E. I. Co. 1829, p. 102. Hewitson, Cat. Lep. Brit. Mus. pl. ii, figs. 10—13, ♂ ♀.

Male and female; the latter much smaller than the former. The bases of both wings in both sexes, but especially in the female, lighter,

with a greenish tinge, so that the whole central portion of the insects appears brilliantly illuminated by a pale greenish blue reflection in most lights.

55. SURENDRA QUERCETORUM, var. LATIMARGO.

*S. latimargo*, Moore, Proc. Zool. Soc. Lond. 1879, p. 142, ♂ ♀.

A male and two females.

Is *A. quercetorum* itself more than a local race or variety of *A. vivarna*, Horsfield, Cat. Lep. E. I. Co. 1829, p. 99, from Java?

Family PAPILIONIDÆ.

Subfamily PIERINÆ.

56. TERIAS HECABE.

*Pap. hecabe*, Linn.

Males and a female.

57. TERIAS HARINA.

*T. harina*, Horsfield, Cat. Lep. E. I. Co. 1829, p. 137.

Males and females.

58. HEBOMOIA ROEPSTORFFII.

*H. Roepstorffii*, Wood-Mason, antea, p. 134 ♂, et p. 150, ♀.

“♂. Differs from *H. glaucippe*, the only species of the genus with which I have been able to compare it, on the UPPERSIDE, in having the apical orange patch of the fore-wing larger, extended into the cell, and less broadly bordered with fuscous, both internally and externally; the submarginal fuscous spots smaller and completely isolated from the fuscous of the outer margin; the fore-wing at the posterior angle tinged, and the hind-wing externally broadly bordered, with bright sulphur-yellow, which colour is shaded off into the cream-colour of the rest of both wings; and the outer margin of the hind-wing narrowly edged with fuscous, which gradually broadens from the anal to the anterior angle and extends inwards in points at the veins:—and, on the UNDERSIDE, in having the brown mottling of the fore-wing arranged in the form of a tolerably conspicuous band coincident with the macular band of the upperside; and the ground-colour of the hind-wing, as also that of the mottled portion of the fore-wing, of a rich golden-luteous colour.

Length of fore-wing 1.76; whence expanse = 3.62 inches.

♀. UPPERSIDE. *Fore-wing* with the orange patch devoid of amethystine gloss, externally more broadly bordered with fuscous (which at each veinlet gives off inwards an angular process the extremity of which is

continued on as a very narrow edging to each side of the veinlet), but internally much less distinctly so than in the male; with the cell more clouded with dark scales; and with the sulphur-colour at the inner angle more diffused. *Hind-wing* with a marginal row of large subtriangular fuscous spots placed upon the veinlets from the first subcostal to the first median (the two last obsolete), decreasing from the second in the direction of the anal angle, and connected together at the extreme margin of the wing by a narrow edging of the same colour, which extends to the anal angle; with a submarginal series of six roundish spots, similarly decreasing from the first, and alternating with those of the marginal series, each being placed upon a fold, the first and largest on the fold between the costa and the first branch of the subcostal, and the last on that between the first and second median veinlets; and with the sulphur-colour around the four intermediate submarginal spots stained with orange. **UNDERSIDE** of *both wings* paler.

Length of fore-wing 1·7; whence expanse = 3·5 inches.

HAB. South Andaman.

In a specimen of the male from the collection of Captain G. F. L. Marshall, the submarginal fuscous spots of the fore-wing are obsolete.

The place of this species would seem to be between *H. vossii* (Maitland) and *H. sulphurea*, Wallace.”

#### 59. IXIAS ANDAMANA.

*I. andamana*, Moore, Proc. Zool. Soc. Lond. 1877, p. 590, ♂ ♀.

Numerous males and females (*A. de R.* and *Moti Ram*).

#### 60. CATOPSILIA CROCALE.

*Pap. crocale*, Cramer, Pap. Exot. 1779, vol. i, pl. lv, figs. C, D, ♀.

*Callidryas crocale*, Butler, Lep. Exot. 1869-74, p. 22, pl. ix, figs. 1, 2, 3, 6, ♂ ♀.

Two males.

#### 61. PIERIS NADINA, var. NAMA.

*Pieris nadina*, Lucas, in Guérin's Rev. et Mag. Zool. 1852, ser. 2, vol. iv, p. 333, ♂.

*P. nama*, Moore, Proc. Zool. Soc. Lond. 1857, p. 102, pl. 44, figs. 1, 2, ♂ ♀.

————— Hewitson, Ex. Butt. *Pieridae*, pl. 6, fig. 37.

Males and females.

#### 62. PIERIS CORONIS, var. LICHENOSA.

*Pap. coronis*, Cramer, Pap. Exot. vol. i, 1776, pl. 44, figs. B, C.

*Pier. lichenosa*, Moore, Proc. Zool. Soc. Lond. 1877, p. 591.

Two pairs.

63. *ERONIA VALERIA*, var. *NARAKA*.

*Pap. valeria*, Cramer, Pap. Exot. 1779, vol. i, pl. 85, fig. A, ♂.

*Eronia naraka*, Moore, Proc. Zool. Soc. Lond. 1877, p. 591, ♂ ♀.

Males and a female.

The Javan specimens of the male described by Horsfield and figured by Cramer both have the black outer border of the anterior as well as the posterior wings immaculate, and thus agree more closely with the S. Indian (var. *pingasa*), Ceylonese (var. *ceylonica*), and Andamanese (var. *naraka*) varieties. As might have been expected from its more northern station, the Andamanese more nearly approaches the north Indian form (var. *gaea*).

64. *TACHYRIS PAULINA*.

*Pap. paulina*, Cramer, Pap. Exot. vol. ii, pl. 110, figs. E, F, ♀.

*Pieris albina*, Boisd., Sp. Gén. Lep. p. 480, ♂.

*Tachyris paulina*, Wallace, Trans. Ent. Soc. Lond. 1867, ser. 3, vol. iv, p. 369.

Two males and two (white) females differing in no respect from those of continental India (Naga Hills, Cachar, Bhutan, and Madras).

*Tachyris galathea*, Felder, is a perfectly distinct race peculiar to the Nicobars, whence we have specimens.

## Subfamily PAPILIONINÆ.

## 65. ORNITHOPTERA HELIACONOIDES.

*Ornith. heliconoides*, Moore, Proc. Zool. Soc. Lond. 1877, p. 592, ♂ ♀.

A male and a female.

## 66. PAPILIO CHARICLES.

*P. charicles*, Hewitson, Ann. & Mag. Nat. Hist. 1874, ser. 4, vol. xiv, p. 356; Exot. Butt. vol. v, Pap. pl. xiv, fig. 45, ♀.

One female of the 3rd form (*Moti Ram*).

This is the Andaman representative of the continental *P. androgeus*; it is interesting to find that it has acquired the red tails of its model, *P. rhodifer*, the slight Andamanese modification of the continental *P. doubledayi*.

## 67. PAPILIO MAYO.

*P. mayo*, Atkinson, Proc. Zool. Soc. Lond. 1873, p. 736, pl. lxiii, fig. 1, ♂.

Two males (*A. de R.* and *Moti Ram*). The species was described by Atkinson without acknowledgment from the specimens obtained by Moti Ram.

The Andamanese representative of the continental *P. polymnestor*.

## 68. PAPILIO POLYTES, var. NIKOBARUS.

Felder, Verh. zool.-bot. Gesellseh. Wien, 1862, vol. xii, p. 483.

Males and females of the first form only (*A. de R.* and *Moti Ram*).

## 69. PAPILIO AGAMEMNON.

Males and females (*A. de R.* and *Moti Ram*).

## 70. PAPILIO EURYPYLUS.

One pair.

## 71. PAPILIO CLYTIA, var. FLAVOLIMBATUS.

*P. dissimilis*, var. *flavolimbatus*, Oberthür, *Etudes d'Entom.* 4 me livr. p. 101, ♀.

This variety agrees in the size and distinctness of the cretaceous white markings of the upperside best with specimens from Silhet, Sibsagar, and Burmah on the Indian mainland, but differs from them, as indeed it does from all specimens in the Museum, in the large amount of rich golden yellow at the outer margin on both sides of the posterior wings: the marginal and submarginal flavous spots seen at the anal angle of the wing in most continental specimens are in this case so completely run together on both sides as to have left only a small central spot of the black ground-colour that separates them from one another in continental specimens; they are succeeded by a series of six (incisural) marginal spots of the same colour; the submarginal lunules are much larger and more spear-shaped and, moreover, sullied with yellow, especially the one near the anal blotch: on the *underside*, the marginal golden yellow spots are larger and tend to coalesce with the hastate submarginal markings, which consequently are more suffused with yellow than they are on the upperside.

A single male.

## 72. PAPILIO LESTRYGONUM.

*P. laestrygonum*, Wood-Mason, *Proc. Asiat. Soc. Bengal*, June, 1880, p. 102, et antea, p. 178, pl. vi, fig. 1, 1a, ♂.

*P. epaminondas*, Oberthür, *Etudes d'Entom.* 4 me livr. p. 62, pl. iv, fig. 1, ♂.

“♂. Wings above cretaceous-white, the anterior ones black at the insertion, scarcely tinged with greenish at the base, with five black bands commencing at the anterior margin and cutting the cell, the first basal, extending to the inner margin, the second rather broader, also extending to the inner margin, and emitting a short conical process at the origin of the first median veinlet, the third scarcely broader, extending to the median vein, the fourth narrower, triangular, reaching or all but reaching the median vein, the fifth much the broadest of all, triangular, divided anteriorly into two forks by a curved narrow decreasing and interrupted band of the ground-colour running from the costal vein to the third median veinlet, extending to the inner margin, separated from the black outer marginal band by a band of the ground-colour divided by the black veins and very slightly if at all narrowing from the anterior margin up to the second median veinlet, whence it gradually decreases in width and distinctness to

the inner angle; all these black bands connected at the anterior margin, and the first, second, and fifth of them at the inner margin also, by a very narrow edging of black.

Posterior wings with two black bands commencing and connected at the anterior margin and coinciding with bands of the underside, one basal, extending to the end of the first half of the first median veinlet, and the other discal, extending a short distance into the space between the 2nd and 3rd median veinlets; with a small black spot near the end of the cell scarcely distinct from the discal band; with four discal spots immediately beyond the cell running nearly parallel with the band, the first and largest transversely elongated and coinciding with a spot on the underside, the rest smaller than the corresponding ones on the underside, which latter are consequently seen through the wing-membrane beyond the margins of the former; with a black spot succeeded by one of luteous at the anal angle; with a marginal and submarginal series of black lunules coalescent in the anterior third but more distinct in the posterior two-thirds of the wing, where the two series are more or less separated from one another by ashy-grey scales continuous with the ashy patch occupying the outer third of the wing and extending also along so as to obscure the ultra-cellular part of the basal black band; with the discal band and spots more or less irrorated and obscured with ashy-grey scales so that the disk of the wing appears mottled with black and grey; and with the black tails, as also the incisures, margined with cretaceous-white.

Wings below pure white, anterior ones marked as above, with the ground-colour at the base and between the black bands as far as the median vein and its second branch yellowish; with the band of ground-colour separating the fifth black band from the black outer border distinct, and not decreasing but on the contrary rather increasing in breadth, to the inner angle; and with the curved line dividing the fifth black band into two forks more distinct and less discontinuous.

Posterior wings, from the base up to the median vein and the discal black band, yellowish, with three black bands, one narrow running from the insertion along the inner margin close to the abdominal fold, and two broader commencing and connected at the anterior margin and cutting the cell, one of these latter basal, extending nearly to the end of the basal half of the first median veinlet, and the other discal, some distance into the space between the 2nd and 3rd median veinlets, the two first of the three bands connected together at their outer extremities and with two largish coalescent black spots in the anal region; with a small black spot near the extremity of the cell, and six of the same colour immediately beyond it disposed in a line which runs straight from the costal vein as far as the cell, but then curves abruptly inwards, the first of these spots transversely

elongated, extending from vein to vein, and connected with the second, which is roundish and itself connected with the discal band, the third oval, about one-third the size of the second, and touching the discocellular veinlet, the fourth twice the size of the third, in contact with the median vein and its two last branches, the fifth rather smaller than the third, the sixth crescentic and connected with the two above-mentioned large spots in the anal region; with six large diffused luteous blotches externally margined with black, and increasing in size and depth of colour from the anterior to the inner margin; with the ground-colour between these blotches and the discal black spots pure white; with an increasing series of six marginal lunules, between which and the wavy black margins of the luteous blotches the ground-colour is white in the anterior and grey or greyish-white in the posterior portion of the wings; and with the incisures and the tails margined with lutescent.

Head black with two white frontal bands; pronotum with a luteous spot on each side; thorax above jet-black ornamented at the sides with long grey setæ, below cretaceous-white; abdomen cretaceous-white with a tapering dorsal black band and two lateral fuscous ones.

Length of anterior wing 1·7; whence expanse = 3 5 inches.

HAB. South Andaman. Two males.

To mark its close relationship to *A. antiphates*, I have called the species *P. laestrygonum* after the mythical people over whom Antiphates is supposed to have reigned. It differs from its nearest ally in having the upperside much blacker (the bands of the forewing being broader; the first, second, and fifth of them together with the marginal one extending to the inner margin, where they are all connected together by a very narrow black edging; and the disk of the hindwing mottled as it were by black and grey), a much greater extent of grey, and more highly developed marginal and submarginal lunules on the hindwing; in the abdomen being dorsally banded with black and the thorax ornamented with grey setæ, &c."

### 73. PAPILO RHODIFER.

*P. rhodifer*, Butler, Ent. Month. Mag., vol. xiii, 1876, p. 57.

Five males.

### Fam. HESPERIDÆ.

### 74. ISMENE CHROMUS.

Numerous examples (*A. de R.* and *Moti Ram*).

## 75. ISMENE ARIA.

*Ismene aria*, Moore, Proc. Zool. Soc. Lond., 1865, p. 784, ♂ ♀.—Hewitson, Exot. Butt., vol. iv, *Hesp.*, pl. iii, figs. 24, 25, ♀.

Male and female.

## 76. ISMENE LEBADEA.

*Heperia lebadea*, Hewitson, Exot. Butt., 1868, vol. iv, *Hesp.* pl. iii, figs. 22, 23, ♂.

One male.

## 77. ISMENE DRUNA.

*I. druna*, Moore, Proc. Zool. Soc. Lond. 1865, p. 784, ♂.—Hewitson, Exot. Butt. vol. iv, 1868, *Hesp.* pl. iii, fig. 26, ♂.

Two males.

## 78. TAGIADES RAVI.

*Pterygospidea ravi*, Moore, Proc. Zool. Soc. Lond. 1865, p. 779, ♂ ♀.

One male and two females.

## 79. TAGIADES ALICA.

*T. alica*, Moore, Proc. Zool. Soc. Lond. 1877, p. 593, pl. lviii, fig. 11, ♂.

♀. Above lighter, the dark markings consequently appearing more prominent.

The anterior wing has a minute transparent speck behind the three subapical ones, a very indistinct and small double whitish spot near the end of the cell on the upperside, and two discal whitish spots on the underside, the anterior one of which only is partially transparent and visible on the upperside.

The posterior wing is less white above and has the anal angle rounded as in *T. obscurus*.

Male and female.

## 80. PLESIONEURA ALYSOS.

*P. alysos*, Moore, Proc. Zool. Soc. Lond. 1865, p. 789.

Many specimens.

## 81. HESPERIA OCEIA.

*H. oceia*, Hewitson, Desc. *Hesp.* 1868, p. 31.

Males.

## 82. HESPERIA COLACA.

*H. colaca*, Moore, Proc. Zool. Soc. Lond. 1877, p. 594, pl. lviii, fig. 7, ♂ ♀.

Two specimens.

## 83. HESPERIA CAHIRA.

*H. cahira*, Moore, Proc. Zool. Soc. Lond. 1877, p. 593, pl. lviii, fig. 8, ♂ ♀.  
Males and females.

## 84. HALPE BETURIA.

*Hesperia beturia*, Hewitson, Desc. Hesp. 1868, p. 36.  
*Halpe beturia*, Moore, Proc. Zool. Soc. Lond. 1878, p. 690.  
Males and one female. A pair from Calcutta in the Museum.  
The number of spots in the forewing varies from 6 to 8.

## 85. HESPERIA CHAYA.

*H. chaya*, Moore, Proc. Zool. Soc. Lond. 1865, p. 791.  
Male.

## 86. TELEGONUS THYRSIS.

*Telegonus thyrsis* (Fabr.), Butler, Fabr. Lep. p. 262.  
*Hesperia pandia*, Moore, Proc. Zool. Soc. Lond. 1865, p. 790.  
Three males.

## 87. PAMPHILA MÆSOIDES.

*P. maesoides*, Butler, Trans. Linn. Soc. Lond., ser. 2, Zoology, vol. i, p. 554.  
Many specimens.

## 88. PAMPHILA GOLA.

*P. gola*, Moore, Proc. Zool. Soc. Lond. 1877, p. 594, pl. lviii, fig. 9, ♂.  
Numerous specimens (*A. de R.* and *Moti Ram*).

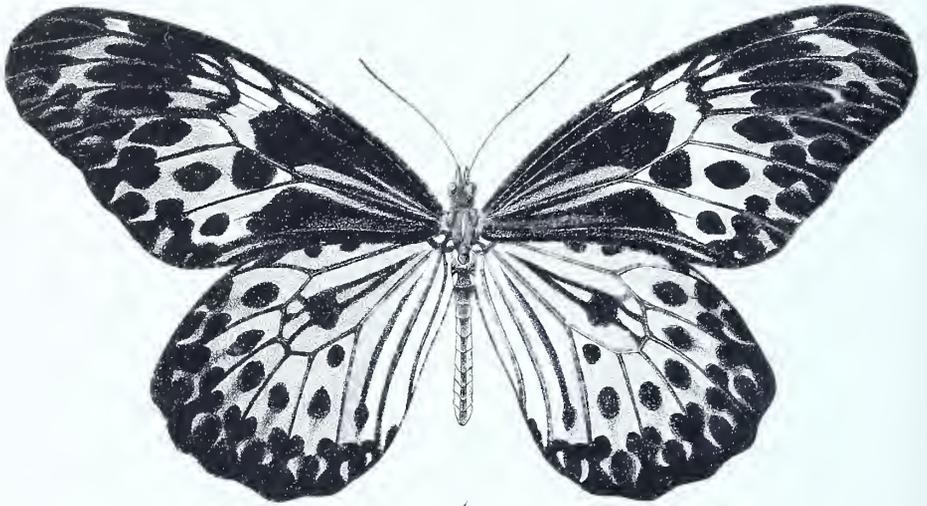
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During the preparation of the foregoing list, we received from Bassein, on the mainland, two females of a species of *Hestia* of the same type as *H. cadelli*, in which the modifications of form and markings begun in *H. agamarschana* and continued in *H. cadelli* are carried to an extreme. These insects were obtained by Mr. Algernon Haden, who has generously presented one of them to the Museum, and after whom we have, consequently, all the more pleasure in naming the species

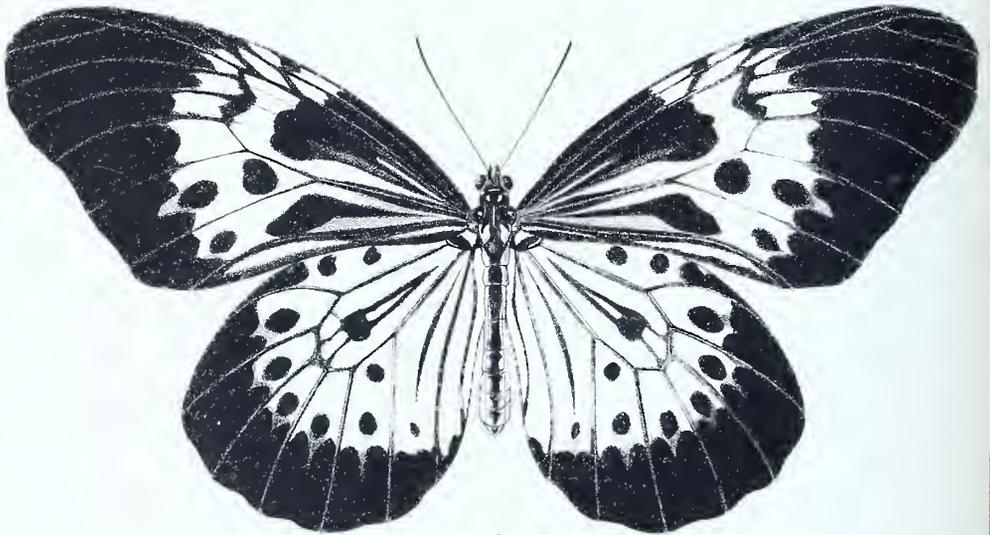
## HESTIA HADENI, n. sp., Pl. XIII, Fig. 2, ♀.

♀. Closely allied to *H. cadelli*. Wings above pure fleckless white marked and veined with black of a fuscous tint; with the marginal, submarginal, and all but the two posterior (which are subcoalescent with the marginal band) of the discal series of spots in the anterior wings, but with the marginal and submarginal series only in the posterior wings, com-





1.



2.

*Fig 1* HESTIA CADELLI, ♂  
*Fig 2* HESTIA HADENI, ♀

pletely run together so that only the inner portions of the outlines of the innermost series of the coalesced spots are in either case still discernible, and so as to form a very broad outer border of black to each of the wings.

Anterior wings broader and shorter, being less than twice as long as broad, the extreme length of the cell bearing the same relation to the submedian vein and to the less deeply emarginate outer margin; with the spot at the base of the second cell smaller and free of the veins, as also is the discoidal cellular spot at its posterior extremity; the curved club-shaped mark in the 3rd inner marginal cell much as in *H. agamarschana*, but not connected by a black streak with the subcoalescent marginal spot beyond it; the outer black border with a clouded white spot in the second cell more or less distinctly separating the second discal black spot off from the band; and the black second inner marginal, or sutural, cell longitudinally streaked with clouded white.

Posterior wings broader, with their undulated outer margin still more broadly rounded; the spot in the discoidal cell smaller and the spots around it also rather smaller and free of the black outer border though exhibiting a tendency to coalesce with it in front of the second median veinlet.

Wings below of a less pure white than above, marked and veined with fuscous.

Thorax more conspicuously marked with greyish-white than in *H. cadelli*, in which these marks are almost effaced, but this character, as also the difference in the proportions, and the less obvious emargination of the outer margin, of the wings, may be sexual.

Length of anterior wing 2.54; extreme length of its discoidal cell 1.35; expanse 5.18 inches.

HAB. Bassein, Burmah. Two specimens agreeing in every respect with one another.

#### EXPLANATION OF PLATE XIII.

Fig. 1. *Hestia cadelli*, W.-M. & de N., ♂.

Fig. 2. *Hestia hadeni*, W.-M. & de N., ♀.



XXII.—*Description of an Arvicola from the Punjab Himalayas.*

By W. T. BLANFORD, F. R. S.

ARVICOLA WYNNEI, sp. nov.

*A. superne rufescenti-fuscus, aliquando griseo-lavatus, subtus pallidior, caudâ pedibusque cum dorso concoloribus, caudâ fere  $\frac{2}{7}$  corporis cum capite æquante; auriculis brevibus, vellere cœctectis, pilis longiusculis extus munitis; unguibus longis, albidis compressis, pilis haud obtectis; pollice brevi, unguifero; dente molario inferiore antico angulis 4 externis, 5 internis, spatiis in coronâ 7 munito, secundo tertioque singulis angulis utrinque tribus, totidem spatiis; dente superiore primo spatiis 5, angulis utrinque tribus, secundo spatiis 4, angulis tribus externis, duobus internis, tertio denique angulis tribus, quorum ultimus rotundatus, externis, duobus internis, in lobum elongato-ovatum postice productum desinente notando. Long. corporis cum capite 0.12 met., caudâ 0.032, auris 0.07, pedis posterioris a calcaneo 0.18, cranii 0.028.*

HAB. Ad Mari (Murree) in montibus Himalayanis occidentalibus, ad latus occidentale fluminis Jhelum.

General colour above dark rich brown with a slight greyish tint, head rufescent, lower parts pale brown, tail the same colour as the back, feet covered with brown hair above, soles pale. Fur very soft, dark leaden grey at the base and for about  $\frac{2}{3}$  the length, tips dark rufous brown on the back, dirty white below. Ears short and rounded, concealed beneath the fur, thinly clad with long hair outside and with short brown hair inside near the border; a tuft of long hair on the anterior edge of the inner surface. Tail between  $\frac{1}{3}$  and  $\frac{1}{4}$  the length of the head and body, cylindrical, clothed with long hair at the base and with short brown hairs throughout the terminal three quarters of its length. Claws long, compressed, white, not concealed by long hairs, thumb small with a short compressed claw. The under side of the tarsus is hairy.

The following are the dimensions, in inches, of two specimens, both adult males, in spirit:—

	1	2
Length of head and body from nose to anus,.....	4.75	3.5
Ditto tail from anus (hairs at end not included), ...	1.35	1.2
Height of ear from orifice, .....	0.25	0.26
Breadth of ditto, .....	0.25	0.26
Length of fore-foot without claws,.....	0.4	0.4
Ditto of hind-foot and tarsus without claws,.....	0.7	0.7
Ditto of claw of middle toe,.....	0.11	0.13

The incisors are deep orange. The following are the characters of the molars :—

Upper molar I	5	spaces or prisms	3	external and	3	internal angles
"    "    II	4	"    "	3	"    "	2	"
"    "    III	4	"    "	3	"    "	2	"
Lower molar I	7	"    "	4	"    "	5	"
"    "    II	3	"    "	3	"    "	3	"
"    "    III	3	"    "	3	"    "	3	"

Described from two specimens in spirit and two skins sent by Mr. A. B. Wynne, of the Geological Survey. I have called the species after the discoverer, by whom I am informed that the native name is '*Kanis*.'

I hope to give a fuller description of this and the other Himalayan forms shortly.



XXIII.—*Some new Species of Rhopaloccerous Lepidoptera from the Indian Region.*—By CAPTAIN G. F. L. MARSHALL, R. E., and LIONEL DE NICÉVILLE.

(Received December 27th, 1880.)

1. *EUPLOEA (SALPINX) ADAMSONI*, Marshall.

♂. Allied to *E. superba*, Herbst, but differing on the UPPERSIDE of the *forewing* in that the brilliant blue gloss is confined to the basal two-thirds not reaching to the costa or the inner margin, and that the spots are reduced to four in number all very small, one subcostal above the end of the cell, and one in the cell at the end both lilac, and two near anal angle, one marginal and the other submarginal, white. *Hindwing* as in *E. superba*.

HAB. Moulmein; taken in the autumn by Captain C. H. E. Adamson.

2. *ZOPHOESSA JALAUURIDA*, de N.

♂. Nearest to *Z. atkinsonia*, Hewitson; from which it differs on the UPPERSIDE in being deep brown instead of tawny and in having the macular bands and bar in the cell of the *forewing* ochreous. On the UNDERSIDE the ground colour is also deep brown, and the *hindwing* is crossed by several silvery white streaks on the basal half.

HAB. Jalauri pass, N. W. Himalayas.

3. *LETHE MAITRYA*, de N.

♂. Allied to *Lethe sidonis*, Hewitson, from which it differs on the UPPER-SIDE in having an obscure ochreous band across the *forewing* beyond the

cell, and on the **UNDERSIDE** in the band in the cell, as also the band beyond the cell, of the *forewing* being very prominent, both of which bands are ochreous instead of silvery white.

**HAB.** Jalauri pass, N. W. Himalayas.

#### 4. *LETHE SIDEREA*, Marshall.

♂. Allied to *L. sidonis*, but differs in being smaller, in the uniform spotless upper surface, and the uniform paler brown ground-colour of the underside. *Forewing* entirely wanting the discal bands and the whitish spots on the costal margin; the only markings being three minute submarginal white spots beyond the cell (the middle one faintly circled with black), a single yellowish marginal line edged on both sides with dark brown, and within this a distinct silvery lilac submarginal line extending from the apex to the second median nervule. *Hindwing* with all the silvery streaks brighter and more distinctly lilac; the ocelli all blacker and less prominently pupilled with white; the second and third ocelli from the apex out of line, much nearer the margin, the silvery band within following this curve and deeply sinuated beyond the cell.

**HAB.** Sikkim.

#### 5. *LETHE SATYAVATI*, de N.

♀. Similar in outline to *L. latiaris* ♀ and differing from it on the **UPPERSIDE** only in the absence of the transverse oblique ochreous line and the subcostal spot near apex of forewing. **UNDERSIDE** pale brown with no ochreous tint, and washed with lilac, especially on the outer half: both wings crossed by a prominent brown nearly straight subbasal line outwardly margined with lilac. *Forewing* with an irregular discal transverse brown line; a bar in the cell within the subbasal line; five indistinct submarginal ocelli circled with lilac and brown on a lilac ground; and a yellowish marginal line edged on both sides with dusky, within which a brown band on the lilac ground between the ocelli and the margin. *Hindwing* with a discal very much angled dark brown line, within which is a very distinct lilac litura above the third median nervule; the submarginal ocelli large, the upper one distinctly pupilled with white and all of them profusely speckled with white; the usual marginal markings.

**HAB.** Sibsagar, Assam (*S. E. Peal*).

#### 6. *NEOPE BHIMA*, Marshall.

♂. Allied to *N. moorei*, Butler. **UPPERSIDE**: *hindwing* with only six oval black submarginal spots circled with yellow, the first minute, the rest large, prominent; two swarthy submarginal lines and the margin itself swarthy. **UNDERSIDE**: the basal area of both wings pale olivaceous brown, irro-

rated and irregularly streaked and spotted with dark brown, with a few ochreous spots and streaks. A nearly straight band of pale ochreous across both wings beyond the middle bordered interiorly with dark brown most broadly on the forewing. *Forewing* with a row of five oval black spots pupilled with white and banded with yellow, the third and fourth much larger, placed on a broad discal brown band; a pale ochreous submarginal band beyond uniting at the anal angle with the pale ochreous median band, the margin and two submarginal lines swarthy on a yellow-brown ground. *Hindwing* with a sinuous band of eight perfect ocelli, the seventh and eighth with yellow irides coalescing.

HAB. Burmah; taken in April in the upper Thoungyeen forests, Tenasserim, by Captain C. T. Bingham.

#### 7. *EREBIA SHALLADA*, Lang.

♂. ♀. Allied to *E. kalinda* but rather larger, and the male broader-winged than in the species mentioned; darker and less brightly coloured. **UPPERSIDE** with a small, diffused, dark ferruginous patch within the middle of exterior margin on *both wings*, smaller than in *E. kalinda* on the forewing, and larger on the hindwing.

HAB. Kunawar. This species was discriminated by Col. A. M. Lang, R. E., some years ago, but no description has hitherto been published.

#### 8. *EREBIA MANI*, de N.

♂. ♀. Allied to *E. kalinda*, Moore, from Kulu specimens of which species it differs on the **UPPERSIDE** in the larger extent and lighter and yellow colour of the patch on the *forewing*; and in the entire absence of the ferruginous patch on the *hindwing*: and on the **UNDERSIDE** by having the yellowish patch on the *forewing* as on the upperside and abruptly defined.

HAB. Chung pass and Lingti, Ladak.

#### 9. *MYCALESIS OCLUS*, Marshall.

♂. ♀. Allied to *M. onatus*, Hewitson. **UPPERSIDE**: *forewing* with the lower ocellus considerably larger, and broadly surrounded with ferruginous yellow; the yellow almost reaching the inner margin and connected by a band of the same colour with the costa: *hindwing* with four increasing black ocelli white-pupilled and with yellow rings, the yellow rings coalescing. **UNDERSIDE** with a yellow discal band crossing both wings, prominent in the female, obsolete except near the costa in the male.

HAB. Travancore; taken in May in the Ashambo hills by Mr. Harold S. Fergusson.

## 10. LIBYTHEA ROHINI, Marshall.

♀. UPPERSIDE brown with pure white markings. *Forewing* with an oval spot filling the end of the cell, a large quadrate spot on the disc between the first and second median nervules, two spots coalescing one on each side of the upper discoidal nervule, and a spot near the costa divided into three by the subcostal nervules. *Hindwing* with a large square spot on the costa, a straight median band across the wing below the cell not reaching the inner or outer margins and cut by the discoidal and three median nervules, and a small spot above between the subcostal nervules. All the spots and bands pure white.

HAB. Khasi hills; taken near Shillong in May by Mr. J. P. Cock.

With the exception of *Euplœa adamsoni*, *Lethe siderea*, and *L. satyavati*, all the species above characterised will be figured in the descriptive hand-book of the butterflies of the Indian region which we shall shortly publish under the title of 'The Butterflies of India, Burmah, and Ceylon'; and in which fuller detailed descriptions of all will be found.

XXIV.—*Description of Parantirrhoea Marshalli, the Type of a new Genus and Species of Rhopalocerous Lepidoptera from South India.*—*By J. WOOD-MASON, Deputy Superintendent, Indian Museum, Calcutta.*

## Family NYMPHALIDÆ.

## Subfamily SATYRINÆ.

*Parantirrhoea*,\* n. gen.

♂. Anterior wings triangular; anterior margin moderately and regularly arched; apical angle acute; outer margin almost straight, being only just perceptibly convex; inner angle rounded; inner margin sinuous, being lobed at the base much as in the males of *Olerome* and *Æmona*, genera of MORPHINÆ; subcostal vein 4-branched, the first branch given off before, and the second beyond, the end of the discoidal cell, the first, second, and third coalescing successively and respectively with the costal vein, the first, and the second, and all three in turn becoming free and running off at a tangent, like the costal vein, to the anterior margin, the fourth being perfectly free from its origin and running to the apical angle; posterior discocellular veinlet long, very slightly concave outwards, almost straight, intermediate one not quite half the length of the posterior, ante-

\* From *παρά*, by the side of, and *Antirrhoea*, generic name.

rior one rudimentary; submedian vein sinuous, short, terminating in the wing membrane near the inner margin at about the level of the junction of the basal and second fourth of the length of that margin, being, in fact, hardly more developed than is the internal vein of the PAPILIONINÆ as compared with that of many Heterocerous Lepidoptera; the first median veinlet directed straight outwards and backwards, out of its normal course, to the inner angle and supplying the place of the rudimentary submedian; on turning to the underside, it is seen that a narrow rounded lobe of the functional sutural area about six times as long as it is broad is folded back upon the under surface, to which it is firmly adherent; this lobe occupies the middle two-fourths of the length of the inner margin, and is thickly clothed on its surface and fringed at its free edge with firmly attached, long, and somewhat raised modified scales rendered conspicuous by their rich dark brown colour and satiny lustre; the outline of this turned up lobe is marked out on the upperside by a curvilinear groove.

Posterior wings tailed, subquadrate, with four distinct margins, *viz.*, a strongly and irregularly arched anterior margin, nearly straight external and posterior margins, and an inner or abdominal margin, marked out by the obtuse-angled apex, the tail, and the well-rounded anal angle; with a black oval sexual mark, divided by the submedian vein, near the anal angle; costal vein short and straight, terminating before, and the first branch of the subcostal which originates close to the base of its vein ending beyond, the middle of the length of the anterior margin, the second branch being given off before the middle of the discoidal cell and extending into the apical angle; 'discoidal' vein in the same straight or slightly curved line with the subcostal; discocellular veinlet sinuous; the third median veinlet produced to a conspicuous tail.

Antennæ fine and distinctly clubbed.

Female unknown.

No Asiatic genus of SATYRINÆ presents us with any approach to the remarkable arrangement of the two hindermost veins of the anterior wings described above; but, in the South American genus *Antirrhoea*, we meet with identically the same arrangement, the first median veinlet in *A. archæa* and its congeners running back to the inner angle and the submedian vein ending a considerable distance short of that angle, though not nearly so far short of it as in the Indian form, for which I propose the above name in allusion to these remarkable points of resemblance, reserving all further comparisons and comment until I shall be in possession of specimens of the South American forms.

*P. marshalli*, n. sp.

♂. Wings above dark fuscous suffused with rich deep violet.

Anterior wings with an outwardly and forwardly arched suberescentic pale violet or mauve band commencing beyond the middle of the wings at the costal vein, terminating at the inner angle, and crossed obliquely by a series of three small white spots disposed in a straight line parallel to the outer margin and placed upon folds of as many consecutive cells, the last being between the two anterior median veinlets.

Posterior wings relatively longer-tailed than in *Melanitis ismene* (Cramer) with the membranous parts of the divergent tails almost wholly formed by the produced wing-membrane of the interspace between the second and third median veinlets, a very narrow anterior membranous edging only being contributed by the interspace next in front; and with rather more than the basal two-thirds of their length in front of the discoidal and subcostal veins ochreous.

Wings below ochreous obscurely striated with a deeper shade of the same colour, and marked with a submarginal series of inconspicuous brown specks, the probable rudiments of ocelli.

Length of anterior wing 1.16; whence expanse = 2.4 inches.

The female will, in all probability, prove to differ from the male not only in the absence of the sexual spot in the posterior wings, but also in having the inner margin of the anterior wings straight and neither lobed at the base nor turned up in the middle, and the first median veinlet and the submedian vein of the same wings normally arranged and developed and directed respectively to the outer margin and to the inner angle after the manner usual amongst butterflies.

HAB. Trevandrum, Travancore, South India. Described from four specimens of the male, one, the type, recently purchased by the Indian Museum, and three belonging to Captain G. F. L. Marshall, R. E., to whom I am indebted not only for the opportunity of describing this interesting insect, but also for permission to dissect one of the specimens in his collection.

P. S.—The species of the genus *Elymnias* alone present the same disposition of the three anterior veins of the posterior wings.

Presented  
8 MAY 1885

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