"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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Description of the Great Śiva Temple of Gangaikonda 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 facsimile 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 appearance and purity of design, which has been lost there.

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

Gangaikondapuram is the site of a deserted town supposed to have been the city or chief town of Gangaikonda Chōla.

* The largest Indian sanctuary towers mentioned by Fergusson (Hist. of Arch. Vol. III.) are those of Jagannāth at Puri and the great Tanjore Pagoda, which are 89 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 formulae 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 Vimánam on a raised basement or terrace, decorated by a rail ornament below, having the upright posts engraved with griffins (or Yáli), and an elaborate scroll-enveloped animal or figure on every third or fourth post, but no cross-bars or horizontal rails between.

The Alódái or terrace-path is 3½ 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 Vimána 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 (purína 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 stubí 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 earned 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 cells 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 stubí is the Móle-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 Vimána, 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 Chidambaram.

I did not see the imitation of wooden rafters and laths, with nail heads &c., to be seen at Tinnevelly.
The usual Bull (Naundë) 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 (yónë 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 Gangaikonḍa Sholapuram temples.

A figure of a rishi (Márkaṇḍa) 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 re-called to my mind the pattern of the plinth moulding of an unfinished temple at Kuttálam (Courtalám) in Tinnevelly.

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 Śiṅ(g)ha Tirtham) 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 Gangaikonḍa Sholapuram and Gangaikonḍapuram. The inhabitants now call it Gangai-konḍapuram. They told me that the Stalapurána or local historical record of Gangaikonḍapuram 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 Nachaiyárkkóvil (or at Tirichirái) near Kumbakónam.

Another place of interest I visited may be worth mentioning though quite modern, and that is Rámalínga-pillai-sálaí, a remarkable church or college building, called variously Pardésimadham, and Sanmárga-Sabai, situate on the high road from "Cuddalore" to Vriddháchálam, a mile or
so west of the point where the high road from Madras (via 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 "Tirumaligai," 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-Kōṭṭai (Anglice Ginges), 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 trisul-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 (?) kulga), 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 3½ feet high and 4½ feet wide, and not very thick, lying flat on the ground. Close to it is an upright figure of "Minudaiyan Virappan," with hands together in the attitude of respect or supplication, and a sacrificial post stood near.
B. R. Branfill—Description of the Great Siva Temple. [No. 1,

The grūm-munsif said that this "kōvil" 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 Hanumān 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 Chittāmūr, 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 Supālaka (or perhaps rather Tūpākala) Nāyak.

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

At Mailam (= Mayūrastalām) near Tindivanam, the Tamburān (or abbot) informed me that his temple was founded by King Jayamba or Jayambaga Mahārāja, from the north, who also founded or built Senji-Kōṭṭā. 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 gōpuram on which I was shown a sculpture of himself in the style of an old bearded Rishi. He reminded me of the Tamburān (or abbot) of Tiru(p)panandāl near Kumbakōnam.

Another very interesting place I visited near Tindivanam is Perumukkal ("Perummool" 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, Perumukkūl.

Like Senji-Kōṭṭai 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 strewn 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 rokey 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 Ponniyår (S. Pennār or Pinākini.)

Mr. Garstin in the S. Arecot District Manual gives Peru-mukal (=great travail), from a legend of Śitatadévi having here given birth to twins. There are two villages near, called Nalmukkūl (or Namukkūl) and Palamukkūl, names having reference to the same legend. Mr. Garstin also mentions Jānikipetāli, and I may add Rāmanāthapuram, all in the immediate vicinity. But the old Sanniyāsi or hermit sent for the stalapurāna (kept by an artizan in the neighbourhood) and wished to show me from it that the proper name of the hill is Mukkiyāchalam, and that it is therein styled Madhyakāsi (Middle Kasi) and is the scene of Rishi Vālmiki'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 Muslim, and many inscriptions on the base of the temples.

The fort was held and besieged repeatedly in the wars of the Karnātik 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 Tiruvadi (A.S. 79), close to Panrutti, I noticed in the bed of the Gedilam or Garudanadi (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 Kāvēri water, whence it is locally called Kolladattumālai = 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 Tiruvadi 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. Arecot 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 Irallabanda Bapannattam, in the Palmaner 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 kaunhi-ammam at Chengi or Senkhoti ("Ginge") S. Arcot.

Rude sepulchral monument of stone slabs at Iralabanda—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 chatham 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 Chittur and Palmaneri whence there is a good road for 15 miles to the S. W. to Baireddipalle, and thence a bridle path for 6 miles via Neilipatla to Bapanattam. 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 unmistakably.

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.

The Coins of the Mahárájahs 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 Biás on its right bank where 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, Biás and Sutlej. The family of these Rájahs claims its descent from Susarma Chandra, governor of Multán at the time of the Mahábhárata. 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 Archeological 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 Mahárájahs 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 Pithama 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 Pithama 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 unmistakable, 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 Kashmir, 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 Rájahs. 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 Kángra must have been subject at different periods to Kashmír as well as Kabul and perhaps to kanauj. General Cunningham gives the following list:

<table>
<thead>
<tr>
<th>Accessions</th>
<th>Name in list.</th>
<th>Name on Coins</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1360.</td>
<td>Ráya.</td>
<td>Rápa.</td>
<td></td>
</tr>
<tr>
<td>1435.</td>
<td>Sansára.</td>
<td>Sansára.</td>
<td></td>
</tr>
<tr>
<td>1450.</td>
<td>Devanga.</td>
<td>Avatára.</td>
<td>There is one coin known of Devanga.</td>
</tr>
<tr>
<td>1480.</td>
<td>Savira.</td>
<td>.....</td>
<td></td>
</tr>
<tr>
<td>1495.</td>
<td>Prayaga.</td>
<td>.....</td>
<td></td>
</tr>
<tr>
<td>1510.</td>
<td>Ráma.</td>
<td>Ráma.</td>
<td>Died 1528, A. D.</td>
</tr>
<tr>
<td>1565.</td>
<td>Manikya.</td>
<td>.....</td>
<td></td>
</tr>
<tr>
<td>1570.</td>
<td>Jaya.</td>
<td>.....</td>
<td></td>
</tr>
<tr>
<td>1555.</td>
<td>Vriddhi.</td>
<td>.....</td>
<td></td>
</tr>
<tr>
<td>1610.</td>
<td>Triloka.</td>
<td>Triloka.</td>
<td>Rebelled against Jahángir, 1619 A. D. Triloka was the last king who coined. There are 12 more names given in the list.</td>
</tr>
</tbody>
</table>

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 Rájah 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 Kángra itself, but in Ludiána, Jalandhar and Umritsur. Vast quantities of them are how-

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 Rájahs 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 Greco-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.
No. 1. is a coin of Samanta Deva. Obverse above bull Sri Sam: reverse horseman.  
No. 2. is a coin of the same prince, with Sri Samanta above bull, reverse horseman.  
No. 3. Pithama. Obverse Sri Pithama 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. 11. Rupa. Obv. bull, above which Sri Rupa Chandra (Deva), rev. horseman.  
No. 12. Obv. bull, above which Sri Rupa Chandra, rev. horseman. The horses of Nos. 10, 11 and 12, have beads round their necks.  
No. 17. Ditto. Obv. Maharajah Sri Hari Chandra 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 घर. The coin in the paper is of Hari घर. 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 Karmma 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.
COINS OF THE MAHARAJAHS OF KÄNGRA
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. 19. Sinsára. Obv. Sri Sansára Chandra Deva, rev. horseman with a large flag on which is a peculiar mark.


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


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 Devi.

No. 23. Triloka. Obv. Maharajah Sri 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 Kangra 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 in Kashmir. [No. 1,]

**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 جو بندان چک مسلمان ژردن در عالم باد
شین عباد قادر و قشن کند پرسته چرخ برخ 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 Phenician 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 547 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-Ábidín (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 Rání 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 Raivatali 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 'Azam author of the Persian history of Kashmír, 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 21¾ by 12 inches and 2½ 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 چر, 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 Kishtwárah 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 Kotahrini† 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 Rájatarangini has the name Rínchan.
† In the Rájatarangini Kotah Rani.
of a royal stock, named Shahmír who, settling in Kashmir 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-u’d-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-dínpurá.

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 Paklí, 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 Kashmir should appertain to Shaháb-u’d-dín, while all to the eastward should acknowledge the sovereignty of Firúz Sháh. Muhammad A’zam* 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 Kashmir, he built the capital of Shaháb-u’d-dínpurá of which now not a trace but the ruins of a mosque remain, and he destroyed the large idol temple at Bijaírah.† In the year A. H. 778 (A. D. 1376-7) he died.

Kuṭb-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. Kuṭb-úd-dínpurá 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-Tálíb, 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 Kuṭb-úd-dín wore in the royal crown. It is feigned that

* His son Muhammad Aslam, who is the author of the History of Kashmir entitled the Gohár-i Aálam and has made considerable additions to his father’s work, goes so far as to say that the conquests of Shahábl-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. 1398-9). 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 Aábidin 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 Muhammed 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 Pargauah 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 Gurjís 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 puncha-yets at which the monarch himself would preside. This conduction 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 Aábidin 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 eommemorate this event, and among these the inscription under notice by Ahmad Allámá Kashmirí was engraved upon a stone and placed above the Mihráb or sanctuary of the mosque. This Ahmad Kashmirí was the author of the Nár-náma, a Persian translation made in the time of Zayn úl Aábidín of an ancient History of Kashmir in the Kashmirian language by Shaikhu Nur-úd-dín Wali. His translation was made use of by Muhammad Asham the son of Muhammad Aázam, in amending the omissions of his father's History. Mention of the slab with its inscription is made by Muhammad Aázam who gives a faithful transcript of the verses Muhammad Asham 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 دو عالم بان

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 Kashmir.
Coins of the Sunga or Mitra Dynasty, found near Rāmanagar or Ahichhatra, the ancient capital of North Panchalā, in Rohilkhand:—the property of H. Rivett-Carnac, Esq., C. I. E., F. S. A., &c. Described by A. C. Carleyle, of the Archaeological Survey of India.

(With a Plate.)

The great ruined site of Ahichhatra, the ancient capital of North Panchalā and now known as Rāmanagar, has of late been yielding a plenteous 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 Rāmanagar, 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, Phaguni-mitra, Surya-mitra,* and Anu-mitra,—besides several coins of Bhānu-mitra, which were already known. The most numerous coins were those of Bhūmi-mitra, and the next numerous were those of Phaguni-mitra,—after whom, in the descending scale of number, followed Agni-mitra, Bhānu-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 Sravanmitra 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 Phalguni-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 Súrya-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 Aśoka. 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 Bhadragnosa, 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 Bhuila (Kapi-lavastu).

But, in the present case of the Rāmanagar 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 Bhūmi-mitra, and that the Rāmanagar hoard was buried immediately after the death of Bhūmi-mitra, and in the early part of the first year of the reign of Indra-mitra. This would account for the plentifulness of Bhūmi-mitra’s coins, and the scarceness of Indra-mitra’s, in the Rāmanagar 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 Rāmanagar hoard, I will place the number of each found, respectively.

<table>
<thead>
<tr>
<th>Initial Date</th>
<th>Names of Kings</th>
<th>Number of Coins found at Rāmanagar</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. C. 178</td>
<td>Pushpamitra, Bhadraghosa, Surya-mitra, Bhūmi-mitra, Agni-mitra, Anu-mitra, Phaguni-mitra, Bhūmi-mitra, Indra-mitra</td>
<td>(None.) 5 7 10 11 1 28 34 1, certain. 1, doubtful.</td>
</tr>
</tbody>
</table>
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*—Bhadraghosa.

*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*—Bhadraghosa.

(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 (Nâgs) 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-mitrâsa.

*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-mitrâsa.
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.—Bhán-mitra.

5. Coin pretty large.

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

Legend—Bhán-mitrása.
(Sometimes the last part of the name appears to be mitrasa.)
Symbols above 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 semicircular 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—Phaguni-mitasa.

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 (Nâgs) 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.—Bhûmi-mitra.

10. Coin, large.

Obverse.

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

Legend—Bhûmi-mitasa.

Symbols, Bodhi Tree, Linga with serpents (Nâgs), 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.


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.


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.
2. Bhadrargosa.
5. Bhanu-mitra.
6. Agni-mitra.
7. Phaguni-mitra.
9. Indra-mitra.
12. Saya-mitra.
14. General Cunningham's Dhruva-mitra.

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 (anuswara?) 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.
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 Bámíán 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 tragic 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 Herát 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 Garm-sír. 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, 7½ 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.**

First circle. 
لا اعنة الا الله محمد رسول الله السلطان الاعظم 
غيات الدنيا والأبد ابوب القنح 
محمد بن سام

Second circle. 

Third circle. 

Centre.

**Reverse.**

First circle. 

Second circle. 

Third circle. 

Centre.

The last two of the three coins with concentric inscriptions referred to above, differ from the first in 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-din. 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 Sūrah 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-din. 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-din.

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

**Obverse.**

First circle.

کورَ المشترکون
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 Panjāb, 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 إله إلا الله  
محمد رسول الله  
السلاطين الأعظم  
غیاث الدين و الديني أب‌الفتح  
محمد بن سام

Margin:—

هو الزئ رسل الله بالله وتین الحکم لیظهر على الدين كله  
Reverse

Area:—

الخالص لدنيا و الله  
السلاطین المعظم  
معز الدين و الديني أب‌الحفاظ  
محمد بن سام

Margin:—

ضرب هذا الدرهم في شهر سنه ثمان وخمسين وخمس مية.
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 muzafir. 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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A Collection of Hindi 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 Hindi, 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 Hindi words bol-i “speech,” bol-áhat “calling,” bol-aná “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 Hindi, 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,” bajh-ai “he understands,” bol, kar and bajh are the roots respectively.

For comparing Hindi roots with Sanskrit, this is the most convenient rule. For a large number of Hindi 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 budhgya in the present tense, whence arises the Hindi form bajh. From the Sanskrit budh comes the 3rd person sing. present budhyate, in Hindi bajhái; but from it comes also the participle future passive bodhavaya “to be understood”; in Eastern Hindi this form is bajhab or bajhab, Western Hindi
būjhīrau, which transliterated into Sanskrit would be būdhyitāvya. This shows that in Hindī the form būjh acts as a root, precisely as budh does in Sanskrit.

Putting aside mere phonetic differences, as in the Hindī sikh or sich, Marāṭhī śik “learn,” Eastern Hindī char, Western Hindī chal “walk,” the Gaudīaian languages differ very little with regard to their roots. There are, however, a few exceptional cases of roots which are confined to some particular Gaudīaian language. Thus “see” is in Sindhī pas, Marāṭhī pākh, but in Hindī dis or dekh, the Sanskrit pāṣ, prēkṣh and dṛīṣ; again “come” is in Sindhī aekh, Bangāli dīs or ās, but in Hindī āo or ā, the Sanskrit āgachh and āgyā.

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 butu-ānā “to speak,” but bu-latā “to call”; chhōr-ānā “to loose,” but chhūr-ānī “to cause to loose”; ghum-ānā “to turn,” but ġhum-ānī “to cause to turn”; pi-nā “to drink;” but pī-lānā “to cause to drink”, &c. There are, however, a few exceptional cases of changeable roots. These are kar “do,” āhar “place,” jā “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 kā or ki, dha or dhī, 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 Hindī dialects. Thus the High Hindī has the past participle ki-yā “done,” Eastern Hindī ka-il or ka-yal, but Western Hindī kar-an; Eastern Hindī also has the radical form ki in ki-his “he did,” ki-khin “they did.”* So also High Hindī mu-ā or mar-ā “dead,” Eastern Hindī 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 Hindī root khā “eat” is a primary one; for its original is the Sanskrit root khād; but the Hindī root paith “enter” is secondary; for there is no Sanskrit root praviṣṭ, though there is a Sanskrit participle praviṣṭa “entered” (of the root praviṣ), 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. chalai, H. H. chale, Skr. chalati, “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 lik-is “he took”, lik-in “they took”.

[No. 2, Collection of Hindī Roots.]

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


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 Hindi these suffixes are incorporated with the roots. Thus, búh “understand,” Skr. budh + ya (budh IVth class); kop “be angry,” Skr. kúp + ya (kúp IVth); núch “damee,” Skr. nút + ya (nút IVth); suñ “hear,” Skr. sú + nu (súnu Vth); bhanj “break,” Skr. bhanaj (bhanj VIIIth); ján “know,” Skr. já + ná (jáná IXth), &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 Hindi 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) páca “obtain” (VIth), Skr. práp + un (Vth; as if it were práp + a VIth); mánya “ask” (VIth), Skr. mágy + aya (Xth); again (b) kara “do” (VIth), Skr. kara-ú (VIIIth, kri); ján “know” (VIth), Skr. já + ná (IXth, jáná). That is, the Hindi roots pár, máng (मांग), ká, ján, all of the VIth class, correspond to the Sanskrit roots práp, mágy, kri, jáná, of the Vth, Xth, VIIIth and IXth classes respectively, &c.

5. Change of “voice.” Some Hindi roots are derived from the passive base of a Sanskrit root. Thus, bhaí “break” (active), Skr. bháj + ya “be broken” (passive of bháj); de “give,” Skr. dí-ya “be given” (dá); sak “eau,” Skr. sak + ya (sák); biś “sell” (aet. intrans.), Skr. vikri-ya (vikrí), &c.

6. Change of tense. Some Hindi roots are derived from the future base of a Sanskrit root. Thus dékha “see”, Skr. drakshya (future of dρίश); (old H.) mák or nák “destroy” or “throw away”, Skr. nákṣhya (future of nág); (old H.) krák “draw”, Skr. krákshya (future of krish); khech or kháich “draw,” Skr. krákshya (future of krish).
7. Addition of the pleonastic suffix api. Thus sukāv "please," Skr. sukha (as if it were sukhāpi). In causal roots this is the universal rule; e. g., karāv (or shortened karā) "cause to do," as if it were derived from a Sanskrit root karāpi (instead of kārī).

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 Hindi 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 Prākrit, unless it had been protected by another consonant following it; Skr. lagati "he belongs" would become Pr. lādī, H. lai; but Skr. laggate is Pr. lāgaī, H. lagai or lage.*

The termination aya of Sanskrit roots (or rather bases) of the Xth class and of causals is contracted in Prākrit to e. This e is changed to a in Hindi, by the 4th law. Thus Skr. mārgaya "ask" is Pr. magge, H. mángga (मिंग); Skr. tṛtaya "break" is Pr. tōde, H. tōra. On the same principle the Skr. vikrīya "sell" (pass.), which in Pr. becomes vikke, is H. bika; thus Skr. vikrīyate "it sells," Pr. vikkē, H. bikvi 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 nahā "bath", Skr. snā. 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 kārī "cause to do," for which, by the 7th law, Hindi places karāv or karā. Now, mistaking nahā, which really is a simple root, to be a causal root (as if it meant "cause to flow"), Hindi re-derives from it a simple root nah; the pair of roots nahā and nah being, in outward appearance, exactly like the pair karā 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 jama "germinate," derived from the Sanskrit substantive janma "birth" (of the Skr. root jan "be born"). Of the other kind are paitk "enter," derived from the

* This process is expressly mentioned by Prākrit Grammarians, in the case of a few roots; as Pr. rujhā (or rukhā) act. "he hinderers" as well as pass. "he is hindered," from Skr. pass. ruñhāya "he is hindered," while the Skr. act. is ranādāhi (VIIIth el.) ; see II. 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 ease of the Hindi root bhāj "break" is exactly similar.  See also S. Goldschmidt in J. G. O. Soc., Vol. XXIX, p. 492. and Weber Saptasataka, p. 64.
Sanskrit participle pravishṭa "entered" (of the Skr. root prā-visor “enter”); baith “sit” and pith “beat”, derived respectively from the Sanskrit participles upavishṭa “sitting” and piṣṭha “beaten” (of the Skr. roots upavīs and piṣṭ).

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 chyut + kṛi, which is a compound of the Sanskrit noun chyut “flowing away” and kṛi “make;” e. g., the Skr. 3rd pers. sing. pres. chyut-kriyate, lit., “he is made a flowing away,” is Pr. chukkei, H. chučai (or chuč) “he ceases.” Similarly ruk “stop” or “be hindered” comes from rut + kṛi, i. e., from the Sanskrit noun ruṭṭh “hindrance” and root kṛi “make;” again kasok “be pained” or “suffer pain” from kashan + kṛi, i. e., from the Skr. noun kasha “pain” + kṛi “make.” It is probable, I think, that the Prākrit termination (3rd sing. pres.) kei, Hindi kai or ke, is phonetically derived from the Sanskrit passive kriyate “he is made,” Skr. rut kvarotī would mean “he makes a hindrance”; this phrase, being treated as a compound word, would form the passive rutkriyate;† “he is made a hindrance” or “he is hindered,” whence would regularly arise the Prākrit rukkei, and the Hindi 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 Hindi 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., dho “carry,” laut “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’ Ist 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 dakkha, is that this root is derived from the Sanskrit future base drakshya (Skr. drakshyat = Pali dakkhative), its original future meaning having been forgotten in later times. The theory, if true, must, of course, equally apply to the root in its Prakrit and Gaudian form dekh. In this form, however, it can hardly be directly connected with the future base. But there is, both in Prakrit and Gaudian, another very common root pekh, also meaning "see". It appears to me most probable that the original form dakkha 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 Hindi. For example there is in E. Hindi the pair of roots de "give", and le "take", representing the Sanskrit roots dá and labh. The 3rd singular present are dey, ley, Pr. deí, leí; here ley and leí "he takes" are formed in assimilation to, or after the analogy of dey and deí "he gives". Prakrit has also the regular form labái "he takes", from Skr. labhate. Again the E. Hindi has the past participles dikhal "given", likhál "taken"; here dikhál is formed after the analogy of likhál, from Prakrit lahída. 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. 46, 46. He does not mention, however, the ingenious theory of the two Goldschmidt's (Paul and Siegfried), who explain dekh as a denominative root derived from the past participle drishtá, by assuming the well-known modern pronunciation of झः sh as झः kh to have already existed in Prakrit; (see S. Goldschmidt's Práctica, pp. 6—8, and F. Goldschmidt's Essay in Göttinger Nachrichten, 1874, pp. 518—520). But there is no evidence, really, of the existence of that usage in Prakrit; moreover in the modern vernaculars, झः would not be pronounced झः, when it stood first in a conjunct, but only when it stood singly or second in a conjunct; thus one might hear purakh (पुरख) or børkhá (बृरख), but not jekkhá (जेखः, always jekkh).

† In Kahn'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 Praktí a very frequent word for 'seeing' is pekkh, 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 dekh to the earlier dakkha is concerned.

§ In the old Hindi of Chand's Prithirája Rasa, dích and pích are commonly used in a transitive sense (see, e.g., the verse on p. 39); also in modern Hindi 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 Prithvirāja Rasan, 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 naśkh or naṇkh “destroy” or “throw away” and krakkh “draw” or “pull.” The former occurs, e. g., in the following verses:

वर्थमणि तस्थो कर लम्बे II (or लम्बे) 27, 88.

i. e. “impatiently he throws away his rosary with his hand”; again चं घार मुख निसिकित जन्में II 27, 84.

i. e. “the chiefs of the cavalry he fearlessly destroyed.”

The root krakkh occurs in the following lines:

चित्रा बुधा परमेव सच्चो हृदि बिचा।
समी रिंडसि जाश्चाय सूरिः प्रथम।

i. e. “unblusingly searching for a partner, Sachī (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 naś “perish” is in Sanskrit naśkṣhyati, which would be Pr. naṇkhāi or naṇkhāi, whence in Hindi naṇkhāi or naṇkhāi with meaning of the present. It is to be noted, that in Hindi the meaning of the root has become transitive (by the 5th law). Similarly the Sanskrit future of the root kriś “draw” is krakṣhyati, Apābhrānta Pr. krakkhaī, whence in Hindi, with meaning of present tense, krakkhaī. It should be observed, that the rhyme in the above lines would require kriṅkhyau or a root krikk. 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 Hindī 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 khench (क्षेच) or khainch (खैच) “draw.” The Sanskrit conjunct kṣā may change in Prākrit to kṣh or ekshh; thus the Skr. root preksh “see” becomes pekkh or pechchh in Prākrit; the Sanskrit future base drakṣhya

* 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 ādakka or ṛadakka in Prākrit (see H. C. 3, 171).* Similarly the Sanskrit future base krakaṣṭya or karkṣṭya would, in Prākrit, become kakka or kachcha; and the Sanskrit compound future base ākarkṣṭya (of root ā + krish "draw") would become ādakka or ādakka. With the insertion of the usual euphonic y, the latter would become āyachchha. The Prākrit 3rd singular future accordingly might be āyachchhai or (with the not unusual nasalization instead of the reduplication of a consonant) āyāchchhāi; and, assuming Childers' theory to be true, this form might occur as a present, equivalent to the Sanskrit karṣhāti. 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 āyāchchhāi, āyaucchchāi, āiuchchhāit as Prākrit equivalents of the Skr. karṣhāti. The last form āiuchhāi (वार्ष्ण) has arisen by contracting ya into i, and is that form which has immediately passed into Hindi, with this difference only, that ehh has been disaspirated (a process not uncommon in the modern vernaculars). Hindi has aiuchhāi or euchchhāi (ईच्छेदः or ईच्छेदः). Now to return to khechh and its compeers; the uncompound root krish would yield a Prākrit form kachechhāi or kaučchhāi, which in Hindi, by transferring the lost aspiration of ehh to k and by assimilation to aiuchhāi and euchchhāi, would result in the modern forms khauchchhāi or khenchhāi (क्षिच्छेदः or खिच्छेदः), or without nasalization, khaichhāi and khechhāi. It will be observed that the later forms khechchhāi or khaichhāi are related to what would be the earlier forms khauchchhāi or kaučchhāi, just as the modern dekchhāi and Prākrit dekhhai are to the Pāli dakkhaṭi.

There are two other roots which also deserve a special word. One is the root hokk “be” or “become.” It is an equivalent of the commoner root lō by the side of which it is very commonly used in Eastern Hindi. In Western Hindi, 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 acheshh “he”, gachchh “go”, yachchh “hold”, the element sk would change in Prākrit either to kkh or to ekh; so that bhūsk (or bhavasck) would become Pr. hokkh, H. hokh, just as āsk (of āś) becomes Pr. aechh, H. ahh, or gask (of gaw) becomes Pr. gaechh. Possibly—though I do not think it, probable—the origin of dekkh might be accounted for in a similar way.

* See also footnote on page 49. The Prākrit word sarvīkchchhā “similar” exhibits the root-form diechchha, which is to dekkh (or dikkh), as peechchh is to pekkh. On the other hand its Sanskrit equivalent sudīkṣṭha exhibits the Prākrit root dekh or diekh in its Sanskrit dress ṛdīkṣṭha, and is, I believe, the only instance of the admission of that mongrel Prākrit root into Sanskrit.

† The MS. readings vary. H. C. also gives the forms snachchhāi and 谯chchhāi; in the former the nasal has been transferred to fill up the hiatus, in the latter āi is contracted into a.
The other is the still more common root āv (or H. H. ā) "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
Maráthí root ye "come" is derived. But this does not explain the terminal
consonant v in the Hindú āv. Now it is a curious fact, that the root
áv imitates, in every respect, the conjugal forms of the root pāv (Skr.
 prá = pra-áp), instead of those of the root já "go" (Skr. yá) which one
would expect it to follow. Thus, present participle E. H. ávat or W. H.
 ávatu "coming," E. H. pāvat or W. H. pācatu* "obtaining," but E. H.
 ját or W. H. játu "going;" past participle E. H. āil or áyal or ává,
W. H. áyan "come," E. H. pāil or pāyal or pāvá, W. H. páyan "ob-
tained," but E. H. gáil or gáyal or gáyá, W. H. gáyan "gone;" 3rd sing.
present H. ávai, H. H. áve "he comes," H. pávai, H. H. páve "he
obtains;" but H. jáy, H. H. jíe "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 āv is
due to the influence of pāv; 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 Prákrit as well as in the Gipsy dialects. In Prák-
rit there is the 3rd sing. pres. ávē, ‡ and shortened ávē (H. C. 4, 367)
"he comes." The regular Prákrit form would be ávāi or shortened ávī
(see H. C. 4, 240); but just as there is utīhei or shortened utīhai (H. C.
4, 17) for utīhāvai or utīhāi (see Vr. 8, 25) "he stands up" (of root ut-sthá),
so there might be ávē or ávē (of root á-yá), from which, by the insertion of
the connecting consonant v, there would arise ávēi and ávāi.§

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

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

† This influence of pāv even intrudes occasionally into the conjugation of jā
"go;" thus the E. H. has sometimes jávād "gone," like ávā, pāvā; and the 3rd sing.
pres. jāvē is rather common in H. H. beside jāe or jāye.

‡ This form is quoted by Dr. R. Mitra from the Píngala in the Vocabulary appended
to his edition of the Sanskrit 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. apyeti
Pr. appē or ápē or ápē (cf. kādum "to do" for kattum). H. C. 4, 400 seems to refer
it to Skr. á-padh (or better á-pāt ?). The Bangáli uses an altogether different root, ais
or ás. Bames, in his Comparative Grammar (III, pp. 44, 45) rightly refers this root,
also as the Sindhí ach, to the Skr. root á-gachh (of á-gam). Disspiration of an
aspirate and pronunciation of chh as s are not uncommon in the Indian vernaculars
(see my Comparative Grammar, §§ 11, 145, ex. 2). The root ágachh would become in
Pr. áchh (see Delinus, Radices Pracriticæ, pp. 69, 70) or ágachh; by contraction in
Pángalí, the former would become ás (for áchh), the latter álás (for álachh). The root
álás might, however, be also referred to the Sanskrit root ā-vis.
PART I.—Primary Roots.*

1 क्षेत्र "room = Skr. क्षेत्र, Passive क्षेत्र (with active sense), Pr. क्षेत्र (H. C. 4, 230), H. खेत्र.

2 अनुभूति resemble = Skr. अनुभूति, प्र. अनुभूति (H. C. 4, 259 = Skr. अनुभूति), E. H. अनुभूति.

3 आय come, see introductory remarks, p. 41.

4 आय feed = Skr. आय, प्र. आय (H. C. 4, 259 = Skr. आय), E. H. आय.

5 उड़ pluck up = Skr. उड़, प्र. उड़ (H. C. 4, 187), H. उड़ (with transfer of aspiration, as in चेहरे, see p. 40 and my Comp. Gramm. § 132); see No. 28.

6 आय reveal = Skr. आय, प्र. आय (H. C. 4, 33), H. आय.

7 उड़ rise = Skr. उड़, Passive उड़ (with active sense), Pr. उड़ (cf. E. M. p. 27 and Ls. p. 315, also उड़) or VI. cl. उड़ (H. C. 4, 17), H. उड़. In Pr. also VI. cl. उड़ or contr. उड़ (Vr. 8, 26), in H. deest.

8 उड़ fly = Skr. उड़, प्र. उड़ (Cw. p. 99, Spt. v. 223) or VI. cl. उड़, H. उड़.

9 उड़ descend = Skr. उड़, प्र. उड़ (H. C. 4, 339), H. उड़.

10 उड़ intr. upset, come off from, come down = Skr. उड़, प्र. उड़ (H. C. 4, 174), H. उड़.

11 उड़ or उड़ tr. upset, take down = Skr. उड़, Causal उड़, प्र. उड़ (H. C. 4, 174), H. उड़ or उड़.

12 उड़ grow up = Skr. उड़, प्र. उड़ (H. C. 4, 142), H. उड़.

13 उड़ boil = Skr. उड़, प्र. उड़ (H. C. 4, 339), H. उड़.

14 उड़ keep in reserve = Skr. उड़, Causal उड़, प्र. उड़ or VI. cl. उड़, H. उड़.

15 उड़ raise up, excite = Skr. उड़, Causal उड़ (H. C. 4, 174), H. उड़.

16 उड़ or उड़ grow up, also reprove = Skr. उड़, प्र. उड़, Pr. उड़ (T. V. 3, 1. 133 = निष्पादित, H. C. 4, 259 has उड़), E. H. उड़, W. H. उड़. In the sense “reprove” perhaps connected with उड़?

17 उड़ subside = Skr. उड़, प्र. उड़ (H. C. 4, 85 उड़, v. 1. उड़ (with euphonic च), H. उड़.

18 मृदु be drowsy = Skr. ? , Pr. उड़ (H. C. 4, 12 = निष्पादित), H. उड़.

* See List of Abbreviations at the end of this article.
19 \textit{kasm be excited, raised up} = Skr. \textit{udr-m}, I. cl. \textit{udravat}, Pr. \textit{udvar} (Vr. 8, 3) or \textit{udvar} (cf. अंवति for अंवति H. C. 4, 305), H. जभ; or denom. from \textit{जभ}, Pr. \textit{udvar}, cf. H. C. 2, 59.

20 \textit{to scream} see secondary roots.


23 \textit{kār do} = Skr. \textit{kar}, VIII. cl. करे, vedic also I. cl. करति, Pr. कर (Vr. 8, 13), H. करे. In Pr. also X. cl. करे (H. C. 4, 337); Vedic also V. cl. कराति, Pr. कर (Vr. 8, 13), \textit{do}est in H.


25 \textit{kām tighten} = Skr. \textit{kām}, I. cl. करति, but also VI. cl. करति, whence Pr. काम, H. कसः.

26 \textit{kād say} = Skr. \textit{kād}, X. cl. काद, Pr. काद (Spt. v. 35) or VI. cl. काद, (H. C. 4, 2. Cw. p. 99), H. कादे.

27 \textit{kād cut} = Skr. \textit{kād}, Causal कार्यति, Pr. काद or VI. cl. काद, (cf. I. sg. कादे H. C. 4, 385), H. कादे.

28 \textit{kād draw} see secondary roots.

29 \textit{kāpā or kāp tremble} = Skr. \textit{kāpā}, I. cl. कापति, Pr. काप (H. C. 1, 30), H. काप or कापे.

30 \textit{ Participants or kān buy} = Skr. \textit{kān}, IX. cl. कार्याति, Pr. किष्ठ (Vr. 8, 30) or किष्ठ (Dl. p. 22), H. किष्ठे or किष्ठे.

31 \textit{kṛṣṇa pound} = Skr. \textit{kṛṣṇa}, X. cl. कृष्ण, Pr. कृष्ण or VI. cl. कृष्ण, H. कृष्ण.

32 \textit{kṛṣṇa or kṛṣṇa jump} = Skr. \textit{kṛṣṇa} (or \textit{kṛṣṇa}), I. cl. कृष्ण, Pr. कृष्ण, H. कृष्ण or कृष्ण.

33 \textit{kāpā or kāpā scrape, dig} = Skr. \textit{kāpā}, X. cl. कापते, Pr. काप or काप, W. H. काप or E. H. कापे.

34 \textit{kāpā or kāp Śbe angry} = Skr. \textit{kāpā}, IV. cl. कृष्ण, Pr. कृष्ण (H. C. 4, 230), H. कृष्ण.


36 \textit{kāpā cat} = Skr. \textit{kāpā}, I. cl. कापरति, Pr. कापर or (contracted) काप (H. C. 4, 228), H. खाप.

37 \textit{kāśa cough} = Skr. \textit{kāśa}, I. cl. काशा, Pr. काशा or काशा, (cf. H. C. 1, 181, खार्मिक = काशा), H. खार्मिक.


* In Prākrit also the Passive \textit{kāp} is used, apparently in an active sense; e.g. \textit{कापति} "they eat" (Dl. p. 54, quoted from the Mrcechhakaṭika; R. M. p. 87, seemingly quoting the same, gives खापति).
39 चाँद या चाँड्रा बेन क्रेश्त वल = स्क्र. चाँड्रा, VI. cl. स्तब्धता; but also VII. cl. चाँड्रा or IV. cl. चांड्रा, Pr. चांड्रा (H. C. 4, 224), H. कांड्य or (corrupted) कांड्य.
40 चुंब विषयका या चुंबका विषयका = स्क्र. चुंब, Passive चुंबन, Pr. चुंबन्न or चुंबन्न, H. चुंबन्न. See Nos. 41, 44.*
41 स्वर स्वर = स्क्र. स्वर, Passive स्वरण, (actively), Pr. चुंब (H. C. 4, 116, said to be a substitute for Skr. चुंबणे of root चुंब), H. चुंब.
42 केन्द्र play केन्द्र (ep. केन्द्र and केन्द्र), I. cl. केन्द्रतिनि, Pr. केन्द्र (H. C. 4, 188) or खेल (H. C. 4, 382), H. खेल. (Pr. also कीवर Dl. p. 47).
43 चें तौग या स्तम्भ, लोउ = स्क्र. चें, VI. cl. चेंतिनि, Pr. चेंद्र, H. चें (with चें for चें, see my Comp. Grammar, § 122).
44 चेंल खेड़ा = स्क्र. खेड़ा divide, X. cl. खेड़ातिनि, Pr. खेड़ार or VI. cl. खेड़ार or खेड़ार, H. खेड़ार. See Nos. 40, 41.
45 गत तीर्थ = स्क्र. गत्तु, IX. cl. गत्तुतिनि, also I. cl. गत्तुतिनि, Pr. गत्तु (H. C. 4, 120), H. गत्तु.
46 गत or गत, form, grave = स्क्र. गत, I. cl. गत; Pr. गत (H. C. 4, 112), H. गत or गत. See Nos. 54, 59.
47 गढ़ अक्षर = स्क्र. गढ़, Caus. गढ़तिनि, Pr. गढ़तिनि or गढ़तिनि (H. C. 4, 340), H. गढ़तिनि.
48 गाँव or गाँव count = स्क्र. गाँव, X. cl. गाँवतिनि, Pr. गाँव (S. B. 11, 27) or VI. cl. गाँव (H. C. 4, 358), H. गाँव or (corr.) गाँव (see my Comp. Grammar § 35, note).
49 गांव be spent = स्क्र. गांव, Pass. गांवने, Pr. गांव (Vr. 7, 9, 8, 58) H. गांवने.
50 गर्ना or गर्ना to abuse = स्क्र. गर्ना or गर्ना, X. cl. गर्ना, Pr. गर्ना (cf. H. C. 2, 104) or गर्ना, E. H. मिराबा for मिराबा.
51 गाँव melt = स्क्र. गाँव, I. cl. गाँवति, Pr. गाँव (H. C. 4, 418), H. गाँवति.
52 गर्ना or गर्ना to seize = स्क्र. गर्ना or गर्ना, IX. cl. गर्ना, Pr. VI. cl. गर्ना (Vr. 8, 15) or गर्ना (T. V. 2. 4. 157), H. गर्ना.
53 गांव sing = स्क्र. गांव, I. cl. गांवति, Pr. गांव (or (contr.) गांव (Vr. 8, 26), H. गांव.
54 गांव or ए. गांव form; see secondary roots.
55 गांव fail = स्क्र. गांव, VI. cl. गांवति, Pr. गांव, H. गांव.
56 गांव thread = स्क्र. गांव, VI. cl. गांवति, Pr. गांव (H. C. 1, 236), H. गांव.
57 गांव catch = स्क्र. गांव (or गांव), I. cl. गांवति, Pr. गांव, H. गांव.
58 गांव decline = स्क्र. गांव, Passive गांव, Pr. गांव, H. गांव.
59 गांव form, happen = स्क्र. गांव, I. cl. गांव, Pr. गांव (H. C. 4, 112), H. गांव. See Nos. 46, 54.

* The roots चुंब, चें, केन्द्र, गत are all connected with one another and with the Sanskrit roots चंद्र, चें, केन्द्र, गत, चुंब, केन्द्र, गत, चुंब, which all mean 1. "lump," 2. "divide" or "break." The original form, apparently, is चंद्र, or चंद्र, or rather चुंब.
60 चस्त् or चिप्र रजिः, be worn away = Skr. द्रायः, I. cl. चर्षितः, Pr. VI. cl. चर्षितः (also चर्षितः), Pr. VI. cl. प्रधानः (H. C. 4, 204, where it is said to be a substitute of चर्षितः), H. चर्षितः or चिप्र.

61 धान्त throw, destroy, mix = Skr. धान्तः, I. cl. धान्तः, Pr. धान्तः or धान्तः (H. C. 4, 334, T. V. 3, 4. 6 where it is said to be a substitute of धान्तः), H. धान्तः.

62 पुन्त or पुन्त mix with a liquid, dissolve = Skr. पुन्तः (also चर्षितः and धान्तः), I. and VI. cl. पुन्तितः (also चर्षितः, पुन्तितः, पुन्तितः), Pr. पुन्तः or धान्तः (Vr. 8, 6. H. C. 4, 117), H. पुन्तः or धान्तः (see also Bs. III, p. 56).

63 छ्री revolve = Skr. छ्रीः, VI. cl. छ्रीः, Pr. छ्रीः (H. C. 4, 117), H. छ्रीः (also Bs. I, 344).

64 धर gather, surround = Skr. धरः?; compare H. धर house with Skr. चरः.

65 धर mount, increase = Skr. उत्तमः, VI. cl. चर्षितः, Pr. (dropping त) चर्षितः or चर्षितः (T. V. 3, 1. 128), H. चरः.*

66 धर be abashed = Skr. चर, press, Passive पुन्तः, Pr. पुन्तः (see H. C. 4, 395. चर्षितः, T. V. 3, 4, 65. चर्षितः), H. चरः. The transitive form is चाप or चापः.

67 धर graze = Skr. धरः, I. cl. धरितः, Pr. धरः, H. धरः.

68 चल्ल or चल्ल walk = Skr. चलः, I. cl. चलितः, Pr. चलः or चलः (H. C. 4, 231), H. चलः or चलः.

69 चप dip = Skr. चपः, I. cl. चपितः, Pr. चपः (H. C. 4, 233), H. चपः. See No. 74.

70 चाचेस masticate = Skr. चाचेस, I. cl. चाचेन, Pr. चाचेस, H. चाचेस (see also Bs. III, 40.)

71 चिन्तत think = Skr. चिन्त, X. cl. चिन्तितः, Pr. चिन्तितः (Spt. 156, H. C. 4, 265) or चिन्तितः (H. C. 4, 422), H. चिन्तितः.

72 चिन्त गather = Skr. चिन्त, V. cl. चिन्तितः, Pr. VI. cl. चिन्तितः (Vr. 8, 29. H. C. 4, 241), H. चिन्तितः.

73 चुन गather, choose = Skr. चुन, V. cl. चिन्तितः, Pr. VI. cl. चिन्तितः (H. C. 4, 238), H. चुनः.

74 चु ल leak = Skr. चु, (or चुः), I. cl. चलेन, Pr. चलच and चलच (H. C. 2, 77), H. चुः.

* चन् + शद् lit. full upwards, an unusual word in Skr., but formed exactly like the common compound चन् + शद्—The final श of शद् becomes द् in Pr., see H. C. 4, 130 चन्द्र and Vr. 8, 51. H. C. 4, 219 चन्द्र. The initial श is dropped, and the aspiration of श transferred to द् or lost altogether, just as in the root चाचेस, desire, from चाचेस = चाचेस and from चाचेस (see my Comp. Grammar § 132). In old H. the root is चुः; M. has both चुः and चुः; but G., S. and B. have चुः, which is the form given by H. C. 4, 206. T. V. 3, 128 gives both चुः and चुः.
75 चूसतकृत्त = Skr. चूस, I. cl. चूसतकति, Pr. चूसाय (Vr. 8, 71), H. चूसत.
76 घो thatek = Skr. घो, X. el. घोतकति, Pr. घोए (cf. Dl. 54) or VI. el. घोठ (T. V. 4, 110 or घोठ in H. C. 4, 21) or घोठ (by contraction; cf. Vr. 8, 26), H. घोठकति.
77 चबित or चबिया or चपुन be hidden = Skr. चबित dwelt secretly, Causal Passive चबिया, Pr. चबिया or चमिया, H. चबिया (or (corr.) चबिया or चपुन). See No. 80.
78 भाय or भाया touch = Skr. भाय, VI. el. सुभायति, Pr. भायिया or भायिया (H. C. 4, 182), H. भाया or भाया. See No. 78.
79 भाय waste away = Skr. भाय, Passive भायिया, Pr. भायिया (H. C. 4, 434), H. भाया.
80 भुई or भुई touch = Skr. भुई, VI. el. भुईत, Pr. भुईत, H. भुई or भुई. See No. 78.
81 भाय or भाय be released = Skr. भाय, Passive भायिया, Pr. भायिया, H. भायिया or भायिया.
82 भाया release = Skr. भाय, Causal भायिया, Pr. भायिया or VI. el. भायिया, H. भायिया (see also Bs. III, 52).
83 जन give birth = Skr. जन, Causal जनतिया, Pr. जनेय (Spt. 75) or VI. el. जनेय, H. जनाय. Skr. also IV. el. जनाय, Pr. जनाय (H. C. 4, 136), H. जनाय.
84 जाप reite = Skr जाप, I. el. जापतिया, Pr. जापत (Vr. 8, 24), H. जाप.
85 जार, be feverish = Skr. जार, I. el. जारतिया, Pr. जार, H. जार.
86 जान burn = Skr. जान, I. el. जानतिया, Pr. जानत (H. C. 4, 365), H. जानत.
87 जा go = Skr. जा, II. el. जातिया, Pr. VI. el. जातिया or (contr.) जात (H. C. 4, 240), H. जात.
88 जान or जान watch = Skr. जान, II. el. जानतिया, Pr. I. el. जानतिया and VI. el. जानतिया (H. C. 4, 80), H. जानति or जानति.
89 जान know = Skr. जान, IX. el. जानति, Pr. VI. el. जानत (H. C. 4, 7), H. जान, (also Bs. III, 41).
90 जी live = Skr. जी, I. el. जीतिया, Pr. जीत (H. C. 1, 101), H. जीत.
91 जूं जूं fight = Skr. जूं, IV. el. जूंतक, Pr. जूंभाद (Vr. 8, 48), जूंभाद (also Bs. I, 328). In old H. also जूंभाद.

* H. C. 4, 182 identifies the roots विसङ्ग and विसङ्ग with Skr. युधिष्ठ, for which he gives the Pr. Pass. विसङ्ग (H. C. 4, 257). The latter is merely a hardened form of विसङ्ग, which would be the regular Pass. of विसङ्ग or rather of विसङ्ग. Now Skr. युधिष्ठ = Pr. विसङ्ग or, on account of labial युधिष्ठ = युधिष्ठ (see No. 80); again in Pr., युधिष्ठ = युधि = युधि. Hence Skr. युधिष्ठ = Pr. विसङ्ग = विसङ्ग. It follows that the radical forms विसङ्ग and युधिष्ठ (H. की र and युधि) are derivative roots, made from the Passives विसङ्ग and युधिष्ठ and that the Skr. root युधि is merely the Pr. root युधि in a Skr. dress (cf. Pr. युधिष्ठ &c., and see S. Goldschmidt in J. G. O. S. 29, 493).
92 जुट be joined = Skr. जुट, Passive जुटति, Pr. जुटू; II. जुटे; a very old secondary denominative root of जुटा p. p. of Skr. root जुट.
93 जोड़, join = Skr. जोड़, X. el. जोड़ति, Pr. जोड़ or VI. cl. जोड़, H. जोड़.
94 भाद argue, dispute = Skr. भाद, I. cl. भादति, Pr. भाद, H. भाद. See No. 96.
95 भाद or भं ट full off = Skr. भाद, VI. el. (श्रद्धि), Pr. भाद (H. C. 4, 130 for भाद), H. भाद or भंट. See No. 97.
96 भाद rush about = Skr. भाद, Passive भादति (used in active sense), Pr. भाद (H. C. 4, 161. for भाद), H. भाद.*
97 भाद sweep off = Skr. भाद, Causal भादवति, Pr. भाद or VI. cl. भाद, H. भाद. See No. 95.
98 भाद polisli = Skr. ज्वल श्वी (?), Causal ज्वलनि, Pr. *भाद्वर or VI. cl. *भाद्वर, H. भाद; cf. Skr. भाद ब्लाइन, ब्लाइन श्वी.
99 टक or टक सितें = Skr. टक, I. cl. टकति, Pr. टकाँ, H. टक or टके. Probably a compound root of ट.
100 टूट or टूट break = Skr. तुट, VI. cl. चुटति, but also IV. el. चुटति, Pr. तुट (H. C. 4, 230) or तुट (Pingal, as quoted by R. M. p. 99), H. तुट or टूट.
101 टेह eheat = Skr. खाग, I. cl. खागति, Pr. टम्र, H. चो.
102 दार or दाल throw away = Skr. द ब श, Causal दारति, Pr. *दारिद or VI. cl. *दारिद, H. दार or दाल (cf. H. C. I, 217 दारि).
103 दाँध or दाध or दाध bite = Skr. दंश, दाध or दाध, I. cl. दंशति or दाधति, Pr. दाध (H. C. I, 218) or दाध, H. दाध or दाध or दाध.
104 दोल swing = Skr. दूल, X. el. दोलति, Pr. दोलेद (H. C. 4, 48) or दोलेद (see H. C. I, 217 दोलत) or VI. el. दोल, H. दोल.
105 दक cover = Skr. खाग, Pass. खागति (used actively), Pr. दक, (Spt. A. 54 for दक) or VI. cl. दक (H. C. 4, 21, where it

* In B. this root is confounded with भाद “sweep.” It is closely connected with the root भाद, the original meaning of which is preserved in Marathi “rush violently into contact with,” and in the Hindi भाद “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 भाद has been received into Sanskrit; from it comes the Skr. भाद “shrub,” “underwood,” the H. भाद or भाद. The original meaning it has preserved in the Skr. भादति “quickly.” The root may possibly be derived (as Bs. I, 177 says) from Skr. चिप्प + भाद, though the sense of “room about very much” would be expressed rather by चिप्प + भाद. But चिप्पति or Pass. चिप्पति (in act. sense) would regularly give Pr. चिप्प or चिप्प, or (by elision of च) भाद or भाद, whence modern भाद or भाद. In the case of the root भाद द does not change to द. (see H. C. I, 195).
is said to be a substitute of खार्), H. द्रै. (See Wb. p. 43, 64, 67). Perhaps compound root of खङ्गः.

106 तम् accuse = Skr. त्यो, I. cl. त्योक्त, Pr. त्यो, H. त्यो.

107 त्रूक् approach = Skr. त्ो, I. cl. त्ोक्त, Pr. त्ो, H. त्ो.

108 त्रू द् search = Skr. त्ुद्, VI. cl. त्ुष्टिः, Pr. त्ुद्, H. त्ुद्.

109 तुम burn = Skr. तुम्, I. cl. तुम्, but also IV. cl. तुम्, Pr. तुम् (see H. C. 4, 140 संस्कृत), H. तुम्.

110 त्य cross = Skr. त्य, I. cl. त्य, Pr. त्य (H. C. 4, 86), H. त्य.

111 तात् attend = Skr. तात्, X. cl. तात्य, Pr. तात् (H. C. 4, 370) or VI. cl. तात्, H. तात.

112 तात् stretch = Skr. तात्, Causal तात्य, Pr. तात्य or VI. cl. तात्, H. तात.

113 तात् save = Skr. तात्, Causal तात्य, Pr. तात् or VI. cl. तात्, H. तात.

114 तुल् intrans. weigh, be weighed = Skr. तुल्, Passive तुल्य, Pr. तुल्, H. तुल्.

115 तोऽ or तोऽ break = Skr. तोऽ, be torn, Causal तोऽ, Pr. तोऽ or VI. cl. तोऽ (see H. C. 4, 116, where however it is given as intrans.), W. H. तोऽ or E. H. तोऽ.

116 तोऽ or तोऽ weigh = Skr. तोऽ, X. cl. तोऽ, Pr. तोऽ or तोऽ (T. V. 2, 4, 97), H. तोऽ or तोऽ.

117 योऽ or योऽ be arrested, be supported = Skr. योऽ, I. cl. योऽ, Pr. योऽ, H. योऽ, or योऽ. See my Comp. Grammar § 120.

118 योऽ or योऽ or योऽ, or योऽ stop = Skr. योऽ, Passive योऽ, Pr. योऽ or VI. cl. योऽ, H. योऽ, &c.

119 योऽ, pile, prop = Skr. योऽ, IV. cl. योऽ, Pr. योऽ, H. योऽ.

120 द् be pressed down, be cowed = Skr. द्, Passive द्, Pr. द्, or द् (H. द्)

121 द् split = Skr. द्, I. cl. द्, Pr. द् (H. C. 4, 176), H. द्.

122 द् intrans. burn = Skr. द्, I. cl. द्, Pr. द् (Pingala, as quoted by R. M. p. 113; H. C. 2, 218 allows only द्; but the root द् does not occur in H.), H. द्.

123 दात् split = Skr. दात्, Causal दात्य, Pr. दात् or VI. cl. दात्, H. दात्.

* H. C. 4, 25 gives Pr. दात्; but the root दात् in a trans. sense does not occur in H., though it is found in M. दात् or दात्. In Skr. the root दात् admits a X. cl. form दात्य, from which the Pr. and M. trans, root दात् is apparently derived.
124 दांतः trans. burn = Skr. दुः, Causal दांतःति, Pr. दांतः or VI. cl. दांतः, H. दांतः, see No. 122.

125 दृष्ट show = Skr. दृष्ट, VI. cl. दृष्टिस्ति, Pr. दृष्ट, H. दृष्टि.

126 दृढः or दृढः to appear = Skr. दृढः see, Passive हृडः, Pr. दृढः or हृडः (H. C. 3, 161), H. दृढः or हृडः.

127 दे give = Skr. दे, Passive देरि (used actively), Pr. दे (Cw. p. 99, H. C. 4, 238), H. दे or दे. In Pr. also VI. cl. दे (Spt. v. 210), H. deest.

128 देख see = Skr. देख, Future देखति (used in sense of present), Pr. देखतः (H. C. 4, 181), H. देखे. See introductory remarks.*

129 धर place or seize = Skr. धर, I. cl. धरति (seize) or धरसे (place), Pr. धर (H. C. 4, 234), H. धरे.

130 धंधः or धंध sink; be pierced, run into = Skr. धंहः, I. cl. धंहसे, Pr. धंहः or प्रभः (Pingala in R. M. p. 118, said to be a substitute for प्रभः), H. धंहे or धंहे.

131 धार hold = Skr. धार, Causal धारणति. Pr. धारी or VI. cl. धार, H. धारे.

132 ध्वेम wash = Skr. ध्वेम, I. cl. ध्वेमति (or ध्वेम, VI. cl. ध्वेमति), Pr. ध्वेम (Dl. p. 77) or (with euphonic धू) ध्वेम, or ध्वेम (Spt. v. 133, 283) or ध्वेम (H. C. 4, 238), H. ध्वेमे or ध्वेमे.

* The Skr. conjunct ध्वेम may in Pr. become ध्वेम or ध्वेम. This will explain the origin of the synonyms of देखतः, which are enumerated in H. C. 4, 181; viz., with कष are formed चधिष्ठकस्ति = Skr. चधिष्ठकति (from root चधिष्ठ); the same, contracted, becomes चधिष्ठत (with च for च, see H. C. 1, 172); and the latter, expanded, becomes चधिष्ठक (with चष for चष, see my Comp. Gramm. § 48). With ध्वेम are formed धध्वेम = Skr. धध्वेमति (for धध्वेम, with euphonic ध्वेम see H. C. I, 180), and निमध्वेम = Skr. निमध्वेमति (from निमध्वेम). Again ध्वेम appears to be softened in धध्वेम, which is probably identical with धध्वेम. From the manner in which Hemachandra places धध्वेम between निमध्वेम and निमध्वेम, it would almost seem as if he looked upon it as a contraction of पुण्यति = Skr. पुण्यासि (of पुण्य). In classical Sanskrit the future of देख takes the irregular gama त (instead of ध्वाय, see Panini VI, 1, 58); but in the ordinary speech, no doubt, both forms देखति and देखिति were used. It is the latter of the two, from which the Prakrit forms are derived; thus दध्वेम = धध्वेम (not = धध्वेम) = धध्वेमति. The alternative form of निमध्वेमति would be निमध्वेम, this seems to be intended by the form निमध्वेम in Vr. 8, 69 (with ध्वेम disaspirated for ध्वेम). The Pr. धध्वेम is regularly formed from Skr. पुण्यति = Pr. पुण्यत (see Delius Rad. Proc.) or पुण्यत (H. C. 1, 43); and Pr. पुण्यत is the Skr. पुण्यति. In Marathi, the Pr. root पुण्य becomes पुण्य. The Pr. पुण्यत is derived from Skr. पुण्यासि (with ध्विं contracted to ध्विं, see my Comp. Gramm. § 122); and Pr. पुण्यत is probably a mere corruption of it. None of all these forms, as far as I am aware, has left any representative in modern Hindī.
133 नहद dance, see secondary roots.
134 नजेद or नजौ intr. bend, bow = Skr. नजद, I. el. नजाति, Pr. नजद (see H. C. 1, 183, नजद 1. pl.) or नजद (H. C. 4, 226), H. नजदे or नजदे.
135 नजदार or निजदार trans. bend, fold = Skr. नजद, Causal नजदाति, Pr. नजदावेद or VI. el. नजदाद, H. नजदावे or निजदावे (with र for र, see my Comp. Gramm. § 55).
136 नाचा bath = Skr. नाच, H. el. नाचति, Pr. IV. el. नाचात्र (cf. DL. 20) or (contr.) नाच (H. C. 4, 14), H. नाचु.
137 नाच dance = Skr. नाच, IV. el. नाचति, Pr. नाच (Vr. 8, 47, H. C. 4, 225), H. नाचै.
138 विकास or विकाश pull out, see secondary roots.
139 विकास expel = Skr. विकास, Causal विकाशति, Pr. विकाशेद or VI. el. विकाशायत, H. विकासे; cf. No. 138, the Skr. root विकास being perhaps adopted from Pr. कल्स for Skr. कल्स.
140 विखाद or विखार peel; see secondary roots.
141 विखार be cleaned, be peeled = Skr. विखार, I. el. विखारति, Pr. विखावेद, H. विखावे.
142 विखार clean, peel = Skr. विखार (or विखाल), Causal विखारति, Pr. विखारेद or VI. el. विखारायत, H. विखारे.
143 विखार swallow; see secondary roots.
144 विखार to make clear = Skr. विखार, Causal विखारति, Pr. विखारेद or VI. el. विखारायत, H. विखावे, 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 विखार be separated, be decided, be accomplished = Skr. विखार, (X. el. विखारति), Pr. विखारेद or विखार (H. C. 4, 62, where it is said to mean “to divide एका हो भरति” H. विखारे. It is the pass, or intrans. form of No. 147. The Skr. root is transitive.
146 विखार or विखार accomplish = Skr. विखार, Causal विखारति, Pr. विखारेद or VI. el. विखारायत, H. विखारे or विखार (with transferred aspiration; see my Comp. Gramm. § 132).
147 विखार separate, divide, accomplish = Skr. विखार, Causal विखारति, Pr. विखारेद or VI. el. विखारायत, H. विखारे. See No. 145.
148 विखार separate, divide, accomplish = Skr. विखार, I. el. विखारति, Pr. विखारेद, H. विखारे (with र for र, see my Comp. Gramm. § 148). This is merely another form of No. 147.
149 विखार kinder = Skr. विखार, Causal विखारति, Pr. विखारेद (H. C. 4, 22) or VI. el. विखारायत, H. विखारे.
150 विखार come out = Skr. विखार, I. el. विखारति, Pr. विखार (see R. M. p. 107; or विखार H. C. 1, 93. 4, 79), H. विखार.
151 नीचा pinch = Skr. नीचा, contract, VI. el. नीचा, Pr. नीचाद H. नीचे (with र for र, see my Comp. Gramm. § 148).
152 पच्च be digested = Skr. पच्च digest, Passive पच्चते, Pr. पच्छ, H. पच्छ.
153 पद्धति send = Skr. प्रद्धति, Causal प्रद्धापयति, Pr. पद्धति or VI. el. पद्धतः (H. C. 4, 87), H. पद्धतः.
154 पड़, or पर fall = Skr. परः, I. el. पपक्र, Pr. पड़र (Vr. 8, 51), W. H. पड़े, E. H. पड़े.
155 पढ़ read = Skr. पढ़, I. el. पढ़ति, Pr. पढ़र (H. C. 1, 199), H. पढ़े.
156 प्रश्न or पुरक examine, test = Skr. प्रश्न, I. el. प्रश्नीचे, Pr. परिष्करः, H. परसे. It also has the secondary meaning “become habituated”, owing to repeated trial.
157 पश्च बने acquainted = Skr. परि-चि, Pr. VI. el. परि-चित, H. परे.
158 पीला or परा run away = Skr. पीला, I. el. पीलाचे, Pr. पश्चाप च or (contr.) पश्चाप (Pingala, quoted by R. M. p. 129),* H. पश्चाप or परा.
159 परिश्रय forsake = Skr. परि-श्रय, I. el. परिश्रयति, Pr. परिश्रयः (H. C. 4, 259 said to be = यकवति), H. परिश्रये.
160 परेत्र offer food = Skr. परेत्रिय, Causal परिष्कर्षयति, Pr. परेत्रिये or VI. el. परेत्रिये, H. परेत्रे (with तो := दे, see my Comp. Gramm. § 122).
161 पश्च be spread = Skr. प-वः, I. el. पश्चरति, Pr. पश्चरः (H. C. 4, 77), H. पवः.
162 पश्च spread = Skr. प-वः, Causal पश्चापयति, Pr. पश्चापः or VI. el. पश्चापः, H. पवः.
163 पश्चाप perspire = Skr. प-वः, IV. el. पश्चापति, Pr. पश्चापः (see H. C. 4, 224), H. पश्चापः.
164 पश्चाप stitch = Skr. प-वः, IV. el. पश्चापति, Pr. *पश्चापः (perhaps contracted for *पश्चापः), H. पवः.
165 पश्चापः or पिन्हापः cause to put on, cause to dress = Skr. पिन्हापः, Causal पिन्हापयति, Pr. पिन्हापः or VI. el. पिन्हापः, H. पिन्हापः (with transposition of न and न्ह) or पिन्हापः (with transposition of र and र्न, see my Comp. Gramm. § 133). See also Nos. 166, 167 for a similar transposition. From this root is formed the derivative root पिन्हापः or पिन्हापः put on, dress.
166 पिन्हाप put on, dress = Skr. पिन्हाप, Passive पिन्हापति, Pr. पिन्हाप (see Cw. p. 99, sutra 21 शेष) or पिन्हाप (see Wb. p. 59 देख and देख of root देख) or पिन्हाप. H. पिन्हापः (with transposition of र and र्न, see No. 165). This root, however, might be also a derivative root from पिन्हापः No. 167. In the Gujarāti form वेढ़ the र of the second syllable has modified the vowel of the first.
167 पिन्हाप, cause to put on, cause to dress = Skr. पिन्हाप, Causal पिन्हाप-
Perhaps or VII. cl. \( \text{fr}^f \text{fr}^f \), as in Nos. 165, 166.

168 पल्च or पल्च or पल्च obtain, arrive = Skr. पल्च, I. cl. पल्च, Pr. पल्च (H. C. 4, 230, H. पल्च). It is formed with the pleonastic suffix \( \text{क} \), like the root \( \text{को} \), see introductory remarks; only in this case, \( \text{क} \) changes to \( \text{क} \) and is afterwards disaspirated. Marāthi has पोल्च or पोल्च, where the ज of the second syllable has modified the first.

169 पाद let fall = Skr. पाद, Causal पाद, Pr. पाद (H. C. 4, 22) or VI. cl. पाद (H. C. 113, 153), H. पाद.

170 पार accomplish = Skr. पार, Causal पार, Pr. पार or VI. cl. पार (H. C. 4, 86), H. पार.

171 पाल cherish = Skr. पाल, Causal पाल, Pr. पाल or VI. cl. पाल, H. पाल.

172 पात obtain, find = Skr. पात, V. cl. पात, Pr. VI. cl. पात (H. C. 4, 239), H. पात.

173 पिल्च melt = Skr. पिल्च, I. cl. पिल्च, Pr. पिल्च or पिल्च, H. पिल्च.

174 पी drink = Skr. पी, I. cl. पी, Pr. पी (H. C. 4, 10), H. पी.

175 पीढ tread down = Skr. पीढ, Future पीढ (with meaning of present), Pr. पीढ or पीढ, H. पीढ (with disaspiration, as in खीढ, see introductory remarks, p. 40).

176 पीढ be pained = Skr. पीढ, I. cl. पीढ, Pr. पीढ, H. पीढ.

177 पीढ grind = Skr. पीढ, VII. cl. पीढ, Pr. X. cl. पीढ or पीढ, (cf. Ls. p. 347) or VI. cl. पीढ or पीढ (H. C. 4, 185), H. पीढ.

178 पुराक fill, thread = Skr. पुराक, Causal पुराक, Pr. पुराक or VI. cl. पुराक, H. पुराक (or W. H. also पीढ in the sense of threading, stringing).

179 पूछ ask = Skr. पूछ, VI. cl. पूछ, Pr. पूछ (H. C. 4, 97), H. पूछ.

180 पूछ or पूछ wipe = Skr. पूछ, I or VI. cl. पूछ, Pr. पूछ or पूछ (H. C. 4, 105), H. पूछ or पूछ.

181 पूज worship = Skr. पूज, X. cl., but also I. cl. पूज, Pr. पूज, H. पूज.

182 पर or प आ swim = Skr. प + आ, I. cl. पत्र or VI. cl. पत्र, Pr. पार, E. H. पार or W. H. पार.

183 पर or प enter = Skr. प, VI. cl. प, Pr. प (H. C. 4, 183) or प or प (H. प or प).

184 पेल squeeze out, shove = Skr. पेल, I. cl. पेल, Pr. पेल (H. C. 4, 143), H. पेल. See No. 42, पेल from root पीढ. Perhaps a denominative of पिल = पिल = पेल = पेल.

185 पेल nourish = Skr. पेल, I. cl. पेल, Pr. पेल, H. पेल.
186 फल् or पाल्द burst = Skr. फल्, Passive फल्टि, Pr. फल्द, H. पाल्दे or पाल्दः.

187 फल् bear fruit = Skr. फल्, I. cl. फल्टि, Pr. फल्द (Spt. 17), H. पाल्दे. Connected with roots फल् and पाल्द; see No. 189.

188 पास् or पासिं stick, be ensnared = Skr. पास्य, VI. cl. पास्यति, Pr. पासिं or पासिं (H. C. 4, 182, probably denom. of पास् or पासिं = पास्य cf. Vr. 4, 15. H. C. 2, 92), H. पासि or पासिं. This root is also used transitively, in the sense of “ensnare”, “deceive”, see H. C. 4, 129, where पास्य is said to be a substitute of निम्नद्वद्वित.

189 पासि cleave, split = Skr. पासि, X. cl. पासिंरति, Pr. पासिं or VI. cl. पासिंदृ, (H. C. 1, 198. 232), H. पासि. Hemachandra refers it to root पर्, X. cl. पासिंरति.

190 पार्द jump = Skr. पार्द shake, Causal पार्दःति. Pr. पार्द or VI. cl. पार्दक, H. पार्दः. 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 पार्द, see secondary roots. H. C. 4, 127 gives पार्द in its original sense of “shaking”, “quivering” = Skr. पार्दः; its synonym पार्दः, which H. C. also gives, still exists in H. पार्दः or पार्दः or पार्दः or पार्दः, &c., “he is fidgety.”

191 पार्द jump = Skr. पार्द shake, Causal पार्दःति, Pr. पार्द or VI. cl. पार्दक, H. पार्दः. Probably connected with root No. 189; H. C. 4, 198. 232 give पार्दः as an other form पार्दः.

192 पित् be paid off; be discharged = Skr. पित्, X. cl. पित्रस्यति, Pr. पित् (H. C. 4, 177, said to be = अंश, “cease”, “decline”), H. पित्; ef. R. फक् and पित्.

193 पुद् or पुद् expand, increase, be broken, be dispersed = Skr. पुद्, Passive पुडःति, Pr. पुडः or पुडः (Vr. 8, 53. H. C. 4, 177, where it is said to be a substitute of अंश, in the sense of “being broken”), H. पुडः or पुडः. See No. 194.

194 पूल् or पूल् blossom = Skr. पूल्, VI. cl. पूलनति, Pr. पूल् or पूल् (Vr. 8, 53) or पूल् (H. C. 4, 387 whence Skr. R. पुल् adopted), H. पूल् or पूल्. * See No. 193.

195 पर् or पर् turn, move round = Skr. पर् + प्, II. cl. पार्ति, Pr. पार् or पार् (with change of प to फ and of अंश to ए, as in पर् for पूल्!), H. पर्.

196 पूल् spread, be dispersed = Skr. पूल्, X. cl. पूलनति, Pr. पार् or VI. cl. पर् (H. C. 4, 358); in H. C. 4, 177 the simple form पीट् is given as a substitute of अंश्) or पीट् (whence Skr. R. पुल्), H. पार् See Nos. 189, 192, 193; the original meaning “split”, hence “expand”, may change either to “increase” or to “decrease”, to growth or to decay.
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197 खों उन्फस्टन — Skr. उन्फस्टन, VI. cl. प्रमुखति, Pr. प्रमुखति (cf. H. C. 4, 91), H. फोर (for पोर = परए).

198 ब्रेक break — Skr. ब्रेक, Causal ब्रेकत्वति, Pr. ब्रेकत्वति (H. C. 4, 350) or VI. cl. ब्रेकत्वति, H. ब्रेकत्वति.

199 बचा, go away, escape = Skr. बचा, I. cl. ब्रजति, Pr. ब्रजति (Vr. 8, 47), H. ब्रजति. More likely from root बचा, or from Pass. ब्रजति of Skr. र. ब्रजति.

200 बचाम or बचा sound = Skr. बचा, Causal Passive बचाम, Pr. बचाम (H. C. 4, 406), H. बचाम or बचाम.

201 बाहार be ensnared = Skr. बाहार, Passive बाहारत, Pr. बाहारत (H. C. 2, 26, 4, 247), H. बाहार.

202 बाहर tr. and intr. twist, divide = Skr. बाहर, Passive बाहरत, Pr. बाहर, H. बाहर.

203 बाहर or E. H. बाहर grow = Skr. बाहर, I. cl. बाहरते, Pr. बाहरत (Vr. 8, 44), H. बाहर or E. H. बाहर.

204 बाहर enlarge, complete = Skr. बाहर, Causal बाहरति, Pr. बाहरति (or VI. cl. बाहरति), H. बाहरति. (T. V. 3, 1. 132 has बाहरति = समाप्ति).

205 बाहर show, relate = Skr. बाहर, Causal बाहरति, Pr. बाहरति or VI. cl. बाहरति, H. बाहरति.

206 बाहर kill = Skr. बाहर (or बाहर, I. cl. बाहरते), Pr. बाहर, H. बाहर.

207 बाहर be made = Skr. बाहर, Passive बाहरते, Pr. बाहर (Vr. 8, 44), H. बाहर or E. H. बाहर.

208 बाहर marry = Skr. बाहर, V. cl. बाहरति, but also I. cl. बाहर, Pr. बाहर (Vr. 8, 12), H. बाहर.

209 बाहर or बाहर rain = Skr. बाहर, I. cl. बाहरति, Pr. बाहरति (Vr. 8, 11; perhaps denom. of बाहर), E. H. बाहर or W. H. बाहर.

210 बाहर burn = Skr. बाहर, I. cl. बाहरति, Pr. बाहर (H. C. 4, 416 बाहरति), H. बाहर.

211 बाहर dwell = Skr. बाहर, I. cl. बाहरति, Pr. बाहर, H. बाहर.

212 बाहर flow = Skr. बाहर, I. cl. बाहरति, Pr. बाहर (H. C. 1, 38), H. बाहर. The root बाहर glide happily, be diverted is a passive or intrans. of a causal बाहरति, formed like पिताय from पिताय drink.

213 बाहर recite, read; see secondary roots.

214 बाहर wish = Skr. बाहर, I. cl. बाहरति, Pr. बाहर (T. V. 3, 1. 133), H. बाहर.

215 बाहर bind = Skr. बाहर, IX. cl. बाहरति, Pr. VI. cl. बाहर (H. C. 1, 187), H. बाहर.

216 बाहर or बाहर kindle, light = Skr. बाहर, Causal बाहरति, Pr. बाहर or बाहर, W. H. बाहर or E. H. बाहर. See No. 210.

217 बाहर perfume = Skr. बाहर, X. cl. बाहरति, Pr. बाहर or VI. cl. बाहर, H. बाहर.
218 विक्रेता be sold = Skr. विक्रेता sell, Passive विक्रेतायणे, Pr. विक्रेतेद्र or विक्रेतेद्र, H. विक्रेता (see Vr. 8, 31. H. C. 4, 240, where however the form विक्रेतेद्र is given as act. trans; in the moderns it is intrans. or pass., and the trans, root is बेच, cf. No. 242.

219 विक्रेदल or E. H. विक्रेता be at variance, be spoiled = Skr. विक्रेदल, I. cl. विक्रेदले, Pr. विक्रेदल (cf. H. C. 4, 112), H. विक्रेदल (for विक्रेदल). See No. 46.

220 विक्रेता make discord, spoil = Skr. विक्रेता, Causal विक्रेतायणि, Pr. विक्रेताद्र or VI. cl. विक्रेताद्र, H. विक्रेते. See No. 54.

221 विक्रेता reflect = Skr. विक्रेता, Causal विक्रेतायणि, Pr. विक्रेताद्र or VI. cl. विक्रेताद्र, H. विक्रेता.

222 विक्रेता scatter = Skr. विक्रेता, IX. cl. विक्रेतायणि, Pr. I. cl. विक्रेता (cf. No. 102), H. विक्रेता.

223 विक्रेता drive away = Skr. विक्रेता, Causal विक्रेतायणि, Pr. विक्रेताद्र or VI. cl. विक्रेताद्र, H. विक्रेता. See No. 102.

224 वित्त grant = Skr. वित्त, I. cl. वित्तायणि, Pr. वित्त, H. वित्ते.

225 विक्रेता tr. spread = Skr. विक्रेता, Causal विक्रेतायणि, Pr. विक्रेताद्र or VI. cl. विक्रेताद्र, H. विक्रेता.

226 विक्रेता mock; see secondary roots.

227 विक्रेता or विक्रेता see, be confused = Skr. विक्रेता, X. cl. विक्रेतायणि, Pr. विक्रेताद्र or VI. cl. विक्रेताद्र, H. विक्रेता or (corrupt) विक्रेता.

228 विक्रेता instr. separate = Skr. विक्रेता Passive विक्रेतायणि (with active sense), Pr. विक्रेता (cf. Vr. 8, 52), H. विक्रेता.

229 विक्रेता ascend = Skr. विक्रेता, I. cl. विक्रेतायणि, Pr. विक्रेता, H. विक्रेता (for विक्रेता).

230 विक्रेता be pleased = Skr. विक्रेता, I. cl. विक्रेतायणि, Pr. विक्रेता, H. विक्रेता.

231 विक्रेता tr. and instr. disperse, vanish = Skr. विक्रेता, Causal विक्रेतायणि, Pr. विक्रेता or VI. cl. विक्रेता, H. विक्रेता.

232 विक्रेता enjoy one's-self = Skr. विक्रेता, I. cl. विक्रेतायणि, Pr. विक्रेता (H. C. 4, 259 where it is said to be a substitute of Skr. श्रोदति), H. विक्रेता.

233 विक्रेता or विक्रेता leave, spend = Skr. विक्रेता, III. cl. विक्रेतायणि, Pr. I. cl. विक्रेताद्र or विक्रेताद्र or (contr.) विक्रेता, H. विक्रेता or विक्रेता; cf. Vr. 8, 26.

234 विक्रेता forget = Skr. विक्रेता, I. cl. विक्रेतायणि, Pr. विक्रेता (cf. H. C. 4, 74), H. विक्रेता.

235 विक्रेता tear, break up = Skr. विक्रेता Passive विक्रेतायणि (used actively), Pr. विक्रेता, H. विक्रेता (for चोचि, with aspiration transferred; see my Comp. Gramm. § 132), or perhaps Skr. विधि, IV. cl. विधायणि, Pr. विध्याद्र, H. चोचि.

236 विक्रेता pass; see secondary roots.

237 विक्रेता or विक्रेता choose = Skr. विक्रेता, IX. cl. विक्रेतायणि or विक्रेतायणि, Pr. VI. cl. विक्रेता or विक्रेता, H. चोचि or विक्रेता.
be extinguished = Skr. विक्रयित, I. cl. विधित, Pr. विक्रय or विद्य (or विद्व), H. क्रये. See Weber Spt. p. 32.*

be extinguished = Skr. विक्रयित, VI. cl. विधित, Pr. विद्य (H. C. 4, 101), H. बुद्धि or बुद्धि or W. H. transposed बुद्धि or बुद्धि.

be extinguished = Skr. विक्रयित, come to an end, I. cl. यायारस, Pr. व वाहु or वाहु or व्रयाद्, H. बुद्धि. Compare H. बुद्धि = बुद्धिका light, lit. wiek.

be extinguished = Skr. विक्रयित, Causal वयारयान, Pr. वयारयान or VI. cl. यारयान, H. वाहुर.

be extinguished = Skr. विक्रयित, IV. cl. वाहुन, Pr. वाहुन (Vr. 8, 48), H. बुद्धि.

be extinguished = Skr. विक्रयित, VI. cl. विधित, Pass. वयानि (used actively), Pr. वयाव (H. C. 4, 419, T. V. 3, 3. 4, transl. वयावि ?), E. H. वेज; or perhaps Skr. विधितिः + ह spend, II. cl. वदेनि, Pr. वदेन or वदेन?

be extinguished = Skr. विक्रयित, Causal वयारयान, Pr. वयारयान or VI. cl. यारयान, H. बुद्धि or बुद्धि (with loss of initial उ, see my Comp. Gramm. § 173).

be extinguished = Skr. विक्रयित, I. cl. वदेनि, Pr. बायाद or बायाद (formed like बायाद of खं, H. C. 1, 64), H. बायाद.

be extinguished = Skr. विक्रयित, Causal वयानि, Pr. वयाव or VI. cl. याव, H. बुद्धि.

be extinguished = Skr. विक्रयित, Causal वयारयान, Pr. वयारयान or VI. cl. याारयान, H. बुद्धि, &c. See No. 249.

be extinguished = Skr. विक्रयित, Causal वयारयान, Pr. वयारयान or VI. cl. यारयान, H. बुद्धि.

be extinguished = Skr. विक्रयित, I. cl. वढ़ित, Pr. बढ़ित (H. C. 4, 2.) or बढ़ित (Cw. 90), H. बढ़ित (cf. No. 245 बढ़ित = बढ़ित, so बढ़ित = बढ़ित).†

The simple root विक्रय would form Pr. विक्रय and contracted विक्रय, after the analogy of दानार, दानाः from स्त्र, भाव or भाव from विक्रय (Vr. 8, 26); this is born out by Pāli भावित, and by Pr. विधित (H. C. 2, 28 = Skr. विधिति); but in compounds the Pr. form might be विद्य or विद्य, just like विद्य or विद्य in विद्य, विद्य form विद्य or विद्य (H. C. 4, 17); thus we should have regularly विद्यित or (as o is short before a conjunct) विद्यित, विद्यित.

† This root is usually connected with Skr. व ः by Prākṛt Grammarians, see Cw. p. 99, where विक्रय, or विक्रय, of root वच, is mentioned as an analogous formation. Now the latter is derived from the passive विक्रय (विक्रय), in an active sense, as appears from H. C. 4, 161. Similarly, I am inclined to derive वाहु from the passive वाहु (for वाहु of root वच), used actively. The conjunct विक्रय becomes अ, as in विक्रयः = विक्रयः, विक्रयः = विक्रयः (Vr. 3, 21).
251 खाव् तर, लभ्यति, प्र. सम्भवः, II. सम्भः.
252 व्रत्म् अच्छन्ति, प्र. सम्भवः, H. सम्भहः.
253 अधिक्ष्यं अधिक्ष्यं स्र्, Passive स्र् (used actively),
254 ब्रज् ब्रज्, VII. cl. भाषन्, Pr. VI. cl. ज्ञान् (H. C. 4, 106), II. सम्भः.
255 भस्म् बोक्ष्, I. cl. भस्मविन्, Pr. भस्मवाद् (H. C. 4, 239), H. सम्भवः.
256 ब्रज् जल्= Sr. जल्, III. cl. धिन्यासि and I. cl. भस्मविन्, Pr. भस्मवाद् (cf. Sp. 288 अर्जिन्), H. सम्भवः.
257 ब्रज् अधिक्ष्यं अधिक्ष्यं स्र्, Passive स्र् (cf. H. C. 4, 401), II. सम्भः or सम्भः. See No. 134.
258 ब्रज् स्नानन्, I. cl. स्नानन्, Pr. स्नानवाद्, H. सम्भः.
259 आविष्कार् सन्धि, X. cl. आविष्कार्यः, Pr. आविष्कार्यः or VI. cl. आविष्कार्यः, H. सम्भः.
260 अधिक्ष्यं अधिक्ष्यं स्र् = Sr. अधिक्ष्यं, I. cl. अधिक्ष्यं, Pr. अधिक्ष्यं (H. C. 4, 203), H. सम्भः.
261 भूषण् अभिष्प्द्व, प्र. भूषणवाद्, H. सम्भः. See No. 234. Or from शभिष-णवि affilct, Pass. शभिषणविन्, Pr. शभिषणवि, H. शभिषणवि (with loss of श, see my Comp. Gramm. § 172).
262 भूषण् be wet; see secondary roots.
263 भूषण् जल्, VII. cl. भूषणलति, Pr. VI. cl. ज्ञानवाद् (H. C. 4, 110), H. ज्ञानवाद्.
264 भूषण् जल्; see secondary roots.
265 संधि स्नानन्, for संधि with transposed aspiration, see No. 244.
266 संधि स्नानन्, for संधि with transposed aspiration, see No. 244.
267 संधि स्नानन्, for संधि with transposed aspiration, see No. 244.
268 संधि स्नानन्, for संधि with transposed aspiration, see No. 244.
269 संधि स्नानन्, for संधि with transposed aspiration, see No. 244.
270 सन्न be propitiated = Skr. सन्न्, Causal Passive सायन, Pr. सन्नच, H. सन्न. See No. 277.
271 मृत die = Skr. मृत्, VI. cl. चित्रति, but Vedic also I. cl. सरतिः, Pr. सरेव (Vr. 8, 12), H. संत्रेव.
272 सन्न rub = Skr. सन्न, IX. cl. श्रावति Pr. VI. cl. सन्न (Vr. 8, 50), H. सन्त्रेव.
273 कच churn = Skr. कच्, I. cl. सरावति, Pr. सन्द्र (cf. Dl. 53), H. सन्द्रेव.
274 कौम ask for = Skr. कौम्, X. cl. सार्ग्यति and I. cl. सार्ग्यति, Pr. समाव (Spt. 71), H. संमन्. Cp. Skr. ब्रम, IV. cl. ब्रम्यति, which would give the Pr. समाव equally well; but the denom. R. साम्य is the more probable source, as Pr. and Gaud. have a preference for denominative verbs.
275 सीजू scour = Skr. सीजू, X. cl. सार्ग्यति (or R. चजू, X. cl. सार्ग्यति, see remarks on No. 274), Pr. संस्पेक्फ or VI. cl. संस्पेक्फ, H. संस्पेक्फे.
276 कच् or सन्न rub = Skr. कच्, IX. cl. श्रावति or I. cl. सन्द्रति, Pr. समाव (H. C. 4, 126), H. समावे or सन्द्रे.
277 सांस honor, heed = Skr. सा, Causal सार्ग्यति, Pr. सारेव or VI. cl. सान्त्, H. सान्त्रे, See No. 270.
278 साम or शाव measure = R. सा, Causal Passive शावे (used actively), Pr. सावच, H. सावे. The form शाव is either a more corruption of शाव, or it may be similarly derived from the Causal Passive शावे (of root शा), Pr. सावच, H. सावे.
279 सांस beat, kill = Skr. सांस्, Causal सार्ग्यति, Pr. सांस्त्र (H. C. 4, 337) or VI. cl. सान्त्र (H. C. 3, 53), H. सान्त्रे.
280 सिल meet = Skr. सिल्, VI. cl. सिल्यति, Pr. सिल्य (H. C. 4, 332), H. सिल्े.
281 सिल remove = Skr. सिल्, VI. cl. श्रावति, Pr. सिल्यच, H. सिल्ये.
282 बोध or बोध wink = Skr. बोध, future बोधत (used in sense of present), Pr. बोधेव or बोधे, H. बोधे or (corrupt) बोधे. See introductory remarks pp. 37—40, and No. 175.
283 कैंजु or कैंजु rub = Skr. कैंजु, II. cl. सांत् or I. cl. श्रावति, Pr. सिंजूच, H. सिंजूचे or सिंजूचे.
284 संच shave = Skr. संच, I. cl. श्रावति, Pr. संचच (H. C. 4, 115), H. संचचे.
285 संच steal = Skr. संच, I. cl. सरावति, Pr. संच (T. V. 2, 4. 69), H. संचे.
286 कैंजु allure = Skr. कैंजु, Causal रावर्धति, Pr. कैंजूच or VI. cl. कैंजूच, H. कैंजूचे.
287 रचक keep, place = Skr. रच, I. cl. रचति, Pr. रचेव (H. C. 4, 439), H. रचे.
288 रच⁴ intr. be made or tr. make = Skr. रच make, Passive रचन् (used actively), Pr. रच (cf. H. C. 4, 422, 23 तरचमि. Spt. 363 रचन = रचन), H. रचे.
289 रूम, उन्हें उपयोग करना = Skr. रव, I. cl. उपयोग करने, Pr. रव (H. C. 4, 168), H. रवी.
290 रखा, रखना = Skr. रखा, Passive रखेंगे, Pr. रखा, H. रखे (for रखी) *
291 राखा be adorned = Skr. राखा or राखा, IV. cl. राखा, Pr. राखा, H. राखे
292 रखा or रखा cook = Skr. रखा, Causal रखेंगा, Pr. रखें or VI. cl रखें, H. रखें or (corr.) रखें.
293 रखा be vexed = Skr. रखा, IV. cl. (or Pass.) रखें, Pr. रखा, H. रखे.
294 रखा be agreeable = Skr. रखा, Passive रखें, Pr. रखा (H. C. 4, 341), H. रखे.
295 रखा intr. be fixed, stop = Skr. रखा, Causal Passive रखें, Pr. रखा or रखा, H. रखे.
296 रखा or रखा be angry = Skr. रखा, IV. cl. रखा, Pr. रखा or रखा (Vr. 8, 46), H. रखे or रखे; cf. No. 302.
297 रखा or रखा or रखा or रखा trample on, probably a corrupt spelling of the following, No. 298.
298 रखा or रखा or रखा or रखा enclose, restrain = Skr. रखा, VII. cl. रखा, Pr. रखा (Vr. 8, 49), H. रखे or रखे or रखे or रखे.
299 रखा creep = Skr. रखा, I. cl. रखा, Pr. रखा or रखा (H. C. 4, 259), H. रखे.
300 रखा wcek = Skr. रखा, II. cl. रखा, Vedic also VI. cl. रखा, Pr. रखा (H. C. 4, 226. 238) or रखा (Spt. 311) or I. cl. रखा (H. C. 4, 226. 238) or रखा (K. I. 4, 69), H. रखे or रखे.
301 रखा roll, plan = Skr. रखा, I. cl. रखा, Pr. रखा, H. रखे.† See Nos. 313, 314.
302 रखा be angry = Skr. रखा, Vedic I. cl. रखा, Pr. रखा, H. रखे; cf. No. 296.
303 रखा see = Skr. रखा, I. cl. रखा, Pr. रखा, H. रखे.
304 रखा be applied = Skr. रखा, Passive रखें, Pr. रखा (Vr. 8, 52), H. रखे.
305 रखा or रखा jump over = Skr. रखा, I. cl. रखा, Pr. रखा, H. रखे or रखे.
306 रखा or E. H. रखा dispute, fight = Skr. रखा, X. cl. रखा, Pr. रखा

* The derivation is somewhat obscure; but it can hardly be referred (as Bs. III, 40) to the Skr. root रख which has a very different meaning "desert". The derivation from रख is supported by the Marathi form राख == रख. On the change of रख to रख, see my Comp. Gramm. § 116.
† There is a large number of Skr. roots, all closely connected in meaning; viz. रखा, रखा, रखा; सा, सा, सा; सा, सा, सा, सा, &c.
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[No. 2,]

or VI. cl. भ्रान्त, W. H. भृण्ड or E. H. भृण्ड.

307 राम or राम shine, be fit = Skr. राम, I. cl. रामित or X. cl. रामित, Pr. राम or रामित, H. रामेय or रामित.

308 देख find, avail, get on well = Skr. देख, I. cl. देखित, Pr. देख (H. C. 4, 335), H. देखी.

309 जान feel ashamed = Skr. जान, I. cl. जानित, Pr. जान (H. C. 4, 103), H. जानी.

310 लेख write = Skr. लेख, VI. cl. लेखित, Pr. लेख, H. लेखी. The ordinary Pr. root लेख (H. C. 1, 187 लेख) does not exist in Hindi.

311 लिप be smeared = Skr. लिप, Passive लिपिते, Pr. लिप, H. लिपी.

312 लोप or लोप smear = Skr. लिप, VI. cl. लिपित, Pr. लिप (H. C. 4, 149), H. लोप or लेप. As to the change of र to र, see my Comp. Gramm. § 148.

313 लुढ roll = Skr. लुढ, VI. cl. लुढित, Pr. लुढ़, H. लुढी. See Nos. 301, 314, 317.

314 लुढ roll = Skr. लुढ, VI. cl. लुढित, Pr. लुढ़, H. लुढी.

315 लुढ or लुढ rob = Skr. लुढ or लुढ I. cl. लुढित or लुढित, Pr. लुढ़ or लुढ़, H. लुढ़ी or लुढ़ी.

316 लेख take = Skr. लेख, I. cl. लेखिते, Pr. लेख, H. लेखी or लेख. The syllable र is contracted into र; similarly क र; speak is sometimes pronounced क, and क र, र.

317 लोट roll about = Skr. लोट, VI. cl. लोटित, Pr. लाट (H. C. 4, 146 in the sense “rolling about in sleep”), H. लोटी.

318 लभ्य be enamoured = Skr. लभ्य, IV. cl. लभ्यित, Pr. लभ्य (H. C. 4, 153), H. लभ्यी. As to the change of उ to उ, see my Comp. Gramm. § 148.

319 भार surround = Skr. भार, Causal भारित, Pr. भारित or VI. cl. भार, H. भारी.

320 बन can = Skr. बन, Passive बनिते (used actively), Pr. बन (Vr. 8 52), H. बनी.

321 संहार or संचार (or समार) destroy = Skr. संहार, Causal संहारित, Pr. संहारित or संहारित (cf. H. C. 1, 264) or VI. cl. संहारित or संहारित, H. संहारित or संहारित (or समारित). Or a denominative of संहार.

322 संहं collect = Skr. संहं, Passive संहिते (used actively), Pr. संहं (cf. H. C. 4, 244 संहं) or VI. cl. संहित (as उंहं for उंहं), H. संहि.

323 संहं or उं be combined = Skr. सं-उं, Passive संहिते (used actively), Pr. संहं or VI. cl. संहं (like उंहं and उंहं), H. संहि or (corr.) संहि.
324 सिद्ध or सिद्ध rot = Skr. चिद्ध (or चिद्ध), I. cl. शैलिनि, but Vedie also
विश्वनि, Pr. सिद्ध (H. C. 4. 219; in Vr. 8, 51 it is ascribed to
चिद्ध), W. H. सिद्ध or E. H. सिद्ध.

325 सताव, persecute, torment = Skr. सताव, Causal सतावथिनि, Pr. सतावथि or
VI. cl. सताव, H. सताव.

326 सिद्ध leak = Skr. सिद्ध, I. cl. सिद्धनि, Pr. सिद्ध, H. सिद्ध. As to elision
of the nasal, see my Comp. Gramm. §§ 143, 146. See No. 353.

327 संबाल or संबाल or समाल sustain = Skr. समाल, Causal समालथिनि, Pr.
समालर्थि or VI. cl. समालर्थि, H. समालि, &c. Or demon. root of समाल.

328 समाव be contained = Skr. समाव, V. cl. समावथिनि, Pr. X. cl. समावि
H. C. 4, 142) or VI. cl. समावि, H. समावि See No. 172.

329 साख or साख understand = Skr. साख, IV. cl. साखथि, Pr. साखअस्त, E. H. साखि or W. H. साखि. See No. 242.

330 धर issue, be ended = Skr. धर, I. cl. धरिनि, Pr. धर (Vr. 8, 12), H. धरि.

331 सराच commend = Skr. साच, I. cl. साचलि, Pr. साचलि, (H. C. 2, 101
has साचलि ?). H. साचलि.

332 सख pierce = Skr. सख or सल, I. cl. शालिनि or श्लिनि, Pr. शलि, H. शलि.

333 संबर or सबर or सबर prepare = Skr. सम्ब, Causal सम्बारथिनि, Pr.
संबारर्थि or VI. cl. संबारर्थि, H. संबारिर, &c.

334 सख endure = Skr. सख, I. cl. सखलि, Pr. सख (H. C. 1, 6), H. सखि.

335 सख arrange = Skr. सख + हु; I. cl. संहरलि, Pr. चंबरि (H. C. 4, 259 = Skr. संहरलि, in H. C. 4, 82 also सांबरि), E. H. संबरि.

336 सब settle = Skr. सब, Causal सबारथिनि, Pr. सबि (cf. Spt. 188 शारद) or

337 धार accomplish = Skr. धार, Causal धारथिनि, Pr. धारर्थि or VI. cl. धार
H. धारि.

338 सख pierce = Skr. शख, Causal शारथिनि, Pr. शारर्थि or VI. cl. शार, H. शारि.
Or from Causal of शलि, see No. 332.

339 सबrule threaten, distress = Skr. सबु, Causal सबुलि, Pr. सबुि or VI. cl.
सबुि (H. C. 4, 197 where however it is = संदि), H. संदि.

340 की sev = Skr. कीच, IV. cl. कीचथि, Pr. VI. cl. कीच or कीच, H. कीचि.
H. C. 4, 230 gives कीच which would be कीच in H., but it does not
exist; there is, however, another reading कीच, H. कीचि which
does exist, see No. 342.

341 कीच learn = Skr. कीच, I. cl. कीचलि, Pr. कीचि, (cf. Spt. 353), H. कीचि.

342 कीच or कीच or कीच irrigate = Skr. कीच, VI. cl. कीचार्, Pr. कीचार, * The root means also “polish” (by rubbing, striking); perhaps this is the
sar mentioned by H. C. 4, 84 as equivalent to the Skr. प्रचलिनि,
<table>
<thead>
<tr>
<th>No.</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>343</td>
<td>देंदूर (स्वक्) = Skr. देंदूर, IV. cl. देंदूर, Pr. देंदूर (H. C. 4, 224), H. सहे. See also No. 344.</td>
</tr>
<tr>
<td>344</td>
<td>देंदूर सेटिया, बोई, देंदूर = Skr. देंदूर (or अ), Passive देंदूर, Pr. देंदूर, H. सहे.</td>
</tr>
<tr>
<td>345</td>
<td>देंदूर be received (as money) be liquidated (as debt) = Skr. देंदूर, Passive देंदूर, Pr. देंदूर, H. सहे.</td>
</tr>
<tr>
<td>346</td>
<td>देंदूर adorn = Skr. देंदूर, Causal देंदूर, Pr. देंदूर, or VI. cl. देंदूर, H. सहे.</td>
</tr>
<tr>
<td>347</td>
<td>देंदूर hear = Skr. देंदूर, V. cl. देंदूर, Pr. VI. cl. देंदूर (Vr. 8, 56), H. सहे.</td>
</tr>
<tr>
<td>348</td>
<td>देंदूर remember = Skr. देंदूर, I. cl. देंदूर, Pr. देंदूर (Vr. 8, 18), H. सहे.</td>
</tr>
<tr>
<td>349</td>
<td>देंदूर be agreeable = Skr. देंदूर, X. cl. देंदूर, Pr. देंदूर (Vr. 169) or VI. cl. देंदूर, H. सहे.</td>
</tr>
<tr>
<td>350</td>
<td>देंदूर smell at = Skr. देंदूर, I. cl. देंदूर, II. cl. देंदूर, Pr. समर्पण or VI. cl. समर्पण, H. सहे.</td>
</tr>
<tr>
<td>351</td>
<td>देंदूर appear = Skr. देंदूर, IV. cl. देंदूर, Pr. देंदूर, (cf. H. C. 4, 217), H. सहे.</td>
</tr>
<tr>
<td>352</td>
<td>देंदूर irrigate = Skr. देंदूर, Causal देंदूर, Pr. देंदूर, or VI. cl. देंदूर, H. सहे. cf. No. 326.</td>
</tr>
<tr>
<td>353</td>
<td>देंदूर or सेव serve, worship = Skr. देंदूर, I. cl. देंदूर, Pr. सेव (H. C. 4, 396), H. सहे or सहे (with euphonic च, see my Comp. Gramm. § 69).</td>
</tr>
<tr>
<td>354</td>
<td>देंदूर regret, meditate = Skr. देंदूर, Passive देंदूर, or VI. cl. देंदूर, Pr. देंदूर, H. सहे.</td>
</tr>
<tr>
<td>355</td>
<td>देंदूर shine, be fit = Skr. देंदूर, I. cl. देंदूर, Pr. सेव (H. C. 1, 187), H. सहे.</td>
</tr>
<tr>
<td>356</td>
<td>देंदूर deliver = Skr. देंदूर, Causal समर्पण, Pr. समर्पण or VI. cl. समर्पण, H. सहे. See No. 349, footnote.</td>
</tr>
<tr>
<td>357</td>
<td>देंदूर kill = Skr. देंदूर, II. cl. देंदूर, but Vedic also I. cl. देंदूर, Pr. देंदूर (H. C. 4, 418), H. सहे.</td>
</tr>
<tr>
<td>358</td>
<td>देंदूर take away = Skr. देंदूर, I. cl. देंदूर, Pr. देंदूर (H. C. 4, 234), H. सहे.</td>
</tr>
</tbody>
</table>

* देंदूर would form देंदूर or देंदूर in Pr., just as देंदूर or देंदूर of देंदूर; and सम would contract to म्न in Hindi, just as in म्न for Pr. समर्पण, see No. 357; the intermediate form being समर्पण (cf. H. C. 4, 397). The root, however, might be derived from Skr. शन्धित, I. cl. शन्धित, Pr. शन्धित; only the Hindi ought to be शन्धित; and the change of देंदूर to देंदूर would be very anomalous. (Dr. R. Mitra in his vocabulary quotes देंदूर सहे. A. F. R. Hoernle—A Collection of Hindi Roots. [No. 2, (H. C. 4, 239) or देंदूर (H. C. 4, 239), H. सहे. or सहे or (corr.) देंदूर (cf. Vr. 2, 41 देंदूर = सदूर, Ls. 199.)
360 चार्स or चर्म् be glad = Skr. चार्स, I. cl. चर्मन, Pr. चर्मच (Vṛ. 8, 11; perhaps denom. of चार्स = चर्म Vṛ. 3, 62), E. H. चर्मल or W. H. चर्मल. See No. 209.

361 चल्लो toss about = Skr. चल्लो, (Causal Passive चल्लोत्तत्त्व), Pr. चल्लो, H. चल्लो.

362 चचेघर serviet = Skr. चचेघर, I. cl. चचेघरति, Pr. VI. cl. चचेघरत् or (contr.) चचेघर, H. चचेघर.

363 चंदा or चंदा laugh = Skr. चंदा, I. cl. चंदा, Pr. चंदा (T. V. 2, 4. 69) or चंदा (Passive), H. चंदा or चंदा.

364 चाँप or चाँप blow = Skr. चाँप, Causal चाँपतः, Pr. चाँप or VI cl. चाँप or चाँप, H. चाँप or (corr.) चाँप.

365 बल intr. shake = Skr. बल, Passive बलते (used actively), Pr. बल, H. बल.

366 बल intr. shake = Skr. बल, I. cl. बलति, Pr. VI. cl. बलत or बलत, H. बलत.

367 झम sacrifice = Skr. झम, V. cl. झमोति, Pr. VI. cl. झम or झम (H. C. 4, 241 where it is referred to Skr. root झम), H. झम.

368 झम drive, goad = Skr. झम झम, Causal झमतः, Pr. झमत or VI cl. झमत, H. झम.

369 बे be = Skr. बे, I. cl. बति, Pr. बत or बत or बत or बत (H. C. 4, 60), H. बे.

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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. चटक be hindered, stopped = Skr. चट + क, Pr. चटक or चटक, H. चटक.

2 comp. चटक be raised, rise = Skr. चट + क, Pr. चटक or चटक, H. चटक.

3 comp. चटक vomit = Skr. चट्ठ + क, Pr. चट्ठ or चट्ठ, H. चट्ठ.

4 comp. चट + क vomit = Skr. चट + क, Pr. चट or चट, Ap. Pr. चट or चट, H. चट or चट (with त for त in or च, see my Comp. Gramm. § 122).
5 der. गड़ बने pull out, slip out, a passive or intransitive, derived from गड़, see No. 6.
6 den. निकोला pull out, uproot = Skr. P. P. पुरुष, Pr. निकोला (cf. H. C. 4, 187), H. निकोला (for निकोला, with transferred aspiration, see my Comp. Gramm. § 132) or निकोला (for निकोला with change of a to e, see my Comp. Gramm. § 148). See No. 13.
7 den. राखा put on, dress = Skr. राखा, I. cl. राखा, Pr. राखा (cf. H. C. 4, 221), H. राखा (contracting राखा to रा). Probably from a P. P. P. of the root रेखा.
8 comp. कक्कु द्र ऋग्गु, thunder = Skr. कर्क्कु द्र + हा, Pr. कक्कु द्र or कक्कु द्र, H. कक्कु द्र.
9 den. कारिया earn = Skr. N. कार; Pr. कारिया or कारिया, (H. C. 4, 111) has कारिया, and gives it as a substitute of the root कारिया; the a is shortened to a, by H. C. 3, 150), H. कारिया.
10 comp. कारक be painful, be pained = Skr. कारक + हा, Pr. कारक or कारक, H. कारक.
11 der. कत be cut, a passive or intransitive, derived from root कत, see primary roots, No. 27.
12 der. कतन बने pull out, escape, a passive or intransitive, derived from root कत.
13 den. कत बने pull out = Skr. P. P. पक्त; Pr. कत (H. C. 4, 187), H. कत.
14 comp. खर्कु द्र or खर्कु द्र make a tremulous noise, rustle, rattle = Skr. खर्कु द्र + हा; Pr. खर्कु द्र or खर्कु द्र, H. खर्कु द्र or खर्कु द्र. There is also a reduplicated root खर्कु द्र or खर्कु द्र of the same meaning. They also occur in Marathi and Panjabi. The primary meaning of the root is; slip or glide along with a sound; this is preserved in the Marathi खर्कु द्र or खर्कु द्र which is used of the running of a stream, or the crashing of a boat, dragged over gravel, &c. The simple root खर्कु द्र occurs in Marathi with its original meaning be shed, fall off; also in Panjabi, where however it has become transitive, carry off: The change of ख or र to र or ह is anomalous; but it already took place in Prakrit; thus in Spt. 44, खर्कू द्र for Skr. खर्कू द्र, Spt. 195 खर्कू द्र for Skr. खर्कू द्र. Perhaps there may be a connection with the root खर्कू द्र; compare also the roots चर्कु द्र and चर्कु द्र. See also roots चर्कु द्र and छर्कु द्र.
15 der. गड़ बने hollowed, be sunk, a passive or intransitive, derived from root गड़; see No. 16.
16 den. गड़ बने hollow, bury = Skr. N. गड़, Pr. गड़ (Vr. 3, 25), Pr. गड़ or गड़, H. गड़. Or possibly a mere corruption of root गड़, No. 17, by dispiration.
17 den. गाढ dig in, fix in, bury = Skr. P. P. P. गाढ (of root गाढ), Pr. गाढ, H. गाढ.
18 den. गोटा mark, brand = Skr. N. गोटा; Pr. गोटा or गोटा, H. गोटा (?); brands being made on the forehead or bosom.
19 den. चवाराब be alarmed, agitated, perhaps corrupted form गडवाराब with the same meaning, a reduplicative or alliterative form, made from गड = Skr. N. गड noise, cries of alarm (?).
20 den. विनायक or विनियाम be disgusted = Skr. N. विनायक or diminutive विनायक (of root विना), Pr. विनायक (H. C. 1, 128) or विनायक; Pr. विनायक or विनियाम or विनियाम, H. विनायक or विनियाम.
21 der. घिर be collected, surrounded, gather, a passive or intransitive of root घिर. See primary roots, No. 64.
22 comp. चपें be compressed, collapse = Skr. चप or चप + ह, Pr. चपक्ष or चपक्ष, H. चपक्ष.
23 comp. चमक्ष glitter = Skr. चमक्ष + ह, pass. चमक्षध्यत्ते (with active meaning), Pr. चमक्षध्यत्ते or चमक्षध्यत्ते, H. चमक्षध्यत्ते.
24 den. बांध wish, corrupted for बांध, see No. 40.
25 der. चिर be torn, split, a passive or intransitive, derived from root चिर; see No. 31.
26 den. विकल्पना smooth, polish = Skr. N. विकल्पना (or विकल्पन; perhaps itself a compound word of विकल्प bright = विकल्प, and ह = Pr. विकल्प; lit. made clear); Pr. विकल्पनायर or विकल्पनायर, H विकल्पनायर.
27 den. विचार or विचार abuse, vex = Skr. P. P. P. विचार (from root विचार abuse); Pr. विचार, H. विचार (with transfer of aspiration) or विचार (with loss of aspiration). As to the changes of aspiration, see No. 47 बें त or कीर, where it is preserved; also primary root, No. 65 चड (footnote, p. 45). As to the change of त to त to त (or त), compare root चुदान from P. P. P. चुदा; and primary roots Nos. 92, 93 जर and चोड.
28 den. विचार make known to, warn, admonish = Skr. P. P. P. विचार; Pr. विचारधत्र or विचारधत्र (cf. S. B. 11, 1), H. विचारधत्र. In Setubandha 11, 1 occurs the past participle विचारविधिः (with a for ा, by H. C. 3, 150), which is correctly explained by the commentator as meaning चेतान made known to, or निम्नभुतु स restrain, warned (or सव) or परिशिष्टते admonished, comforted; (see S. Gdt. pp. 34, 156).
29 den. चित paint = Skr. N. चित; Skr. चित, Pr. चित य or चित, H. चित.
30 den. चित or चित recognize = Skr. N. चित, Pr. चित (H. C. 2, 50); Skr. चित, Pr. चित or चित, H. चित or चित.
31 den. चिर tear, cleave = Skr. N. चिर (raja), whence Skr. चिर, Pr. चिर or चिर, H. चिर.
32 comp. चुक्त be finished, cease = Skr. चुक्त + छ; Pr. चुक्त (H. C. 4, 177), । H. चुक्ते. H. C. gives it as a substitute of the Skr. root अंग fall down, decay, a synonym of चुक्त; so also the commentator to Spt. 323, see Wb. p. 184. The correct derivation from चुक्त is given by the commentator on Setubandha 1, 9. The Skr. root चुक्त inflict pain, X. cl. चुक्तचार, is doubtlessly reintroduced from the Prákrit. See No. 33.

33 comp. चूक blunder, miss = Skr. चूक + छ; Pr. चूक, H. चूके. 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 Prákrit; e. g., Spt. v., 323, चूकचार “blundered or missed meeting”; again Spt. v. 199, Setubandha 1, 9, where the commentary correctly explains it प्राचे डेशो इति केवलत, i. e., according to some it is a dési word meaning “blundering” (See S. Gdt., p. 157). See No. 32.

34 den. सूत चार steal = Skr. N. चार or चार; Pr. सूतनिवेद or सूतनाय, H. चारे।

35 comp. चूक start (from fright) = Skr. चमत + छ, passive चमत्त्विज्ञान (used actively), Pr. चमत्त्वार or चमत्त्वार, Ap. Pr. चमत्त्वार, H. चोकेल।

36 der. छग be strained, filter, a passive or intransitive derived from छाग, No. 38.

37 den. छो देविय, cheat = Skr. N. देव; Skr. देवतानि, Pr. देवेक or देवे, H. दे।

38 den. छाण strain, search = Skr. P. P. प्राण (of root प्राण), Pr. प्राणेत or प्राणेत (Ls. 199) or प्राण, H. छाणे (?)

39 den. छाप stamp, print; an active or transitive derived from root छप; perhaps merely another form of root चाप; see Appendix Nos. 4 and 13.

40 den. छाच or छाच wish = Skr. N. त्वाच; Pr. त्वाचाच (cf. H. C. 22) or त्वाचाच, H. छाचे or (disaspirated) छाच; or from Skr. N. चन्त, Pr. चापाच or चापाच, H. चाचे (with transferred aspiration) or छाचे. As to the elision of initial उ or उ, see my Comp. Gramm. § 173 (cf. Addenda); and as to the change of aspiration, ibidem § 132.

41 comp. तिटक be dispersed, be scattered = Skr. तिट + छ; Pr. तिटक, or तिटक, H. तिटके। See No. 46.

42 den. तिट be vexed, take offence, a passive or intransitive, derived from R. तिट, or तिट, No. 46.

43 comp. तिटक sprinkle = Skr. स्तूप + छ; Pr. स्तूपक or स्तूपक, H. तिटके। As to the derivation of तिट from Skr. स्तूप, see No. 45 तिट; and as to the softening of the final, तिट is to तिट, as छुट to छूट, q. v.
44 den. स्नेह sneeze = Skr. N. स्नेत्स, Pr. स्नेठ्स or स्नेठ्स, H. स्नेथेङ. The word स्नेत्स, however, is itself a compound from बिंत्स sneezing and छ; and the word स्नेठ्स is probably another form of दृष्ट्स sneezing, from Skr. root च्छ sneeze.

45 den. ब्रज or ग्रज or ब्रज sprinkle = Skr. P. P. प्रज sprinkled, Pr. प्रज (with ज for सु, as in बिंद्र or बिंद्र or बिंद्र, H. C. 4, 182, 257; see also primary roots Nos. 78, 80); Pr. प्रज or प्रज, H. ब्रज or ब्रज or ब्रज (on disaspiration see my Comp. Gramm. § 145, Exc. 2; on the amunāsika, § 149; and on the change of द to र, § 148). Or from Skr. N. स्नेत्स (of root स्नेत्स), see primary root No. 432.

46 den. ब्रज or ब्रज abuse, vex = Skr. P. P. प्रज abused; Pr. प्रज or प्रज, H. प्रज or प्रज. See Nos. 27, 42. Probably from प्रज was derived a root ब्रज, just as Skr. root ब्रज from ब्रज; the causal of प्रज would be प्रज, just as causal 'जेि of जेि; whence we should have Pr. प्रज, just as Pr. प्रज, and H. प्रज just as H. प्रज. The root प्रज which would correspond to ब्रज does not exist in Hindī, except in the compound ब्रजक, see No. 41. A similar series of roots are ब्रज or ब्रज and ब्रज.* Possibly also Nos. 43 and 45, may be derived from प्रज.

47 den. चौन take away, snatch = Skr. P. P. प्रज (of root प्रज), Pr. प्रज or प्रज, H. प्रज.

48 den. कट or कट be let off, be released = Skr. P. P. प्रज, Pr. कट (H. C. 2, 138) or कट (S. C. 1, 3, 142 कट?); Pr. कट or कट, H. कट or कट. See Nos. 46 and 50. The root कट or कट has not been adopted into Sanskrit, except in its causal or transitive form चोटः।

* There would be the following series of forms:

Skr. चौन, Pr. चौन or चोट; Roots Skr. चोट; Pr. चोट or चोट; H. चोट or चोट; Caus. चोट, चोट, चोट, चोट, चोट, चोट, चोट, चोट, चोट, चोट, चोट, चोट, चोट, चोट, चोट, चोट.

The Pr. roots in चोट would seem to be the original derivatives from the Skr. P. P. P. ; they were reintroduced into Sanskrit with one final र, and afterwards gave rise to the alternative Pr. root in ड, by the ordinary phonetic change of र to ड. The two alternative Pr. roots in ड and ड, reappear in H. as roots in ड and ड. As to the Skr. root चोट, see footnote to No. 48. The root चोट appears to have beenlittle used; it is not mentioned among Skr. roots, nor does it survive in Hindī, except in चोटक, see No. 41.

† The root चोट does exist in Skr., but it has assumed a somewhat different, though connected meaning "cut" (whence H. चोट डों knife). The same transition of
49 den. ब्रक्ष त perforate = Skr. N. ब्रक्ष (of R. ब्रक्ष); whence Skr. ब्रक्षति, Pr. ब्रक्ष्य or ब्रक्ष्य, H. ब्रक्षत.

50 der. ब्रक्ष्य release, an active or transitive, derived from R. ब्रक्ष No. 48.

Compare Skr. root विजय.

51 den. ग्रहण pair off labor (i. e., assist another with labor, in expectation of similar assistance being returned hereafter) = Skr. N. ग्रह, Pr. ग्रह (H. C. 2, 78); Pr. ग्रहण or ग्रहण, H. ग्रहवेत. The root comes to mean generally: be provident, be careful of.

52 den. अवताव make known, warn = Skr. P. P. P. अवताव (of caus. of R. अवता); Pr. अवताबेद or अवताबेद, H. अवतावि.

53 den. जत germinate = Skr. N. जति, Pr. जत or जति (H. C. 4, 136), H. जति.

54 den. जीत overpower, win = Skr. P. P. P. जीत (of R. आ); Pr. जीतिर or जीति, H. जीति.

55 der. जोड़ be joined, a passive or intransitive, derived from root जोड़ see No. 57.

56 den. जोड़ unite = Skr. P. P. P. जोड़, Pr. जोड़ (H. C. 1, 42) or जोड़, (see Nos. 46, 48), Pr. जोड़ or जोड़, H. जोड़ि. Compare Skr. root जोड़.

57 der. जोड़ join, an active or transitive, derived from root जोड़, see No. 56.

58 den. जोड़ yoke = Skr. N. जोड़, Skr. जोड़, Pr. जोड़ or जोड़, H. जोड़ि.

59 den. जोड़ or जोड़ or जोड़ see = Skr. N. जोड़ eye, sight; Pr. जोड़ (H. C. 4, 422, 6) or जोड़, (cf. H. C. 4, 332 जोड़ति), H. जोड़ि or जोड़ि or जोड़ि (with euphonic ज and ज, see my Comp. Gramm. § 69).

60 comp. भजण tr. twitch, intr. shake = Skr. भज ।; Pr. भज कर or भज कर, H. भज करि. As to the derivation of भज, see primary root भज़ No. 96.

61 comp. भक्षण intr. spring ; tr. throw on, move to and fro, snatch = Skr. भक्षण ।; Pr. भक्षण or भक्षण, H. भक्षणि. Hemachandra 4, 161 notices the corresponding uncompound verb भक्षण, but only as an intransitive "move to and fro" (said to be Skr. भक्षणि). Hindi and Marathi have the same uncompound verb भक्षण, 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 भिन्न. The latter becomes in Pr. भिन्न (H. C. 2, 127) or भिन्न (Spt. v. 278) or भिन्न; whence Pr. den. roots भिन्न or भिन्न (H. C. 4, 116 भिन्न and भिन्न he breaks), H. भिन्न (भिन्न does not exist). This root भिन्न as well as the corresponding causal or transitive forms भिन्न or भिन्न have been adopted into Sanskrit. See primary root No. 41.

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

62 comp. अंग्न शीत, ग्लार्ण = Skr. अंग्न + छ; Pr. अंग्नक क जा or अंग्नक, H. अंग्नक. As to the derivation of अंग्न, see primary root No. 98.

63 den. अंग्न पीप, स्पै = Skr. नु. अंग्न + छ; Pr. अंग्नक क जा, H. अंग्नक (with loss of initial अ, and dispiration)?

64 comp. अंग्न क सिङ्क, लोमं = Skr. अंग्न + छ; Passive अंग्नक (used actively), Pr. अंग्नक or अंग्नक, H. अंग्नक.

65 comp. अंग्न or अंग्नक स्ट्रागर, नोड, बीड = Skr. जू. (acc. sg. neut. जूृ. + छ); Pr. जू. अंग्नक, H. अंग्नक or अंग्नक. As to अंग्न = एव, see my Comp. Gramm. § 122?

67 der. टिकेबे prop, टाइस, बीड, a passive or intransitive, derived from No. 68.

68 comp. टिकेबे prop, सूपोर्ट = Skr. चाय (of root चै) + छ; Pr. टाइस्क, H. टिकै?

69 den. टिकेबे fks, अंग्रेज़, arrange = Skr. P. P. P. अंग्रेज़ (of root अंग्रेज़); Pr. टाइस्क or टाइस्क, H. टिके. The hardening of छ to छ is probably caused by the influence of the initial छ. In old Hindi टाइस्क 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 छ is still preserved in Hindi; thus old Hindi टाइस्क, modern Hindi टिके "standing".

70 comp. टिकेबे or टिकेबे stop short, stand amazed = Skr. अंग्न + छ; Pr. टाइस्क, H. टिके or टिके. As to the derivation of टिके, see No. 69; as to छ for छ, see my Comp. Gramm. § 35.

71 comp. टाइस्क jingle, tinkle, &c. = Skr. जू. सूंद Randy + छ; Pr. टाइस्क or टाइस्क, H. टिके. Compare Skr. टाइस्क अंग्रेज़, त्वांग, &c. from ट + छ; छ or छ means any "sound."

72 comp. टाइस्क strait = Skr. अंग्न + छ; Pr. टाइस्क or टाइस्क, H. टिके. Skr. अंग्न becomes Pr. अंग्न or अंग्न (H. C. 2, 9, whence H. अंग्न prop, pillar and टाइस्क place, residence. The change of छ to छ to म may be observed in the primary roots Nos. 117, 118.

73 comp. टाइस्क knock, chip = Skr. तच + छ, see root टाइस्क No. 10. in Appendix. Hindi has an interjection टाइस्क, imitating the sound of knocking or hammering; also टाइस्क rammer (an instrument).

74 den. टिके be fixed, remain, another form of No. 75; possibly arisen by

* Panjábí has अंगैं, with छ for म; and अंगैं thatch, with छ for म. The former might be referred to the Skr. root अंगैं.
a mere transposition, ठण्ड thard = ठहार thahar = ठहर thahar. Or the element र may be the same as र or ल in ठर or ठहर, &e. (see my Comp. Gramm. § 354, 2), and ठर = Pr. ठड़ = Skr. स्थ. Hindi has the noun ठहर place.

75 den. ठड़ or ठढ़ be fixed, be erect, stand = Skr. P. P. P. स्थान, Pr. ठड़ (H. C. 2, 39); Pr. ठढ़ or ठढ़ (H. ठढ़ or ठढ़).

76 den. ठहार fear = Skr. N. ठहार, Pr. ठहर (H. C. 8, 217); Pr. ठहर (H. C. 4, 198), H. ठहार.

77 den. ठाह be hot, burn = Skr. N. ठाह, Pr. ठाह (H. C. 1, 217); Pr. ठाज or ठाज़, H. ठाह.

78 comp. ठक cover = Skr. N. स्था (acc. sing. neut. स्थत cover) स्थत; Pr. ठक (H. C. 4, 21), H. ठक़ See primary root No. 105.*

79 der. ठल or ठज flow, a passive or intransitive of root ठल or ठह, see Appendix No. 11.

80 comp. ठक or ठाक be wearied, be fatigued = Skr. स्थान (acc. sing. neut. स्थान + ठ); Pr. ठक (H. C. 4, 370) or VI. el. ठक (H. C. 4, 87, 259; where it is said to be a substitute of Skr. ठकत more slowly from fatigue), H. ठक or ठाक. In H. C. 4, 16 the root is given as an equivalent of ठहार stand; the Bangali has ठक (pronounced thak) stand, remain. The original meaning of the Hindi is to come to a stop (from fatigue). The Skr. passive स्थान ( = स्थत + ठियोरे) means "to be made firm or rigid, be paralysed, be stopped. The original meaning of "rigidity" is preserved in the Hindi ठक or ठक a concealed lump, a clot. The stoppage may be owing to fatigue or to wonder; hence Hindi ठकन stopped or wearied or astonished. Other derivatives of the Hindi root are ठकन unwearyed, ठकावत weariness, ठकाभ्यास perplexed.

81 comp. ठपक strike, slap, tap from ठप + ठ; as to the derivation of ठप, see root ठाप in the Appendix No. 13.

* It might be also derived, as a primary root, from Skr. नच, I. cl. नचङ, Pr. नचह = शरह (with transfer of aspiration) = शरह (softening and cerebralising थ). Compare the roots ठाप, ठक, ठाप, ठाक in the Appendix, which show that the Skr. roots नच and लच had a tendency in Prakrit to transfer the aspiration (अ) and cerebralise the initial (ठ). The Skr. root ठच means chipping off (by striking) and covering; a similar change of meaning appears in the Hindi root ठह cover from Skr. ठह rub, strike.

† S. Goldschmidt, Prakritica, No. 7, p. 5 derives it, as a denominative root, from P. P. P. ठर of a root ठर, which he identifies with the root ठह, and assumes a change of ठ to ठ. This theory is based on three hypothetical steps: the identity of ठह and ठह, the existence of a P. P. P. ठह, the change of ठ to ठ. Pischel in Be-
82 comp. चक्क or चक्क tremble, flutter; probably a mere various pronunciation of चक्क or चक्क, q. v.; the interchange of च and छ is shown by the Pr. चक्क and चक्क (H. C. 4, 87), and that of ख and छ by खेमि and छेमि (H. C. 2, 8). There is also a reduplicated root चक्कचक्क or चक्कचक्क corresponding to चक्क and चक्क.

83 comp. चिर क बस set, be settled, well postured (e. g., in dancing) = Skr. चिर ए; Pr. चिरखइ or चिरखइ, H. चिरखइ.

84 den. चिराविन intr. settle (as liquor) = Skr. निश्च; Skr. निश्चारखनि Pr. चिरखइ or चिरखइ, H. चिरखइ.

85 comp. चुक split = Skr. चुक (or स्थव) ए; Pr. चुकिक or चुकिक, H. चुकिक. As to the contraction of ए to ए or ए, see my Comp. Gramm., § 122.

86 den. देसह or देसुह run = Skr. न. देस; Pr. diminutive देसह; Pr. देसहइ or देसहइ, E. H. देसहइ or W. H. देसहइ. In Chanda's Prakrit Lakshana C D, II, 278, there is noticed a root देसह run about with lowering face (चारतभासादू कदाहन रतसहा महम देसह)| Marāṭhā has both देसहइ and देसह in the same sense; it has also देसह run; these two roots are probably identical, the change of initial द to ए being not uncommon; see H. C. 1, 217.

87 comp. देसह or देसुह intr. split = Skr. देसह म; Pr. देसहइ or देसहइ, H. देसहइ.

88 comp. देसह intr. burn = Skr. देसह म; Pr. देसहइ or देसहइ, H. देसहइ.

89 den. दुस ह intr. pain = Skr. दुस ह; Skr. दुसारखनि, Pr. दुसहइ or दुसहइ, H. दुस ह.

90 comp. घड़ि ब्लाई, बे हो (from any passion), be distressed, tremble (from fear), = Skr. घड़ म; Pr. घड़इह, H. घड़इह (for घड़इह, with transfer of aspiration). There is also reduplicated root घड़इह*.

91 den. धार pour = Skr. न. धार; Pr. धारइ or धारइ, H. धारइ.

92 comp. धेक or धेक blow, breathe upon = Skr. धेक म; Pr. धेकइ or Ap. Pr. धेकइ, H. धेकइ.

93 den. न डूंग dance = Skr. न. डूंग; Skr. नादारखनि, Pr. न डूंगइ or VI. el. न डूंग (H. C. 4, 230. 2, 30), H. न डूंग. The Skr. root नट (1. el. नटित or X. el. नादारखनि) is adopted from the Prakrit.

94 der. न प्रो flow, a passive or intransitive, derived from primary root न्या No. 136.

95 den. चाँटा प्लो eee = Skr. प. प. प्लो (of R. चाँटा eject); Pr. प्लेटह, E. H. चाँटा. Compare Pr. प्लेटह (H. C. 4, 200) from Skr. प्लेटह.

* Hindi has a word घड़ body, and घड़ firm, strong, sound. This is probably derived from Skr. घड = Pr. घड = H. घड.
96 der. निकलो or निकर be pulled out, come out; a passive or intransitive, derived from root निकाल। See No. 98.
97 der. निक्षत्र be expelled, come out; a passive or intransitive, derived from root निकाल। See primary root No. 139.
98 den. निकाल or निकार pull out, eject = Skr. P. P. पिक्ष्यत्; Pāli and Pr. पिन्धु, Pr. पिन्धुद्र or पिन्धार, W. H. निकाले or E. H. निकारे. As to the change of द to त, see my Comp. Gramm. § 115.*
99 den. निका or निकार peal, extract = Skr. P. P. पिक्ष्यत्; Pr. निर्दास (with o for u, by H. C. 1, 116) or निकासद्र (with transfer of aspiration, as in पिक्षित H. C. 4, 188 = पिक्षित, a derivative of आकृत extracted).
100 den निकास grin = Skr. N. निकास (from root नि + क + स्त्र); Skr. निकास्योत्त, Pr. निकासद्र or VI. cl. निकासद्र (cf. H. C. 1, 116), H. निकास्य। See my Comp. Gramm. § 148.
101 den. निला swallow = Skr. N. निला; Pr. निलास or VI. cl. निलास, H. निलास। It might, however, be a primitive root = Skr. नि + र, VI. cl. निलास, with change of द to श.
102 den. निश्चित terminate = Skr. N. निश्चित (from root निश्च + यु); Pr. निश्चित or VI. cl. निश्चित, H. निश्चित (?). As to the change of dental न to cerebral न, compare Pr पर्यन्त for Skr. पर्यन्त, Vr. 3, 23; cf. also Pr. पर्यन्त for Skr. पर्यंत Vr. 8, 51.
103 der. निभाय or निभ्य be accomplished, succeed, a passive or intransitive root, derived from the primary root निबाय, No. 146.
104 den. पड़ or पैदा enter = Skr. P. P. प्रठिन्द्र, Pr. पढ़ (H. C. 4, 340); Pr. पढ़ा or VI. cl. पढ़ा, E. H. पढ़े or W. H. पढ़े.
105 den. पक ripen = Skr. P. P. पक्ष, Pr. पक्ष (H. C. 2, 79); Pr. पक्ष or पक्ष, H. पक्ष।
106 den. पक्ष चुना seize = Skr. P. P. पक्ष; Pr. पक्ष (cf. H. C. 4, 187), H. पक्ष (for पक्ष, with lost aspiration, as in root गाढ़ No. 16, गाढ़ No. 6, गाढ़ No. 75, and others).
107 den. पक्षत्व repent = Skr. N. पाक्षत्व; Pr. पाक्षत्वद्र or VI. cl. पाक्षत्वद्र, H. पक्षत्व।
108 den. पठ be paid, be roofed, be watered = Skr. N. पठ or पठ or पठ; Pr. पठ or VI. cl. पठ, H. पठ। Skr. पठ is any “vessel”, used for irrigating; पठ is the table or leaf on which the accounts of payments are kept; पठ means a “roof.”

* So also Bs. I. 354. III, 58. The Hindi root निकाल् is, of course, referable to the Skr. root निम + कल्; but the latter is most probably itself adopted from the Prakrit; Skr. निकालण्यति = Pr. निकालित। The Pr. form निकालित, quoted by Bs. III, 58, is misspelt for निकालित।
109 den. पन्नु निर्माण = Skr. N. पन्नु (of root पन्न-), Skr. पन्न-, Pr. पन्न or पन्न (cf. Pr. पन्न-b charismatic H. C. 2, 42), H. पन्न (transposed from पन्न, see my Comp. Gramm. § 133, see also primary roots Nos. 165, 166).

110 den. पिन्याव विन्याव = Skr. N. पिन्याव, Pr. पिन्याव (H. C. 1, 101), Pr. पिन्यावत् or पिन्याव, H. पिन्यावित् (see my Comp. Gramm. § 25).

111 den. परिमेय or परमेय touch = Skr. N. चुक, Pr. परिमेय (Vr. 3, 62); Pr. परिमेय (H. C. 4, 182), H. परिमेय or परिमेय (with lost aspiration, and change of i to a; see my Comp. Gramm. §§ 58 note, 130).

112 den. पलट or पलट intr. turn over = Skr. P. P. पलट, Pr. पलट or पलट (Vr. 3, 21, H. C. 2, 47), Pr. पलट or पलट (H. C. 4, 200), H. पलट or पलट. In H. C. 4, 200. 258 पलट and पलट are spelled so; see my Comp. Gramm. § 161.

113 den. पुन्याव or पुन्याव recognise = Skr. N. पुन्याव; Pr. पुन्याव or पुन्याव, H. पुन्याव or पुन्याव (for पुन्याव; with elided र and inserted euphonic च, see my Comp. Gramm. §§ 69, 124) (?).

114 der. विपुन or पिन्य intr. dress, put on, a passive or intransitive, derived from the primary root पिन्याव or पिन्याव, No. 165.* See also primary root पिन्य No. 166.

115 comp. पिन्यक be squeezed, be shrivelled = Skr. पिन्यक + क; Pr. पिन्यक or पिन्यक, H. पिन्यक. Compare Skr. विचित्र squeezed; and as regards the derivation of पिन्य or पिन्य, see primary root पिन्य No. 175. The word has been adopted into Skr. from the Prākrit.†

116 den. पिन्यक्त or पिन्यक्त slip = Skr. N. पिन्यक्त or पिन्यक्त slippery; Pr. पिन्यक्त or पिन्यक्त, H. पिन्यक्त or पिन्यक्त. (transferring the aspiration to प and changing ब to ब; see my Comp. Grammar § 11). See No. 125.

117 der. विपुन be beaten, a passive or intransitive, derived from root पिपुं No. 119.

118 der. पिपुन be beaten, bruised, a passive or intransitive, derived from root पिपुन, No. 121. See also No. I, 184.

119 den. पोट beat = Skr. P. P. पोट; Pr. पोट (Spt. 173) or पोट (with ्त for ्त, as in पोट for पोट (H. C. 4, 200), H. पोट. See No. 121.

120 den. पूकार call, shout = Skr. N. स्कूकार or फूकार or पूकार; Pr. फूकारेि

* In Bengali the root is पिपुं, which is a denominative of the Skr. P. P. यिपुं dressed. Possibly the Hindī root may be explained in the same way by a further change of ि to ि.

† In the Skr. word विचित्र pressed down a metathesis of प and ि appears to have taken place.
or युक्तर्द or युक्तर्द, H. युक्ताय. A similar change of ख to ख, in root परिस No. 111. An intransitive or passive form of this root occurs in the old Hindi of Chand's Prithviraj Rasau: पुक्त्‌

can be called.

den. पंज squeeze, beat = Skr. P. P. P. पिञ्ज; see primary root No. 184.

den. पुंस revile, perhaps = Skr. N. पुंस blessed; euphuistically.

comp. फाटक tr. separate, winnow, or intr. be separated = Skr. फाट +

; Pr. फाटक or फाटक, H. फाटक. The Pr. doubles the radical ट; see primary root फाट No. 186.

comp. फाटक or फाटक tremble = Skr. फाट + छ; Pr. फाटक or

फाटक, H. फाटक or फाटक. The reduplicated root फाटक or फाटक also occurs. See roots फाटक No. 82 and फाटक No. 14.

den. दिस्क slip, slide, see No. 116. For a similar transfer of aspiration on account of change of ह to व, see root दिस्क in Appendix No. 8.

comp. फुक blow = Skr. फुक + छ; Pr. फुक or फुक, H. फुक. See H. C. 4, 422, 3. पुक्त्‌अत्यर्द, and Spt. 178 फुक्त्‌अत्यर्द.

der. फुक be blown, a passive or intransitive, derived from root फुक No. 126.

den. बृह्त or बृह्त sit = Skr. P. P. P. उपयुक्त, Pr. उपयुक्त (like पाद, No. 104) or बृह्त (cf. H. C. 1, 173), H. बृह्त or बृह्त (as to change of ह to व, see my Comp. Gramm. § 71). The initial व for व is somewhat anomalous, as such an "expansion" व does not ordinarily harden to व. Another way of explaining the Hindi बृह्त is to assume that the initial व of Pr. उपयुक्त 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. व, does not, as a rule, harden in Hindi.

comp. वक talk, chatter = Skr. वाच + छ; Pr. बच, H. बचे. Or possibly a mere corruption for वक्‌, Pr. बच or बुक (H. C. 4, 98), Skr. बुकित or बुक्तित a comp. of बुक्‌ + छ. Hindi does not possess the form बुक्‌, but it has a derivative of it, बुक्तियाँ; Marathi has both बुक्‌ and बुक्तियाँ.

den. बुक read, recite = Skr. न. बाच; Pr. बच, H. बाचे.

comp. बहु go beyond bounds, stray = Skr. बहुस + छ; Pr. बहुसेज or बहुसज, H. बाहुसे.

der. बिष्णु be spread, a passive or intransitive, derived from the primary root बिष्णु No. 225.

den. बिराज mock, jeer = Skr. N. बिराज sound, noise; Pr. बिराजेज or बिराज, H. बिराज.

der. बिलास become bad, perhaps connected with P. P. P. विलासित (विलास?) wasted.

den. बीट scatter, spill = Skr. P. P. P. आत; Pr. बिट (for विट, as प्रत्य for प्रत्य, see No. 112); Pr. बिट or बिट, H. बोटे.
136. den. बौद्धिक pass = Skr. P. P. P. बौद्धिक, Pr. बौद्धिक (like विद्वध्वन्व for Skr. ज्ञित, H. C. 2, 99; otherwise the preservation of न is not explicable); Pr. बौज्व्व्व or बौज्व्व्व, H. बौज्व्व्व.

137. den. भए भए declare, surround = Skr. भए, Causal शेत्थित or I. el. शेत्ते, Pr. शेत्ते (H. C. 4, 51) or शेत्ते (H. C. 4, 221), H. भेत्ते. The root is probably a denominative of an anomalous P. P. P. or some other derivative of the root बिन्दू or बिन्दू. The so-called Causal shows its derivative form.

138. den. बूङ्ग भूङ्ग go mad = Skr. N. बाध्व; Pr. बाध्वावें or बाध्वावें, H. बालावें or बालावें. See my Comp. Gramm. § 25.

139. den. भाग भाग note = Skr. P. P. P. भाग, Pr. भाग (cf. H. C. 4, 354), Pr. भाग्य or भाग्य, H. भाग्य.

140. den. भींभीं or भींभीं be wet = Skr. भींभीं; Pr. भींभीं, or भींभीं, H. भींभीं or भींभीं (?). As to the loss of initial ब, see my Comp. Gramm. 172. Compare the primary root भींभीं in the Appendix No. 21.

141. der. सूक्ष्ण be fried, be cooked, a passive or intransitive, derived from सूक्ष्ण No. 143.

142. der. सूक्ष्ण or सूक्ष्ण or सूक्ष्ण forget, blunder = Skr. P. P. P. भूक्ष्ण; Pr. भूक्ष्ण (H. C. 4, 177), W. H. भूक्ष्ण or भूक्ष्ण, E. H. भूक्ष्ण or भूक्ष्ण. Skr. भूक्ष्ण = Pr. भुक्ष्ण = सूक्ष्ण = सूक्ष्ण; the change of भ to भ caused by the labial bh. As to the change of भ to भ, see my Comp. Gramm. § 148.*

143. den. सूक्ष्ण or सूक्ष्ण or सूक्ष्ण fry, cook = Skr. P. P. P. भूक्ष्ण (Pan 8, 2, 44); Pr. भूक्ष्ण or भूक्ष्ण, H. भूक्ष्ण.

144. den. सूक्ष्ण or सूक्ष्ण or सूक्ष्ण cover, gilt (i. e. encase by rubbing on) = Skr. P. P. P. भूक्ष्ण, Pr. भूक्ष्ण or (disaspirated) भूक्ष्ण; Pr. भूक्ष्ण or भूक्ष्ण (H. C. 4, 126), H. भूक्ष्ण. The Skr. root सूक्ष्ण cover is adopted from the primitive Prakrit or Pali संध = संध, whence संध a covering, hut, H. संध or संध. Similarly are formed the roots संध, संध, &e.

145. den. सूक्ष्ण consult = Skr. N. सूक्ष्ण; Pr. संक्ष्ण or संक्ष्ण (cf. H. C. 4, 260 संक्ष्ण), H. संक्ष्ण (with elided nasal, see my Comp. Gramm. § 143).

146. der. सूक्ष्ण be effused, cease to exist, a passive or intransitive, derived from the root संध, No. 153.

147. der. सूक्ष्ण be shaved, a passive or intransitive, derived from the primary root संध, No. 284.

148. der. सूक्ष्ण be closed, a passive or intransitive, derived from the root संध, No. 151.

* This derivation I owe to S. Goldschmidt, Prákritica, No. 8, p. 9. Formerly, looking upon सूक्ष्ण or सूक्ष्ण as the more primitive form, I was inclined to consider it a denominative of Skr. जम्बर, whence comes Hindi जम्बर or जम्बर a simpleton.
149 den. मृ die = Skr. P. P. P. अ, Pr. मुष (H. C. 4, 442); Pr. मुष, H. अे.
150 den. मृ दischarge urine = Skr. N. मृ; Skr. दस्तन, Pr. में or सँघ, H. मृ.
151 den. मृ close (lit. with a seal ring) = Skr. N. मृत्र; Skr. दस्तन, Pr. में or सँघ, H. मृ.
     See H. C. 4, 401 दिस्या मुघ sealed.
152 den. मृ be silent = Skr. P. P. P. मृ (of root मृ); Pr. मृण or मृण, H. मृ, (or from N. मृ)
153 den. मृ breakfast = Skr. P. P. P. प्, Pr. स्त्र or स्त्र (disaspirated for स्त्र, cf. Pali स् or स् = प्), H. मृ, (with ो for ी, see my
     Comp. Gramm. § 148).
154 den. मृ or श् blossom = Skr. N. मृ; whence मृलयति, Pr. मृलष्ट or मृलष्ट, W. H. मृलष्ट or E. H. मृलष्ट.
155 den. मृ or श् blossom = Skr. N. मृ; Pr. मृलष्ट or मृलष्ट, W. H. मृलष्ट or E. H. मृलष्ट.
156 den. र्ष be attached = Skr. P. P. P. र्ष, Pr. र्ष (H. C. 2, 10);
     Pr. र्षो or र्षः.
157 den. र्ष dye = Skr. N. र्ष; Skr. र्षचारण, Pr. र्ष or र्ष, H. र्ष.
158 der. र्ष क be hindered, a passive or intransitive, derived from root र्षक
     No. 162.
159 der. श् or ह्र् be restrained, a passive or intransitive, derived from
     the primary root ह्र्ष No. 298.
160 den. ह्र्ष or ह्र् be angry = Skr. P. P. P. वष, Pr. वष (H. C. 4, 414)
     or ह्र्, Pr. ह्र् or ह्र्, H. ह्र् or ह्र्.
161 comp. र्ख्रं bray = Skr. र्ख्रं (acc. sg. neut. र्ख्रं) + छ; Pr. र्ख्रं or र्ख्रं, H. र्ख्रं.
162 comp. र्ख्रं hinder = Skr. श् (acc. sg. neut. श्) + छ; Pr. श् or श्, H. र्ख्रं.
163 der. र्ख stop, plant; a transitive or active, derived from primary
     root श्, No. 295.
164 den. ह्र्षी limp = Skr. N. ह्र्षी, Pr. diminutive ह्र्षी; Pr. ह्र्षी or ह्र्षी, H. ह्र्षी.
165 den. ह्र्ष or ह्र् reaq = Skr. N. ह्र्ष; Skr. लुघथनि, Pr. ह्र्ष or ह्र्ष, H. ह्र्ष or ह्र्ष.
166 comp. ह्र्ष disappear, conceal oneself = ह्र्ष + छ; Pr. ह्र्ष (H. C.
     4, 55), H. ह्र्ष. The word ह्र्ष properly means "dropping out", "elision";
     it is derived from the Skr root ह्र्र break. This origi-
     nal meaning of the root is still preserved by the Pr. ह्र्ष, which
     means both break, cut of; (H. C. 4, 116, where it is said to be =

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Skr. तुड़ी and disappear, conceal oneself (H. C. 4, 56, where it is given as an equivalent of the Skr. तुड़ी) *

167 den. लुभाव or लुभाव covet, be enamoured with = Skr. N. लुभाम; Pr. लोभाय or लोभाय, H. लुभाव or लुभाव, (with u for o, see my Comp. Gramm. § 25).

168 der. जन ज be adorned, be prepared, a passive or intransitive, derived from root सज, see Appendix No. 24.

169 comp. चटक or सड़क get away, disappear, conceal oneself = Skr. सत्त च or सद + छ; Pr. सत्तक or सत्तक, H. सटक or सटक. The word सत्त means covering, concealment. The root सत्त becomes सट in Pr.; see Vr. S, 51. H. C. 4, 219.

170 der. सज ज be settled, a passive or intransitive, derived from the primary root साप ज No. 336.

171 den. सुमस्व स be in presence of = Skr. N. सुम्बस; Pr. सुमस्वचेद or सुमस्वचेद, H. समस्वचे.

172 comp. चरक ज be moved, move = Skr. चर + छ; Pr. चरक्ष or चरक्ष, H. चरके. Possibly it is a mere variety of the root चटक.

173 den. चराप curse, denom. made from the Hindi चराप a corruption of the Skr. चाप; see my Comp. Gramm. § 135.

174 der. संद or संद or संद combine, a transitive or active, derived from the primary root संध, No. 323.

175 den. शील moisten = Skr. N. शीर; Pr. शीलखेड or शीलखर, H. शीले. on the absorption of a after i, see my Comp. Gramm. § 97.

176 der. सुधार be correct, mend, a passive or intransitive, derived from the primary root सुधार, see No. 346.

177 den. सुधार be pleased or give pleasure = Skr. N. सुध; Pr. सुधचेद or सुधाचेद, H. सुधचे.

178 den. सुधार be beautiful or make beautiful = Skr. N. सम; Skr. शोभायति, Pr. शोधायद or शोधायद, H. शुष्माय. This might, however, be a primary root, from the causal of root हुभ.

179 den. सुख or सुख be dry = Skr. N. सुख, Pr. सुखवेद or सुखद, H. सुखे or सुखी.

180 den. सुम्त सleep = Skr. P. P. प. सुष्म; Pr. सुन्त or सुन्त, H. सुन्ते.

181 den. सैंत or सैंत adjust = Skr. P. P. प. समाहित, Pr. समाहित (cf. H. C. 2, 99 तितित= Skr. तितित), Ap. साध्यित or साध्याप, H. (contracted) सैंत; whence Pr. समाहित, H. सैंत or सैंदे.

182 comp. चप evacuate = Skr. चट + छ; Pr. चयाद, H. चम (for चम) ?

* The root लुड़क might also be derived from लुच + छ, from the root लुच which (like लुप) means both cut off and disappear. Or it might be derived from लूच + छ; the root लूच meaning become invisible.
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183 comp. वकार or वकार bowl, drive away or keep off (with shouts) = Skr. वक + छ; Pr. वकार or वकार, H. वकार or वकार. This is a pleonastic form of No. 187.

184 den. वकार bowl, drive away or keep off (with shouts) = Skr. वकार; Skr. वकारण, Pr. वकार or वकार, H. वकार. Connected with roots Nos. 183 and 187.

185 लहू slay = Skr. प. प. प. लहू, Pr. लहू (like लिखित H. C. 2, 99); Pr. लहू or लहू, H. लहू.

186 comp. लहू move = Skr. लह + छ; Pr. लहक or लहक, H. लहक.

187 comp. वक bowl, drive (with shouts) = Skr. वक + छ; Pr. वक or वक (H. C. 4, 131), H. वक. See Nos. 183, 184. Probably connected with root म्यू or भङ्ग or भाप talk + छ.

188 den. लार lose, be beaten, be unsuccessful = Skr. न. लार, Pr. लार or लार, H. लार. H. C. 4, 31 has लार (for लार by H. C. 3, 150), said to be = नसन; it is merely a pleonastic form of लार.

Hindi has लार or रिलार.

189 comp. लिंन blow = Skr. धम + छ; Pr. धमक or धमन, Ap. धमक, H. वनक (for वनक). See No. 92.

Appendix.—Primary Roots.*

1 रंच or रंच pull, attract = Skr. र + छ, future राव (used in the sense of the present), Pr. रांच or रांच (H. C. 4, 187), H. रंच or रंच (with loss of aspiration). See introductory remarks, pp. 39, 40. This root occurs in the shortened form रंच both in Pr. (H. C. 4, 187 रंच) and in old Hindi (Prithiraj Rasau 27, 38 रंच); see No. 2.

2 रोंच or रोंच or रोंच or रोंच pull = Skr. रो + छ, future राव (used in the sense of the present); Pr. कच or कच, H. रोच, रोच or रोच, रोच (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 आ to आ or ए, see my Comp. Gramm. § 118; here it occurred by assimilation to root रंच or रंच No. 1. See introductory remarks pp. 39, 40. In old Hindi this root occurs in the form रंच, which is much nearer the original Prákrit form कच; and corresponding to it, the old Hindi has a root-form रंच which has evidently been modified from the original form रंच (see No. 1), in order to assimilate it to रंच; just as the original form रंच has

* These are roots which I was at first inclined to consider to belong to the secondary class.
been modified to बैंच in order to assimilate it to रैच. Thus the two forms खंचि and खंचि occur in the Prthiraj Rasa 27, 38.

The Mangol Khan Lalarí draws twenty daggers, and the four-sworded Sabbaj pulls out the enemy's life with his arrows."

3 बांट, vomit, let go, release = Skr. बृद्धि, I. el. बृद्धि, Pr. बृद्धि (H. C. 4, 91), H. बृद्धि. The root is also spelled बृद्धि; and it might be derived from बृद्धि, VII. cl. बृद्धि. Pr बृद्धि or बृद्धि, H. बृद्धि or बृद्धि (as Pr. अंजन for Skr. अंजन). It might also be derived from the Skr. denominative root बृद्धि. X. cl. बृद्धि; as it seems to have been done in H. C. 2, 38 (बृद्धि from बृद्धि).

4 बूढ़ पे pressed down, be stamped, be printed = Skr. बूढ़, I. el. बूढ़ि, Pr. बूढ़ि, H. बूढ़ि. Or perhaps from बूढ़, IV. el. बूढ़ि.*

5 अंजन or अंजन or अंजन sigh, chatter (wildly), lament, be sorry for = Skr. अंजन, I. el. अंजनि, Pr. अंजन (H. C. 4, 140), H. अंजनि, अंजन or (disaspirated) अंजनि. As to the change of अ to अ, compare Pr. अंजन for Skr. अंजन; (H. C. 2, 27). As to the meaning, compare the English "croak."

6 अंच्र throw on, cover = Skr. चष्ठ throw, Passive चष्ठि (used actively), Pr. अंच्र, H. अंच्र. The अ for अ is as in चप्पो for चप्पो H. C. 2, 3, and the inserted anusvára, as in चप्पो (H. C. 4, 2, 1, 26, for जप्पु). Or it might be derived from Skr. अंच्र + अ, Causal अंच्रि. Pr. अंच्रि or अंच्रि (for अज्ञप्पु, with loss of initial अ, see my Comp. Gramm. § 172).

7 ठक knock, hammer = Skr. ठक, I. el. ठकि, Pr. ठक (with ठ for ठ as in ठमरो H. C. 1, 205), H. ठके (for ठके with transfer of aspiration). Compare Skr. ठकर. See No. 9.

8 ठंछ ram, hammer = Skr. ठंछ, I. el. ठंछि, Pr. ठंछ (as to ठ for ठ, see H. C. 1, 205), H. ठंछे (for ठंछे with transfer of aspiration from ठ to ठ, and change of ठ to म, see my Comp. Gramm. §§ 11, 132). See No. 10, also Nos. 7 and 9.

9 ठोक or ठोंक ram, hammer, drive in, (nail, &c.) = Skr. ठोक, I. el. ठोकि, Pr. ठोक (as to ठ for ठ, see H. C. 1, 205), H. ठोके or ठोके (for ठोके, with transferred aspiration). See No. 7.

10 ठाम or ठांच ram, hammer = Skr. ठाम, I. el. ठामि, Pr. ठाम (cf. H. C. 1, 205), H. ठांचे or ठांचे (for ठांचे). See No. 8.

* The root बूढ़ also might produce a Pr. passive (used actively) बूढ़ि, analogous to बूढ़ि (H. C. 4, 257).

† This verb is noted by Hemachandra not less than five times; in 4, 140 as = लंचि repent, in 4, 148 =विलयि lament or prattle, in 4, 156 =उपाचारे scold, in 4, 201 = खिणि sigh, and in 4, 259 = अंच्र talk.
11 धार्म or धार्म send forth, pour out, cast, a modification of धार्म, No. 14
q. v., cerebralisation transferred to the initial ध from ध.
12 धार्म fix, settle = Skr. धार्म Passive धार्म (used actively), Pr. धार्म (formed similarly to धार्म from धार्म H. C. 4, 237), H. धार्म.
See footnote on p. 46; ध = ध = ध.
13 धार्म or धार्म splash, strike, pat = Skr. धार्म Passive धार्म (used actively), Pr. धार्म or धार्म, H. धार्म or धार्म. See footnote on p. 46; ध = ध = ध = ध.
14 धार्म send forth, pour out, cast = Skr. धार्म, I. cl. धार्म, Pr. धार्म (H. C. 4, 79), H. धार्म. See No. 11. The Skr. धार्म is adopted from the Pr., and is probably a denominative of ध, P. P. P. of ध, glide, flow, Pr. ध = ध = ध.
15 फलबुर leap = Skr. प + स्व, I. cl. पलबुर, Pr. पलबुर, H. पलबुर (with transfer of aspiration).
16 फन्क or फन्क hurl, fling, throw away = Skr. प + स्व, Future पलबुर (used in sense of present), Pr. पलबुर or पलबुर, H. पलबुर or पलबुर (with transfer of aspiration).
17 विच weave = Skr. व, IX. cl. वष, Pr. वष, H. वष; see No. 19; also No. I, 237. The Skr. root for weave is व, I. cl. वष or IV. cl. वष; it seems impossible to derive the H. root विच from it; but the roots व and व ए are probably connected; both mean cover.
18 विच be spread = Skr. विस्तृत, Passive विस्तृत (for विस्तृत; like फलिये, फलिये), Pr. विस्तृत or विस्तृत, H. विस्तृत. Compare Pr. विस्तृत in Chañda 2, 21 for Skr. विस्तृत.
19 बुन weave = Skr. बुन, V. cl. बुन, Pr. बुन, H. बुन, formed like धार्म No. I, 347. See No. 17.
20 लाल load = Skr. लाल, Passive लाल (used actively) or Causal Passive लाल, Pr. वाल (cf. H. C. 4, 245 वाल), H. वाले.
21 भूम or भूम be wet = Skr. भूम + भूम, Passive भूम, Pr. भूम, H. भूम or भूम (with loss of initial भ; see secondary root भूम No. 140).
22 भूंक or भूंक or भूंक talk foolishly, bark = Skr. भूंक, Future भूंक. Pr. भूम (H. C. 4, 186, with disaspiration for भूम), H. भूम, &c. The original aspirate form भूम occurs in Hindi. There is an identically spelled root, meaning thrust, drive, which probably has a different origin and may be a compound root.
23 भूम send = Skr. भूम + भूम, Passive भूम (used actively), Pr. भूम, H. भूम (with loss of initial भ and change of i to e, see my Comp. Gramm. §§ 172, 148. As to the change of ya to i, see ibidem, § 121.
24 सखा adorn, prepare = Skr. सखा, Passive सखा (used actively), Pr. सखा, H. सखा. The Skr. root सखा has been adopted from the Prákrit.
APPENDIX
TO "A COLLECTION OF HINDI ROOTS."

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

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## ERRATA.

Page 83, line 22, read *buddha* for *buddha*.

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CORRIGENDA ET ADDENDA.

Page 1, for Trichinopoli, read Trichinopoly.
" 2, for stubi (passim), read stubi.
" 2, line 19, for purána, read púrāna.
" 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 Yāli (? Griffins') heads, and the spiral lumps noticed may be the Yāli'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 now, 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 necropolis read necropolis.
" 9, " 19, for similar read kistvaen.
" 9, " 13, from bot., for chahut read chathut.
" 9, last line, for Neilipatla read Nellipatla.
" 10, line 7, for three or four read six or seven.

B. R. BRANFIL.
ABBREVIATIONS.

Bs. = Beames' Comparative Grammar.
Cw. = Cowell's edition of the Prákrity Prakṣa.
Dr. = Delius' Radices Praeiticae.
E. M. = E. Müller's Beiträge zur Grammatik des Jainaprakrit.
H. C. = Hema Chandra's Prákrit Grammar.
K. I. = Kramad Iṣvara's Prákrit Grammar.
R. M. = Dr. Rajendralal Mitra's Prákrit Vocabulary.
S. B. = Setubandha (ed. S. Goldschmidt).
S. C. = Subha Chandra's Prákrit Grammar.
T. V. = Trivikrama's Prákrit Grammar.
Vr. = Vararuchi's Prákrit Grammar.

G. = Gujaráti. S. = Sindhi.
M. = Márathi.

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 Gaznú 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 mumalliki on the reverse. I am inclined to ascribe this coin to Muhammad Sám or his general Eibek. The word I have transliterated as mumalliki 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 Babram 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-din struck coins of the very same type, using the square area for his name and titles and dividing the latter similarly to Muizz-ud-din. No. 7, Pl. V, I claim also for Muhammad Sám. It has Muizzí on obverse and on reverse in Hindí, Sri Samanta Deva.

Nos. 3 and 4, Pl. V, are undoubtedly new types of Shams-ud-din 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-din's. The star seems to indicate this. A'dl i Sultan 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 Dehlí. 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 Sultan i Muazzim; the alif and dín are altogether missing.

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

Nos. 11, 12 and 13 are I think Shams-ud-din's. The obverse and reverse are simple A'dl and Dehlí. 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-din'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-din.

No. 8 I ascribe to Reziah. In the rayed circle is the name Reziah. 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 Sultan and on the margin Ul A'zím A'la ud Dunya wa ud dín Muhammad (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 Firoz Sháh Zafar, son of Fíroz Sháh. The obverse has on it in square area Firoz Sháh. The margin reads *Zafar ibn Firoz Sháh Sultan*, the reverse has *núbi i amir ul Muminin 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 Gujrat 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 Amir ul Muminin 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 Amir ul Muminin Khallad Khilafatuhu*. There is no date. There is some uncertainty as to the date of the death of this king. Thomas, quoting *Badoní*, 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., Mubáarak 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 Bahlol'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 coins. It is a binominal coin, struck evidently by Bahrám Sháh. Obverse:—*A'zul us Sultán ul Azim Bahrám Sháh*. Reverse:—*A'zul 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'zul) 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 din 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 Ala 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 Umritisur 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 Gyas 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. Bidsháh Gázi 962. Margin:—Us Súltan ul A'dil 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 alâh mulkahu wa Sultanahu; margin:—Shams ud Dunya wa ud dín abu ul Muzaffar, Zarb, Sattân. 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
COINS SUPPLEMENTARY TO THOMAS CHRONICLES OF PATHAN KINGS.
Baber. Obverse:—Zahir ud din Muhammad Bābar, Bādshāh Ghāzī (9)37. Khatlal allah mulkahu va Sultānahu, zarb Agrah. (The bars and knots are not peculiar to the Kashmir coinage. They are found on the anonymous coins of both Baber and Humāyūn). Reverse Area:—the Kalimah; Margin:—names and titles of the four Companions.

Nos. 10, 11, 12, are three varieties of a new type of Humāyūn's anonymous coinage. They were all struck at Champānīr. Firishtāh spells this word جاہنیاری. The coins all agree in giving it حسانیر. The inscriptions of these coins give a new feature—a title to a city. Champānīr is entitled the noble city Shahr-i Mubarram. It speaks well for Humāyūn'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 Humāyūn's anonymous coinage. Instead of Fi ut tārīkh, they have ba tārīkh. Obverse:—Zarb Shahr-i Mubarram. Reverse:—Champānīr ba tārīkh 942. No. 11 belongs to Dav. Ross, Esq.

No. 13 is another of the anonymous coins of either Baber or Humāyūn. 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 Dār ul zarb Khatta i Jaunpur Mutabarrak. Reverse:—Fi ut tārīkh san 937; ornaments at the top and bottom. Most of the coins of Jaunpur 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 Zamān 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 zamān, Reverse:—Sher Sháh ul A'dil Sultán.

No. 17 is Islámi 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 zamān Abú (ul Mazaffar).

No. 14 is Sikundar Súrí's. Obverse:—Khalifah uz zamān 962. Reverse:—Sikundar 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 Islámi Sháh are rare, those of Muhammad A'dil
Sháh are extremely rare, while I have only seen one of Ibrahim Sháh and not one of Sikandar Sháh's. General Cunningham had a large copper one of Sikandar Sháh. Mr. Delmerick published one of Ibrahim's. The large coins of the other three are common, the greater numbers of course being Sher Sháh's and Islam's. I have not as yet come across a small coin of Ibrahim'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 Reziah's and one of Kutub ud din Mubarak Sháh's together with several others must stand over to a future paper, in which I hope to be able to show that No. 138, p. 190 of Thomas was struck in Talang (Telingann), 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 Ramaduta.

No. 2, A and B are 2 small coins with the legend Achya or Bhan-ya. (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).

_Agni 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. En.]
COINS OF THE MITRA OR SUNGA DYNASTY.
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 Bhumitras 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 Bhumitras 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. Carlile, 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. Carlile 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-yúga had elapsed, then would Vicramáca 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-yúga, to be found in the Bhágavata, Bráhmánda, 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 Vicrama, and the other Mitra; and they are supposed to have been originally meant for Vicrama mitra who, according to some, reigned fourteen years; and in these lists, the father, or predecessor of Vicrama, is called Ghospa Rája or the king of thickets, which is another name for Gandharupa, or Ghádá-rája in the west. This looks like an interpolation; and the more so, as it will appear hereafter, that Ghospa-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 Ghospa 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 Kanwa 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. Carleyle 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.
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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 Afghan 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 via the Kákar country and Ba'rkho'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 Afghánas 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 Páthán and Afghán Tribes.

The people of the nation known in India as the Páthán Tribes call themselves Bání Isrá'il or Pukhitu'n (pl. Pukhitá'na), and the Afghánas, as a race of these Páthán Tribes, claim descent from Tálú't or Sa'rú'l (the Saul of the Bible) as their ancestor. According to native accounts Sa'rú'l had two posthumous sons Barák'á (Barachiah) and Irámiá'á (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 Barákia became prime minister and Irámia Commander-in-Chief. In Sulíma'n's (Solomon's) time they were succeeded in their posts each by his son, Barákia by Ašáf and Irámia by Afghaná, and Afghaná is said to have had the building of the Baitu-l-Muqaddas or Temple of Jerusalem. Ašáf left 18 and Afghaná 40 sons, and these founded important families or tribes. When the Baitu-l-Muqaddas was destroyed by Bakhtu-n-Nasr (Nebuchadnezzar) the Afghaná Tribe, adhering to their forefathers' religion, were banished from Sha'm (Palestine) and took refuge in Kohistán-1-Ghor and Koh-l-Fíroza. Here their neighbours called them Afghán (or Aóghán)

* 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 Armiah according to Raverty.
or Bani Isrā'il. From Ghūr by degrees the Afghāns extended to the Kōhišta'-n-i-ka'bud, Kandahā'rar and Ghazni.

Until the advent of Muhammad the Afghāns followed the religion of the Peutateuch or Tauret Kiwā'n. But in the 9th year of the announcement of Muhammad's mission they heard of him from one of the Bani Isrā'il by name Kha'lid-bin-(or ibn)-Wali'd. A deputation was sent to Medina under one Kais (also Kish, Kesh or Kāsh) a leading Afghān, 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 Afghāns.* Arabie names also were given them; thus Kais was called Abdu-r-Rahih'd (Servant of the Wise). And to him was also given the title of Pihtā'n (Pāthā'n) meaning in Syriac a rudder, signifying that he, Kais, was the pilot of his people. From this Kais are descended all the Afghān Tribes properly so called, and all Afghāns are Pāthāns, the name by which the nation is most generally known in India. But there are many tribes who are Bani Isrā'il and Pukhtūn (Pukhṭānā) who are not Afghāns.

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

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

6. Wazīris. 13. Afrādis. (Kōhistānīs.)

Kais married a daughter of Kha'lid-bin-Wali'd by whom he had three sons, Sarāran, Batān and Gurgusht 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 Pāthān family or tribal subsection is called malik.
† There are several legends to account for the names of Afghān and Pāthān, that above given in the text is the commonest. The following are, however, worth noticing.

The word Pukhtūn (Pukhtāna) is said variously to be of Ibrā'īn or Ibrā'īmī (Hebrew) and of Su'kia'ni (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 Pathán Tribes we have to deal with in this paper are the Duránis slightly, and with the Tarín, Kakar, Lání and Zarkháns more fully. Of

The common tradition about Afghán is, that the mother of their ancestor Afghanistan 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, “Afghán (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 “Pathán” is a corruption of Pret Khán, the title given to the Káis above mentioned by the Prophet. Raverty in the Introduction to his Grammar of Pushto gives an extract from the Tázkirát-ul-Muluk or History of the Saddozais according to which the words Pushto (or Pukhto) and Pashtún (or Pukhtún) are derived from Pusht orPasht the name of the place Afghanistan first fixed on as his residence on leaving Palestine. In the same work a characteristically oriental derivation of the word Afghanistan is thus given. “The original meaning of Afghání is Fighán, a Persian word which means complaint, lamentation, because he (Káis) was a cause of lamentation to the devil, the jinn 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 Pathán is further derived from batán or patán which in Arabic (بطن) 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 Bátán is more than doubtful. It appears that Bibi Máto (or Mái) the daughter of Bátán formed an illicit connection with Sháh Husain, (or Hüssén, called also Mas'áli) a Persian Prince of Ghór and was made to marry him. The offspring resulting was named Ghálzai that is “the child of theft.” She, however, also bore him a son Ibrahim Lódi from whom the former Pathán rulers of Delhi sprung. This Sháh Husain was also by a fraud induced to marry Bibi Máhi (or Min) daughter of the Kág of barb who managed his marriage with Bibi Máto, and from her are descended the present Kágzai, Bangash and Sarwání Patháns,
these the Duránís, Tarín and Kákar are Afghání proper and so probably are the Lúnís, but the Zarkháns are merely known as Paígháns.

First then regarding the Duránís, the chief of the Afghání clans. 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 Tázkira‘-ul-Mulú‘í above quoted, the Durání descent is as follows:

**KAIS or ABD-UR-RASHÍD.**

<table>
<thead>
<tr>
<th>Sárábán,</th>
<th>Kharshabdún,</th>
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<tbody>
<tr>
<td>Shákkabún, eldest son.</td>
<td>Kháshshabdún, eldest son.</td>
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**Malik Rajár Abdáli.**

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<tr>
<td>Malik Zái’k Abdáli.</td>
<td>Isháq.*</td>
<td>'Álí.*</td>
<td>whence the Khákár is called also Khúgianí.</td>
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<tr>
<td>Popál.* Bárák.* Álká.*</td>
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<tr>
<td>Malik Habíb Abdáli.* Badú.* Ayúb.*</td>
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<tr>
<td>Malik Báme Abdáli.* Ismáil.* Hasan.*</td>
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<tr>
<td>Salíh.* 'Álí.* Záyil.* Waráká.*</td>
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**Malik Sado Abdáli,**

where

Ahmad Sháh Abdáli and afterwards Durání.

The old name of the Duránís was Abdáli, till Ahmad Sháh, an Abdáli of the Sadozai family or subsection of the Popálzai section of Abdális, the hero of Páñipat, in 1747 took the title of Durr-i-Durráx, the Pearl of Pearls, and named his tribe after himself Duránís. The two great divisions of the Duránís are Zárák and Panjá’o, and of these the most honorable by descent are the Záráks. The Záráks are usually divided into 4 sections (1)

* Those marked with an asterisk with the addition of Zai are the names of present Durání sections or subsections.
Pópálzai, (2) Alakó'zai, (3) Bárakzai, (4) Achakzai and the Panj-pha'ós into 5 sections, thus, (5) Nú'rzái, (6) Ali'zái, (7) Ishá'kzai, (8) Khú'gía'nte, (9) Ma'kú.* Along our present route, however, only the Achakzais were found in any numbers, but a few of the Pópálzais and Bárákzais were also found in the Pishín. As far as I know there is but one Pópálzai village and one Bárákzai village in Pishín, but there are a good many Bárákzais scattered about the valley formerly concerned with the late government there. The Pópálzais of the valley are of the Sadozáí subsection †

The Bárákzais met with in the Pishín are all Muhammádzais,‡ connected in some way with the late government of the valley. Súrdár Khú'shdil Khá'ń of the royal house seems to have been Governor of the

* There is also a low class of Duráníis called Ságzai found in the Archísán valley.

† The Sadozais were the old ruling family of the Pópálzais and under Asád-ul-lám (of the Tribe Andáll, sec. Pópálzai, subsec. Sadozái) threw off the yoke of the Persian at Herát in 1716, soon after Mír Váis, the Ghilzái, began to assert the independence of the Afghan nation. On the assassination of Nádir Sháh in 1747, Ahmad Khá'n, a Sadozái (afterwards Ahmad Sháh Durrání) gradually conquered for himself all Afghanistan 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 Támu'á Shá'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 Súkhás. The brothers who were ruling at the time of Támu'á Shá'h's death were Záma'n Shá'h in Khá'bul,

Háma'ún Shá'h in Kandahár,

Máhmu'd Shá'h in Herát.

Ahrá's Mihrá'zai in Pesháŵur,

Ko'hándil Mihrá'zai in Kashmír.

Of these Záma'n Shá'h and Máhmu'd Shá'h obtained the throne of Afghanistán with the usual bloodshed, and after them another brother, the famous Shá'h Sháhul-ul-Mulk, about 1809. Mahmád Shá'h, however, ousted him and again ruled till 1818, when he was deposed by the Bárákzai brothers, sons of Páind Khá'n, his Wázír, and son of Hájí Jámál Khá'n (a Muhammádzai Bárákzai), the Súrdár who had helped Ahmad Shá'h in the early days of his sovereignty. Since that date the Muhammádzai Bárákzais have fought among themselves for the throne resulting in the victory and sovereignty successively of the Amírs Dost Muhammád Khá'n, Shír Ali Khá'n and Ya'súb Khá'n the Interíruler. In 1839 the first Afghan war, the history of which is of course still fresh in our memories, was undertaken to restore Shá'h Sháhul-ul-Mulk, the Sadozái, to his throne at Khá'bul. The Sadozáis are still highly respected, and the Pópálzais from which they sprung are the most honoured among Afghan Tribes. During the greater part of the Sadozái ascendancy, the ministers were chosen from the Bárákzai subsection of the Pópálzais. The chief other subsections of the Pópálzais as far as I could ascertain are (3) Marsínzáis, (4) Khá'nzáis, (5) Ayúbdzáis, (6) Madozáis, (7) Nó'záis.

‡ The other subsection of the Bárákzais as far as I could ascertain were (2) Achalzais, (3) Sulmánzais, (4) Khunserzáis, (5) Balánzais.
Pishin under Shér 'Ali, 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 Khán (Muhammadzai Báarakzai) 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 Beluchistan, with the fort Khúshdil Khán, to another Nu'r Muhammad Khán, Luga'ri', a Belúch in our service as Názim or ruler.* This Khúshdil Khán's descent was given me locally, thus:

HAJJ JAMÁL KHÁN (temp. Ahmad Sháh Durrání.)

Sir Dá'r Paind Khán (Muhammadzai Báarakzai)

MiHARDíl Khán.

Pu'rdil Khán.

DOST MUHAMMAD Khán,
Amír of Kábul.

MiR Khán.

Mi'YAfzu'l Khán.

Governor of Kandahar, 1878.

SheK Khán,
Amír of Kábul.

KHUSHDIL Khán.

Governor of Pishin, 1878.

YAKU'R Khán,
Amír of Kábul†

* 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-Kahím Khán (Muhammadzai Báarakzai) was his Naib, but on Shér 'Ali's final accession in 1869, Khúshdil Khán lost his government and went to reside in Kandahár, while Nu'r Muhammad Khán (Muhammadzai Báarakzai) was sent to govern the Pishin direct from Shér 'Ali himself.

† Paind Khán's sons by 5 mothers were—

1. Fateh Khán Wazír of Mahmúd Sháh,
   
2. Muhammad Ázim Khán,
   
3. Taimúr Khán,
   
4. Pu'rdil Khán, Governor of Kandahár,
   
5. Sherdil Khán, Governor of Kandahár,

6. Kohandil Khán, Governor of Kandahár,

7. Rahimdil Khán,

8. MiHARDíl Khán.

9. DOST MUHAMMAD Khán, Amir of Kábul,

10. AMÍR MUHAMMAD Khán,


12. SULTÁN MUHAMMAD Khán,

13. YÁR MUHAMMAD Khán,

14. Fír MuHAMMAD Khán,

15. SAYAD MUHAMMAD Khán.

16. NAWÁB ÁsAD Khán,

17. NAWÁB Sama't Khán,

18. NAWÁB JABÁR Khán.
The Achakzai section of the Duránis is the tribe inhabiting the mountains known as the Kh奧أ Amā'n Range, the Tora Plateau, and the Pishin and Kadaniei valleys in part. They are said to have been divided off from the Bārakzaís by Ahmad Sháh, as that tribe was getting too powerful, and I have met Patháns about Kandahár, who classed the Achakzái as a Bārakzai subdivision. The Achakzái are divided into Bahá'durzáis and Gajanzáis.

**BAHÁ'DURZÁIS.**

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<thead>
<tr>
<th>Ghabezáis</th>
<th>Shamuzaís</th>
<th>Bákárzáis</th>
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<tr>
<td>Ka'kozáis</td>
<td>Fá'mzáis</td>
<td>Ishá'nzáis</td>
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**GAJANZÁIS.**

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<th>Alozáis</th>
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<td>Hu'senzáis</td>
<td>Shákarzáis</td>
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<td>Ka'milzáis</td>
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<td>Adázáis</td>
<td>Abdullázaís</td>
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<tr>
<td>Adrakzáis</td>
<td>Ba'zmázaís</td>
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I, however, came across two subsections of Achakzáis not here mentioned called Habi'bzáis* and Abdáls in the Pishin. This name Abdal may perhaps only be the title of the malik or chief as the present Sirdár Mír Aslám Khán Abdal or Abdáli, as also is Madat Khán, the head of an Achakzái village in the Pishin, called after him. All the inhabitants of the last village, however, are called Abdáls.

The next clan we have to deal with are the Tarínás. These are the second of the Afghan Tribes in point of importance and national estimation. Their legendary descent from Kais is clearly made out. Sárabán, 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 Tarínás inhabit the Pishin valley and the Spín Tarínás the country about Tal and Chotiáli. Lumsden subdivides this clan as follows:

* Lumsden, however, makes out the Habi'bzáis to be Tór Tarínás, but as far as I could ascertain, they are Achakzáis.
This list agrees with that given me en route as far as the Spín Tarins are concerned, but as regards the Tór Tarins mine differs considerably. First I would remark that the Hamízaís are, as far as I could make out, Achakzaís and not Tarins at all. Next as regards the Karbélas, who have been hitherto put down as Tarins 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 Tarins, Kákars and Duránis. The local legend regarding their origin is this. In days gone by, a little child by name Karbélá was travelling through the Pishin in a káila. 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 Patháns who had to take refuge in the Pishin from some other distant place. The Khánizaís are divided into Lúr Khánizaís and Dáb Khánizaís according to my information. In the list of Tór Tarins which I collected, the following do not appear in Lumsden.*

<table>
<thead>
<tr>
<th>MALIKAÍS</th>
<th>MANZAKAÍS</th>
<th>KAMÁLZAÍS</th>
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</thead>
<tbody>
<tr>
<td>MÁZEAÍS</td>
<td>HÁRUÍNS</td>
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</table>

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

<table>
<thead>
<tr>
<th>KÁDAZAÍS</th>
<th>NÁOZAÍS</th>
<th>HAMRÁNZAÍS</th>
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</thead>
<tbody>
<tr>
<td>KHÁMAZAÍS</td>
<td>ABDURRAHMÁNZAÍS</td>
<td></td>
</tr>
</tbody>
</table>

* 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 Tarins, after whom they rank, i.e., third on the list of clans, the Kákar claim direct descent from Káis. Firstly, Káis's third son was GURGHUSHT who had three sons DÁNÍ, BÁRÍ 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 SARABÁN Káis's eldest son, on account of family squabbles joined the Kákar and called himself a GURGUSHTAI. Such is the common legend. The Kákars themselves vary it thus. Káis went to Mecca and there obtained the name of PReT KhÁn (elsewhere PIHTÁN). His eldest son SHARÍF-UD-DÍN or SARABÁN had five sons SHÍRÁNÍ, TARÍN, MUUNGí, 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 Kákar under one name. This subverts the other legends which make the Kákars claim descent through GURGHUSHT from KáIS.

The following clans claim relationship with or descent from the Kákars. The GÁKARS of Kashmir along the Jhilam, the TAIMUNÍS (EIMAKs) of Ghor, the FirozkoHí HAZÁRAS (EIMAKs) of HeráT, the KAYANÍS of SEISTÁN,* and lastly the KÁKARS and GHILZÁIS 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 Káis would seem to be doubtful.

* Among the tribes of Tarín descent are said to be the ZAIMUKHTS.
† This would make the PA'NY'ZAIs separate from the Kákars, but they seem to be considered a section of them at the present day.
‡ Whence the BARECHI' Patháns of SHORÁWAR.
§ Usually called Beléchís, 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 TAJÁNes and by language Persians. They are divided into TAIMUNÍs, HAZÁRAS, TAÎMÚRÍs and Zu'ÁRÍs. It may help towards the solution of the Eimak origin to quote the following from Yule's Marco Polo, I, 94. "Contemporaneously with the KARAUNÁHS (or KARAWINÁHS the celebrated robbers of medieval Persia) we have frequent mention of predatory bands known as NIGU'DARÍs who seem to be distinguished from the KARAUNÁHS, but had a like character for truculence. Their head-quarters were about SHISTA', 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 OXKODAI and uncle to MANGKE, KUBLAI and HULÁKA), and that they were a rabble of sorts, Mongols, Turkmen, Kurds, Shíls 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 Márri (Beloch) country. They are divided into two main divisions, the Great Kákers (Lowín Kákai) and the Lesser Kákers (Kuchnai Kákai). As regards the Great Kákers, the present writer had but little opportunity of learning much. They occupy the Zhób valley and apparently are divided into—

Khwaidázais,  
Aktarzais,  
Mursiángzais,  
Mehtarzais,  
Awazais,  
Sargarais.

And probably also the Jalagais, Muśa Khel and Karízais belong to this division.

The Lesser Kákers are divided into Sulimán Khelis; Amand Khelis; Mehtarzais; Pánízais; Bázais; Shamozais; Surgarais; Malagais; Isá Khelis; Sára-ngzais, of which Mulázais and Táháns are subsections; Zakhspels, subdivided into Amakais, Kanozais and Náozais; Dumaras; Után Khelis; and Sandar Khelis, whose known subdivisions are Alázais, Shabozaíz, Muśais, Dargais, Wáháris and Tenizais.* The Kákers about Khunchagai near Mt. Kand, variously called the Sanátí and Símantí Kákers, are I believe the Amand Khel above mentioned. They were, formerly, under the name of Targánís, under Háí 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 Lonái) Khel, about whom very little is known. They are generally supposed to be Kákers by descent, but I should say from what I heard from the Lu'nis themselves and from the Kákers, this is not the case. They call themselves of Dúrání descent, a claim which is allowed by their neighbours. The Hamzázais are the only known subdivision of this Tribe, but there are

1839, 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 Hcrát, whilst in Bábér's time they turn up as Nukdaris fairly established as tribes in the mountainous tracts of Kánu'd and Ghór to the west of Kábúl, and coupled with the Hazáras who still survive both in name and character. Among them, says Bábér, 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 descendents of the Káranas or Nígu'daris or of both, and that the origin 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 Kábúl says, the Hazáras are the remains of the Chagataian army which Mángku Khán sent to the aid of Hulá'ku under the command of Nígu'darár Oghzá'n.

* The Esóts of the De'rájá't are sometimes called Kákers but this is doubtful. Kaśí Kákars are said to inhabit the Sha'íl 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 consider-
ably deserted, and used merely as grazing-ground. Their villages are mostly found in what is called the Lu'ní Valley to the south of the Bórái, i. e., between it and the Tal Valley. All the country from the Bórái Valley east of the Tal Valley as far as the Belóch Border and the Mu’sá Khel country belongs to them, except the small portion occupied by the Zarkhán’s near Chótíáli.

Of the Zarkhán’s nothing more is known except that they are Patháns and not of Kákár, Tarin or Lúní extraction. They are to be found about the mountains to the east and south of Chótíáli, in the Hanokai Pass and Bátá Dhá’ká. The Marris have nearly wiped them out as a race by con-
tinual raids. In Leech’s time* there were three villages belonging to them near Chótíáli, viz., Dost Muhammad, Fazl Khan and Álí Khan, but I do not know if they still exist.

Perhaps the origin of the Lúnis and Zarkhán’s 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. In
deed 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 Patháns. For the Kainiíís about Chattar and Puleji in Káchi, now acknowledged to belong to the Belóch Tribes, are of unques-
tioned Pathán 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’nís, Sandar Khéls and Zarkhán’s to the neigh-
bouring Belóch Tribes of Bar’khó’ám is quite remarkable, and they might well have a common origin with them, especially as the Belóchís can hardly be called a nation, being rather an agglomerate of heterogeneous tribes. Thus the Bar’kho’ís are probably aboriginal, the Gurchánís a Sindian Tribe, the Ránda and Lu’mris probably of Híní (Rájpút) origin and the Gádúrs of Las of Arab descent, while the tribes of Makrán are Arabs, Sikhs, Sindhís, Persians, Jats and what not.‡

* Major Leech’s journeys were made about 1839.
† Hughes’s Beluchistán.
‡ In connection with the probable Turkmán or Mongol origin of the bulk of the Belóch Tribes, the words Túman and Tumándár are interesting. Túman or Tóman was a Mongol division of the army, viz., 10,000, and hence in the Mongol dominions it came to mean 10,000 generally. Wassá’f describing Kínsay (Kingsse’ or Hángchái) states it had “70 Tomans of soldiers and 70 Tomans of Rayats.” Marco Polo states its revenue in Tomans of gold and Fráy Odoric in Tomans of Balish (paper money). Tom or Tma is still used in Russia for 10,000. In Beluchistán Túman means a camp and Tumándár the commander of a camp and thence the chief of a tribe, but whether
While discussing the Pathan Tribes something should be remarked about the Sayads found in every part of Afghanistan 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 Pathans in general. They are not considered Pathans 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 Afghan, they are subdivided in a suspiciously similar manner, and the story of their descent confirms the suspicions as to their separate origin from the Pathans 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.
Ajadzais. Haidarzais.‡

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

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<tbody>
<tr>
<td>I.</td>
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<td>6 Nausazai.</td>
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this is due to the passage of the Mongols through their country on towards Hindustan or to their Central Asian origin does not appear. Yule's Marco Polo, I, 94, 281 and II, 169, 171.—Hughes's Beluchistan.

* I saw one village of them in Bakho'm among the Independent Beluch Tribes.
† According to one legend, the Kardezais are descended from a waif picked up by this Ha'ru'n. See above.
‡ Among the Pishin Sayads faces of a Si'it type are not uncommon, and I saw one woman with purely African features near Alizai. This may result, however, from their wandering habits and be no indication of descent.

I. Dura’ni or Abdali.

1. MUHAMMADZAI.
2. ACHARZAI.
3. SULIMANZAI.
4. KHUNSEZAI.
5. BAIANZAI.

II. Dura’ni or Panpao.

1. Cha’lakzai.
2. BABDIZAI.

III. Nu’rzai.

1. HASSANZAI.
2. ALAKZAI.
3. GWARAZAI.

IV. Ali Zai.

1. HAWAZAI.
2. TEROZAI.
3. MANDARZAI.
4. I’DZAI.

V. Ish’a’kzai.

1. HABIBZAI.
<table>
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<tr>
<th>Tribe</th>
<th>Division</th>
<th>Section</th>
<th>Subdivision</th>
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<td>8 Khugia'ni</td>
<td>1 Ra'ni Khel</td>
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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 references 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 Bhāskara’s Siddhánta-Siromaṇi. “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 Bhāskara’s is manifestly founded on a passage found in Brahmagupta’s Sphuṭa-Siddhánta where we read in the so-called Dūsha-nádhyaya:

भार्ती चतुः पश्चात् द्वै द्वाभिंद्रै जिनेवऽन् यन्।

प्रमाणश्च सार्वच च संवत्स यत्वा तत्सतः।
“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 Pañchasiddhántikā.

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 Sūryaprajñāpī, 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 profounded in the Sūryaprajñāpī shows in many points an unmistakable resemblance with that contained in the Jyotisā-Vedaṅga 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 Sūryaprajñāpī 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 Sūryaprajñāpī, 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 Sūryaprajñāpī, 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 Sūryaprajñāpī than on the text of the latter work itself; which apparently anomalous proceeding finds its explanation in the fact of the Manuscripts
of the Sūryaprajñāpatti, 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 Sūryaprajñāpatti is less inconvenient that 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 Sūryaprajñāpatti; 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 Sūryaprajñāpatti is written in Jaina-prākṛit, and divided into twenty books called prābhārītas, some of these again into chapters, called prābhārita-prābhārītas. The arrangement of the matter treated of is by no means systematic, 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 Jambudvipa; 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 Puráñas, 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 Bharata-varsha 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 Bharata-varsha 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 Aśvini has passed through the twenty-eight nakshatras, he enters, according to the generally received opinion, again into the same nakshatra Aśvini, according to the Jaina opinion into a second nakshatra called Aśvini 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 Revatí and followed by Bharaní, and as at the same time when the sun has entered into the second Aśvini, another sun the exact and indistinguishable counterpart of the former one has entered into the former Aśvini, 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 Súryaprajñapti is based, is the well-known quinquennial yuga or cycle with which we have long been acquainted from the Jyotisha Vedāṅga. The same cycle is described in the Garga Sāmhitā as we see from the extant fragments of the latter work, and we learn from Varāha Mihira's Pañchasiddhántikā that it likewise formed the fundamental doctrine of a Paitámaha Siddhánta which, according to Varāha 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 dushāṇādyāya 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-Vedāṅga manages to maintain harmony between civil and lunar time—continues "and thus the cycle of five years consists of 1860 lunar days or 1830 nyethemera, 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 Vedāṅga, 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 Vedânga itself or—and this is of great importance as the Vedânga is still partially unexplained—in the Sûryaprajñâpî 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 Sûryaprajñâpî 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 30½ 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, year in its turn being divided into twelve months of 30 days each; in the Sûryaprajñâpî this kind of year—commonly known as the sâvana 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 atirâtras. 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 Sûryaprajñâpî on the occurrence of each sixty-second tithi. The details of this process are not stated in the Sûryaprajñâpî, 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 dvitiyâ, second lunar day, but as triirtyâ 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-samyâtsara, 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 Śūryaprajñāpīti to group these months into years nor are they subdivided into days of equal duration; they are simply said to comprise $27\frac{3}{2}$ 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 Śūryaprajñāpīti of the revolutions of sun and moon, we find at the outset that it differs from the statements made by Garga and in the Vedāṅga in one important point. According to the latter authorities (see Jyotisha-Vedāṅga, v. 6; this Journal for 1877, p. 415; Weber, Nakshatras II, pp. 28, 33), the yuga begins with the winter solstice, at the moment when it is new-moon, sun and moon being in conjunction in the beginning of the nakshatra Dhanishthā; according to the Śūryaprajñāpīti the yuga begins with the summer solstice, 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 solstice with new moon marking, according to the Vedāṅga, 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 solstice, 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 Śūryaprajñāpīti 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 Dhanishtá 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 Súryaprajñáapti 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 Aśleshá 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 Súryaprajñáapti 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 Súryaprajñáapti throughout employs twenty-eight nakshatras of unequal extent, while the Vedánga 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 Siromañi (Graha-ganita, Sphuta-sádhikára, 71-74, p. 93 of Bápu Deva's edition) and a parallel passage from Brahmagupta's Sphuta-siddhánta. The former of the two, translated, runs as follows:

“...”
commentary, the Vásaná, where the common names of the nakshatras (Viśákhá, Punarvasu, Rohíní, the three Uttarás; — Aśleshá, Ardrá, Sváti, Bharani, Jyeshthá, Satabhishaj) are given and where Pulíśa, Vasishtha, 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 Súrya Siddhánta, II, 61. 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 Abliṣțit. Bháskara’s statements are manifestly founded on a passage met with in the 14th chapter of the Sphuta Brahmasiddhánta which gives the same details regarding the different extent of the nakshatras, and is introduced by the following verse——

पैलिस्रामकाश्च एकादशे द्वितीय दशम्।
तत्र च चालवथ साइभेंधीतो तेनक्षित:॥

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

And later on——

अथवाद देवांद्रोकधिक बृहस्पतिप्रदेस्य भर्तरि:॥
बहुतत देवायथमुपेक्षा नद्याननम॥

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 Vedánāga 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 afterthought, consequent on the improved knowledge of the length of the moon’s periodical revolution. With regard to the books in which, according to Bháskara 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 Súrya-siddhánta known to us contains no such statement; the Saura-siddhánta of Brahmagupta may have been a different work. We are unable to control the statement with regard to the Romaka, Pauliśa, Vásishṭha-Siddhántas. Of Garga, however, we know from quotations several passages bearing on the point in question: in the first place, the passage quoted by Bhāṭottpala (in his commentary an Varāha Mihira’s Bṛhatsamhitā, IV, 7; see Weber, Nakshatras, I, p. 309), which corroborates Bháskara’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 Bháskara’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, vīz., at the beginning of Dhanishthá and the middle of Aśleshá; for if we calculate the place of the summer solstice by starting from the beginning of Dhanishthá and making use of the unequal extent of the nakshatras, we obtain as place of the summer solstice not the middle of Aśleshá but rather the end of it or the beginning of Maghá.

To return. The special difficulty by which we are met when attempting to compare the places assigned to the solstices in the Sûryaprajñapti with the places which they occupy according to Garga and the Vedánāga on one hand and the Siddhántas 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 Sūryaprajñāapti 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 Vedāṅga and the Sūryaprajñāapti, or rather between the observations of the solstices recorded in the two works. According to the Vedāṅga the winter solstice takes place in the beginning of Dhanisthā, according to the Sūryaprajñāapti in the beginning of Abhijit (which is the place of the full moon on the day of the summer solstice 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 Sravaṇa and Abhijit. Having, according to the hypothesis stated above, reduced the extent of Sravaṇa ( = 13°18) by the 27th part of the extent of Abhijit, which extent is equal to about 4°12, we obtain for Sravaṇa 13°18; to this we add Abhijit = 4°12; the sum vīz., 17°3 indicates the extent of the displacement of the solstice during the intervening period. Allowing seventy-two years for 1° of precession, the length of this period would be about 1246 years. If we therefore knew the absolute date of the Vedāṅga we might state the approximate absolute date of the observation recorded in the Sūryaprajñāapti, 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 Vedāṅga, and we therefore abstain from giving a positive opinion about the date of the Sūryaprajñāapti.

We now proceed to a detailed consideration of the hypothesis by which the author of the Sūryaprajñāapti 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 Sūryaprajñāpīti 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 Sūryaprajñāpīti 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 Airavata-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 Sūryaprajñāpīti 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 Śrāvaṇa, the sun describes round the mountain Meru a circle, the diameter of which is 99,610 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 $5 \frac{3}{5}$ yojanas, so that the distance of the sun, from Mount Meru now amounts to $49,820 + 2 \frac{3}{5}$ yojanas. In the same manner the diameter of the circle described by the sun increases by $5 \frac{3}{5}$ 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
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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 lavañoda, 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 Súryaprajñáapti, is तमाच्छइ or शृंगार्धिति (न); 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 Súryaprajñáapti treats of the increase and decrease of the length of the day. As in the Jyotisha-Vedánga, the length of the day of the summer solstice is estimated at eighteen muhúrtas, that of the shortest day at twelve muhúrtas. 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 $\frac{6}{11} = \frac{2}{3}$ of a muhúrta.

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 Súryaprajñáapti.

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 "immerses" 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 (= diameter 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 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 Bhagavati 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 Bhūshmaparvan 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 dvîpa with the addition of the surrounding ocean intervenes between the two; according to the second two dvîpas and two oceans; according to the third three dvîpas and three oceans. The distance in yojanas is not given. Two more opinions concerning the extent to which the sun enters into the Jambudvîpa are stated; according to some the sun enters on the longest day into half the Jambudvîpa 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 Jambudvîpa nor into the salt ocean, but moves in the interval (apîntarâla) 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 (áyáma 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 "váhalya," 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 Súryaprajñâpti to \( \frac{3}{7} \) 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 Súryaprajñâpti 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 muhúrtas, the whole circle is described by one sun in sixty muhúrtas, 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 muhúrtâ. 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:

\[ \text{Chandaśaḥ सचापां राणेनकास्य नमः: । विष्णुगृहि कुष्ठं च चर्यलिङ्गश्च मधुम् इति.} \]
of which is 315,089 yojanas long, passes in one mūhūrtā through $5,251 \frac{5}{6}$ 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 nycthemerion travel somewhat faster, pass in one mūhūrtā through $5,251 \frac{7}{6}$ 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 $5,305 \frac{5}{6}$ yojanas in one mūhūrtā. 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 Sūryaprajñāpī 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 Sūryaprajñāpī) 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 mūhūrtas out of thirty; from the moment of his rising he will therefore take nine mūhūrtas 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 $5,251 \frac{5}{6}$ yojanas in one mūhūrtā; consequently he travels in nine mūhūrtas over $47,263 \frac{5}{6}$ 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 mūhūrtas only; we have therefore to multiply the amount of his motion in one mūhūrtā 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 Sūryaprajñāpī. According to some teachers, the sun travels in one mūhūrtā 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 Śūryaprajñāpti, 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 Śūryaprajñāpti to amount to eight hundred yojanas. At the beginning of the yuga at sunrise on the first of Śrāvana 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 Viṣṇupurāṇa (II, S), 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 dvípas. 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 Sūryaprajñāpti 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 ākāśā 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 tirthántarīyas 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 (uttishtāti 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 Vishnu 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 शक्ति सम्पत: सत: which he translates "of the sun which is always in one and the same place." But this translation is quite untenable, since the Vishnu 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 Sūryaprajñāpti 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 circles 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 Sūryaprajñāpti 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 $78,333\frac{3}{5}$ yojanas ($= 45,000 + \frac{200,000}{6}$). 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 area of the truncated sector, three of the second kind the exterior arc. On the shortest day we have to take two-tenths 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, svavimānad ārdhvat). 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 (adholaukikagrahamā), 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 $\frac{11}{10}$ 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, 3½, 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 tāpakshetra, 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 $2 \frac{5}{11}$ 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, “bhedaḥatena” 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 Alabasters.
The wheel of the Law.

From Gisidol's
Italian Antiquities
(See No 12.)

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 Súryaprajñāpti 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 Súryaprajñāpti expresses it, the sun begins from the moment he has entered the first circle to move "śānavi śānavi" 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 "kāraṇa" 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 "kāraṇa," 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 Súryaprajñāpti'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 Fategharh 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 Fategharh district, the village urchins 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 carried 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 dises 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.
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 Schliemann's No. 458. On another, No. 6, is what looks like the sign of Saturn or what Dr. Schliemann 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 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. Schliemann'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. Schliemann'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 ½ 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, Archaeological Reports) "to have descended from the Trayastrimsha 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-Thsang in the 7th century A.D. A detailed account of these interesting ruins will be found in General Cunningham's Archaeological 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 Archaeologists 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 Cocconni, 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.”
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 S 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
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 

*pačhisi* 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. Rajendralāha 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 Bchar. 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?
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 XVa, 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 Carlileyle of the Archaological Survey for the readings on the coins.

Plate XVI, Nos. 1, 2. Legend Vaisakha Decasa. 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 Raja 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 Faizabad.

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

No. 7. Satya Mitrasa.
COPPER BUDDHIST COINS.
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 Edjasu. (Tree) Sūgāta-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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PART II.

III. Distribution of the Tribes.

In the above description of the Tribes along the Tal Chotiáli 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 Achakzaís are confined to the region about To'ba and the Khó'ja Amrán range, and the To'rá Taríns to the Pishin Valley. Among the Kákár sections the same thing is to be observed. The Amánd Khe'í occupy the country about the north of the Pishin to Mt. Kand and the Sulimán Khe'í the range dividing the Pishin and Do'f Valleys, the Mehtarzaís all the country to the north of the R. Ro'd Gorge and the Pánízaís 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 Bázaís, Shamozaís, Surgaizes, Malagaís, Isa' Khe'ils and Saha'angozaís amid the surrounding Mentarázais and Panízaís are found in the districts in question. Sayads do not seem to have penetrated into the Kákár country beyond the R. Ro'd, near which there is one village of them, and a few Spín Tarín is said to be about Alízai in the Pishín, but practically there seems to be no communication between the Spín and the To'r Tarín. The Dumars probably occupy all the country to the south of the Sho'r Valley from Mt. Māzīwō to the Tal Valley, but in the Zho'o Valley the tribes seem to be mixed, though the Zho'o Valley Kákars seem to be a section apart and to hang together.

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[B. C. Temple—Route of the Tril Chota'li Field Force.]

[No. 4]
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 Isáf Kách, 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 Duránis, the Tór Tarín and such Kákars as inhabited the Do'f and Gwál Valleys, while the bulk of the Kákars, the Lúnís, the Zárkháns and the Spin Tarín have always been independent. For the purposes of this paper the country will be divided into Amír's Territory and Ya'ghista'N or Independent Territory.

Under the Amír, Government in our sense of the term there was none, though the head of the Government 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 sirdârs. 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 Sirdârs. 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 Sirdârs 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 Sátâd Sa'lo or Urmzâi were passed. It had been but recently destroyed by a more powerful neighbouring village called Sátâd Paind in a quarrel between the two Kháns. The Urmzâis had to fly altogether out of Afghán Territory across the Belo'ch Border to Khu'šla'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 Malîkya'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 Warla'gâi in the Bo'rai valley, where an evidently lately ruined village called Old Warla'gâi 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 Khâns 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. Kâch in the Shô'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'jî Khâ'n (Amand Khê'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'ûn Khe'l, Zarkhâ'n and Spîn Tarîn country on the Afghân side and in Bârkhô'm on the Beloch side, the result of endless border raids. The lawlessness of the Ghilzais along the roads between Kandahâr and Kâbul 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 Zurrmat (Ghizai 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 Kâkar country, and in that portion about Mts. Ma'zhwô and Spiskhâr where the heights are crossed between the Usâ 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 Shô'r and Bûràî 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, Hanokai and Triîkî Kuram passes they may be seen in clusters in many places telling of some fights either among the local tribes themselves or with the Belôchis.

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 Ka'kârs are an abomination to Tarîns and Achakzais and Lu'nîs to Ka'kârs, while the wretched Zarkhâ'n is harried on all sides. The Isa' Khe'l Kâkars and the inhabitants of the Gwâ'l valley manifested an extraordinary fear of the Pa'nîzai Kâkars of the hills to the east of them. Sandar Khê'l Kâkars could not be induced to venture into the neighbouring Lu'nî territory and I did not personally meet a man who had been towards Chazni by the To'ba Plateau or along the Tal Chotiaíi Route. A guide

* Macgregor's Gazetteer.
from the Do'f Valley an Is'a Khe'l, showed the liveliest anxiety to get back again from Ispira Ra'gha and would not venture into the Zakhpe'l Territory and an old Utma'n Khe'l guide told me he had never ventured beyond the territories of his section of the Kákas.

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, Sandar and Lu'ni Khe'l's 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 Khánizai Ka'rez 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 Achakzaís have a bad name as thieves and robbers.

Government among the Duránís differs considerably from that of the other tribes, noticeable chiefly in its regularity and order. Each section of the Duránís is governed by a sirdar and each subsection by a Malik or Mushir. The principle is election qualified by hereditary claims, i.e., the sirdar is elected from the chief family of the clan or section, and the malik from the chief family of the subsection. The sirdar has a deputy or naib always a near relative appointed by himself. Their occupation of the land is directly from the Amir on the condition of military service. Among themselves the Duránís 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 sirdar, by the inter- position of the elders, by friends of the parties, by the priests (Mullas), or by the civil and ecclesiastical judges (Ka'zi's). The Achakzaís, the section of the Duránís 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 Amrán Range about the Kadanei and Pishin Valleys during the winter, where their black tents or Kizhdaís are to be seen everywhere. Their Sirdar is at present Mir Aslam Khán, son of Mir Abdulla Khán who built the well known fort or village of that name at the Pishin entrance of the Kho'jak Pass.

The Kákas and Independent Patháns do not apparently recognise any particular sirdar 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 Khā'ın of the Lu'nis, now their leader, is the son or near relative of Pānda Khā'ın their late ruler. Sha'īn Jehā'ın of Khasnō'b (Zho'b valley) is a great man among the Kākars and Gwarat Khā'ın among the Sandar Khē'īl.

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 Afghāns 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 Kashmir. 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 Kandahār. The Afghāns 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 Duránīs show as usual a considerable superiority over the other tribes. The following was found to be a fairly true description of their dress.§ "The Duránīs about

* Maegregor's Gazetteer.
† A thick white material like felt for the outer cloak is common about Kandahār and the Pishin, and to this is often added a "pōshţīn" or coat of skin with the hair turned inwards.
‡ The cloaks about Kandahār and all over the South have frequently long false sleeves reaching nearly to the ground.
§ Maegregor'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 shep-
herds, 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, Tarín and Kákars, etc. met with en route
there is little to be remarked except that they all wore the unmistakable
Afghan dress. In the more civilized valleys as the Pishin, Dóf, Gvál,
Ghazgai and the Bórai the dress was better and more respectable answering
to the above given description of the Durání dress.* But in the hill dis-
tricts especially in the elevated region about Mt. Mázhwó the dress mere-
ly appeared to be a collection of dirty rags, the remains of what was origin-
ally the national costume. The Pánízais, Mehtarzais, Sarángzais,
Amand and Sultán Khéls, Dumars and Zakhpéls among the Kákars
bear off the palm for dirt and squalor. The Isá, Utmán and Sandar
Khéls 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'í 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 con-
structed 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 Kadoanei Valleys.

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

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

Fig. 6. Kákar Hut. Upper Gorge.

Fig. 7. Mt. Syájgai, 9,000 feet (a landmark in the Shór Valley near Chimján) from Khowa looking East.

Fig. 8. Zakhpél (Kákar) Hut. Shór Valley. Chimján.
where to the west of the Khô'jâ Amrân Range. These are square dwellings of mud (kachcha) 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 Afghanistan (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'n 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'rushtikâ, Khwâra and Chimjân, a hut very similar in appearance to that of the lower Ro'n 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 Shô'r and Zhô'n 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 (kaechhá makán) are built simply of wet mud (gondhá) without foundation (bunyád), then smoothed over with liquid mud (kaigal) and finally covered with a wash of cowdung and mud (göbrí) and often also with whitewash (sufédi) or a coloured lime-wash (rang). The roof (ehhat) is of rafters (khárd) covered with a light reed thatch (sirkí), plastered over with mud or earth (mitthí) and cowdung (göbri).

† 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. China Ko’t in the Bo’raï 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’l. 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 Salmán and Amand Khe’ls of the Pishin and the bulk of the Pánizais, Dubani, and Zakhpe’ls; even the more fixed and agricultural sections of the Kákars, as the Sandar and Utman 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 Kizhdaï, which has been thought peculiar to the Duránis, but as far as I could ascertain, it is common to all the nomad sections whether Durání or Kákar. The Kizhdaï 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 Kizhdaïs 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 Kizhdaïs 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’raï 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. Bhusa (chaff or chop-

* J. R. G. S., 1880.
ered 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 Sirdârs or of the Amîr.

Secondly, Asyâs or watermills are noticeable objects everywhere. Their general features have been frequently before described, as they are common to Afghânistân, Persia and Turkistân, 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 Ku‘l 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 Alîzâi in the Pishin, long lines of Asyâs 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. Afghânistân, especially in the direction of Ku‘ls or artificial water-courses, of Kârzâs or underground water-courses, and of groins and river dams. Wells are not seemingly in use for cultivation as in the Panjâb and Persia. The Ku‘l 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. Afghânistân, where along the Tânk 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 Kâchî Plain of Belúchistân. 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 Bârâi Valley I observed a Ku‘l carried under the stony bed of the R. To‘e Khaize‘ by a rough but practicable syphon.

* 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 Ku‘l.
Fig. 9. Utmán Khél (Kákar) Hut. Ghazái Valley. Ningánd.

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

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

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

SKETCHES FROM AFGHANISTAN.
The Kāre'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 Kermān (Kirmān)", 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 subterraneous canal (called Kanāt and Kāre'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 Kirmān 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 Kāre'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 Kāre'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 Kāre'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 Kāre'z is the prevention of the rapid evaporation the water would undergo in such a climate if freely exposed to the air. Kāre'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 Kàrèzès is the shifting of the subterraneous water lodgment, and it is not uncommon to see parallel lines of Kàrèz' wells close to each other. Kàrèz digging is a special occupation, the Ghilžais being famous for it.

The system of irrigation by tanks or open reservoirs so successfully used in Māisūr and many parts of the Madras Presidency is only sparingly used in Afghanistán, and I only observed a few small irrigation tanks in the Pishin and Kādānī Valleys, though from the universal presence of uneven country in Afghanistán it would appear that the Māisūr 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 Ṭhā'n and in the Shō'ān Valley in the neighbourhood of Chimmān 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 Kākār 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 Afghanistán and sold all over India by Patháns as Mābiz or Mābib, is to be found in the Do'īr Valley in highly cultivated lands deeply furroughed 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'īr 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-Pul 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 Ye'su'tzais and other such Patháns as inhabit British Territory. I saw the body of a Subahdār of the 26th Panjáb Native Infantry who had died at Quetta being carried down the Bolān Pass to be buried in the Peshāwar District, and on the Panjáb Railways
there are special rates and arrangements for the carriage of corpses. On the other hand among the Pathans 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 Pathan should be buried by the tomb of the Pir or Saint he followed in life, at whatever distance it may be. This accounts for graveyards on the summits of mountains, as on Mt. Khwaja Amran in the Gwaja Pass, and in the Trikhi Kuram and Balkai 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 Zummat 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 Topobarthi Valley near Mt. Mäzhwö in the highlands separating the country of the Zakhpels and Panizais, 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 Gurkhas in passing these Pathan cairns throw stones on them from sheer habit.

The Luntis form little pillars of rough stones to mark the spots of victories over the Beluchis, 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 Haruns (Tamins) on a hill called Shre' Khilla deserted about 60 years ago; and near Samalzai, not far from Khushdil Khan, a small artificial mound with some fortifications on it like those at Quetta, with which it has probably a similar origin. It is called Spin Khilla (White Fort) but has apparently no local history. The only distinctly historical traditions which the Kákars appear to have relate to Nádir Shah's time, i. e., only a century back, and in the Bo rái all

* The Zakka Khel's, a wild troublesome tribe about the Khairbar, who have a bad name, are said to have stolen a saint from the Yúsufzais and murdered him to obtain the Pir 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 Bó'ráí Valley and along the route thence, via the HANUMBÁR, TRÍKH KURAM and HÁN Passes, towards BÁRKHOM 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 SHAH'S army, but as this was an old KÁTILA route, the present one via MEKTAR being not far distant, it is as likely that the presence of the remains is due to this as to NÁDIR SHAH'S march in this direction; it is, however, more than likely that he and his successor AHMÁD SHAH, 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 DUMÁRS, ZAKHPE'LS, PÁNZÁIS and AMAND KHE'LS bear off the palm for wildness, and their civilization is merely nominal. The ÚTMÁN and SÁNDAR 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 LUNI 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'LS or SHAMOZAI Kákár is to be found, who has been in Karachi 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 Geological collection he made in the districts under discussion.
SKETCHES FROM AFGHANISTAN.
women and children in the villages passed by the army, the knowledge of Hindûstânî, 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 Sayâds, than among the Tarîns, though many of these speak Hindûstânî fluently, as also can some of the Do‘r and Gwál Valley Kâkars. Many of the so-called Pathâns who travel to all parts of India and even to Burmah selling horses are Pishin Sayâds, some of whom make it a yearly practice to do so, keeping regular agents at Bangalu‘r (in Maisû‘r) and other horse marts. When the field telegraph was first opened at Gâlistán Kârê‘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 Sayâds and Tarîns, 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 Pushito* in dialects not, however, differing so much from the standard Pushito of our army as to prevent the soldiers from being readily understood. Its most prominent feature, the excessive gutturalness, seen in such words as Ghwazî, ÚkhuMughdî, Zhizhâ Tangâî, is apparently such as is commonly to be found in the language, as also are the harsh cerebral ŋ, ņ and ř, 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.‡

* Or Pukhto. Kh (خ) and sh (ش) are convertible sounds in the language.
† This is especially the case in the Bo‘hai Valley and in the country approaching the Belôch Border. But this might be due to the propinquity of the Belôchhi dialects in which ŋ and ŋ are very hard.
‡ All such interchanges are valuable for comparing and identifying the names given by various authors to places along the same route.
Changes of Z.

**into d.**
- **Dargai** = **Zargai** : **Manzakai** = **Mundakai** : **Sandar Khe'li** = **Sanzar Khe'li**

**into z.**
- **To're Khaize'** = **To're Khaide'**

**into zh.**
- **Zawar** = **Zhawar** : **Zadum** = **Zhadun**

**into g.**
- **Mulazai** = **Malagai**

Changes of R and R.

**r into r.**
- **Bo'rai** = **Bo'rai** : **Wariagai** = **Wariagai**

**r and r into l.**
- **Multat** = **Murtat** : **Kala** = **Kire'** = **Kile'**

- **Shnagal** = **Shnaghai** = **Shnaghal**

**r into d.**
- **Khwara** = **Khwpa**

**r into zh.**
- **Kizhrai** = **Kirdai**

Changes of D.

**into g.**
- **Angand** = **Ngang** = **Nigand** : **Syajgai** = **Syajdal**

Changes of G.

**into k.**
- **Ko't** = **Go't**

**into gh.**
- **Shnagai** = **Shnaghai** : **Gwand** = **Gund** : **Gundamarai**

Changes of KII.

**into k.**
- **Ksho'it Kare'z** = **Khsho'it Kaire'z**

**into gh.**
- **Igbarg** = **Ikhbarg**

Changes of F.

**into v and b.**
- **Isaf** = **Isab** = **Isav**

Changes of B.

**into p.**
- **Alab** = **Alip**

Changes of S.

**into sh.**
- **Lastai** = **Lashtai**

Changes of TS.

**into ch.**
- **Tsamaulang** = **Chamalang**

Changes of V.

**into w.**
- **Vata'kri** = **Wata'kari**

Instances of the loss and addition of consonants are:

- **G.** **Pla'ngzhara** = **Pla'nzghara**
- **D** and **G.** **Anga'nd** = **Niga'n** = **Nga'ng**
- **R.** **Dumar** = **Duma'** : **Bagha'wa** = **Baghawar**
- **K.** **Lashtai** = **Lashtkai**

And instances of the transposition of syllables and consonants are:

- **R.** **Surghwand** = **Sragh'nd**
- **Gh.** **Ghobargai** = **Oghbargai** : **Zaghlu'n** = **Ghazlu'n**
- **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, KHI, 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 Khairbaris 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, UZHDO, MA'ZHWO. And also the common termination ai (written by Raverty aey) which is sounded with a closed mouth and sharply as one syllable, though it partakes of the nature of two; thus, ai. 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. ANGÄND = INGÄND: KAZHDAI = KIZHDAI: KALA = KÍLE' = KÍLE': TSAMULANG = CHIMAŁANG: ALAB = ALIP.

a into u. MULAZAI = MALAGAI: MANZAKAI = MUNDAKAI.
a and á into au. TSAMULANG = CHIMAŁANG = CHIMALANG.

Changes of AL.
into i and o'i. ZAI = ZO'I = ZÍ: LÁKAI = LÁKI: BO'RAI = BO'RI: LÚNAI = LÚNI: DARGAI = DARGI.

into a. MANGAL = MAINGAL.

Changes of U.

into o. LÚNAI = LO'NAI.

Changes of I.

into e. I'SAF = E'SAP.

Changes of WA.

into ou. WARIÁ = URIÁ.
into u and au. GHWAND = GUND: WARIAGAI = URIAGAI = URIAGAI.

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: ADIZAI for ADIZAI: BÁNZA for BÁZAI: Ajjí KHA'N for HA'JÍ KHA'N: HANUMBAR = ANUBAR: ANGÄND and NINGÄND =
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 خواب 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+AB; red water): SURHWAND and SURGHAN.

Before leaving the vowels a curious insertion of y in the following word is worthy of remark. CHÓ'TIA'LI is locally CHÓ'TALAI: ZAKHPET and ZAKHPEY'I are synonymous and so are SYA'GAI 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 = NGO'NJEH, NIGA'NJEH, NIGA', INGAN, NINGA', NGA'NG, NIGA'ND, ANGAND, NGO'NDEH.*
2. MUZARAI = MZARAI.
3. AJJI KHA'N = I'AJI KHA'N.
4. GWÁ'JA = KHWÁ'JA.
5. SKAN = ISKAN.
6. ZAI = JAI, JÉ, ZO'I.†
7. ZHO'B = JÖ'B, YÖ'B.
8. ISAF KACH = ISAB KACH, ÉSAB KACH, É'SAF KACH, YÚSUF KACH.‡
9. KHARZANGAI = KHABARZANGAI.
10. ALLA'ÍDA'D = KHA'LAKDA'D.§
11. KHUSHLA'K = KHULILA'K.
12. KIZHDAI = KIRDÁI, KAZHDÁI, KIZHDI.||  
13. KALA = KILE', KI'RE', KÔ'R.||
14. SURKHWA'B = SURKHA'B.
15. KHUNCHAGAI = KHUNJAGAI.
16. GO'T = KO'T,||
17. KUSHO'Í KÁ'RE'Z = KSHO'Í KÁ'RE'Z.

* Jeh is for Deh, a village. These words represent the Lúr ANGÁNG and KÉZ ANGÁNG of the map (Do'f Valley).
† To show pronunciations of aí: this is a termination not a word.
‡ These names arise from the confusion between Isav and Yusuf (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.
19. Ighbarg = Ikhbarg.
20. Amadún = Amandún.
22. Zadún = Zhadún.
23. Mangal = Maingal.
24. Ba'zai = Banzal.
25. Surghwand = Surgha'n, Surgha'nd, Sragh'and, Surghan, Surghand, Sraghand.
27. Waría Kach = Auría Kach.
29. Mulazai = Malagai.
32. Dumar = Duma'j.
33. Sya'jgai = Sya'dgí, Sya'dgai, Sa'zai, Sya'jdaí, Sazdal.
34. Khwa'ra = Khwa'da, Khwa'r.
35. Zaghlún = Ghazlá'na, Ghazlún.
36. Dargai = Zargai, Dargí.
37. Ghundamarai = Gundamarai.
38. Ghwand = Gund.
40. Surmastaili = Surmas'tali.
41. Bai'a'nai = Bia'ní.
42. Sandar Khe'l = Sanzar Khe'l.
43. To'r Khaize' = To'r Khaide'.
44. Cho'tial = Cho'tial.
45. Bo'ri = Bo'rai, Bo'rai.
46. Lashtai = Lastai, Lashtkal.
47. Waria'gai = Waria'gai, Uria'gai, Auria'gai.
48. Hanumba'r = Anuba'r, Anumba'r, Hanuba'r.
49. Múltat = Murat.
50. Lúni = Lo'nai, Lúnaí.
51. La'kai = La'kí.
52. Tsamaulang = Chimalang, Chamalang, Chamaulang, Cha'malang, Cha'malang.
53. Alab = Alip.
54. Sobá'h = Sobá't.
55. Bagha'wa = Bagha'o, Baghawwa'r.
56. Vata'kri = Wata'kari.
57. Zarkha'n = Zwarkhán.
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 hazardous:

1. **Tangai** means a gorge or pass, so **Spîr Tangai** would be the White Gorge (Spîr for Spîn) and **Tûr Tangai** the Black Gorge (Tûr for To’r.)

2. **Ghund** is round, globular and the **Ghund Peak** would mean the Round Hill, and Mt. **Surchwand** the Red Round Hill. Again **Ghundra** 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. **Sîrek Khila** would be the Inn or Caravanserai Fort. It was the old rendezvous of the Hárún Tarins 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 ژک a yard-measure or the Tamarisk Hills from ژگ 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. **Surkha’b** is the Red River.

9. **Zarghûn** 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. **Lûr** means Upper and Kûz, 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 Spîn Ghwazh, (?) the White Ear Hills. **Zhwazh** means the murmuring of a brook and may be the deriv-

* A corruption of Káli Chûppri the Belôeh name for the same place with the same meaning, viz., Black Rock. Thus **Tâkh 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 **Hamshullah**, Khûshdil 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 Kanda broken ground.

14. Mt. Pil from its fancied resemblance to an elephant, Pil or Fîl.

15. Sharan Kâ'irz and Sharan occurring two or three times and once as Shê'rin, are probably for Shîrîn, sweet.

16. Sûr of Surai is red and is met with in several words. Surai also means a passage and the so-called Suraïri Pass (the Surai Pass of my maps) is for Suraï Narâi, the Slender Passage. Cf. also Laindai Surai (?) the Lower Passage. Mo'Mand Sarâi (?) the Momand's Passage.

17. The word Ghirîg, as in Oghirîg, Ichirîg, Ighirîg and in the plural forms Ghobargai and Oghbargai, 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 Naraghîrîg Hills may mean the Narrow Valley Hills.

18. Ro'd means merely a river: Ro'dbar, a valley stream.

19. Kshâi means in, between, etc. and Ksho'î Kârez might mean the Middle Kârez.

20. Khwara is probably for Khwara, a sandy stream-bed, as several such beds debouche into the Shor valley at the spots so named.

21. Sagâr, Srâghâr, Sarîghâr, Surghâr all common names mean the Red Hills (Sûr + Ghar). So the Sagardand Pass would be the Red Hills Pass.

22. Surkai Zangal is the Red Forest.

23. Darga, 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. Gorkhal is applied to a mountain stream and its defile and may mean rattling, noisy, as Garkal 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.


27. Uzhdô, the name of a peak, is apparently the plural of Uzhd, Uzd and U'kd, long, lengthy, stretched out.


29. The Mo'sai Pass may derive its name from Mo'sai, a child's marble, a round stone, or from Mo'zt', 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-
31. Sho’r which constantly appears as a name is probably for Sho’ra or Khö’ra, saltpetre, nitre: a common property of the soil along the route. It appears again in So’r Kūram, the Salt Springs.

32. Sin’ā Khōrāl occurring as a synonym for Sinagha’l, a village name, would mean a Mastic Eater.

33. Tri’khī is salt, bitter, and appears in Trikha’dagh, the Salt Hills-side, if Da’gh is for Ta’k, or the Salt Plain, if Da’gh is for Da’e: and in Tri’khī Kūram, the Salt Springs.

34. Chappar or Tsappar, a corruption of Hind. Chappar 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. Spinkelhār, the White Hill; Spē’ra-ghar Hills, the Grey Hills; Tang Ghar, the Narrow Hills. Zhar, appearing in several hill names, is probably for Ghar: Zarfatīa Peak, the Sunny Peak, Pla’nzhara Hills, the Broad Hills; Zaruband Peak, Hills End, is given to the last hill of a line in the Sho’r Valley.

37. Ispira Ra’gha, the Open Meadow (Sparai + Ra’gh); the place is an open spot near Mt. Malaviwō. 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. Surtak Peak, the Red Precipice.

41. Male’e’wa Peak (?) The Camel Saek (Malau).

42. Lāndai Peak, the Lower Peak.

43. Pla’n Springs, the Wide Springs.

44. Khunti 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 Uchshalan’ Springs. (?) The Upper (ū) Springs.

48. Baghu To’r Peak (?) The Black Bogie. Bagū is a bugbear, bogie.

49. Ba’la Dha’ka (?) The Upper Plain (da’g).

50. Hanokai is probably a diminutive of Han, the two passes being near each other.

51. Toghai, a river name, is Turkī 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-Pūl is such a name, Mein Manda is another; villages 10 miles apart are called Takht-i-Pūl and Mein 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, Barakzai; (3) after the subdivision, thus, Khunse'zai or Mohammadzai, (4) after its late owner if recently dead, (5) after its present owner, thus, Kalā-i-Nūr-ud-Dīn Khan merely means Nūr-ud-Dīn Khan'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 Amīn Kala in my map of the Arghisān valley was named to me as Barakzai, Mohammadzai, Amīn Khan and Lattif Khan. Lattif Khan is its present owner: Amīn Khan was the late owner, Mohammadzai is the subdivision and Barakzai 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 Tarīn and Kā'kār country. Thus in the Pishin, Gangalzai and Shamdad are names for the same place, and so are Urumzai and Sayad Sa'lo and also Brijān Kala and Auliya Kala. Several villages are called Brahzmzai, viz., Sayad Do'ist Mohammad, Sayad Khama'ndai, Sayad La'l. Three are called Lūr (Upper) Khā'ni kazai, viz., Mohammad Sa'dik, Va'kul, and La'l Mohammad and two Bagarzai, viz., Sayad Alab and Sayad Paiyo; two Ya'singzai, viz., Sayad She'rībat and Sayad Tōti. The more specific are the malik's (or owner's) names. In the case of the Brahzmzai villages, that of Do'ist Mohammad may be called Brahzmzai 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 Angā'ng or Nanga'nd are found to be locally Lūr and Kūz Angāng, Upper and Lower Angā'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 Talrai (Iṣā Khe'ī) and

Tlarai (Mehtarzai). In the Bo'rai valley, however, Wazia'gai and Khánkai seem to be general names for groups of villages and we have two Múrs and two Wahár's. 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, Chima'ân, Kach, Bál'naí in the Shó'r valley, and in still wilder regions Nangalúna, Tó'pobargh, Tríkh Kúram, Tsamaulang and Bál' Dha'ka. Towards the Belóch Border double names, the Pathán and the Belóch are met with, as To'í Tsappar and Ka'í Chuppri, both of the same meaning, the Black Hill: and Bál' Han Kund (Pathán) = Bání'wa'la' Kach (Belóch).

Some names are corruptions and abbreviations; such as Sayad Sálo and Sa'íyad Átu probably, and perhaps Skán and Iskán for Alexander (Iskandar): Ajjí for Há'í: Samálzai for Isma'ílzai: Bahámzai for Ibra'ímizat: Alím and Aláb for Hálab (Aleppo): and perhaps Sopa'ízai for Isfahánízai.

*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 Mútát in the Bo'rai valley.*

Before leaving this point I would remark that across the Belóch Border in Bárkho'm (or Bárkha'n) a similar if not a greater confusion of nomenclature exists. Thus the place called Luga'ri Bárkha'n is also called Bangala': Hasný Ko't = Ta'íkh Shahr: Cha'íhe'n = Bábúl Khán ka Ko't of Shahr: Na'índha' = She'íkh Ko't while all the Na'hár villages are sometimes grouped as Na'íhár Ko't, and finally the valley itself is variously called Bárkho'm, Bárkha'n, Luga'ri Bárkhan, Lúndí'a'n and Kaho.

Having now explained as far as possible the reasons why the nomenclature of travellers* along the same route in Afghanístán 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.†

† The works referred to in the comparison are Notes on the Survey Operations in Afghanístán in connection with the Campaign of 1878-9 by Major Waterhouse, J. A. S. B. 1879. MacKenzie's Routes in Asia, Sec. II, Afghanístán. Macgregor's Gazetteer, Afghanístán, Leech's Route: Derá Ghází 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.
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Bahan Kund  | Bahanwa'la' Kach  |  |  | Ba'hanwa'la'ka'ch  |  
Barboz Hills  | Barboz  |  |  |  |  
Bagha'o  | Bagha'o  |  |  |  |  
Srachar  | ? Shinghar  |  |  |  |  
(ulti Valley)  | ? Sanghai  |  |  |  |  

II.—Tal, Chotiali, and Neighbourhood.

---|---|---|---|---|---
Chotiali  | Chotiali  | Chotiali  | Chotiali  | Chotiali  | Chotiali  
Kolu  | Kolu  | Kolu  | Kolu  | Kolu  | Thal.  
Tal  | Tal  | Tal  | Tall  | Tall  | Thal.  
Ra'la  | Ra'la  |  | Ra'ha  | Rehi  | Rehi.  
Bagha'wa  | Bagha'o  |  | Bagha'o  | Bagha'o  | Bagha'o.  
Samalan  | Samalan  |  | Samalan  | Samalan  | Samalan.  
Shinla'z  | Shinja'zai  |  | Shinla'zai  | Shinla'zai  |  
Sinza'vai  | Shinja'vi  |  | Shinja'vi  | Shinja'vi  | Saga'we.
### III.—Bórai Valley and Neighbourhood.

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### IV.—Shór Valley to Pishin Valley.

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V. — Pishin Valley and Neighbourhood.

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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.

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On the Śûryaprajñâpti.—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 Śûryaprajñâpti 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 tîrthân-kâras 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 815) 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 uttarâyana and a dakshinâyana, 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 Śûryaprajñâpti, 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 nakṣattra month = 27 days, 9 $\frac{2}{7}$ muhārtas. 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 nakṣattra 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 uttārāyaṇa, describes the thirteen circles intermediate between the outermost and the innermost ones and enters into the fifteenth (innermost) circle, through $13 \frac{13}{67}$ 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 $13 \frac{13}{67}$ 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-kṣetra 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-kṣetra 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 Sūryaprajñāpīti). The diameter of the moon herself is estimated at $\frac{56}{61}$ yojanas, the interval between consecutive circles described by the moon at $35 + \frac{30}{61} + \frac{4}{7} \times \frac{61}{61}$ 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
\[\left(509 \frac{58}{61}\right)\]

as the whole vikampakshetra during one lunar half month. Here—as likewise above with reference to the sun—the Sūryaprajñāpti 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 Sūryaprajñāpti 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 vikampaka-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 vikampaka-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-samīśrāṇī," 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 Sūryaprajñāpti 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 34 34—

which is to be used for the calculation of each parvan, is equal to

\[ 1 + \frac{4}{67} + \frac{9}{31 \times 67}, \text{ viz., of one of the circles described by the moon.} \]

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 \(\text{(viz., } \frac{13}{67}\)\), 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 inner-
most 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, mühúrta, 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 nak-
shatras—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 (tárál) faster than the nakshatras. It is need-
less 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 Sūryaprajñāpti as far as we can judge from the commentary.

The next point to be considered is the information the Sūryaprajñāpti 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 ahorātra = thirty muhūrtas; to this class belong Revati, Aśvini, Kṛttikā, Mṛgaśīra, Pushya, Maghā, Pūrvaphālgunī, Hasta, Chitrā, Anurādhā, Mūla, Pūrvābhīṣṭhā, Śravaṇa, Śravīṣṭhā, Pūrvabhadrapadā. The one ahorātra for which the conjunction lasts may be expressed as $\frac{2010}{67}$ muhūrtas, 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 muhūrtas $= \frac{1005}{67}$ muhūrtas; to this division belong Satabhishaj, Aślesha, Bharaṇi, Jyesṭhā, Ārdrā, Svātī. To the third division belong those nakshatras with which the moon is in conjunction for one and a half nycthemeron = 45 muhūrtas $= \frac{3015}{67}$ muhūrtas; these nakshatras are Uttarābhīṣṭhā, Uttaraphālgunī, Uttarabhādrapada, Punarvasu, Viśākhā, Rohiṇī. The fourth division comprises one nakshatra only, viz., Abhijit, with which the moon is in conjunction for $9 \frac{27}{67} = \frac{630}{67}$ muhūrtas. We see now for what reason the time of conjunction has been expressed throughout in sixty-sevenths of a muhūrta; 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 muhūrtas; 6 days, 21 muhūrtas; 20 days, 3 muhūrtas; 4 days, 6 muhūrtas.—According to the space the nakshatras occupy they are either sama-kṣētra, occupying a mean (medium) field or apārdhakṣētra, 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 therefore 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 $9 \frac{27}{67}$ muhûrtas later, that is, in the afternoon and so on. Other difficulties will appear from the following detailed reproduction of the Sûryaprajñapti's account concerning this point. The nakshatras are either "púrvabhâga" i. e., such as enter into conjunction with the moon during the forenoon; or "páscádbhâga" i. e., such as enter into conjunction during the afternoon or "naktambhâga" i. e., such as enter into conjunction during the night or "ubbhayabhâga" which term will be explained further on. The nakshatras of the two first classes are the samakshetras, those of the third class the apárdhakshetras, 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 apárdhakshetras 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 Sûryaprajñapti appears to be "Abhijit and Sravana are páschádbhâga samakshetra." To this the commentator rightly objects that Abhijit is neither samakshetra, since it occupies only $9 \frac{27}{67}$ muhûrtas of the moon's periodical revolution, nor páschádbhâga, 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 páschádbhâga, because it is always connected with Sravana to which both these attributes rightly belong, or that it may be called páschádbhâga 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 S'rabana, after having finished their conjunction with the moon, hand her over to Dhanishtá at evening (Abhijit-sravana vde nakshatre sáyam-samayád árabhya ekám rátrim ekam cha sátierekam divasam chandreñca sárdhám yogam yuktah ctávantam kálam yogam yuktvá tad-anantaram yogam anu-parivartayatah átmanaś chyávayatah yogam chánuparivartya sáyam divas-asya katitame paschádbháge chandram dhanisbháyah samarpayatah). For this reason Dhanishtá also is paschádbhága. After having been in conjunction with it for thirty muhúrtas the moon enters Satabhishaj at the time when the stars have already become visible (parishphutanakshatramanda-lávaloke); Satabhishaj is therefore naktambhága. How Satabhishaj enters into conjunction at night, while exactly one ahorátra before Dhanishtá has been said to enter into conjunction during the afternoon, is not explained. Satabhishaj being apárdhakshetra, the moon remains in conjunction with it for fifteen muhúrtas only and enters on the next morning into conjunction with Púrva-proshthapada, which being samakshetra remains in conjunction during one whole ahorátra. On the following morning the moon enters Uttara-proshthapada, which therefore would be púrvabhága. But the matter is looked at in a different light, Uttara-proshthapada is dvyárdhakshetra, i. e., remains in conjunction for 45 muhúrtas. If we now deduct from this duration the fifteen first muhúrtas and imagine Uttara-proshthapada 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 kilottarabhátradápyam nakshatram uktraprakárcena prátaś chandreñca saba yugam adhihachchhati, kevalam prathamán páñeha-daśa muhúrtán adhikán apaníya samakshetram kalpayitvá yadá yogas chintyate tadá naktam api yogo 'stíty ubhayabhágam avaseyam). Uttarakshárapada remains in conjunction for one day, one night and again one day, on the evening of which the moon enters Revatí; Revatí is therefore paschádbhága. After it has remained in conjunction for one nychtheme-ron the moon passes into Asvini at evening time. Asvini is therefore likewise paschádbhága. From it the moon passes on the next evening into Bharapi, at the time, however, when the stars have become visible and night may be said to have begun; Bharapi is therefore naktambhága. Being at the same time apárdhakshetra, the moon leaves it on the next morning to enter Krittiká, which therefore is púrvabhága. On the next morning the moon enters Rohini which is dvyárdhakshetra and, on account of that, ubhayabhága. Mrígaśiras which she enters forty-five muhúrtas
later at evening is páschádbhága; Ardrá which enters into conjunction thirty muhúrtas later, at the time when the stars have come out, is naktambhága; Punarvasu into which the moon enters on the next morning, being dyardhá, is uhhayabhága. Pushya comes into conjunction on the evening of the following day and is páschádbhága; Aślesha thirty muhúrtas later, when the stars have come out, and is naktambhága; Maghá and Púrvaphalguni into which the moon enters on the mornings of the two following days are púrvahága; Uttara-phalguni which comes into conjunction on the morning after that is uhhayabhága, because it is dyardhakshetra. Hasta and Chitrá enter into conjunction on the evenings of the two following days, before night has set in, and are therefore páschádbhága. Then again follows one naktambhága nakshatra, viz., Sváti which enters into conjunction after nightfall, and upon this a dyardhakshetra and consequently uhhayabhága nakshatra, viz., Viśákhá. Then Anurádhá páschádbhága, after this Jyeshtá, 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 dyardhakshetra, reckoned among the uhhayabhága. It remains in conjunction for one nycthemeron and the following day, in whose evening the moon arrives at Abhíjít 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 Súryaprajñápti, 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, \textit{viz.}, Mṛgāśiras, Ādṛā, Pushya, Āśleṣhā, Hasta, Mūla always stand to the south of the moon whenever she enters into conjunction with them. Twelve nakshatras—Abhijit, Sravaṇa, Dhanishṭāḥ, Satabhishaj, Pūrva-bhādrapadā, Uttara-bhādrapadā, Revatī, Āśvini, Bharaṇi, Pūrva-phālgunī, Uttara-phālgunī, Svāti always stand to the north of the moon. Seven nakshatras—Krīttikā, Rohiṇī, Punarvasu, Maghā, Chitrā, Viśākhā, Anurādhā—sometimes stand to the north of the moon entering into conjunction with them; sometimes, however, the moon enters into conjunction with them “pramardarūpeṇa” \textit{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 Sūryaprajñāpti add also Jyeshṭā. Two nakshatras, \textit{viz.}, the two Āshādhaḥs 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, \textit{viz.}, to the north of the fifteenth circle of the moon, while the two remaining ones are placed outside, \textit{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 “pramardarūpeṇa.” Finally one nakshatra, \textit{viz.}, Jyeshṭāḥ, always enters into conjunction with the moon pramardarūpeṇa. Regarding the relation of the nakshatras to the fifteen circles of the moon, the following statements are made. Eight circles always are “undeprived” (avirahitāni) of nakshatras. The twelve nakshatras mentioned above, beginning with Abhijit, are in the first circle; in the third circle there are Punarvasu and Maghā; in the sixth, Krīttikā; in the seventh, Rohiṇī and Chitrā; in the eighth, Viśākhā; in the tenth, Anurādhā; in the eleventh, Jyeshṭāḥ; in the fifteenth, Mṛgāśiras, Ādṛā, Pushya, Āśleṣhā, Hasta, Mūla and the two Āshādhaḥs. 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 Sūryaprajñāpti’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 Sūryaprajñāpti 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 is 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 Siddhántas, we find that the Súryaprajñápti agrees with the latter with regard to five out of the six nakshatras said always to stand south of the moon (Mrignásiras, Ardá, Aláleshá, Hasta, Múla), 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 Siddhántas lies in the ecliptic, so that it almost appears as if the Pushya of the Súryaprajñápti were an altogether different asterism. From among the twelve nakshatras said to stand always north of the moon ten (Abhijit, Sravaña, Sravishthá, Púrva-Bhádrapadá, Uttara-Bhádrapadá, Aśvini, Bharaní, Púrva-Phálguni, Uttara-Phálguni, Sváti) may be identified with the nakshatras of the Siddhántas whose latitudes—excluding Abhijit—vary from 9° to about 30° north.Strange it is only that these nakshatras occupying a zone of about 21° 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 Siddhántas—exceeding the latitudes of the other nakshatras, with which it is here thrown into one class, by about 30°. The Satabhishaj and Revati of the Siddhántas are situated in and close to the ecliptic; here too therefore we might doubt if the Súryaprajñápti denotes by these two names the same stars as the Siddhántas. The remaining nakshatras may be identified with those of the Siddhántas, the latitude of none of the latter much exceeding the greatest latitude reached by the moon; a considerable margin must of course he allowed for the inaccuracy of the observations on which the statements of the Súryaprajñápti are based. Quite unfounded is the statement about the moon always passing right through Jyeshthá; 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 prati-pattis regarding this point the author details only one, viz., that one according to which Krittiká stands first. The author of the Súryaprajñápti 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 solstice 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 Aśvini. It may here be mentioned by the way that the Súryaprajñápti 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 Súryaprajñáapti itself as well as in a great number of old karana-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 Súryaprajñáapti itself. A comparison of these calculations with those contained in the jyotisha-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 Súryaprajñáapti 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 Súryaprajñáapti divides the sphere into $819 \frac{27}{67}$ mühúrtas, this being the duration of the periodical revolution of the moon, and allots to each nakshatra a certain number of mühúrtas according to its greater or smaller extent. Fixed subdivisions of the mühúrta such as are commonly met in Indian astronomical works are, however, nowhere employed by the author of the Súryaprajñáapti; he apparently preferred to keep himself perfectly free from restrictions of this kind and uses throughout those fractions of the mühúrta 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 ($62 = \text{number of synodical months in a yuga}, 67 = \text{number of periodical months}$) 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 dhruvaráśi—entering as a multiplier 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 (i.e. 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 nakshatra 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 púrṇamási 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 preceding 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 (Āśleṣhā); again from the remainder 30 (Maghā), 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 (sodhanaka) for Uttara-phálguni is said to be 172, for Viśākhā 292, for Uttara-āśadhā 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-āśadhā; if 292 can be deducted, she has passed the limits of Viśākhā and so on. The subtrahends are not carried on from Punar-vasu beyond Uttara-āśadhā, 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-bhádrapadā 159, of Rohini 309, of Punarvasu 399, of Uttara-phálguni 549, of Viśākhā 669, of Múla 744, of Uttara-āśadhā 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-sections 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 gāthās 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 nyethe- mera 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 Sravana 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 muhūrtas 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., Sravana. 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 muhūrtas 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 \(26 + \frac{42}{62} + \frac{2}{62 \times 67}\) muhūrtas.

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 avamarātras (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 sūryanakshatra) 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 nychthemeron. 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 karana-gāthās. The rule again assumes a “dhruvarāsi”, a constant quantity, to be used in all calculations of this kind. This quantity is \( 33 + \frac{2}{62} \)

\[ + \frac{34}{62} \times \frac{67}{67} \] 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 \( 19 + \frac{43}{62} + \frac{33}{67} \times \frac{62}{62} \) muhūrtas belonging to Pushya, after that the 15 muhūrtas of Aslesha, 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-phalguni, 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-phalguni. 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 30½ 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 Sūryaprajñāpti’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 30½ and division by 122 instead of 61 (the number of days of a season) in order to get rid of the fractional part of 30½.

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 parvam pratiṇdy 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 avama-ratra? add one to one (number of the tithi) result two; this multiplied by two gives four; therefore pratipad is avama-ratra in the fifth parvan, after four parvans have elapsed. Or again it may be asked: when does the second tithi become avama-ratra? 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 avama-ratra. Thus all the avama-ratras 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 sávana 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 Winter solstice, ................. 7th " " " mágha.  
2nd S. S., ................. 13th " " " śrávana.  
2nd W. S., ..................... 4th light half of mágha.  
3rd S. S., ..................... 10th " " " śrávana.  
3rd W. S., ................. 1st dark half of mágha.  
4th S. S., ..................... 7th " " " śrávana.  
4th W. S., ................. 13th " " " mágha.  
5th S. S., ..................... 4th light half of śrávana.  
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 7/10 of a sidereal revolution which the moon performs during one solar ayana in excess of six complete revolutions constitute the “dhruva rasi” for our case. The Súryaprajñapti 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 ávṛtīs the places of the two first ones of course recur.

Incidently 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 kārma-gāthā 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 avamarātras 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 avamarātra; 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 muhūrtas 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 dvāpara-yugma), we add sixty-two to it; if it yields three (tretā-oja), we add thirty-two; if there is no remainder (kṛta-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 muhūrtas 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 \( \frac{94}{124} \) days. The first parvan therefore terminates when \( \frac{94}{124} \) of the day = \( \frac{94 \times 30}{124} = \frac{47 \times 30}{62} \) muhūrtas 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 44 \( \frac{34}{124} \) 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 Súryaprajñápti. Now it will be apparent to every one who is to some extent familiar with the Jyotisha-vedánga* that the rules contained in the, as yet partly unexplained, verses of the latter refer to calculations exactly analogous to those contained in the Súryaprajñápti and the old gáthás 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 Vedánta, 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 Súryaprajñápti to the elucidation of the Vedánta. In the first place the Vedánta 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 Súryaprajñápti 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 quinqueennial yuga can never be the same according to the Súryaprajñápti as it is according to the Vedánta, etc. Nevertheless it is highly probable that somebody who should apply himself to the study of the obscure portions of the Vedánta after having made himself thoroughly conversant with the contents and methods of the Súryapra-

* Since the publication of the paper on the Jyotisha-vedánga in the 46th volume of this Journal, the writer has received some very important contributions to the explanation of the Vedánta 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 Vedánta before long and will then avail himself of the new results most kindly placed at his disposal by Dr. Oldenberg.
jañapti, 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 Sūryaprajañapti, 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 Sūryaprajañapti 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.

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 Sūryaprajañapti, 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 cup 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 Sūryaprajñāpīṭi 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 Sūryaprajñāpīṭi, according to which the sun is nothing but a "kīranaśaṅghāta," 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 dvipas 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 lead 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 Sūryaprajñāpāti 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 Sūryaprajñāpāti. 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 hypothenuse 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-pei 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 solstice. The day of the winter solstice is the shortest during the year; the day of the summer solstice the longest. On the day of the winter solstice 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 solstice 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 solstice.

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 solstice; Leon 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 Tcheou-pei 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 counterpart 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 Tcheou-pei to differ from the Jaina system in all those details which depend on the fundamen-
Dr. G. Thibaut—On the Sūryaprajñāpītī. [No. 4,

tal period and the advantage is of course altogether on the side of the Chinese. On the whole the Tcheou-peī is much superior to works of the stamp of the Sūryaprajñāpītī, 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 Sūryaprajñāpī. 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 Sūryaprajñāpītī itself but some hypothetical older work of the same class, less elevate and more moolerate in the statement of dimensions, figures etc. That such works if not existent at present must have existed at same earlier period is manifest from the remarks the Sūryaprajñāpītī 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 Tcheou-peī (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 Sūryaprajñāpītī.

"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 be 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.
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 Ghaznî kings, all struck at Lahore, came to hand, some quite new and unpublished, and after that a batch of silver coins of Ala-ud din 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 Ghaznî and Fārívān or as Thomas calls it 'Perván.' He gives no drawings of them and only alludes to them as giving us the mint of Perván. These Ghaznî 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 Ghaznî 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 bazaars 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 daulat Khusrav Malik,
Rev. Bull with new mark on its jhál.

This coin is quite a new type of Khusrav Malik’s coins.

No. 2. Obv. (As sultan ul) Azim Tij ud Daulat Khusrav Malik.
Rev. Bull with new mark on its jhál.

No. 3. Obv. (Us sultan ul) Azim Rukn ud dunyá wa ud Din
Firoz (Shákh).
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 unmistakeable 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 sultan al Muazzim Rezia ud Dunyá wa ud Dín.” Rev. Horseman and steed, exactly like Thomas’. In my coin the zwád (ش) 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 Din
Firoz Shákh’s. Obv. As sultan ul Azim Shams ud Dunyá wa ’d Din, abá’l
Muzaffur Rukn ud Dunyá wa ’d Din Firoz Shákh. Rev. Fi ahd il Inán
Al Mustansir, Amir ul Mominiy, fi shahár i san thaláth wa thaláthin 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 Bahram Sháh. In it the
title of Muazzim was given to Sanjar. In my present paper I give coins
which show 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 sultan ul Muazzim, Abá ud Dunyá wa ’d Dín.”
Rev. Horseman and steed.

No. 9. Obv. As sultan ul Muazzim Elattaush as Sultan. Rev. Horse-
man and steed and remains in Hindi of Sír Hamírah.
COINS SUPPLEMENTARY TO THOMAS CHRONICLES OF PATHÂN KINGS.
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 din Abú 'l Muzaffar (Eltamash?). Rev., in a rayed circle, the Kalimah, under which (Al Mustansir) bimri 'llah Amir ul Momínin. This coin weighs 62 grs. only. It is therefore a tankah. It came to hand with three Bahá ud Din Sám’s silver tankahs.
No. 8. Obv. in Hindi above bull, Samasa Dín. Rev. above horse Ḥa and no other letter of Hamírah.
This type is quite new.
No. 10. Obv. As Sultan ul Azim Shams ud Dunyá wa 'd Din. Rev. Horseman, to right of which Eltamash, 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) Eltamash as Sultan. Rev. Horseman and Sri Hamírah.
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.
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 Dúnýa wa 'd Dín."
Rev. 'Abdu 'l Malik ul Muazzim, Túj ud Dúnyá wa 'd Dín Yalduz.

No. 18. Obv. "As sultán ul Muazzím Abú 'l Fath Yalduz as Sultán."
Rev. Horseman with remnants of Sri Hamiráh and Star underneath horse.

Plate II. No. 1. Gold Mohur of Sher Sháh. Obv. in Mahrábi area "As Sultán Sher Sháh, khalád 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, khalád Allah sáe."
Margin:—"Faríd ud Dúnyá wa 'd Dín abú 'l Muazzár" 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 Ujáin. 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, khalád Allah mulkahu." Margin "Faríd ud Dúnyá wa 'd Dín, zarb i Shergarh, in Hindí "Sher Sháhii."
Rev., kalimáh 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.

Obverse: "Al Imam ul Azim, Kutub ud Dúnyá wa 'd Dín, Abú 'l Muazzár, Khalífatulláh."
Rev. central area: "Mubárak Sháh as Sultán, ibn us Sultán Al Wásiq billah, Amír ul Mominín."
Margin.—"Zarb házá il Fizzat bi Hazrat dár il Khiláfát, Fi sanat, saba ashhrata wa saba miáta."

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 khiláfát."
COINS SUPPLEMENTARY TO "THOMAS' CHRONICLES OF PATHAN KINGS"
No. 8. Gold coin of Gyās ud Dīn 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 Tulang." It was struck in Telingana.

No. 9. A gold mohur. Rev. Mahmūd Shāh, bin Muḥammad Shāh bin Tuglaq Shāh as Sultān 752." 

Obv. "Fī zaman i Amīr ul Mominūn, Gyās ud Dunyā wa 'd Dīn, Abū 'l Muzaffār."

When Muhammad Tuglaq died, Fīroz Shāh was with him at Tatta in Scinde. Ahmad Ayāz Khwājah i Jahān set up in Dehli a boy of six years of age as king. Ferishta says that he was called Gyās ud Din Muḥammad, but the coin shows that his name was Mahmūd. On Fīroz Shāh's arrival in Dehli Mahmūd was deposed.


Rev. Horseman over which words which may be Hindī "Srī Hamīrān, but they look like Persian "Farmān rawā."

These last four coins are all new types. Kirmān* may be the Persian province and town. Ḫalāl ud Dīn Khwārizmī went there by way of Mekrān after he left India. At least so says the author of the "Rauzat us Sofā."


Rev. "Abū 'l Muzaffār Mubārah Shāh as Sultān ibn us Sultān Al wisiq billah."

No. 15. Obv. "Al Mujāhid fi sabīl i 'llah Muḥammad Tuglaq," Above, "Abubakr;" to right, "Alī;" to left "Umūr" under "Othmān."

Rev. the Kalimah in a circle. Margin: "Zarb hāzā wa Sikka, bi Hazrat Dehlī, fi sa'at Khams asharin wa saba mi'ata. This coin is a very

* Thomas identifies it with Karun near Bunn. Kism is I suppose the island and town at the entrance to the Persian Gulf. If so, there is no reason why Kirmān should not be the Persian one, except this one, that here we have coins struck in Hindī.
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 Tuglaqpur 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 *Tuglaqpur* 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 Burns' "*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.
COPPER COINS OF AKBAR.
Copper Coins of Akbar. By Chas. J. Rodgers, Amritsar.

(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.

<table>
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<tr>
<th>No.</th>
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2Sa. 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  
dô tânke pieces; No. 3 is a yak tânke piece. No. 4 is a dâm. Nos.  
5—17 inclusive and Nos. 22—25 inclusive are fulus pieces. No. 27, is a damrî.  
Nos. 18, 19 and 28 are called Sikka i Akbar Shâhi. The term fûlûs is  

applied to coins varying from 37 to 326 grains, one struck at Kábul weighing  
149. The word fûlûs in Arabic means want, indigence, hence fûls or  
fi, a small coin, an obolus, money given to relieve poverty, or small change  
or copper, as we say in English.* Fûlûs is the plural of fûls. The first  
coin I have seen with fûlûs 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 dâm, damrî and tânke. We know that the last of  
these was a name applied to coins from the time of Mahmûd of Ghazni.  
We know also that tânkes were of two kinds, silver and copper. The  
weights of tânkes varied as did also their values. The tânkes of Sikandar  
Lodî 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 fûls 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 Sháhi seems to be such a standard value. In the Aín i Akbarí we are told that the dám was a coin of the value of five tánkes. And farther 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 krors 54 lacs of rupees or £3,510,000.

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, Nárnl, Ahmadábád, Dehlí, Fath-púr, Hissár Fírozah, Lakhnau, Urdu Zafarán, Multán, Ilahábás, Gobindpur, Dogáww (?), Attak Banáras, Kábúl, 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.

Nárnl is not given in Thomas, neither is Fathpúr or Dogáww 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 Sháhjáhán struck at the same place. Attak Banáras is undoubtedly Attoek on the Indus; for interesting remarks on this place I must refer the reader to General Cunningham's Archaeological 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 Shahrewar, Azr, Farwardín, Uríd i Bihipsht, Anor Đád, and Zu, 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 REPLACING. 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 molars 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 Khalifahs 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 Sultans whether Pathan or Mogul, and of the Maharájás and Rajahs. Another object should be series of local mints. Thus Lahore, from the time of Mahmud of Gazni 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 Jahángir 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. Ibbettson, C. S. of Kurnál.

With respect to the fulus coins I may add that these are probably the the coins of which Bormier says that Aurungzib had bags of 1000 peysas ready for distribution. In a loose fashion the term dán seems also to have been given to the large fulus pieces. And generally we see that with respect to Akbar's copper coins there was a want of definiteness which excludes 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 یک پایί 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 پایی, 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 piec weighs about 100 grains. Hence a rupee is worth about 6100 grains. If a dán weighed 320 grains and a rupee were worth forty dáns then in Akbar's time a rupee represented 12,800 grains. But if also the dán 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 tankes 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 tankes and dán 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-uddin and Abúl Fazl are £6,000,000 and £7,000,000 respectively.
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INTRODUCTION.

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 Hindi and Sanskrit Grammar and circulated them as widely as possible amongst the Paññits, 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 gurû, who knew little more than the herd-boys he taught, to the most learned Paññits 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 bolt in the literal sense of the word. Beyond a History of Krishna and
the songs of Vidyāpati Thākur, 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 Maithilī is a language and not a dialect. It is the custom to look upon it as an unenlightened 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 Bihār, at least five millions can neither speak nor understand either Hindī, or U'rdu without the greatest difficulty. It differs from both Hindī and Bangālī, both in Vocabulary and in Grammar, and is as much a distinct language from either of them as Marāṭhī or Uriyā. 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 gāōwārī, 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.

Maithilī is spoken by all the Hindūs and Muhammandans, who inhabit the great plain which is bounded on the North and South by the Himalayas and the Ganges, and on the East and West by the Kośī and Gandak respectively. It is thus the native language, not only of the 7½ millions of North Bihār, but also of the unnumbered millions of the Nepāl Tarā, bordering on the districts of Champāran, Tirhut and Bhāgalpūr. It has various dialects, differing slightly from each other, the two extremes being that of Champāran on the west, which approaches the language of Chaprā, and that of Bhāgalpūr on the east which contains a few forms tending towards Bangālī. The dialect which I have adopted as a standard is that of the Madhubani Sub-division, which is centrally situated, and which is admitted by all Brāhmaṇs to be the head-quarters of Mithilā. I have a practical and personal knowledge of the dialects of North Bhāgalpūr,

* Population of—

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<tr>
<td>Tirhut</td>
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<td>43,84,706</td>
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<tr>
<td>Bagh Sarai Sub-Division of Munger</td>
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<td></td>
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<td>5,37,725</td>
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<tr>
<td>Supaul</td>
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<td></td>
<td>5,65,747</td>
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<td>Madhaipārā</td>
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<td></td>
<td>3,91,086</td>
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<tr>
<td><strong>Total</strong></td>
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<td></td>
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<td>73,20,079</td>
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* The population figures are rounded and may not add up exactly due to rounding errors.
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 Hindu origin, is composed mainly of words derived through Prakrit from Sanskrit, and at the same time borrows freely from Sanskrit itself. Even the Musalmans, while of course using more Arabic and Persian words than the Hindus, abstain from using them to anything like the extent to which their Urdu 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 Hindi grammar. I have had it constantly by my side, and I have made its arrangement the skeleton which I clothed with Maithili 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.

PART I.

CHAPTER I.

THE ALPHABET.

§ 1. The Alphabets in use in Mithilá are three.—The Deva-nágarí, the Maithili, and the Káyathi. 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 Maithíli is the character used by the Maithilí Bráhmanas, both in the affairs of common life, and in their sacred books. Few of the Bráhmanas, who are not professed pándits, can read the Deva-nágarí character. The Maithíli character is also affected by Maithil Káyasthas, who pretend to be better educated than their fellows. The Maithíli character is nearly the same as Bangálí, differing only in one or two letters.

§ 3. The Káyathi character is that in general use throughout Mithilá by all educated persons who are not Bráhmanas. It is a corruption of the Deva-nágarí, and can be written much faster than the latter, or even than shikasta U’rdú. There is a clerk in my office in Madhubání, who can write excellent Káyathi much quicker than even the most practised of the old “Persian” mullahris. 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 Sámskrit, with the following exceptions.

§ 6. The pronunciation of the vowel उ 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 cheek. 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 ऐ ऐ, ऋ ऋ, and उ उ, when final and preceded by consonants are not pronounced in prose and conversation. This is absolute in the case of ऐ ऐ. E.g., फ़ल, is pronounced phal, and not phala. With respect to ऋ ऋ and उ उ, 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 ऋ ऋ and उ उ 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. पौर्णेश, will be written हान्द. It must be remembered however that this apostrophe must, in pronunciation, be coloured by the omitted vowel. Thus the pronunciation of the apostrophe in हां, for पौर्णेश, is very different from that of the apostrophe in अह for ब्रह्म. 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 anunásika. E.g. नां नाहँ न.

As in High Hindi, ऐ ऐ, 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 ऐ ऐ, in transliteration, by an apostrophe, ', which in this case will have a slight colour of the tone of the guttural vowel ऐ ऐ. E.g. देखिलहि, 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 ऐ ऐ, and a palatal or labial colour, when final and representing a final or nasalized final ऋ ऋ or उ उ, respectively. And logically, I ought to represent the inert final ऐ ऐ 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 ऐ ऐ, and that a final apostrophe or a final apostrophe nasalized, stands for a palatal ऋ ऋ or a labial उ उ, either simple or nasalized, respectively.

§ 9. ऐ ऐ is pronounced like the English word “1,” and never like oi. It thus differs from अय ay which has a broader sound. E.g. देख kaib is pronounced very differently from देख kai'b.

§ 10. (°)Anunásika 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 Sindhi and Telugu.
short vowel which is not pronounced, be represented in transliteration by a circumflex over the qualified vowel. Thus चौ will be represented by चौ, चौ by चौ, चौ by चौ, and so on. E.g. चौषधि ब्रह्मी. When final, after a short vowel which is not pronounced, as explained in § 7, it will be represented by न. Thus, नाय नारी.

Anusvāra (’) will only be used throughout this grammar as a compendium scripturarum for क्व; च्, छ्, न्, न्, or स् m before another consonant of the same class. Thus वंद्वः instead वंदा bundle. It will hence be represented in transliteration by v; न, न, n, or m, according to circumstances. This distinction between anusūsika and anusvāra is adopted in order to prevent any misapprehension as to pronunciation.

(6) Consonants.

§ 11. क k, ख kh, ग g, घ gh, ङ n, च ch, छ ch, छ j, ज ž, झ jh, ञ nh, ट t, ठ th, ड d, ढ dh, ण r, त t, थ th, द dh, ध dh, न n, य p, य p, भ bh, ब b, भ bh, म m, य y, र r, ल l, व v, श s, ष s, and ह h are usually pronounced as in Sanskrit. As usual in modern Aryan languages, ज and ज, and व 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 ज, य sounds by य, ब sounds by either ब or ब, and व and व sounds by व respectively. It is not usual, however, to make these distinctions in writing.

§ 12. The pronunciation of य n is peculiar. The lingual nature of its sound is much more marked than in the Sanskrit of Western India. It has more the sound of a muffled lingual r followed by a lingual n; e.g. राजस्थान is pronounced almost like राजस्थान, the r in र त having a peculiar muffled sound, impossible to describe in writing. न n is occasionally substituted for य n and is then pronounced as n.

§ 13. श sh, when standing alone and not compounded with another consonant, is always pronounced as ख kh. Thus ष ष ष ष “sixth” is pronounced khashtha. This pronunciation is universal; the vulgar even write such a ष sh, phonetically ख kh. In the compound consonant ष rsh, ष sh is also always pronounced as ख kh; e.g. जाकर्षण ākarkhaṇ is pronounced ākarkhaṇ. A similar pronunciation is optional in the compound श ल ल sh; e.g. the word सुवर्ण (Sams. loc. plur. of सुवर्ण) 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 چ kh, or the च in Pakistan. This pronunciation is, however, condemned by the best pandits. The compound letter ष ksh is pronounced like छ cheh, which is occasionally written for it by the vulgar; e.g. जच्छी is so written, and is pronounced as Lakshmi by purists, but is commonly written and pronounced लक्ष्मी lākṣhmi. The compound ष shp is peculiar. It is pronounced something like hfp; e.g. पुष्प pushp “a flower” is pronounced puḥfp.
§ 14. The letter छ h, when compound with य y, becomes छ hy, which is pronounced in a peculiar way. If zh be taken to represent the Persian ژ zh, the pronunciation of this compound can best be represented by zhyy; e.g. श्रेष्ठ, fit to be accepted, is pronounced grázhjya, the final च a being retained in pronunciation, though usually inert, for the sake of euphony.

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 Sàmskàrit, which were originally neuter, become masculine in Maithili.

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 उच्छ uá or छा á to all nominatives, especially to those of proper names. E.g. गार ghar or गघरा gháruá, a house; राज Raghó or राजु Raghruá, a proper name: नेनी není or निनिना neniá, a girl.

§ 18. The accusative is formed by adding the postposition इ 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 इ ke, इ kē, इ kē, इ kē, and इ kē'. The oldest form, which is met with most frequently in poetry, is इ kē, but the one most commonly used nowadays is इ 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 श्र sō, of which श्रं sō is an occasional variety. श्रं sō is the poetical and older form. There is another form of the instrumental made by the addition of the syllable श्रे श्रे. This is formed in two ways.

A. by the substitution of श्रे श्रे for the final vowel in,—

(1) all nouns ending in श्रा a, which is not pronounced; e.g. क्र phal, fruit, has for one of the forms of its instrumental क्रल phalē.

(2) All nouns ending in श्रा आ, whether directly borrowed from Sanskrit, or from Prakrit sources. E.g. क्रा kathā, a saying, makes one of its instrumental forms क्रा kathē, and नेना nenā, a boy, similarly makes नेनं nenē.

B. In all other nouns by the simple addition of श्रे श्रे, before which a final long vowel is shortened. Thus पाणि pāni, water, becomes in one form of the instrumental singular पाणी pāni, and बेटी betē, a daughter, similarly becomes बेटें betē.

§ 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 श्र ke, श्रे ke, श्र kā or श्रे kā is not liable to be dropped.

§ 21. The ABLATIVE indicates separation or removal from. It is formed by adding the postposition श्र sō, of which श्रं sō is an occasional variety. श्रं sō is the poetical and older form.

§ 22. The GENITIVE “denotes connection generally, whether arising from origin or possession.” Its sign is श्र k. An older form, but still in occasional use, is श्र kēr. In the pronouns, too, the distinguishing termination of the genitive is the letter श्र. None of these three postpositions, श्र k, श्र kēr or श्र k, shows any symptom of being influenced by gender, as is the case with the corresponding Hindi postpositions श्र kā, श्रē kē and श्रē kē. Although really ending in an inherent short श्र a, this final vowel is not pronounced in prose or in conversation, so that श्र k, श्र kēr and श्र k are usually pronounced as if they were श्र k, श्रē kēr and श्रē k. In order to prevent mispronunciation, throughout the following paradigms, the postpositions श्र and श्रē are written as part of the qualifying word. Thus नेनाक nenāk, हमर hamār, and not नेना k nenā k, हमर हम r, which would be the more logical way of writing them. But it must never be forgotten that श्र and श्रē 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 श्र me, of which श्र me and श्र mō are optional forms. Of these three forms, श्र mō is the oldest and is usually found in poetry. An old form of the Locative ended, like the Sanskrit, in श्र 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 या or या is used as follows. नेना nená, a boy, becomes रूँ नेना राउ nen'vá. नेनी není, a girl, becomes नेनी गाई gai není. रघु Raghú, a proper name, becomes रघु राघु राग्वा.

The following interjections are used with the vocative.

(a.) With masculine inferiors,—or familiarly, रूँ, रे.
(b.) With masculine equals or superiors, आु, है, हे.
(c.) With feminine inferiors,—or familiarly, गाई.
(d.) With feminine equals or superiors, है.

Chapter III.

§ 25. The plural number of nouns in Maithili is simply formed by the addition of a noun signifying multitude. Those most commonly used are सम sabh and सवङ्ग sabák meaning all, and लोकानि lokani* meaning people. The last is only used with animate objects. सम sabh and सवङ्ग sabák can be used indifferently either before or after the qualified noun. Thus नेना समक nená sabhak, नेना सवङ्गक nená sab'ák, सम नेनाक sabh nenák, सवङ्ग नेनाक sabák' nenák and नेना लोकानिक nená lokanik are all possible forms of the genitive plural of नेना nená, a boy. लोकानि 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 सम to designate the plural; but it must always be understood that unless specially forbidden, सवङ्ग sabák and लोकानि lokani can also be used.

Chapter IV.

§ 28. There is in Maithili 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 वा या.

II. The second class will consist of all nouns ending in inherent या, 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.
§ 30] DECLENSION OF NOUNS.

CLASS I.

ALL NOUNS ENDING IN चा ए.

§ 30. (1) Example of a Masculine noun ending in चा ए.

नेना nená, a boy.

SINGULAR एकवचन Ek'vachan.

Nom. नेना nena, a boy.

Acc. नेना nena, a boy.

Inst. नेना सें nena sa, by a boy.

Dat. नेना के nena ke, to a boy.

Abl. नेना से nena se, from a boy.

Gen. नेना के बनक nena ke bnek, of a boy.

Loc. नेना से nena se, in a boy.

Voc. नेना au nena.

PlURAL बहुवचन Bahuvachan.

Nom. नेना समः nena sabh, boys.

Acc. नेना समः nena sabh, boys.

Inst. नेना सभे सें nena sabhe sa, by boys.

Dat. नेना सभे के nena sabhe ke, to boys.

Abl. नेना सभे से nena sabhe se, from boys.

Gen. नेना सभे बनहक nena sabhek, of boys.

Loc. नेना सभे से nena sabhe me, in boys.

Voc. नेना एक रूपः nena vap, O boys.
Other forms are सब नेना sabh nená, नेना सवाँहिं nená sabah', सवाँहिं नेना sabah' nená and नेना लोकानि nená lokani.

[2.] Other forms are नेना सवाँहिंः nená sabah' kē, and नेना लोकानि के nená lokani kē.

[3.] Other forms are नेना सवांहिंः nená sabah' sā, नेना लोकानिः nená lok'niē and नेना लोकानि सें nená lokani sā.

[4.] Other forms are नेना सवांहिंः nená sabah' kē and नेना लोकानि के nená lokani kē.

[5.] Other forms are नेना सवांहिंः sā, नेना लोकानिः sā and नेना लोकानि सें nená lokani sā.

[6.] Other forms are नेना सवांहिंः nená sabh'ik, नेना लोकानिः nená lokanik.

[7.] Other forms are नेना सवांहिंः nená sabah' mē and नेना लोकानि में nená lokani mē.

[8.] रूँ नेना सवांहिंः rau nená sabah', रूँ नेना लोकानि au nená lokani.

§ 31. (2) Example of a feminine noun, ending in ऑ ऑ.

कथा kathā, a story.

**Singular स्त्रियाविधि Ek'vachan.**

Nom. कथा kathā, a story.

Acc. \{ कथा kathā, \} a story.

\{ कथा कैँ kathā kē, \} a story.

Inst. \{ कथा सँ kathā sā, \} by a story.

Dat. कथा कैँ kathā kē, to a story.

Abl. कथा सँ kathā sā, from a story.

Gen. \{ काथाक kathāk, \} of a story.

\{ काथाकेर kathāker, \} of a story.

Loc. कथा में kathā mē, on a story.

Voc. ये कथा he kathā, O story.
§ 32. Declension of Nouns.

Plural बहुवचन Bahuvachan.

Nom. कथा सर्व kathā sabh, stories.

Acc. कथासब्ब केमें kathā sabh kē, stories.

Inst. कथासब्ब सां kathā sabh sā, by stories.

Dat. कथासब्ब केमें kathā sabh kē, to stories.

Abl. कथासब्ब सां kathā sabh sā, from stories.

Gen. कथासब्बके kathā sabh’ker, of stories.

Loc. कथासब्ब में kathā sabh mē, in stories.

Voc. हे कथा सर्व he kathā sabh, O stories.

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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 phal, a fruit.

Acc. फलकें phal kē, a fruit.

Inst. फलसं phal sā, by a fruit.

Dat. फलकें phal kē, to a fruit.

Abl. फलसं phal sā, from a fruit.

Gen. फलक phalak, of a fruit.

Loc. फलमें phal mē, in a fruit.

Voc. हे फल he phal, O fruit.
Plural बहुवचन Bahuwachan.

Nom. फल सभ phal sabh, fruit.

Acc. { फल सभ phal sabh, } fruit

Inst. { फल सभ के phal sabh kē, } by fruit.

Dat. फल सभ के phal sabh kē, to fruit.

Abl. फल सभ से phal sabh sā, from fruit.

Gen. { फल सभक phal sabhak, } of fruit.

Loc. फल सभ में phal sabh mē, in fruit.

Voc. हे फल सभ he phal sabh, O fruit.

CLASS III.

ALL NOUNS NOT ENDING IN अ अ, OR SILENT अ a,

§ 33. (1) Example of a masculine noun, ending in इ i

पानि pāni,* water.

Singular एकवचन Ekvachan.

Nom. पानि pāni, water.

Acc. { पानि pāni, water, } water.

Inst. { पानि के pāni kē, } by water.

Dat. पानि के pāni kē, to water.

Abl. पानि से pāni sā, from water.

Gen. { पानिक pānik, } of water.

Loc. पानि में pāni mē, in water.

Voc. हे पानि he pāni, O water.

* The i in the termination of this word is pronounced.
§ 34. ]

DECLENSION OF NOUNS.

Plural बहुवचन Bahuvachan.

Nom. पानि सभ pāni sabh, waters.

Acc. { पानि सभ pāni sabh, }
    { चानि सभ के pāni sabh kē, } waters.

Inst. { पानि सभें pāni sabhē, }
      { पानि सभ से pāni sabh sā, } by waters.

Dat. पानि सभ के pāni sabh kē, to waters.

Abl. पानि सभ से pāni sabh sā, from waters.

Gen. { पानि सभक pāni sabhak, }
      { पानि सभकेर pāni sabh’ker, } of waters.

Loc. पानि सभ में pāni sabh mē, in waters.

Voc. चे पानि सभ he pāni sabh, O waters.

§ 34. (2) Example of a feminine noun ending in र i.

नेनी nenī, a girl.

Singular एकवचन Ek’vachan.

Nom. नेनी nenī, a girl.

Acc. { नेनी nenī, }
     { नेनी के nenī kē, } a girl.

Inst. { नेनिये neniyē, }
      { नेनी से nenī sā, } by a girl.

Dat. नेनी के nenī kē, to a girl.

Abl. नेनी से nenī sā, from a girl.

Gen. { नेनिक nenik, }
     { नेनिकेर neniker, } of a girl.

Loc. नेनी में nenī mē, in a girl.

Voc. गै नेनिया gai neniyā, O girl.
Plural बहुवचन Bahuvačan.

Nom. नेनी सभ neni sabh, girls.

Acc. { नेनी सभ neni sabh,
{ नेनी सभ के neni sabh ke, } girls.

Inst. { नेनी सभः neni sabhæ,
{ नेनी सभः सँ neni sabh sæ, } by girls.

Dat. नेनी सभः के neni sabh ke, to girls.

Abl. नेनी सभः सँ neni sabh sæ, from girls.

Gen. { नेनी सभवः neni sabhak, } of girls.

Loc. नेनी सभः मँ neni sabh mæ, in girls.

Voc. मै नेनिया सभ gai neniá sabh, O girls.

§ 35. (3) Example of a masculine proper noun ending in जु.

रघु* Raghú a proper noun.

Nom. रघु Raghú, Raghú.

Acc. रघु के Raghú ke, Raghú.

Inst. { रघुँ Raghùæ,
{ रघुँ सँ Raghù sæ, } by Raghú.

Dat. रघुँ के Raghù ke, to Raghú.

Abl. रघुँ सँ Raghù sæ, from Raghú.

Gen. रघुँक Raghúk, of Raghú.

Loc. रघुँ मँ Raghù mæ, in Raghú

Voc. राँ रघुँत्या rau Raghútā, O Raghú (or respectfully) छा रघु hau Raghú.

* Usually spelt thus in Maithili.
§ 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, prefix 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 pujdits 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 Hindi the adjectives which are derived from the prakrit stock of the language, and which end in ़ा ा are in reality the only ones in that language which are affected by gender. Adjectives imported direct from the Samskrit, and forming their feminines after the model of that language, do not form part of the living spoken stock of the Hindi dialect, but belong rather to the dead language of the books. The same is only partly true in Maithili. In this language we find not only prakrit but even some Samskrit adjectives forming feminines distinctly the property of the language in which they have been adopted.

§ 39. The genitival terminations of High Hindi, का का, के के, and क़ kि evidently correspond to the prakrit derived adjectives ending in ोषा-ा, ोष-e, and ोष-i. In fact the genitive of a substantive may be considered as, and is liable to the same changes as, a prakrit derived adjective in ोषा-ा, ोष-e, and ोष-i.

§ 40. Without wishing it to be supposed that Maithili is in any way whatever derived from High Hindi, it may be taken as a general rule that wherever a prakrit derived word occurs both in High Hindi and in Maithili, if that word ends in a long vowel in High Hindi, the usus loquendi of Maithili tends to shorten that vowel. Thus we have

**High Hindi.**

पानी pānī.

पानी का pānī kā.

बड़ा barā.

**Maithili.**

पानि pānī, water.

पानिक pānī k(a) of water.

बड़ी bar (a) great.

The above rule is not universal, for we have in Maithili words like 

अन्न a boy, बाली bindi a girl, बेटा betā a son, and बेटी betī a daughter; but it is nearly so, and may be taken as general.
§ 41. It may be therefore remembered that what corresponds to the prakrit derived termination ओष्ठ-ा in High Hindi, is the prakrit derived termination ओष्ठ-ा in Maithili; both corresponding to the prakrit nominative in ओष्ठ-ा, and both apparently derived from it.

§ 42. Similarly prakrit derived nouns, adjectives, and genitives in High Hindi ending in ओष्ठ-ा, form their feminines by changing this ओष्ठ-ा into ओष्ठ-ि, while prakrit derived nouns and adjectives in Maithili ending in ओष्ठ-ा, form their feminines by changing the ओष्ठ-ा into ओष्ठ-ि. This rule does not, be it observed, apply to the genitive in Maithili, which has lost all trace of its former adjectival form. That the termination of the genitive ओष्ठ-ि (a) was originally an adjective, and derived from the Sanskrit वृत्त krita, through the prakrit केलक 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 ओष्ठ-ि ker used alongside of ओष्ठ-ि, and a study of the older Maithili 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 Maithili, Prakrit-derived words ending in short ओष्ठ-ा, form their feminine in short ओष्ठ-ि.

Examples:

- Masc. गोर gor fair
- बड़ bar great
- बुधिवार budhiyar wise
- Fem. गोरी gor'.
- बड़ी bar'.
- बुधिवारी budhiyar'

Note.—गोर gor also has an irregular feminine गोरिया goría.

§ 44. The second rule is peculiar to Maithili, and is as follows. Many pure Sanskrit words ending in ओष्ठ-ा, adopted unaltered in Maithili, form their feminines in short ओष्ठ-ि; and that, whether in Sanskrit these words form their feminines in long ओष्ठ-ि or not.

Examples:

<table>
<thead>
<tr>
<th>Masc.</th>
<th>Fem.</th>
</tr>
</thead>
<tbody>
<tr>
<td>सुदर sundar beautiful</td>
<td>सुदरी sundari.</td>
</tr>
<tr>
<td>मैथिली Maithili</td>
<td>सुदरी sundari'.</td>
</tr>
<tr>
<td>S.</td>
<td>मैथिली Maithili</td>
</tr>
<tr>
<td>द्वुसर dhúsar</td>
<td>द्वुसरा dhúsara. or द्वुसरी dhúsari.</td>
</tr>
<tr>
<td>M.</td>
<td>द्वुसर dhúsari'.</td>
</tr>
<tr>
<td>S.</td>
<td>अत्यंत atyant excessive</td>
</tr>
<tr>
<td>M.</td>
<td>अत्यंत atyant'.</td>
</tr>
</tbody>
</table>
ADJECTIVES.

The following may here be noted as irregular:

Masc. | Fem.
---|---
S.  | सुबोध subodh wise (सुबोधा subodhā).
M.  | सुबुध subudh'.

§ 45. Rule III. A few prakrit-derived words ending in ओ्र-ा, form their feminines in ओ्र-ी.

Examples:

Masc. | Fem.
---|---
बेटा beśā a son | बेटी beṭi a daughter.
नेना nenā a boy | नेनी nenī a girl.

§ 46. Rule IV. Prakrit-derived words signifying colour form their feminines as follows:

Masc. | Fem.
---|---
उजर ujar | उज्री ujōri
उज्रा ujrā | उज्री ujar’ki.
उजर्का ujar’kā
कारी kāri
कारिया kariā | करिकी karikki.
कारिका karikkā
पीरा pirā
पीरार piar | पिरुर्की piar’ki.
पिरार्का piar’kā
हरिया hariar | हरिरकी hariar’ki.
हरियार्का hariar’kā
ADJECTIVES.

§ 47. Rule V. The following classes of words, adopted directly from Sanskrit, form their feminines generally as in that language.

a. Verbal adjectives in ओर-ि, and ओङ-ि, corresponding to Sanskrit adjectives in द्र in.

Examples:

<table>
<thead>
<tr>
<th>Masc.</th>
<th>Fem.</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. मानिन् मानिन</td>
<td>मानिनी मानिनी</td>
</tr>
<tr>
<td>M. मानि मानि</td>
<td>मानिनि मानिनि</td>
</tr>
<tr>
<td>S. भाविन् भाविन</td>
<td>भाविनी भाविनी</td>
</tr>
<tr>
<td>M. भावि भावि</td>
<td>भाविनि भाविनि</td>
</tr>
<tr>
<td>S. चारिन् चारिन</td>
<td>चारिकी चारिनी</td>
</tr>
<tr>
<td>M. चारि चारि</td>
<td>चारिनि चारिनि</td>
</tr>
<tr>
<td>S. धारिन् धारिन</td>
<td>धारिकी धारिनी</td>
</tr>
<tr>
<td>M. धारि धारि</td>
<td>धारिनि धारिनि</td>
</tr>
<tr>
<td>S. कारिन् कारिन</td>
<td>कारिकी कारिनी</td>
</tr>
<tr>
<td>M. कारि कारि</td>
<td>कारिनि कारिनि</td>
</tr>
<tr>
<td>S. चिरांजीविन् चिरांजीविन</td>
<td>चिरांजीवि चिरांजीबि or चिरांजीबि चिरांजीबिनी</td>
</tr>
<tr>
<td>or चिरांजिबिचिरांजिबिन</td>
<td>चिरांजीबिचिरांजीविचिरांजीबिन,</td>
</tr>
</tbody>
</table>
As an irregular under this head falls,—

Masc.  Fem.

S. सुधर्म् sudharman  } virtuous  सुधर्मां sudharmanā.
M. सुधर्मा sudharmanā  } सुधर्मस्वी sudharmanī.

§ 48. (b) Participles of the Reduplicated perfect in विद्वद- and comparatives in विद्वद्व-.
Examples:

Masc.  Fem.

S. विदवस (विद्वान्) vidvas, (vidvān)  } wise  विद्वद्वी vidushi.
M. विद्वान् vidvān  }

S. गारियस gariyas  } heavier  गारियसी gariyasi.
M. गारियान gariyān  }

S. लथियस laghiyas  } lighter  लथियसी laghiyasi.
M. लथियान laghiyān  }

§ 49. (c) Nomina agentis terminating in अक(a).
Examples:

Masc.  Fem.

कारक kārak a doer  कारियां kārīkā.
पालक pālak a protector  पालिकां pālikā.
रक्षक rakshak a guardian  रक्षिकां rakshikā.
पाचक pāchak a cook  पाचिकां pāchikā.
सहायक sahāyak a helper  सहायकां sahāyakā.

§ 50. (d) Gerundials and past participles passive.
Examples:

Masc.  Fem.

मंतवय mantaby to be remarked  मंतवया mantabyā.
बंदनीयः bandanīypraiseworthy  बंदनीया bandanīyā.
जौग्य jogy worthy  जौग्या jogyā.
मन्य múny reverend  मन्या múnā.
साध्य साधि easy  साध्या sādhyā.
§ 51. (e) Other nouns and adjectives as,—

Masc.

युक्त juk\textsuperscript{t} joined
सुध (सुध्द) suddh (suddh) pure
वार्ता\textsuperscript{त} árt\textsuperscript{t} pained
खिन्न khinn\textsuperscript{a} broken

Fem.

युक्ता juk\textsuperscript{t}á.
सुधा suddh\textsuperscript{a}.
वार्ता\textsuperscript{त} árt\textsuperscript{t}á.
खिन्ना khinn\textsuperscript{a}.

§ 52. Rule VI. The following anomalous forms should be noticed.

(a) राजा rāj\textsuperscript{a}, a king, makes रानी rān\textsuperscript{i} a queen.

(b) Forms borrowed from Sanskrit nomina agentis in नृ tri present some curious anomalies.

Examples.

Masc.

S. धातू dhātr\textsuperscript{i} \{ creator \{ धाती dhātr\textsuperscript{i}.
M. धाता dhāt\textsuperscript{a} \{ creator \{ धाती dhātr\textsuperscript{i}.

S. ज्ञातू jñātr\textsuperscript{i} \{ knower \{ ज्ञाती jñātr\textsuperscript{i}.
M. ज्ञाता jñ\textsuperscript{a}t\textsuperscript{a} \{ knower \{ ज्ञाती jñ\textsuperscript{a}tr\textsuperscript{i}.

S. पातृ pātr\textsuperscript{i} \{ protector \{ पात्री pātr\textsuperscript{i}.
M. पाता pāt\textsuperscript{a} \{ protector \{ पात्री pātr\textsuperscript{i}.

Comparison of Adjectives.

§ 53. (a) Comparative. As in High Hindi, 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, द गान्धि शंख गान्धी से सुंदर बेक i gáchhi oh gáchhi sā sundar chhaik. “This grove is more beautiful than that.”

§ 54. (b) Superlative. This is formed either by prefixing सभ sā, the ablative case of सभ sobh all, or the adjective बड़ bar (which is liable to inflection according to gender) to the principal adjective. Examples; द गान्धी सभ से सुंदर बेक i gáchhi sobh sā sundar chhaik “this is the most beautiful grove;” or द गान्धी बड़ सुंदर बेक i gáchhi 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.

Chapter VI.

Pronouns सर्वनाम Sarvanām.

§ 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 नपुष अप'नe or बहू अहान, and the interrogative adjectival pronoun क्या kī, 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 कः kā.

§ 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.
§ 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:

<table>
<thead>
<tr>
<th>1st Person</th>
<th>Direct Form</th>
<th>Oblique Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Honorific</td>
<td>हम ham</td>
<td>हमरा ham’rā</td>
</tr>
<tr>
<td>Non-honorific</td>
<td>हम ham</td>
<td>हमरा ham’rā</td>
</tr>
<tr>
<td>2nd Person</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Honorific</td>
<td>अपने ap’ne</td>
<td>अपने ap’ne</td>
</tr>
<tr>
<td>Non-honorific</td>
<td>तोह tōk</td>
<td>तोह toharā</td>
</tr>
<tr>
<td>3rd Person</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Honorific</td>
<td>उठ o</td>
<td>उठनका hun’kā</td>
</tr>
<tr>
<td>Non-honorific</td>
<td>उठ o</td>
<td>उठकरा okarā</td>
</tr>
</tbody>
</table>

* 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. {हम्मा ham'rá, } to me.
    {हम्मा कँ ham'rá kē, }

Abl. हम्मा सँ ham'rá sā, from me.

Gen. हम्मा hamar, or हम्मा hamār, of me, my.

Loc. हम्मा मँ ham'rá mē, in me.

Plural.

Nom. {हम सभ ham sabh, } we.
    {हम सभ, सबस्, लोकन्र ham'rá sabh, or sabh, or lokani, }

Acc. {हम सभ कँ, सबस् कँ, लोकन्र कँ ham'rá sabh kē, } us.
    {हम सभ कँ, सबस् कँ, लोकन्र कँ ham'rá sabh kē, or sabh' kē, or lokani kē, }

Inst. {हम सभ सँ, सबस् सँ, लोकन्र सँ ham'rá sabh sā, or sabh' sā, or lokani sā, } by us.

Dat. {हम सभ कँ, सबस् कँ, लोकन्र कँ ham'rá sabh kē, } to us.
    {हम सभ कँ, सबस् कँ, लोकन्र कँ ham'rá sabh kē, or sabh' kē, or lokani kē, }

Abl. {हम सभ सँ, सबस् सँ, लोकन्र सँ ham'rá sabh sā, } from us.
    {हम सभ सँ, सबस् सँ, लोकन्र सँ ham'rá sabh sā, or sabh' sā, or lokani sā, }

Gen. {हम सभक, सबस्क, लोकन्क ham'rá sabhak, or sabh'k, or lokani k, } of us, our.

Loc. {हम सभ मँ, सबस् मँ, लोकन्र मँ ham'rá sabh mē, or sabh' mē, or lokani mē, } in us.

*हम सबह ham sabh', and हम लोकन्र ham lokani are not used.

D
§ 65.  

 creditor, I.

The following forms are used in poetry:—

**SINGULAR.**

Nom.  creditor, I.

Acc.  creditor, me.

Inst.  creditor, by me.

Dat.  creditor, to me.

Abl.  creditor, from me.

Gen.  creditor, or creditor, of me, my.

Loc.  creditor, in me.

The plural forms are not used. When necessary, the plural forms of  creditor  ham are substituted. This, however, occurs but seldom.

**SECOND PERSON सदाय सुधा madhyam purush.**

§ 66.  thou.

**SINGULAR.**

Nom.  thou.

Acc.  thee.

Inst.  by thee.

Dat.  to thee.

Abl.  from thee.

Gen.  creditor, of thee, thy.

Loc.  creditor, in thee.

Voc.  O thou.
Plural.

§ 66.]

PERSONAL PRONOUNS. 27

Nom. \{ toh sabh, or to sabh, \\
\{ tohab sabh, sabah', or lokani,

Acc. \{ tohab sabh ke, sabah ke, lokani ke tohab sabh ke, \\
\{ you, ye.

Inst. \{ tohab sabh, sabhik, lokanik or tohab sabh, \\
\{ sabhik or lokanik,

Dat. \{ tohab sabh, sabah ke, lokani ke tohab sabh ke, \\
\{ to you.

Abl. \{ tohab sabh, sabhik, lokanik tohab sabh, \\
\{ sabhik or lokanik,

Gen. \{ tohab sabh, sabah, sabhik, lokanik tohab sabh, \\
\{ of you, your.

Loc. \{ tohab sabh, sabah, sabhik, lokanik tohab sabh, \\
\{ in you.

Voc. \{ hau tohab, hau tohab, sabah or lokani,

N.B.—For tohab, tohab, and tehab, and tehab, tehar, tora, tora, 
and tor are used by the vulgar.

* tohab sabh, and tehab lokani are not used.
§ 67. तौँ तो, thou.

The following are used in poetry: —

**SINGULAR.**

<table>
<thead>
<tr>
<th>Case</th>
<th>Noun</th>
<th>Pronoun</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nom.</td>
<td>तौँ तो</td>
<td>तौँ तो</td>
</tr>
<tr>
<td>Acc.</td>
<td>तौँ तो</td>
<td>तौँ तो</td>
</tr>
<tr>
<td>Inst.</td>
<td>तौँ तो</td>
<td>तौँ तो</td>
</tr>
<tr>
<td>Dat.</td>
<td>तौँ तो</td>
<td>तौँ तो</td>
</tr>
<tr>
<td>Abl.</td>
<td>तौँ तो</td>
<td>तौँ तो</td>
</tr>
<tr>
<td>Gen.</td>
<td>तौँ तो</td>
<td>तौँ तो</td>
</tr>
<tr>
<td>Loc.</td>
<td>तौँ तो</td>
<td>तौँ तो</td>
</tr>
</tbody>
</table>

The plural forms are not used. When necessary, the plural forms of तोँ तो are substituted. This, however, occurs but seldom.

**SECOND PERSON RESPECTFUL.**

§ 68. अहाँ ahā', thou.

**SINGULAR.**

<table>
<thead>
<tr>
<th>Case</th>
<th>Noun</th>
<th>Pronoun</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nom.</td>
<td>अहाँ, अपने ahā', or ap'ne, thou.</td>
<td></td>
</tr>
<tr>
<td>Acc.</td>
<td>अहाँ के, अपने के ahā' kē, or ap'ne kē, thee.</td>
<td></td>
</tr>
<tr>
<td>Inst.</td>
<td>अहाँ, अहाँ सँ, अपने सँ ahāi, ahā' sā, or ap'ne sā, by thee.</td>
<td></td>
</tr>
<tr>
<td>Dat.</td>
<td>अहाँ जँ, अपने जँ ahā' kē, or ap'ne kē, to thee, thy.</td>
<td></td>
</tr>
<tr>
<td>Abl.</td>
<td>अहाँ सँ, अपने सँ ahā' sā, or ap'ne sā, from thee.</td>
<td></td>
</tr>
<tr>
<td>Gen.</td>
<td>अहाँ, अपनेक ahā' k, ap'nek, of thee.</td>
<td></td>
</tr>
<tr>
<td>Loc.</td>
<td>अहाँ मँ, अपने मँ ahā' mē, ap'ne mē, in thee.</td>
<td></td>
</tr>
<tr>
<td>Voc.</td>
<td>अहाँ मँ ahä' au ahā', O thou.</td>
<td></td>
</tr>
</tbody>
</table>
\[ § 68. \]  

**Personal Pronouns.**

**Plural.**

Nom. \{ अहा सभ्; सवर्चु; लोकनि ahā sabh, sabah', or lokani, \} you, 

\{ अपने सभ्; सवर्चु; लोकनि ap'ne sabh, sabah', or lokani, \} ye.

Acc. \{ अहा सभ् कें; सवर्चु कें; लोकनि कें ahā sabh ke, sabah' ke, or lokani ke, \} you, 

\{ अपने सभ् कें; सवर्चु कें; लोकनि कें ap'ne sabh ke, sabah' ke, or lokani ke, \} ye.

Inst. \{ अहा सभ् सं; अहँ सभ् सं; अपने सभ् कृं; सवर्चु सं; लोकनि सं ahā sabh sā, ahāi sabh sā, ap'ne sabh sā, sabah' sā, or lokani sā, \} by you.

Dat. \{ अहा सभ् कृं; अपने सभ् कृं; सवर्चु कृं; लोकनि कृं ahā \} to you. 

\{ अहा सभ् सं; अपने सभ् सं; सवर्चु सं; लोकनि सं ahā sabh sā, ap'ne sabh sā, sabah' sā, or lokani sā, \} from you.

Abl. \{ अहा सभ्; अपने सभ्; सवर्चु; लोकनि ahā sab- 

hak, ap'ne sabhak, sab'hih, or lokanih, \} of you.

Gen. \{ अहा सभ् मैं; अपने सभ् मैं; सवर्चु मैं; लोकनि में ahā \} of you.

Loc. \{ अहा सभ् मैं; अपने सभ् में; सवर्चु में; लोकनि में ahā \} in you.

N.B.—अपने ap'ne can be used throughout for अहा ahā'. It is the more honorific term of the two. अहा ahā' is sometimes even used when talking to inferiors. अहा ahā', in fact, is polite, and तोह toh is vulgar.
Reflexive Pronoun.

अपनाः ap'nah′n, self.

§ 69.

**Singular.**

Nom. अपनाः ap'nah′n, self.

Acc. अपना कँ ap'ná kē, self.

Inst. अपना सँ, अपनाः सँ ap'ná sā, or ap'nah′n sā, by self.

Dat. अपना कँ ap'ná kē, to self.

Abl. अपना सँ, अपनाः सँ ap'ná sā, or ap'nah′n sā, from self.

Gen. {अपन apan, } of self.

Loc. अपना मँ ap'ná mē, in self.

**Plural.**

Nom. {अपनाः सभ, सववछ, लोकाः अपनाः ap'nah′n sabh, } selves.

Acc. {अपना सभ कँ, सववछ कँ, लोकाः कँ ap'ná sabh kē, sabah' kē, or lokani kē, } selves.

Inst. {अपना सभ सँ, सववछ सँ, लोकाः सँ ap'ná sabh sā, sabah' sā, or lokani sā, } by selves.

Dat. {अपना सभ कँ, सववछ कँ, लोकाः कँ ap'ná sabh kē, sabah' kē, or lokani kē, } to selves.

Abl. {अपना सभ सँ, सववछ सँ, लोकाः सँ ap'ná sabh sā, sabah' sā or lokani sā, } from selves.

Gen. {अपना सभक, सववछक, लोकाः अपनाः ap'nah′n sabhak, sabahik, or lokanik, } of selves.

Loc. {अपना सभ मँ, सववछ मँ, लोकाः मँ ap'ná sabh mē, sabah' mē, or lokani mē, } in selves.
Third Person अन्य पुरुष anya purush.

Proximate Demonstrative Non-honorific.

§ 70. ० इ or देवी, this; not used as an adjective, and only used when referring to animate objects.

Singular.

Nom. ० इ or देवी, this.

Acc. एकरा, एकरा कें ekarā, or ekarā kē, this.

Inst. { एकरा ekarē, एकरा औं ekarā sā, } by this.

Dat. एकरा, एकरा कें ekarā, ekarā kē, to this.

Abl. एकरा सं ekarā sā, from this.

Gen. एकर ekar, of this.

Loc. एकरा में ekarā mē, in this.

Plural.

Nom. { ० इ or देवी सभ, सवहिं, लोकनि i or i sabh, sabah', } or lokani, these.

Acc. { एकरा सभ कें, सवहिं कें लोकनि कें, ekarā sabh kē, sabah' kē, or lokani kē, } these.

Inst. { एकरा सभ सं, सवहिं सं, लोकनि सं ekarā sabh sā, sabah' sā or lokani sā, sab'hiē, or lok'niē, } by these.

Dat. { एकरा सभ कें, सवहिं कें, लोकनि कें ekarā sabh kē, sabah' kē, or lokani kē, } to these.
Plural.

Abl. {एकरा सभ सँ, सबबि सँ, लोकणि सँ ekará sabh
sā, sabah' sā, or lokani sā,} from these.

Gen. {एकरा सभक, सबबिक, लोकणिक ekará sabhak,
sab'hi k, or lokani k,} of these.

Loc. {एकरा सभ मेंः, सबबि मेंः, लोकणि मेंः ekará sabh
mē, sabah' mē, or lokani mē,} in these.

Proximate Demonstrative Honorific.

Singular.

§ 71.

Nom. द or ई, i or i, this.

Acc. चिनका, चिनका कें hin'kā, or hin'kā kē, this.

Inst. चिनका सं hin'kā sā, by this.

Dat. चिनका, चिनका कें hin'kā, or hin'kā kē, to this.

Abl. चिनका सं hin'kā sā, from this.

Gen. {चिनका hinak,} of this.

Loc. चिनका मेंः hinkā mē, in this.

Plural.

Nom. {द or ई सभ, सबबि, लोकणि i or i sabh,}
sabah', or lokani,} these.

Acc. {चिनका सभ केंः, सबबि केंः, लोकणि कें hin'kā}
sabh kē, sabah' kē, or lokani kē,} these.
§ 72.] DEMONSTRATIVE PRONOUNS.

**Plural.**

<table>
<thead>
<tr>
<th>Case</th>
<th>Pronoun</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inst.</td>
<td>चिनका सभ सें, सवविच सें, लोजनिल लें हिन्कः</td>
<td>by these.</td>
</tr>
<tr>
<td>Dat.</td>
<td>चिनका सभ केें, सवविच केें, लोजनिल केें हिन्कः</td>
<td>to these.</td>
</tr>
<tr>
<td>Abl.</td>
<td>चिनका सभ सें, सवविच सें, लोजनिल सें हिन्कः</td>
<td>from these.</td>
</tr>
<tr>
<td>Gen.</td>
<td>चिनका सभका, सवविचका, लोजनिलका हिन्कः सब्ह-अक, सब्हा’किक, or लोजनिलकिक</td>
<td>of these.</td>
</tr>
<tr>
<td>Loc.</td>
<td>चिनका सभ में, सवविच में, लोजनिल में हिन्कः</td>
<td>in these.</td>
</tr>
</tbody>
</table>

**Third Person बच्चपुरुष anya purush.**

**Remote Demonstrative Non-Honorific.**

§ 72. वो o, he, she, it, that, not used as an adjective, and only used when referring to animate objects.

**Singular.**

<table>
<thead>
<tr>
<th>Case</th>
<th>Pronoun</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nom.</td>
<td>थो o, he, she, it, that.</td>
<td></td>
</tr>
<tr>
<td>Acc.</td>
<td>थोकरा, थोकरा कें okराः, or okराः kेः, him, etc.</td>
<td></td>
</tr>
<tr>
<td>Inst.</td>
<td>थोकरा सें* okराः sाः, by him, etc.</td>
<td></td>
</tr>
<tr>
<td>Dat.</td>
<td>थोकरा, थोकरा केें okराः, or okराः kेें, to him, etc.</td>
<td></td>
</tr>
<tr>
<td>Abl.</td>
<td>थोकरा सें okराः sाः, from him, etc.</td>
<td></td>
</tr>
<tr>
<td>Gen.</td>
<td>थोकर okर, of him, etc.</td>
<td></td>
</tr>
<tr>
<td>Loc.</td>
<td>थोकरा में okराः mेः, in him, etc.</td>
<td></td>
</tr>
</tbody>
</table>

* The form थोकरे okरेः, is wanting.
DEMONSTRATIVE PAKOUNS.

Plural.

Nom. यो सभ, सबचि, लोकनिन o sabh, sabah', or lokani, they, those.
Acc. योकरासभ केँ, etc. okarā sabh kē, etc., them, etc.
Inst. योकरासभ सं, etc. okarā sabh sā, etc., by them, etc.
Dat. योकरासभ केँ, etc. okarā sabh kē, etc., to them, etc.
Abl. योकरासभ सं, etc. okarā sabh sā, etc., from them, etc.
Gen. योकरासभ, etc. okarā sabhak, etc., of them, their, etc.
Loc. योकरा सभ में, etc. okarā sabh mē, etc., in them, etc.

Remote Demonstrative Honorific.

Singular.

§ 73.

Nom. यो o, he, she, it, that.
Acc. जनका, जनका केँ hun'kā, or hun'kā kē, him, etc.
Inst. जनका सं hun'kā sā, by him, etc.
Dat. जनका, जनका कें hun'kā, or hun'kā kē, to him, etc.
Abl. जनका सं hun'kā sā, from him, etc.
Gen. जनक, जनक सं hunak, hun'kar, of him, his, etc.
Loc. जनका में hun'kā mē, in him, etc.

Plural.

Nom. यो सभ, सबचि, लोकनिन o sabh, sabah', or lokani, they, those.
Acc. जनका सभ केँ, etc. hun'kā sabh kē, etc., them, etc.
Inst. जनका सभ सं, etc. hun'kā sabh sā, etc., by them, etc.
Dat. जनका सभ केँ, etc. hun'kā sabh kē, etc., to them, etc.
Abl. जनका सभ सं, etc. hun'kā sabh sā, etc., from them, etc.
Gen. जनक, जनक सं hunak, hun'kar, of them, their, etc.
Loc. जनका सभ में, etc. hun'kā sabh mē, etc., in them, etc.
The Relative Pronoun.

संबंधवाचक सर्वनाम Sambandh'váchak sarvanám.

§74. Like the Personal and Demonstrative pronouns, the Relative also has two forms—one honorific, and the other non-honorific.

The same observation applies also to the correlative न se and to the Interrogative श ke, and as attention is here drawn to the fact, the remark will not be repeated.

The Relative Pronoun, Non-Honorific.

§75. जे je, who, which, that.

Singular.

Nom. जे je, who, which, that.

Acc. जकरा, जकरा जे, jakará, or jakará kē, whom, etc.

Inst. जकरा सँ, जांचि सँ *jakará sā or jálē sā, by whom, etc.

Dat. जकरा, जकरा जे jakará or jakará kē, to whom, etc.

Abl. जकरा सँ, जांचि सँ jakará sā, or jálē sā, from whom, etc.

Gen. जकर jakar, of whom, whose, etc.

Loc. जकरा मेँ, जांचि मेँ jakará mē, or jálē mē, in whom, etc.

Plural.

Nom. 

\[
\{ जे सभ, सर्वाच, लोकानि je sabh, sabah', or \}

- lokani, 

\} who, which, that.

Acc. 

\[
\{ जकरा या जांचि सभ जे ए एके, jakará or jálē \}

\} whom, etc.

sabh kē, etc.,

* Other forms noted are जे je and jakarē.

† The form जांचि जि jálē is not used throughout the singular, but only in those cases where it is specially given. In the plural it is used in all the oblique cases.
Plural.

Inst. { जकरा or जाँचि सभ सें, etc. jakarā or jāh' } by whom, sabh sā, etc., etc.

Dat. { जकरा or जाँचि सभ कें, etc. jakarā or jāh' } to whom, sabh kē, etc., etc.

Abl. { जकरा or जाँचि सभ सें, etc. jakarā or jāh' } from whom, sabh sā, etc., etc.

Gen. { जकरा or जाँचि सभक, etc. jakarā or jāh' } whom, etc.

Loc. { जकरा or जाँचि सभ में, etc. jakarā or jāh' } in whom, sabh mē, etc., etc.

The Relative Pronoun Honorific.

§ 76.

Singular.

Nom. जे je, who, which, that.

Acc. जनिका, जनिका कें janikā, or janikā kē, whom, etc.

Inst. जनिका सें janikā sā, by whom, etc.

Dat. जनिका, जनिका कें janika, or janikā kē, to whom, etc.

Abl. जनिका सें janikā sā, from whom, etc.

Gen. जनिक, जनिकर janik, janikar, of whom, whose, etc.

Loc. जनिका में janikā mē, in whom, etc.
§ 77. Correlative Pronouns.

Plural.

Nom. जी सभ je sabh, who, which, that.
Acc. जाँकितां सभ कः, etc. janikā sabh kē, etc., whom, etc.
Inst. जाँकितां सभ सँ, etc. janikā sabh sā, etc., by whom, etc.
Dat. जाँकितां सभ कः, etc. janikā sabh kē, etc., to whom, etc.
Abl. जाँकितां सभ सँ, etc. janikā sabh sā, etc., from whom, etc.
Gen. जाँकितां सभक, etc. janikā sabhak, etc., of whom, etc.
Loc. जाँकितां सभ में, etc. janikā sabh mē, etc., in whom, etc.

The Correlative Pronoun Non-Honorific.

§ 77.

Singular.

Nom. से se, he, she, that.
Acc. तकरा, तकरा कः takarā, or takarā kē, him, etc.
Inst. तकरा सँ, ताल्हि सँ* takarā sā, or tāl' sā, by him, etc.
Dat. तकरा, तकरा कः takarā or takarā kē, to him, etc.
Abl. तकरा सँ, ताल्हि सँ takarā sā, or tāl' sā, from him, etc.
Gen. तकर takar, of him, his, etc.
Loc. तकर में, ताल्हि में takarā mē, or tāl' mē, in him, etc.

Plural.

Nom. से सभ, सबत्थि, etc. se sabh, sabh', etc., they, those.
Acc. \{ तकरा or ताल्हि सभ कः, etc. takarā or tāl' sabh kē, etc., \} them, those.
Inst. \{ तकरा or ताल्हि सभ सँ, etc. takarā or tāl' sabh sā etc., \} by them.

* Other forms are ते tē and तकरें takarē.
§ 78.

The Correlative Pronoun Honorific.

Singular.

Nom. से se, he or that.

Acc. तानिका, तानिका कें taniká, or taniká kē, him, etc.

Inst. तानिका सं taniká sā, by him, etc.

Dat. तानिका, तानिका कें taniká, or taniká kē, to him, etc.

Abl. तानिका सं taniká sā, from him, etc.

Gen. तानिका, तानिकाः tanik, tanikar, of him, his, etc.

Loc. तानिका से taniká mē, in him, etc.

Plural.

Nom. से सभ, सबचि, etc. se sabh, sabah' etc., they, those.

Acc. तानिका सभ कें, etc. taniká sabh kē, etc., them, etc.

Inst. तानिका सभ सं, etc. taniká sabh sā, etc., by them, etc.

Dat. तानिका सभ कें, etc. taniká sabh kē, etc., to them, etc.

Abl. तानिका सभ सं, etc. taniká sabh sā, etc., from them, etc.

Gen. तानिका सभक, etc. taniká sabhak, etc., of them, their, etc.

Loc. तानिका सभ से, etc. taniká sabh mē, etc., in them, etc.
§§ 79—80.]

INTERROGATIVE PRONOUNS.

INTERROGATIVE Pronoun Non-Honorific.

प्रश्नवाचक सर्बनाम praśnavāchak saranām.

§ 79.

Singular.

Nom. कै ke, who? which?
Acc. काकरा, काकरा एके kakarā, kakarā ke, whom? which?
Inst. काकरा सँ kakarā sā, by whom? by which?
Dat. काकरा, काकरा एके kakarā, or kakarā ke, to whom? to which?
Abl. काकरा सँ kakarā sā, from whom? from which?
Gen. काकर kakar, whose?
Loc. काकर में kakarā mē, in whom? in which?

Plural.

Nom. के सभ, सब्रि, लोकनिन ke sabh, sabh'e, or lokani, who? which?
Acc. काकरा सभ एदॆ etc. kakarā sabh ke, etc., whom? etc.
Inst. काकरा सभ सँ, etc. kakarā sabh sā, etc., by whom? etc.
Dat. काकरा सभ एदॆ etc. kakarā sabh ke, etc., to whom? etc.
Abl. काकरा सभ सँ etc. kakarā sabh sā, etc., from whom? etc.
Gen. काकरा सभक etc. kakarā sabhak, etc., whose? etc.
Loc. काकरा सभ में etc. kakarā sabh mē, etc., in whom? etc.

The form काक्र hāḥ' which might be expected, is not used so far as my experience goes.

INTERROGATIVE Pronoun Honorific.

§ 80.

Singular.

Nom. के ke, who? which?
Acc. कानिका, कानिका एके kanikā, or kanikā ke, whom? etc.
Inst. कानिका सँ kanika sā, by whom? etc.
Singular.

Dat. कशिका, कशिका के kaniká, or kaniká ke, to whom? etc.
Abl. कशिका से kaniká sā, from whom? etc.
Gen. कशिक, कशिकर kanik, kanikar, whose?
Loc. कशिका में kaniká mē, in whom? etc.

Plural.

Nom. 

Acc कशिका सभे, etc. kaniká sabh kē, etc., whom? etc.
Inst. कशिका सभे, etc. kaniká sabh sā, etc., from whom? etc.
Dat. कशिका सभे, etc. kaniká sabh kē, etc., to whom? etc.
Abl. कशिका सभे, etc. kaniká sabh sā, etc., from whom? etc.
Gen. कशिका सभेक, etc. kaniká sabhak, etc., whose? etc.
Loc. कशिका सभे में, etc. kaniká sabh mē, etc., in whom? etc.

Interrogative Pronoun (used with inanimate objects.)

§ 81. की ki, what. (Irregular).

Singular.

Nom. की ki, what?
Acc. काथी थे, की kathi kē, or ki, what?
Inst. काथी से kathi sā, by what?
Dat. काथी वै kathi vai, to or for what? why?
Abl. काथी से kathi sā, from what?
Gen. काथीक kathi k, of what?
Loc. काथी में kathi mē, in what?

Plural wanting. The singular is used instead. Note the form of the Dative.
### The Interrogative Pronominal Adjective.

§ 82. कौन *kauhn* what? referring to both animate and inanimate objects is not declined.

### Indefinite Pronoun.

§ 83. जो *jo* any one, some one. (Irregular.)

**Singular.**

Nom. जो *jo* any one, some one.

Acc. कारकः, कारकः शेरः *kakaruk* or *kakara-ku* someone, or

Inst. कारकः सः *kakaruk सः* by any one, etc.

Dat. कारकः शेरः *kakaruk* or *kakara-ku* to any one,

Abl. कारकः सः *kakaruk सः* from any one, etc.

Gen. कारकः *kakaruk* of any one, etc.

Loc. कारकः में *kakaruk में* in any one, etc.

### Indefinite Pronoun.

§ 84. किस्तु *kichh* any thing.

Nom. किस्तु *kichh* any thing.

Acc. किस्तु केरः *kichh केरः* any thing.

Inst. किस्तु सः *kichh सः* by any thing.

Dat. किस्तु केरः *kichh केरः* to any thing.

Abl. किस्तु सः *kichh सः* from any one.

Gen. किस्तु *kichhuk* of any thing.

Loc. किस्तु में *kichh में* in any thing.
ADJECTIVAL PROXIMATE DEMONSTRATIVE PRONOUNS.

INDFINITE PRONOUN.

किछु kichh', something.

Nom. किछु kichh', something.
Acc. कथू केघो kathú kē, something.
Inst. कथू सँ kathú sa, by something.
Dat. कथू केघो kathú kē, to something.
Abl. कथू सँ kathú sa, from something.
Gen. कथू काम kathuk, of something.
Loc. कथू में kathú me, in something.

ADJECTIVAL PROXIMATE DEMONSTRATIVE PRONOUN.

§ 85. द i or डे, this, used only as an adjective, when referring to animate objects and used either as an adjective or substantive when referring to inanimate objects.

SINGULAR.

Nom. द or डे (नेना) i or i (nená), this (boy).
Acc. श्यिऱ्थ (नेना) केठ ch' (nená) ke, this (boy).
Inst. \{श्यिऱ्थ (नेना), श्यिऱ्थ (नेना) सेँ ch' (nená) or ch'\} by this (nená) sa, (boy).
Dat. श्यिऱ्थ (नेना) केठ ch' (nená) ke, to this (boy).
Abl. श्यिऱ्थ (नेना) सेँ ch' (nená) sa, from this (boy).
Gen. श्यिऱ्थ (नेनाख) ch' (nenák) of this (boy).
Loc. श्यिऱ्थ (नेना) सेँ ch' (nená) me, in this (boy).
§§ 86—87. ADJECTIVAL PROXIMATE DEMONSTRATIVE PRONOUNS.

Plural.

Nom. { इ or इं सभ (नेना) i or i sabh (nená), }
{ इ or इं (नेना) सभ i or i(nená) sabh, }
these (boys).

Acc. { याइ सभ (नेना) कें eli' sabh (nená) kē, }
{ याइ (नेना) सभ कें eli’ (nená) sabh kē, }
these (boys).

Inst. { याइ सभ (नेना) कें eli’ sabh (nená), }
{ याइ सभ (नेना) सं eli sabh (nená) sā, }
by these (boys).

Dat. { याइ सभ (नेना) कें eli’ sabh (nená) kē, }
{ याइ (नेना) सभ कें eli’ (nená) sabh kē, }
to these (boys).

Abl. { याइ सभ (नेना) सं eli’ sabh (nená) sā, }
{ याइ (नेना) सभ सं eli’ (nená) saah sā, }
from these (boys).

Gen. { याइ सभ (नेना) eli’ sabh (nenák), }
{ याइ (नेना) सभ अं eli’ (nená) sabhak, }
of these (boys).

Loc. { याइ सभ (नेना) में eli’ sabh (nená) mē, }
{ याइ (नेना) सभ में eli’ (nená) sabh mē, }
in these (boys).

§ 86. Similarly is declined the adjectival remote Demonstrative Pronoun谁ick, that, (oblique form टोडी 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 यो je, who, which, that, में se, he, she, क्ये ke, who, ? which? की ki? what, कैब्रो keo, any one, some one, क्रिक्क kichhi, any thing and क्रिक्क kichhi', 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 क्ये ke, who? and की ki, what?) retain
the forms of their respective nominatives. If, however, agreeing with a noun in the oblique form, they themselves change as follows:—

जे जे, who, which, that, becomes जाँचि jaḥ.
से se, he, she, becomes जाँचि táḥ.
केब्बी keo, any one, some one, becomes कोनो kono.
किच्चु kichh', any thing, remains किच्चु kichh'.
किच्चु kichh', something, remains किच्चु kichh'.

But जे ke, who? which? and की ki, what? when used ad-
jectivally always become कोन kono.

§ 88. Examples.

1. जे घायल छल, से मेल je āel chhal, se gel ;—he who came, went.
2. जे लोक घायल छल, से लोक मेल je lok āel chhal, se lok gel ;—
the man who came, went.
3. जकर खेत, ताकर धान jakar khet, takar dhán;—he who
owns the field owns the rice crop.
4. जाँचि लोकक खेत, जाँचि लोकक धान jaḥ' lokak khet, táḥ' lokak
dhán ;—the man who owns the field, owns the rice
crop.
5. जे छल ? ke chhal ? ;—who was he ?
6. की कोन लाज थङक? o kon lok thik ?—what caste is he ?
7. जकर घोड़ छैँक kakar ghor chhaik ;—whose horse is it ?
8. कोन कोनक घोड़ छैँक ? kon lokak ghor chhaik ?—what per-
son is the owner of the horse ?
6. की छैक? *ki chhaik*?—what is it?
10. कोन छठ्छ छैक? *kon briksh chhaik*?—what tree is it?
11. कत्थी में पानि लाएल कछ? *kathē mē pāṇi lāel chhāh*?—n what have you brought the water?
12. कोता लोटा में पानि लाएल कछ? *kon lotā mē pāṇi lāel chhāh*?—in what lotā have you brought the water?
13. केथे नल्लां छायल? *keo nah'n āel*?—no one came.
14. कोटो नेनां लल्ल छायल *kono nenā nah'n āel*?—no boy came.
15. यौहि ग्राम में कत्थो छिंधु नल्लां छैक *oh' grām mē kākaro kichh' nah'ñ chhaik*?—in that village no one has any property.
16. यौहि ग्रामकत्थी कोटो बनीयाँ सं छिंधु नल्लां भेंटाँ *oh' grāmak kono baniā sā kichh' nah'ñ bhētāt*?—he will get nothing from any shopkeeper of that village.
17. छिंधु चमोट पठबिछ्छक *kichh' amot pathabiha*?—send me some mango conserve.
18. चो चायाध कयू में धैज दोटेक o aukhadh kathū mē dhail hotaik?—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.
<table>
<thead>
<tr>
<th>Time</th>
<th>Near Demonstrative</th>
<th>Remote Demonstrative</th>
<th>Interrogative</th>
<th>Relative</th>
<th>Correlative</th>
</tr>
</thead>
<tbody>
<tr>
<td>ह धि this.</td>
<td>होऽि that.</td>
<td>होऽि or कोऽि who?</td>
<td>होऽि who, which.</td>
<td>होऽि that.</td>
<td></td>
</tr>
<tr>
<td>एखळ now.</td>
<td>तखळ then.</td>
<td>कखळ when?</td>
<td>जखळ when.</td>
<td>तखळ then.</td>
<td></td>
</tr>
<tr>
<td>Place</td>
<td>हतळ here.</td>
<td>हतळ there.</td>
<td>कतळ where?</td>
<td>जतळ wherever.</td>
<td>ततळ there.</td>
</tr>
<tr>
<td>एखळ hither.</td>
<td>हौऽि hither.</td>
<td>बेहळ whither?</td>
<td>जळळ whether.</td>
<td>तळळ thither.</td>
<td></td>
</tr>
<tr>
<td>मणमण thus.</td>
<td>होऽि in that way.</td>
<td>होऽि how?</td>
<td>जळळ as</td>
<td>तळळ so.</td>
<td></td>
</tr>
<tr>
<td>Likedates.</td>
<td>एहळ like this.</td>
<td>बेहळ like that.</td>
<td>जळळ like as.</td>
<td>तळळ like the same.</td>
<td></td>
</tr>
<tr>
<td>Quantity</td>
<td>धतळ this much.</td>
<td>बतळ that much.</td>
<td>बतळ how much.</td>
<td>बतळ as much.</td>
<td>बतळ so much.</td>
</tr>
</tbody>
</table>
The following are the Cardinals up to 100. It will be observed that they differ from those in use in Hindi. It has not been thought necessary to transliterate them.

<table>
<thead>
<tr>
<th>Hindi</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td>० एक</td>
<td>0 सप्टेनबर</td>
</tr>
<tr>
<td>१ दुह</td>
<td>1 जून</td>
</tr>
<tr>
<td>२ तीन</td>
<td>2 जूलाई</td>
</tr>
<tr>
<td>३ चार</td>
<td>3 जुलाई</td>
</tr>
<tr>
<td>४ पाँच</td>
<td>4 जुलाई</td>
</tr>
<tr>
<td>५ की</td>
<td>5 जुलाई</td>
</tr>
<tr>
<td>६ सात</td>
<td>6 जुलाई</td>
</tr>
<tr>
<td>७ आठ</td>
<td>7 जुलाई</td>
</tr>
<tr>
<td>८ नौ</td>
<td>8 जुलाई</td>
</tr>
<tr>
<td>९ दस</td>
<td>9 जुलाई</td>
</tr>
<tr>
<td>१० एकादश</td>
<td>10 जुलाई</td>
</tr>
<tr>
<td>११ एक्साडेस</td>
<td>11 जुलाई</td>
</tr>
<tr>
<td>१२ बार्थ</td>
<td>12 जुलाई</td>
</tr>
<tr>
<td>१३ तेन्थ</td>
<td>13 जुलाई</td>
</tr>
<tr>
<td>१४ चार्ड</td>
<td>14 जुलाई</td>
</tr>
<tr>
<td>१५ थ्रेस</td>
<td>15 जुलाई</td>
</tr>
<tr>
<td>१६ सब्स फॉर सब्सॉ डेस</td>
<td>16 जुलाई</td>
</tr>
<tr>
<td>१७ सेव्स</td>
<td>17 जुलाई</td>
</tr>
<tr>
<td>१८ बार्थर्स</td>
<td>18 जुलाई</td>
</tr>
<tr>
<td>१९ उन्नेस</td>
<td>19 जुलाई</td>
</tr>
<tr>
<td>२० वीस</td>
<td>20 जुलाई</td>
</tr>
<tr>
<td>49</td>
<td>युक्तावलीस</td>
</tr>
<tr>
<td>50</td>
<td>वेष्यावलीस</td>
</tr>
<tr>
<td>51</td>
<td>वैंलावलीस</td>
</tr>
<tr>
<td>52</td>
<td>चौथ्यावलीस</td>
</tr>
<tr>
<td>53</td>
<td>चैंलावलीस</td>
</tr>
<tr>
<td>54</td>
<td>चैंलावलीस</td>
</tr>
<tr>
<td>55</td>
<td>अठतालीस</td>
</tr>
<tr>
<td>56</td>
<td>अठतालीस</td>
</tr>
<tr>
<td>57</td>
<td>उनचास</td>
</tr>
<tr>
<td>58</td>
<td>चच्चरि</td>
</tr>
<tr>
<td>59</td>
<td>छछारि</td>
</tr>
<tr>
<td>60</td>
<td>सतसज्जरि</td>
</tr>
<tr>
<td>61</td>
<td>तेह्वरि</td>
</tr>
<tr>
<td>62</td>
<td>चैंलावलीस</td>
</tr>
<tr>
<td>63</td>
<td>उनसज्जरि</td>
</tr>
<tr>
<td>64</td>
<td>चैंलावलीस</td>
</tr>
<tr>
<td>65</td>
<td>रावचास</td>
</tr>
<tr>
<td>66</td>
<td>चच्चरि</td>
</tr>
<tr>
<td>67</td>
<td>सतसज्जरि</td>
</tr>
<tr>
<td>68</td>
<td>तेह्वरि</td>
</tr>
<tr>
<td>69</td>
<td>चैंलावलीस</td>
</tr>
<tr>
<td>70</td>
<td>चैंलावलीस</td>
</tr>
</tbody>
</table>
§§ 91—93.]

**ORDINALS.**

§ 91. Ordinals are simple in their formation and run as follows:—

- पच्चिम first.
- दोसर second.
- तेसर third
- चौथ or चारिम fourth.
- पाँचव fifth.
- कष्टम sixth.

Etcetera; the ordinals of the remaining numbers being formed by adding न as a termination.

**FRACTIONAL NUMBERS.**

§ 92. The following are useful:—

- पाचया a quarter.
- चाध a half.
- तीन three quarters; or, less by a quarter.
- सवेरा one and a quarter; or, plus a quarter.
- द्वेषोहा one and a half; or, plus a half.

**AGGREGATE NUMBERS.**

§ 93. Note the form द्वृत both.
§ 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 kālas (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 Hindi;—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.
3. Double non-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

* 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 अव अव, or अव अव, and the conjugational base or root of the verb may be found by cutting off this अव अव, or अव अव, from the infinitive. Thus देख देख is the infinitive mood, and means "to see." Cutting off अव अव we obtain देख देख, which is the root.

§ 106. By adding, the termination नाल नाल to the root we obtain the present participle. Example, देख देख देख, "seeing".

§ 107. By adding the termination अल अल to the root we obtain the past participle. Example, देख देख, "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 Hindi the Retrospective Conditional is said to be formed from the Present Participle. In Maithili 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. छब chhab, to be.
2. दिकिब thikab, to stand (?)
3. रहब rahab, to remain.

It is also defective, only the present and imperfect forms existing. A past participle is also borrowed from the irregular verb ज्ञान hoeb, to be.

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Chapter VIII.

THE AUXILIARY VERB.

छह 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. छम or छमा सभ छ्री ham, or han'ra sabh chhi, (1) I am, or we are.

2nd P. चाहा or चाहा सभ क्री ahā, or ahā sabh chhi, (1) you are.

3rd P. ओ or ओ सभ छ्रिच o, or o sabh chhath', (2) he is, or they are.

(1) Optional forms of क्री are क्रिं chhiai, and क्रिंक chhiaik. The forms क्रिङ्ग chhiau, क्रिङ्गक chhiauk and क्रिङ्गह chhiah', are also used, but only in the first person.
b. Non-Honorific.

1st P. चहम, or चहमरा सम् की ham, or ham'rā sabh chhi,(1) I am, or we are,

2nd P. तोह, or तोहरा सम् कह् tōh, or toharā sabh chah,(2) you are.

3rd P. चो, or चो सम् चक्ष्न o, or o sabh achhi,(3) he is or they are.

(1) Optional forms for की are ह्यतिय chhiai, ह्यतिक chhiaik, ह्यतित chhiau, ह्यतित्र chhiauk, and ह्यतित्र chhiah'.

(2) Optional forms of कह् chhah are ह्यक chhē, ह्यक chhāi, कहक chhahak and कहक chhahik.

(4) Optional forms of चक्ष्न achh' are ह्यक chhai, ह्यक chhaik, ह्यक chkau, and ह्यक chhauk.

Feminine.

The feminine is the same as the masculine, except that in the 2nd Person non-Honorific, the form कह्न chhah'न is substituted for कह् chhah.

Form II.

Used when special respect is attributed to the object.

Masculine.

Honorific.

1st P. चम, or चमरा सम् क्षितन्त्न् ham, or ham'rā sabh chhiainh', I am or we are.

2nd P. अहां, or अहां सम् क्षितन्त्न् ahā', or ahā' sabh chhiainh', You are.

3rd P. चो, or चो सम् क्षीतन्त् o, or o sabh chhathānh', he is, or they are.

(3) An optional form of क्षीतन्त् chhathānh', is क्षीतन्त् chhathānh'.

Non-Honorific.

1st P. चम or चमरा सम् क्षितिन्त् ham or ham'rā sabh chhiainh', I am, or we are.
2nd P. तों or तोहरा सभ ꟻँहूँपि tōh, or toharā sabh chha-
hūnh', you are.

3rd P. चौ, or चौ सभ ꟻँहूँपि 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 थिक 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.

<table>
<thead>
<tr>
<th>1st P.</th>
<th>2nd P.</th>
<th>3rd P.</th>
</tr>
</thead>
<tbody>
<tr>
<td>thih,* thikah*h,*</td>
<td>thih,* thikah*h,*</td>
<td>thih,* thikah,*</td>
</tr>
</tbody>
</table>

(1) Optional forms for थिकह thikanh' are थिकह thikaś, थिकह thikaś, and थिकह thikaś. The forms थिकिय thikia, थिकिय thikia, and थिकिय thikiah' are also used but only in the first person.

(2) Optional forms for थिकह thikah (2nd Person non-Honorific) are थिकह thik, थिकह thik, थिकह thikahak, and थिकह thikahak.

(4) Optional forms for थिक thik are थिक thik, थिक thik, थिक thik, थिक thik, and थिक thik.

Feminine.

<table>
<thead>
<tr>
<th>1st P.</th>
<th>2nd P.</th>
<th>3rd P.</th>
</tr>
</thead>
<tbody>
<tr>
<td>thik,*</td>
<td>thik,*</td>
<td>thik,*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>thik,* thikah*h,*</td>
<td>thik,* thikah*h,*</td>
<td>thik,* thik,*</td>
</tr>
<tr>
<td>thik,* thikah,*</td>
<td>thik,* thikih,*</td>
<td>thik,* thik,*</td>
</tr>
</tbody>
</table>

* Optional forms for थिकह thikanh' are थिकह thikaś, थिकह thikaś, and थिकह thikaś. The forms थिकिय thikia, थिकिय thikia, and थिकिय thikiah' are also used but only in the first person.

(2) Optional forms for थिकह thikah (2nd Person non-Honorific) are थिकह thik, थिकह thik, थिकह thikahak, and थिकह thikahak.

(4) Optional forms for थिक thik are थिक thik, थिक thik, थिक thik, थिक thik, and थिक thik.
(1) Optional forms of ḍhirḍu thikah'ū are already given under the masculine.

(2 & 3) An optional form of ḍhirḍi thikih is ḍhirḍi thikih'.

(4) Optional forms of ḍhirḍi thik are given under the masculine, as optional forms of ḍirḍi thik.

**Form II.**

*Used when special respect is attributed to the object.*

**Masculine.**

<table>
<thead>
<tr>
<th>Honorific</th>
<th>Non-Honorific</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st P. thikiaṇh',¹</td>
<td>thikiaṇh',¹</td>
</tr>
<tr>
<td>2nd P. thikiaṇh',¹</td>
<td>thik'huṇh',²</td>
</tr>
<tr>
<td>3rd P. thik'thāṇh',³</td>
<td>thikāṇh'.⁴</td>
</tr>
</tbody>
</table>

(3) An optional form is ḍhirḍi thik'thāṇh'.

**Feminine.**

The Feminine is the same as the Masculine.

§ 113. **NOTE.** Wherever the persons of ḍri chhi can be used, the corresponding forms of ḍhirḍu thikah'ū can also be used. This rule is universal, and must be noted. ḍri chhi is used as an auxiliary in forming the present and perfect tenses of other verbs, and in those cases ḍhirḍu thikah'ū can always be substituted for it. In the verbal paradigms, I shall only give ḍri chhi as an auxiliary, but it must never be forgotten that ḍhirḍu can also be used.

**Imperfect Tense.**

§ 114. **“I was” etc.**

**Form I.**

*Used when no special respect is attributed to the object.*

a. **Honorific.**

<table>
<thead>
<tr>
<th>1st P.</th>
<th>1st P. or ḍhrārā sābh ḍhrān ham, or ḍhrārā sābh chhalah'ū;</th>
</tr>
</thead>
<tbody>
<tr>
<td>thun</td>
<td>I was or we were.</td>
</tr>
</tbody>
</table>
2nd P. यहाँ, or यहाँ सम खले "ahā', or ahā sabh chhalah'न, you were.

3rd P. औ, or औ सम खलाँ o, or o sabh chhalāli, he was or they were.

(1) Optional forms of खल ह are खलन्द्रिय chhalai, and खलन्द्रिय chhalai. The forms खलियिय chhaliau, खलियिय chhaliau and खलन्द्रिय chhaliah are also used, but only in the 1st Person.

b. Non-Honorific.

1st P. चम, or चमरा सम खलङ्ग ham, or ham'rá sabh chhalah'न, I was, or we were.

2nd P. तोंह, or तोंहरा सम खलाँ तोह, or tohará sabh chhalāli, you were.

3rd P. औ, or औ सम खल o, or o sabh chhal, he was, or they were.

(1) Optional forms of खल ह are given above.

(2) Optional forms of खलाँ chhalāli are खलियिय chhalāli, खलियिय chhalāli, खलन्द्रिय chhal'hak, and खलन्द्रिय chhal'hik.

(3) Optional forms of खल chhal are खलियिय chhalai, खलियिय chhalai, खलियिय chhalai and खलियिय chhalau.

Feminine.

(Personal pronouns, and meanings are omitted to save space).

Honorific. Non-Honorific.

1st P. खलच " chhalah'न, खलच " chhalah'न, खलहै chhalah'न, 1.

2nd P. खलच " chhalah'न, खलीच chhal, 2.

3rd P. खलीच chhal, खल " chhal, 3.

(1) Optional forms of खल ह are given above.

(2&3) An optional form of खलीच chhalh is खलीच chhalh'ः.

(4) Optional forms of खलिन chhal, are given under the masculine as optional forms of खल chhal.
THE AUXILIARY VERBS.

FORM II.

Used when special respect is attributed to the object.

Masculine.

a. Honorific.

1st P. चम, or चमरा सम छलियेन्हि ham, or ham'rā sabh chhaliain'h', I am or we were.

2nd P. बहा or बहा सम छलियेन्हि ahā', or ahā sabh chhaliain'h', you were.

3rd P. बो or बो सम छलथून्हि o, or o sabh chhal'thün'h.3 He was or they were.

(3) An optional form of छलथून्हि chhal'thün'h', is छलथून्हि chhal'thün'h.'

b. Non-Honorific.

1st P. चम or चमरा सम छलियेन्हि ham, or ham'rā sabh chhaliain'h', I was, or we were.

2nd P. तोह, or तोहरा सम छलून्हि toh, or toharā sabh chhal'thün'h', You were.

3rd P. बो or बो सम छलून्हि o, or o sabh chhalain'h'. 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

<table>
<thead>
<tr>
<th>Honorific</th>
<th>Non-Honorific</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st P.</td>
<td>रही rahī³</td>
</tr>
<tr>
<td>2nd P.</td>
<td>रही rahī¹</td>
</tr>
<tr>
<td>3rd P.</td>
<td>रहविय rahahi³</td>
</tr>
</tbody>
</table>
§§ 116—117

(1) Other forms are रहिये rahiai, रहियेिक rahiaik. The forms रहियेि rohiau, रहियेिक rahiauk and रहियेिह rohiah, are also used, but only in the first person.

(2) Other forms are रह rah, रहहह rohahak, and रहहीक rahahik.

The Feminine is the same as the Masculine, except that the form रहििह रहँिद्व is substituted for रहिद rahah of the 2nd Person non-Honorific.

**Form II.**

*Used when special respect is attributed to the object.*

**Masculine.**

<table>
<thead>
<tr>
<th>Honorific</th>
<th>Non-Honorific</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1st P.</strong> रहियेििह rahiainh',¹</td>
<td>रहियेििह rahiainh',¹</td>
</tr>
<tr>
<td><strong>2nd P.</strong> रहियेििह rahiainh',¹</td>
<td>रहौििह rah'ünih',²</td>
</tr>
<tr>
<td><strong>3rd P.</strong> रहौििह rah'ünih',³</td>
<td>रहौििह rahainh'.⁴</td>
</tr>
</tbody>
</table>

(3) Another form is रहिििह rah'ünih'.

**Feminine.**

The Feminine is the same as the Masculine.

§ 116. **Note.** Wherever the persons of चलहु ehalah'n can be used, the corresponding forms of रहि rahe can also be used. This rule is universal, and must be noted. चलहु ehalah'n is used as an auxiliary in forming the imperfect and pluperfect tenses of other verbs, and in those cases रहि rahe can always be substituted for it. In the verbal paradigms I shall only give चलहु ehalah'n as an auxiliary, but it must never be forgotten that रहि rahe can also be used.

§ 117. The only remaining form in use is as follows :—

**Past Participle.**

Masculine, मेष bhel.
Feminine, मेषि bhel'.
THE TRANSITIVE VERB.

§ 118. I now proceed to give the conjugation in full of the transitive verb देखब dekhab 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 अन-ab directly to the root, and the second by adding अत-at either directly to the root, or with an intermediate अ-i (in the latter case the initial अ-a of the stem termination being omitted). We thus get देखब dekhab, and देखत dekhat, or देखित dekhit. To either of these stems the termination ग-ɡa, 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 भवितासि bhavitāsi “I am to be” or “I shall be” and the French jˈaimer-ai “I have to love”, or “I shall love”. In the same way we have देखब-ɡa dekhab-ɡa “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 dekhit or देखत dekhat, 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 dekhit may be connected with a low Sanskrit form of दिखिता dorśita, the less common form of the periphrastic future of दृढ dṛś “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 भवित “to be”.

Chapter IX.
§ 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 ए a, of the present participle being absent from the tense, except in one form of the 3rd person non-Honorific (देखित 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 जिः achh' "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.
THE CONJUGATION OF A TRANSITIVE VERB. [§§ 131—132.

CONJUGATION OF A TRANSITIVE VERB.

Active Voice.

Model Verb देखन dekhā, "to see".

Principal Parts.

§ 131.

Root ... देख देख, "see."

Present participle ... देखै देखै, "seeing".

Past participle ... देखल देखल, "seen".

1. Four tenses are formed from the root देख देख.

§ 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.

Honoriific. Non-Honoriific.

1st. P. देखी देखी,¹ देखी देखी.¹

2nd P. देखी मेखी,¹ देखल देखल,²

3rd P. देखली देखली,³ देखल देखल.⁴

(1) Other forms are देखिन dekhīai, देखिन देखिन, dekhīaik. The forms देखिन dekhīau, देखिन देखिन, dekhīau, and देखिन देखिन, dekhīaik, are also used, but only in the first person.

(2) Other forms are देख dekh, देखल देखल, देखल देखल.

The Feminine is conjugated like the masculine; except that in the 2nd person non-Honoriific the form देखल dekhā is not used, the form देखल dekhā 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.
§ 133. ]  THE CONJUGATION OF A TRANSITIVE VERB.  63

Form. II.

Used when special respect is attributed to the object.

Masculine.

<table>
<thead>
<tr>
<th>Honorific</th>
<th>Non-Honorific</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st P.</td>
<td>देखिएन्ति देखिएन्ति</td>
</tr>
<tr>
<td>2nd P.</td>
<td>देखिएन्ति देखिएन्ति</td>
</tr>
<tr>
<td>3rd P.</td>
<td>देखिएन्ति देखिएन्ति</td>
</tr>
</tbody>
</table>

(1) Another form is देखिएन्ति देखिएन्ति, 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.

<table>
<thead>
<tr>
<th>Honorific</th>
<th>Non-Honorific</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st P.</td>
<td>देखव देखव</td>
</tr>
<tr>
<td>2nd P.</td>
<td>देखव देखव</td>
</tr>
<tr>
<td>3rd P.</td>
<td>देखव देखव</td>
</tr>
</tbody>
</table>

(1) Other forms are देखव देखव, देखव देखव, देखव देखव, देखव देखव, देखव देखव, देखव देखव, देखव देखव, देखव देखव.

(2) Other forms are देखव देखव, देखव देखव, देखव देखव.
(4) Other forms are देखि dekh’tai, देखते देख’taik, देखती देख’tau, देखताक देख’tauk.

In the Feminine the following forms are substituted.

For 2, देखन हि dekh’bāni. For 3, देखती हि dekh’tih, or देखति हि dekh’tih.

For 4, देखति dekhat’ instead of देखि dekhat. The remaining forms are common to both genders.

**Form II.**

*Used when special respect is attributed to the object.*

**Masculine.**

<table>
<thead>
<tr>
<th>Honorifique</th>
<th>Non-Honorifique</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st P. देखन हि देख’bainhi'</td>
<td>देखन हि देख’bainhi'</td>
</tr>
<tr>
<td>2nd P. देखन हि देख’bainhi'</td>
<td>देखन हि देख’bainhi'</td>
</tr>
<tr>
<td>3rd P. देखन हि देख’thainhi'</td>
<td>देखन हि देख’thainhi'</td>
</tr>
</tbody>
</table>

(3) Another form is देखन हि देख’bainhi'.

The Feminine the same as the masculine.

*Note.* That to all the above forms, with the exception of देखि dekh’ga, the termination ग-गा, can optionally be added. In this syllable the inherent त्र-ा, is pronounced. E. g. देखि dekhab, or देखन हि dekhab’ga.

§ 134.  

**The Imperative.**

"Let me see," "See thou," etc.

**Form I.**

*Used when no special respect is attributed to the object.*

**Masculine.**

<table>
<thead>
<tr>
<th>Honorifique</th>
<th>Non-Honorifique</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st P. देखू dekhuí</td>
<td>देखू dekhú'</td>
</tr>
<tr>
<td>2nd P. देखू dekhú'</td>
<td>देखू dekhú'</td>
</tr>
<tr>
<td>3rd P. देखू dekhath'</td>
<td>देखू dekhau'</td>
</tr>
</tbody>
</table>

*Note.* The final त्र-ा in this form is pronounced.
(1) Other forms are देखिया देखिया, देखिया देखिया, and देखिया देखिया. The forms देखिया देखिया, and देखिया देखिया, are also used, but only in the first person.

(2) Other forms are देख देख, देख देख, देख देख, and देख देख.

The Feminine is conjugated like the masculine, except that in the 2nd person non-Honorific the form देख देख, is not used, the form देख देख or देख देख being used instead.

### Form II.

*Used when special respect is attributed to the object.*

**Masculine.**

<table>
<thead>
<tr>
<th>Honorific</th>
<th>Non-Honorific</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st P. देखिया देखिया</td>
<td>देखिया देखिया</td>
</tr>
<tr>
<td>2nd P. देखिया देखिया</td>
<td>देखिया देखिया</td>
</tr>
<tr>
<td>3rd P. देखिया देखिया</td>
<td>देखिया देखिया</td>
</tr>
</tbody>
</table>

(1) Another form is देखिया देखिया.

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.**

<table>
<thead>
<tr>
<th>Honorific</th>
<th>Non-Honorific</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st P. देखिया देखिया</td>
<td>देखिया देखिया</td>
</tr>
<tr>
<td>2nd P. देखिया देखिया</td>
<td>देखिया देखिया</td>
</tr>
<tr>
<td>3rd P. देखिया देखिया</td>
<td>देखिया देखिया</td>
</tr>
</tbody>
</table>
(1) Other forms are धक्षितिण्ड dekhitai, and धक्षितिण्ड dekhitaiak. The forms धक्षितिण्ड dekhitaun, धक्षितिन्द्र dekhitaun, and धक्षितिण्ड dekhitaun, are also used, but only in the 1st Person.

(2) Other forms are धक्षिते dekhiti, दक्षिताडक dekhitahak, and धक्षिताहिण्ड dekhitahik.

(4) Other forms are धक्षिते dekhitai, धक्षिताड dekhitaiak, धक्षिता dekhitau and धक्षिताहिण्ड dekhitahik.

The Feminine is conjugated like the masculine, except that, in the 2nd person non-Honorific, the form धक्षिताड dekhitah is not used; the form धक्षिताड dekhitah or धक्षिताड dekhitah being used instead.

Form II.

Used when special respect is attributed to the object.

Masculine.

Honorific. Non-Honorific.

1st P. धक्षितादे dekhitai, 1st P. धक्षितादे dekhitai, 1
2nd P. धक्षितादे dekhitai, 2nd P. धक्षितादे dekhitai, 2
3rd P. धक्षितादे dekhitai, 3rd P. धक्षितादे dekhitai, 3

(3) Another form is धक्षितादे dekhitai.

The Feminine is the same as the masculine.

§ 136.

2. Two tenses are formed from the Present Participle धक्षित 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. धेखित धे dekhait chhi, 1st P. धेखित धे dekhait chhi, 1
2nd P. धेखित धे dekhait chhi, 2nd P. धेखित धे dekhait chhah, 2
3rd P. धेखित धे dekhait chhath, 3rd P. धेखित धे dekhait achh, 3

4. Another form is धेखित धे dekhait.

The Feminine is the same as the masculine.
(1) For the auxiliary की chhi may be used ड्रें chhiai, and ड्रेंएक chhiaik. The forms ड्रें chhiau, ड्रेंक्रील chhiauk, and ड्रेंएलस chhiah', are also used, but only in the first person.

(2) Other forms of the auxiliary are ड्रें chhê, ड्रें chhêi, ड्रें chhahak; and ड्रेंक्रील chhahêk.

(4) Other forms of the auxiliary are ड्रें chhài, ड्रें chhaik, ड्रें chhau, and ड्रेंक्रील chhauk.

Feminine.

The Feminine is conjugated like the masculine, except that the feminine form of the Present Participle, ड्रेंहेिल dekhait', is used instead of the masculine form ड्रेंहेिल dekhait. E.g. ड्रेंहेिल की dekhait' chhi, instead of ड्रेंहेिल की dekhait chhi. The form ड्रेंहेिल की dekhait' chhah' (which might be expected as the 2nd person non-Honorific) is not used, ड्रेंहेिल की dekhait' chhah' or ड्रेंहेिल की dekhait' chhah' न being substituted.

Form II.

Used when special respect is attributed to the object.

Masculine.

Honorific.

1st P. ड्रेंहेक्ला ड्रेंब्रेक्ला dekhait chhiainh',
2nd P. ड्रेंहेक्ला ड्रेंब्रेक्ला dekhait chhiainh',
3rd P. ड्रेंहेव ड्रेंब्रैह्न्ड dekhait chhathánh',

Non-Honorific.

1st P. ड्रेंहेक्ला ड्रेंब्रैह्न्ड dekhait chhiainh',
2nd P. ड्रेंहेव ड्रेंब्रैह्न्ड dekhait chhánh',
3rd P. ड्रेंहेव ड्रेंब्रैह्न्ड dekhait chhaíinh',

(3) Another form of the Auxiliary is ड्रेंब्रैह्न्ड chhathính'.
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- of the Present Participle may be, and usually is, omitted. The Participle and auxiliary then form one word. E. g. देखैत छौ dekhait chhī, or देखैतै dekhaitchhī. Similarly, when feminine, the final °त- of the participle may be omitted. E. g. देखैत छौ dekhait chhī, or देखैतै dekhaitchhī.

§ 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 क्रजङङ देकहैत च्ह्हराहँ,

2nd P. देखैत क्रजङङ देकहैत च्ह्हराहँ,

3rd P. देखैत क्रजङङ देकहैत च्ह्हराहँ,

**Non-Honorific.**

1st P. देखैत क्रजङङ देकहैत च्ह्हराहँ,

2nd P. देखैत क्रजङङ देकहैत च्ह्हराहँ,

3rd P. देखैत क्रजङङ देकहैत च्ह्हराहँ.

(1) Other forms of the auxiliary क्रजङङ च्ह्हराहँ, are क्रजङङ च्ह्हलाई, and क्रजङङ च्ह्हलाईक. The forms क्रजङङ च्ह्हलाई, क्रजङङ क्रजङङ च्ह्हलाईक and क्रजङङ च्ह्हलाई are also used, but only in the first person.

(2) Other forms of the auxiliary are क्रजङङ च्ह्हलाई, क्रजङङ च्ह्हलाई, क्रजङङ क्रजङङ च्ह्हलाई, क्रजङङ च्ह्हलाईक.

(4) Other forms of the auxiliary are क्रजङङ च्ह्हलाई, क्रजङङ च्ह्हलाईक, क्रजङङ च्ह्हलाईक, and क्रजङङ च्ह्हलाईक.
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FEMININE.

As explained under the head of the present tense, the Present Participle takes the form \textit{dekhait} in the feminine. Also, in the feminine, the form चालिध चहलिध, or चालिध चहलिध' is substituted for चालिध चहलिध of the 3rd person Honorific, and 2nd person non-Honorific, and the form चालिध चहल' is substituted for चाल चहल of the 3rd person non-Honorific.

FORM II.

Used when special respect is attributed to the object.

MASCULINE.

Honorific.

1st P. \textit{देखैत} किल्चिक्स देखाईत चहलाईन्ह',
2nd P. \textit{देखैत} किल्चिक्स देखाईत चहलाईन्ह',
3rd P. \textit{देखैत} किल्चूहून्ख देखाईत चहल'मार्न्ह ',

Non-Honorific.

1st P. \textit{देखैत} किल्चिक्स देखाईत चहलाईन्ह',
2nd P. \textit{देखैत} किल्चूहून्ख देखाईत चहल'मार्न्ह ',
3rd P. \textit{देखैत} किल्चून्ख देखाईत चहलाईन्ह'.

(3) Another form of the auxiliary is कल्चून्ख चहल'मार्न्ह'.

FEMININE.

As in the Present Tense, the present participle takes the feminine termination कीत-ँ. In other respects the feminine of this form is the same as the masculine.

Observe.—As in the present tense, the masculine termination कीत-ँ, and the feminine termination कीत-ँ of the present participle may optionally be omitted. E. g. \textit{देखैत} चलाईन्ह देखाईत चहला'न or देखैत चलाईन्ह देखाईत चहला'न. The latter is the more usual form.
§ 138.
3. Three tenses are formed from the Past Participle देखा देखा.

a. The Past.

“I saw,” etc.

Form I.

Used when no special respect is attributed to the object.

Masculine.

Honorific. Non-Honorific.

1st P. देखल देखल; देखल, देखल.
2nd P. देखल देखल.
3rd P. आर आर.

(1) Other forms are देखल, देखल; देखल; देखल, and देखल. The forms देखल; देखल; देखल; देखल are also used, but only in the first person.

(2) Other forms are देखल देखल, देखल देखल, देखल देखल, and देखल.

(4) Other forms are देखल देखल, देखल देखल, and देखल.

Feminine.

The following forms are substituted:\n
In (1). For देखल देखल, देखल.
In (2). For देखल देखल, देखल; देखल; देखल, or देखल; देखल.

Form II.

Used when special respect is attributed to the object.

Masculine.

Honorific. Non-Honorific.

1st P. देखल; देखल; देखल.
2nd P. देखल; देखल.
3rd P. आर आर आर.
§ 139. THE CONJUGATION OF A TRANSITIVE VERB.

(1) Another form is देखिलाइहँ' dekh'liainh'.

(2) Another form is देखिलाइहँ' dekh'laikh'.

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. देखिलाइहँ' dekh'liainh' ;
2nd P. देखिलाइहँ' dekh'laikh' ;
3rd P. देखिलाइहँ' dekh'lanh' aehh' ;

Non-Honorific.

1st P. देखिलाइहँ' dekh'laikh' aehh' ;
2nd P. देखिलाइहँ' dekh'lah aehh' ;
3rd P. देखिलाइहँ' dekh'laikh aehh' .

(1) Other forms are देखिलाइहँ' dekh'ial aehh' , देखिलाइहँ' dekh'liai aehh' , देखिलाइहँ' dekh'liai aehh' , देखिलाइहँ' dekh'liai aehh' , देखिलाइहँ' dekh'laikh aehh' , and देखिलाइहँ' dekh'li aehh' . The forms देखिलाइहँ' dekh'liau aehh' , देखिलाइहँ' dekh'liau aehh' , देखिलाइहँ' dekh'liau aehh' , देखिलाइहँ' dekh'liau aehh' , देखिलाइहँ' dekh'lauk aehh' , and देखिलाइहँ' dekh'liah aehh' , are also used but only in the first person.
(2) Other forms are देखाने रत्नक dekh', देखाइ dekh'āi achh', देखांक रत्नक dekh'ā'k akh', देखाये रत्नक dekh'ahāk achh'.

(4) Other forms are देखाए रत्नक dekh'kai dekhka, देखाए रत्नक dekh'kai, देखाए रत्नक dekh'kait, and देखाए रत्नक dekh'kait achh'.

**Feminine.**

The following forms are substituted:

In (1) For देखान dekhal; देखि dekhā.

In (2) For देखाए dekh'ā; देखि dekh'ā', or देखिय dekh'ā'k.

**Form II.**

*Used when special respect is attributed to the object.*

**Masculine.**

**Honorific.**

1st P. देखानि रत्नक dekh'ā'k iuch' achh',
2nd P. देखानि रत्नक dekh'ā'k iuch' achh',
3rd P. देखानि रत्नक dekh'ā'k iuch' achh'.

**Non-Honorific.**

1st P. देखानि रत्नक dekh'ā'k iuch' achh',
2nd P. देखानि रत्नक dekh'ā'k iuch' achh',
3rd P. देखानि रत्नक dekh'ā'k iuch' achh'.

(1) Another form is देखानि रत्नक dekh'ā'k iuch' achh'.

(3) Another form is देखानि रत्नक dekh'ā'k iuch' 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.

<table>
<thead>
<tr>
<th>Person</th>
<th>Honorific</th>
<th>Non-Honorific</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st P</td>
<td>देखनें छोरी देखलेच्छि ¹</td>
<td>देखनें छोरी देखलेच्छि ¹</td>
</tr>
<tr>
<td>2nd P</td>
<td>देखनें छोरी देखलेच्छि ¹</td>
<td>देखनें छोरी देखलेच्छि ²</td>
</tr>
<tr>
<td>3rd P</td>
<td>देखनें छायि देखलेच्छि ³</td>
<td>देखनें छायि देखलेच्छि ³</td>
</tr>
</tbody>
</table>

(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.
(3) 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 देखनें हाँ देखलेच्छि हाँ is not used; the form देखनें हाँ देखलेच्छि हाँ or देखनें हाँ देखलेच्छि हाँ being substituted.

Form II.

Used when special respect is attributed to the object.

Masculine.

Honorific.

<table>
<thead>
<tr>
<th>Person</th>
<th>Honorific</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st P</td>
<td>देखनें क्रियेन्ह देखलेच्छि ¹</td>
</tr>
<tr>
<td>2nd P</td>
<td>देखनें क्रियेन्ह देखलेच्छि ¹</td>
</tr>
<tr>
<td>3rd P</td>
<td>देखनें क्रियेन्ह देखलेच्छि ³</td>
</tr>
</tbody>
</table>

(1) Other forms of the auxiliary may be substituted, as in the Present Tense. q. v.
THE CONJUGATION OF A TRANSITIVE VERB. [§ 141

Non-Honorific.

1st P. देखिले chhainh';
2nd P. देखिन्ते chhainh';
3rd P. देखिले chhainh'.

(3) As in the Present, another form of the auxiliary is देखिन्ते chhainh'.

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. देखिले chhalah'n;
2nd P. देखिले chhalah'n;
3rd P. देखिले chhalah'.

Non-Honorific.

1st P. देखिले chhalah'n;
2nd P. देखिले chhalah;
3rd P. देखिले chhal'.

(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 देखिे छलाह dekh'le chhalaking; देखिे छलाह dekh'le chhalaking, or देखिे छलाह dekh'le chhalaking. The remaining forms are common to both genders.

In (4). For देखिे छलाह dekh'le chhal; देखिे छलाह dekh'le chhal'.

**Form II.**

*Used when special respect is attributed to the object.*

**Masculine.**

**Honorific.**

1st P. देखिे छलाह dekh'le chhalaking',
2nd P. देखिे छलाह dekh'le chhalaking',
3rd P. देखिे छलाह dekh'le chhalathing',

**Non-Honorific.**

1st P. देखिे छलाह dekh'le chhalaking',
2nd P. देखिे छलाह dekh'le chhalhaking',
3rd P. देखिे छलाह dekh'le chhalaking'.

(3) Another form is देखिे छलाह dekh'le chhalathing'.

**Feminine.**

The Feminine is the same as the masculine.
§ 142. Participles—Declinable.

Adjective Participles.

Present, 'seeing'.

Masculine.

देखैत dekhait.

Feminine.

देखैति dekhaiti.

Past, 'seen'.

Masculine.

देखि, देखि भेज, dekhal, or dekhal bhel.

Feminine.

देखि, देखि भेजि, dekhal', or dekhal bhel'.

§ 143. Participles—Indeclinable.

Conjunctive Participles.

'seeing', 'having seen'.

देखिक dekhikā, देखिकी dekhikī, देखिकै dekhikaikā,

Adverbial Participles.

देखिin dekhitah'n, 'on seeing', 'in the act of seeing'.

§ 144. Precative or Respectful Forms.

1: Respectful Imperative.

देखि जाय dekhal jāy and देखि जायो dekhal jāo, 'be you,' or 'ye pleased to see'.

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2. Respectful Future.

देखन जायस देखाल जायें, or देखन जायतम देखाल जायेंगा, 'you will see,' or 'will be pleased to see'.

3. Mild Imperative.

देखिए देखिए, 'see you', or 'see ye'.

Infinitive or Verbal Noun.

§ 145. देखेब देखेब, '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 अच्छ 'achch', 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 मूलग उत्तब 'to sleep', is an example of a verb whose
root-vowel (ः उ) is long. When such a vowel is छा आ * छे ई or आ, 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, सूत त suta. 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 सूतिग sutiqa.

(2) If it is followed in the same word by three syllables, any of which contains either the vowel ए ई, or the vowel उ उ. Example, सूतिक sutiak. If neither of these vowels follows, the root-vowel may be long or short. Example, सूतह sutahak, or सूतह sutahak.

(3) If it be followed in the same word by any number of syllables more than three. Example, सूताह sutabahak: but सूतह sutahak, where only three syllables, none of which contains either ए ई or उ उ, follow the root-vowel ः उ.

(4) Also in the Mild Imperative, the vowel is shortened in spite of the foregoing rules. Thus:—

सूतिह sutiha, ‘be pleased to sleep’.

Model verb सूत ल suta, ‘to sleep’.

§ 149. Root ... ... ... छूत suti, ‘sleep’.

Present Participle ... सूतैत sutait, ‘sleeping’.

Past Participle ... छूतल sutil, ‘slept’.

* There is a considerable diversity of custom with regard to the shortening of छा आ. Some speakers shorten it as often as छे ई or ः उ are shortened. Others always keep it lengthened; and others again only keep it lengthened when छा आ is the root-vowel of an Active or Causal Verb, which has been lengthened from the radical छ a of a Neuter Verb, as will be seen later on. An example of the last case is the छा in सारह márah, ‘to kill’, which is the Active form of the Neuter Verb सार marah, ‘to die’. This last custom is probably the most correct of the three.
§ 150. 1. Four tenses are formed from the root, सुत् sūṭ.

a. The Prospective Conditional or Simple Present.

'(If) I see', 'I see', etc.

Honorific. Non-Honorific,

1st P. चर्ली sūṭī,¹ चर्ली sūṭī,¹
2nd P. चर्ली sūṭī,¹ चर्लच sūṭah,²
3rd P. चर्लच सूताठ्य', ³ सूलौ sutaʊ.⁴

(1) Other forms are सुतिंग sutiā, and सुतिंग sutiāk. The forms सुतिंग sutiā, सुतिंग sutiāk, and सुतिंग sutiā are also used, but only in the first person. The form सुतिंग sutiāṅ is also used, but only in the first and second persons Honorific.

(2) Other forms are सुतंग्न, sutiāṅ, चुतंग्न sutaṅk, and सुतंग्न sutaṅk.

(3) Another form is सुतांग्न sutiāṅh'.

(4) Another form is सुतांग्न sutiāṅh'.

The Feminine is as the masculine, except that in the second person Non-Honorific the form सतं sūṭah, is not used, the form सुतं sūṭah'ः or सुतं sūṭah'ः being used instead.

§ 151. 2. The Future.

'I shall or will sleep', etc.

Masculine.

Honorific. Non-Honorific.

1st P. चर्लच sūṭab,¹ चर्लच sūṭab,¹
2nd P. चर्लच sūṭab,¹ चर्लचच्च sūṭab,²
3rd P. चर्लचच्च sūṭāh,³ चर्लच sūṭat ⁴

(1) Other forms are सुत्रं sutiā, सुत्रं sutiāk, सुतिंग sutiā, सुतिंग sutiāk, सुतिंग sutiāṅ. The form सुतिंग sutiāṅh'ः is used only in
the first and second person Honorific. The forms सुताँ झुिह, सुताँ झुिह, सुताँ झुिह, सुताँ झुिह, सुताँ झुिह, सुताँ झुिह, सुताँ झुिह, and सुतिया झुिह, are also used, but only in the first person.

(2) Other forms are सुताँ झुिह, सुताँ झुिह, and सुताँ झुिह.

(3) Other forms are सुतां झुिह, and सुतां झुिह.

(4) Other forms are सुतां झुिह, सुतां झुिह, सुतां झुिह, सुतां झुिह, सुतां झुिह, and सुतां झुिह.

In the Feminine the following forms are substituted.

For (2), सुतां झुिह.

For (3), सुतां झुिह, or सुतां झुिह.

For (4), सुतां झुिह.

Note. That to all the above forms, with the exception of सुति झुिह, the termination ग झुिह, can optionally be added. In this syllable the inherent झुिह, is pronounced. E.g. सुतां झुिह, or सुतां झुिह.

§ 152.  

c. The Imperative.

'Let me sleep,' 'Sleep thou,' etc.

Masculine.

Honorific.

Non-Honorific.

1st P. सुतां झुिह,' सुतां झुिह,'

2nd P. सुतां झुिह,' सुतां झुिह,'

3rd P. सुतां झुिह,' सुतां झुिह.'

(1) Other forms सुतां झुिह, सुतां झुिह, सुतां झुिह, and सुतां झुिह. The forms सुतां झुिह, and सुतां झुिह, are also used but only in the first person and second person Honorific.

(2) Other forms are सुतां झुिह, सुतां झुिह, सुतां झुिह, and सुतां झुिह.

(3) Another form is सुतां झुिह.
§ 153—154. [THE INTRANSITIVE VERB.

The Feminine is as the masculine, except that in the feminine of the second person Non-Honorific the form शत्स sūtah, is not used; the form शत्सह् sūtah'न or शत्सहं sūtāh'न being used instead.

§ 153.  

d. THE RETROSPECTIVE CONDITIONAL.

'If I had slept,' etc.

MASCULINE.

Honorific.  

| 1st P. | sūtītā | sūtītāh'न |
| 2nd P. | sūtītā | sūtītāh'न |
| 3rd P. | sūtītā | sūtītāh'न |

(1) Other forms are सूतितियिं sūtītai, सूतितियिञ्ञ sūtītaiyik. The forms सूतितितियिं sūtītai, सूतितितियिञ्ञ sūtītaiyik, and सूतितितियिं sūtītah, are also used but only in the first person. The form सूतितियिं sūtītaih'िं is used in the first person and second person Honorific.

(2) Other forms are सूतितिह sūtītā, सूतितिहिं sūtītāh'िं, सूतितिहिं sūtītāh'िं, सूतितिहिं sūtītāh'िं.

(3) Other forms are सूतितितियिं sūtītāh'िं, and सूतितिनियिं sūtītāh'िं.

(4) Other forms are सूतितिह sūtītai, सूतितिहिं sūtītaiyik, सूतितिहिं sūtītai, सूतितिहिं sūtītaiyik, and सूतितितियिं sūtītaih'िं.

The Feminine is as the masculine, except that in the second person Non-Honorific the form शत्स sūtah is not used; the form शत्सहिं sūtāh'िं or शत्सहं sūtāh'िं being used instead.
§ 154. 2. Two tenses are formed from the present participle सुतैत sutait.

a. The Present.

'I sleep', or 'am sleeping', etc.

<table>
<thead>
<tr>
<th>Masculine</th>
<th>Non-Honorific</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st P. सुतैत छिि sutait chhi,¹</td>
<td>सुतैत छिि sutait chhi,¹</td>
</tr>
<tr>
<td>2nd P. सुतैत छिि sutait chhi,¹</td>
<td>सुतैत छ्छ sutait chhah,²</td>
</tr>
<tr>
<td>3rd P. सुतैत छबि sutait chhath',³</td>
<td>सुतैत छबि sutait achh',⁴</td>
</tr>
</tbody>
</table>

(1) Other forms are सुतैत छिए sutait chhiāi, and सुतैत छिए sutait chhi- aik. The forms सुतैत छिए sutait chhiau, सुतैत छिए sutait chhiauk, and सुतैत छिए sutait chhiah' are also used, but only in the first person. The form सुतैत छिए sutait chhiāinh' is used in the first person and second person Honorific.

(2) Other forms are सुतैत छिि sutait chhāi, सुतैत छिि sutait chhāi, सुतैत छ्छ sutait chhahak, सुतैत छ्छ sutait chhahik, and सुतैत छबि sutait chhahān'.

(3) Other forms are सुतैत छबि sutait chhathānh', and सुतैत छबि sutait chhathān'.

(4) Other forms are सुतैत छिि sutait chhai, सुतैत छिि sutait chhai, सुतैत छिि sutait chhau, सुतैत छिि sutait chhauk, and सुतैत छिि sutait chhoinh'.

**Feminine.**

The Feminine is the same as the masculine, except that the feminine form of the Present Participle, सुतैत sutait, is used instead of the masculine सुतैत sutait. E. g. सुतैत छिि sutait' chhi, instead of सुतैत छिि sutait chhi. The form सुतैत छह sutait' chhah (which might be expected as the 2nd person Non-Honorific) is not used, and in its place is used सुतैत छह sutait' chhah'ⁿ or सुतैत छह sutait' chhah'ⁿ.

**Note.** In the above forms, when masculine, the final म -t of the present participle may be, and usually is omitted. The Participle and auxiliary then form one word. E. g. सुतैत छिि sutait chhi, or सुतैत sutait chhi. Similarly, when feminine the final म -t of the participle may be omitted. E. g. सुतैत छिि sutait chhi, or सुतैत sutait chhi.
§§ 155—56.]

THE INTRANSITIVE VERB.

§ 155.

b. The Imperfect.

Honorific.  Non-Honorific.

1st. P. सुतैत् छलाँञ् sūtait chhalal'न् सुतैत् छलांञ् sūtait chhalal'न्,

2nd. P. सुतैत् छलाँञ् sūtait chhalal'न्, सुतैत् छलां च sūtait chhalāh,

3rd. P. सुतैत् छलां च sūtait chhalāh, सुतैत् छल sūtait chhal.

(1) Other forms are सुतैत् छलाँिष् sūtait chhalalai, and सुतैत् छलाँिष् sūtait chhalalaič. The forms सुतैत् छलांिष् sūtait chhaliau, सुतैत् छलांिष् sūtait chhaliauč, and सुतैत् छलांिष् sūtait chhaliau' are also used, but only in the first person. The form सुतैत् छलांिष् sūtait chhalainh’ is used in the first person and second person Honorific.

(2) Other forms are सुतैत् छलाँिष् sūtait chhalai, सुतैत् छलाँिष् sūtait chhalaič, सुतैत् छलाँिष् sūtait chhalah'ak, सुतैत् छलाँिष् sūtait chhalah'ik, and सुतैत् छलाँिष् sūtait chhalainh’.

(3) Other forms are सुतैत् छलांिष् sūtait chhalainh’, and सुतैत् छलांिष् sūtait chhalainh’.

(4) Other forms are सुतैत् छलाँिष् sūtait chhalalai, सुतैत् छलाँिष् sūtait chhalalaič, सुतैत् छलाँिष् sūtait chhalau, सुतैत् छलाँिष् sūtait chhalauč, and सुतैत् छलांिष् sūtait chhalainh’.

Feminine.

The Feminine is the same as the masculine, except that the feminine form of the Present Participle सुतैत् sūtain’ is used. E. g. सुतैत् छलाँञ् sūtait chhalal'न्. The forms for the 3rd Person Honorific and the 2nd Person Non-Honorific, are सुतैत् छलांिष् sūtait chhalaič, and सुतैत् छलांिष् sūtait chhalaič instead of सुतैत् छलां च sūtait chhalāh. The form सुतैत् छल sūtait chhal is substituted for सुतैत् छल sūtait chhal in the 3rd Person Non-Honorific.

Note. As in the present tense the masculine termination नं त- and the feminine termination नं त- of the present participle may optionally be omitted. E. g. सुतैत् छलाँञ् sūtait chhalal'न्, or सुतैत् छलाँिष् sutaichhalal'न्. The latter is the more usual form.
§ 156. 3. Three tenses are formed from the Past Participle मृत्ति sütal.

a. The Past.

Masculine.

_Honorific._

1st P. सुतलिङ्ग sut'laṅ'ṇ,¹
2nd P. सुतलिङ्ग sut'laṅ'ṇ,¹
3rd P. सुतलङ्ग sut'laḥ,³

Non-Honorific.

1st P. सुतलिङ्ग sut'laṅ'ṇ,²
2nd P. सुतलङ्ग sut'laḥ,²
3rd P. सुतलङ्ग sut'laḥ,³

(1) Other forms are सुतलाङ्ग sut'laṅ, and सुतलाङ्ग sut'laṅk. The form सुतलाङ्ग sut'laṅk is also used, but only in the first person. सुतलाङ्ग sut'laṅk is used in the first person and second person Honorific.

(2) Other forms are सुतलङ्ग sut'laṅ, सुतलङ्ग sut'laṅ, सुतलङ्ग sut'laṅk, सुतलङ्ग sut'laṅk, and सुतलङ्ग sut'laṅk.

(3) Other forms are सुतलाङ्ग sut'laṅk, सुतलाङ्ग sut'laṅk, and सुतलाङ्ग sut'laṅk.

(4) Other forms are सुतलङ्ग sut'laṅ, सुतलङ्ग sut'laṅ, सुतलङ्ग sut'laṅ, सुतलङ्ग sut'laṅk, and सुतलङ्ग sut'laṅk.

In the Feminine the following forms are substituted.

For 2 & 3, सुतलङ्ग sut'laṅ, or सुतलङ्ग sut'laṅ.

For 4, मृत्ति sütal.

§ 157.  b. The Perfect.

'I have slept', etc.

Masculine.

_Honorific._

1st P. सुतलङ्ग अच्छः sut'laṅ'ṇ ačch‘,¹
2nd P. सुतलङ्ग अच्छः sut'laṅ'ṇ ačch‘,¹
3rd P. सुतलङ्ग अच्छः sut'laḥ ačch‘,³

Non-Honorific,

1st P. सुतलङ्ग अच्छः sut'laṅ'ṇ ačch‘,¹
2nd P. सुतलङ्ग अच्छः sut'laḥ ačch‘,²
3rd P. सुतलङ्ग अच्छः sut'laḥ ačch‘,³
1. Other forms are सुत्लिन्द्र चष्कः sut'liai achhh', सुत्लिन्द्र चष्कः sut'liai achhh'. The form सुत्लिन्द्र चष्कः sut'liai' achhh' is also used, but only in the first person. सुत्लिन्द्र चष्कः sut'liai' achhh' is used in the first and second person Honorific.

2. Other forms are सुत्लेचः sut'leh chhah, सुत्लेचः sut'leh chhahak; सुत्लेचः sut'leh chhahih, सुत्लेचः sut'leh chhalah, and सुत्लेचः sut'leh chhalah in the third person.

3. Other forms are सुत्लिन्द्र चष्कः sut'liai' achhh', सुत्लिन्द्र चष्कः sut'liai' achhh', and सुत्लिन्द्र चष्कः sut'liai' achhh'.

4. Other forms are सुत्लिन्द्र चष्कः sut'liai' achhh', सुत्लिन्द्र चष्कः sut'liai' achhh', सुत्लिन्द्र चष्कः sut'liai' achhh', and सुत्लिन्द्र चष्कः sut'liai' achhh'.

In the Feminine the following forms are substituted.

For 2 & 3, सुत्लिन्द्र चष्कः sut'liai' achhh' or सुत्लिन्द्र चष्कः sut'liai' achhh'.

§ 158. c. The Pluperfect.

'I had slept,' etc.

Masculine.  Non-Honorific.

1st P. सुत्लेचः sut'leh chhalah'n,1 सुत्लेचः sut'leh chhalah'n,1

2nd P. सुत्लेचः sut'leh chhalah'n,1 सुत्लेचः sut'leh chhalah,'2

3rd P. सुत्लेचः sut'leh chhalah,3 सुत्लेचः sut'leh chhalah,4

(1) Other forms are सुत्लेचः sut'leh chhalai, and सुत्लेचः sut'leh chhalai.

(2) Other forms are सुत्लेचः sut'leh chhalai, सुत्लेचः sut'leh chhalai, सुत्लेचः sut'leh chhalai, and सुत्लेचः sut'leh chhalai.

(3) Other forms are सुत्लिन्द्र चष्कः sut'liai' chhalah' and सुत्लिन्द्र चष्कः sut'liai' chhalah'.

(4) Other forms are सुत्लिन्द्र चष्कः sut'liai' chhalai, सुत्लिन्द्र चष्कः sut'liai' chhalai, सुत्लिन्द्र चष्कः sut'liai' chhalai, and सुत्लिन्द्र चष्कः sut'liai' chhalai.
§ 159. 1. Participles—Declinable.

Adjective Participles.

Present, 'sleeping'.

Masculine. Feminine.

सूतेल् sutait.

Past, 'slept'.

Masculine. Feminine.

सूताल sútal.

§ 160. Participles—Indeclinable.

Conjunctive Participles.

'sleeping', 'having slept'.

Adverbial Participles.

सूतितल् sutitaliḥ, 'on sleeping,' 'in the act of sleeping'.

§ 161. Precautive or Respectful Forms.

1. Respectful Imperative.

सूतल जाय sútal jáy, and झुलल जायत sútal jáy, 'be you', or 'ye pleased to sleep'.

2. Respectful Future.

सूतल जायत sútal jáct, or झुलल जायतल sútal jáct'ga, 'you will sleep', or 'will be pleased to sleep'.

In the Feminine the following forms are substituted.
For 2 & 3, सुलेल्ह chhalik, or सुलेल्ह chhalik.'
For 4, सुलेल्ह chhal.

For 2 & 3, सुलेल्ह chhalik, or सुलेल्ह chhalik.'
For 4, सुलेल्ह chhal.
§§ 162—64.] Observations on the foregoing. 87

Mild Imperative.

स्तित्वः sutih, 'sleep you' or 'sleep ye'.

§ 162. Infinitive or Verbal Noun.

सति sūtab.

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 देख देख.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>देखिये</td>
<td>निये</td>
<td>देखिये</td>
<td>निये</td>
</tr>
<tr>
<td>देखिये</td>
<td>निये</td>
<td>देखिये</td>
<td>निये</td>
</tr>
</tbody>
</table>

2. Tenses formed from the present participle देखिये देखाई.

<table>
<thead>
<tr>
<th>Present</th>
<th>Imperfect.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject Honorific.</td>
<td>Subject Non-Honorific.</td>
</tr>
<tr>
<td>कुश्कु</td>
<td>कुश्कु</td>
</tr>
<tr>
<td>कुश्कु</td>
<td>कुश्कु</td>
</tr>
</tbody>
</table>

3. Tenses formed from the past participle देखी देखा.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>देखिये</td>
<td>देखिये</td>
<td>देखिये</td>
<td>देखिये</td>
</tr>
<tr>
<td>देखिये</td>
<td>देखिये</td>
<td>देखिये</td>
<td>देखिये</td>
</tr>
</tbody>
</table>

The sign ° signifies that the final vowel of देख is omitted before the termination.
The sign ‘o’ signifies that the final vowel of देख 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 ए ए. These verbs are nearly regular.

§ 166. Example of a root ending in a vowel other than ए ए.

Model verb चिरिab ए “to sew”.

Principal Parts.

Root, चि si, “sew,”

Present Participle, चिरते siat, or चिउर siut, “sewing”,

Past Participle, चिरिल sial, or चिउर siul, “sewn.”

First Form. Non-Honorific.

1st Person. 3rd Person,

Prospective Conditional.

चिउर siot, चिउर siot.

Note.—In the optional forms the letter ए b is inserted as follows. Some writers use ए v instead of ए b. In pronunciation, however, the sound is something between b and v.

1st Person. चिउरें(क) sibiar(k), चिउरियो(क) sibiar(k), चिउरित sibiar:.

2nd Person. Non-Honorific. चिउरः sibah, चिउरः sib’hek, चिउरः sib’-<br>hik, चिउरः sib’hanh’.
§ 106.] VERBS WITH ROOTS ENDING IN VOWELS. 91

3rd Person. Honorific, सिहलिं sibath', or सिहलिं siath', नित्रसिहलिं sib'\-thänk'. Non-Honorific, सिबाहिं sibainh'.

FUTURE.

सिहब siab, नित्रसिहलिं siat or नित्रसिहलिं siut.

Note. In the 1st Person instead of the forms नित्रसिहलिं siobai(h), the forms नित्रसिहलिं sibai(h) may optionally be used. The form नित्रसिहलिं siiah' is seldom used.

IMPERATIVE.

सिउ siú. नित्रसिहलिं siau.

Optional forms of the 1st Person are, नित्रसिहलिं sitiai(h), नित्रसिहलिं sitiau(h), नित्रसिहलिं sithah', and नित्रसिहलिं sithainh', in all of which the letter न has been inserted.

2nd Person. Non-Honorific, Optional forms are सित sit, सितहिं sit'-hak, सितहिं sit'hik, and सितहिं sit'hänk'.

3rd Person. Honorific. The form for this person is नित्रसिहलिं siathänk'.

RETROSPECTIVE CONDITIONAL.

I conjugate this tense in full.

Honorific.

1st P. सिताहिं siitah'n, or सिताहिं sitah'n,

2nd P. As in the 1st. P., सिताहिं siitah, or सिताहिं sitah,

3rd P. सिताहिं siitath' or सिताहिं siitath'.

Past.

1st P. नित्रसिहलिं sialah'n, or नित्रसिहलिं sialah'n.

3rd P. नित्रसिहलिं sial, or नित्रसिहलिं siul.
The other tenses do not require explanation, being perfectly regular, and presenting no difficulty.*

§ 167. **Example of a root ending in long ा े.**

**Model verb.** वाच्य pāb “to obtain.”

**Principal Parts.**

Root, ... ... या pā, “obtain.”

Present Participle, पवैत pavait, or वाच्य pāit, “obtaining”.

Past Participle, पात्श्य pādl, or वाच्य pādl, “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.**

<table>
<thead>
<tr>
<th></th>
<th>Honorific</th>
<th>Non-Honorific</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st P.</td>
<td>याई pāi,</td>
<td>—</td>
</tr>
<tr>
<td>2nd P.</td>
<td>—</td>
<td>वाच्य pābah,</td>
</tr>
<tr>
<td>3rd P.</td>
<td>वाच्यचि pābath’,</td>
<td>पली patau,</td>
</tr>
</tbody>
</table>

Optional forms.

(1) देन(क) pāiak(k), देन(क) pāiak(k), देन(ब) pāih.

* Other examples are चूंच्च chāb, “to drip”. 1. Imperative चूब चाबा; 2. Fut. चूब चाब or चूब चाब; 3. Do. चूबत चात or चूब चात; Past Part. चूबल चाल, or चूबल चाल. घीन dhoēb, “to wash”. 1. Imperative घीब dhoobā; 1. Fut. घीन, dhoēb or घीव dhoab; 3. do. घीब dhoēt, or घीव dhoat; Past Part. घीब dhoēl, or घीब dhoal. Generally speaking व b or व v may optionally be inserted between concurrent vowels.

† In this and all similar cases, व v is written by some for व b. See § 166.
(2) पैवहँ, पैवहँकः पैवहँकः, पैवहँकः.

The second conjugational forms are
(1) पैवँिँिः पैवँिँिः, (2) पैवँिँिः पैवँिँिः, (3) पैवँिँिः पैवँिँिः.
(4) पैवँिँिः पैवँिँिः.

Future.

1st P. पैवँिः पाहँः,

2nd P. ———

3rd P. पैवँिँिः पाहँिः, or पैवँिँिः पाहँिः, पाहँः पाहः, or पाहः पाहः.

Optional forms.
(1) पैवँिँिः पैवँिँिः, पैवँिँिः पैवँिँिः, पैवँिँिः पैवँिँिः, पैवँिँिः पैवँिँिः,
(2) पैवँिँिः पैवँिँिः, पैवँिँिः पैवँिँिः, पैवँिँिः पैवँिँिः.
(4) पैवँिँिः पैवँिँिः, पैवँिँिः पैवँिँिः.

In all the above forms औद औद may be substituted for औद औद throughout; as पैवँिः पैवँिः, पैवँिः पैवँिः, पैवँिः पैवँिः.

Imperative.

1st. P. पैवँिः पाहः

2nd. P. ———

3rd. P. पैवँिः पाहः, पाहः पाहः

Optional forms, as in the Prospective Conditional.

Retrospective Conditional.

1st P. पैवँिः पाहः

2nd P. ———

3rd P. पैवँिः पाहः

In this and all similar cases, औा औा is written by some for औा औा. See § 166.
Optional forms.
(1) पैतिए(क) paitiainh(k), पैतिए(क) paitiainh(k), पैतिए paitah.
(2) पैतिए paiti, पैतिए paiti, पैतिए paiti, पैतिए paiti, paiti, paiti.
(4) पैतिए(क) paitiainh(k), पैतिए paitiainh(k).

The 2nd. conjugational forms are,
(1) पैतिए(क) paitiainh(k), (2) पैतिए(क) paitiainh(k), (3) पैतिए(क) paitiainh(k), पैतिए(क) paitiainh(k).

For पैतिए paiti, पैतिए paiti or पैतिए paiti may be used throughout; thus पैतिए pautah'n, पैतिए pautah'n, &c.

The Present and Imperfect are regular and do not require comment.

Past.
1st P. पौलेः paulah'n, 1
2nd P. ———— पौलाः paulah', 2
3rd P. पौलावस्त्र paulanli', 3 पौलाः paulak. 4

Optional forms
(1) पौलैलई(क) paulai(k), पौलैलई(क) paulai(k), पौलैलई pauli, &c.
(2) पौलैलई paut, पौलैलई paut, पौलैलई paut, पौलैलई paut, &c.
(4) पौलैलई(क) paulkai(k), पौलैलई(क) paulkai(k).

In older Maithilā poetry we sometimes find पैल pail instead of पौल paul, but this never occurs nowadays: thus पौल pail paulah'n, &c. The verb आएब āeb, "to come," however, still makes its 3rd P. Non-Hon. आएब āeb instead of आएब āeb.

Perfect.
पौले की paulē chhi. of पौलेः क्रिया paulah'n achh.

Pluperfect.
पौलेः क्रिया paulē chhalah'n

Note. It is important to note the conjugation of पैल pāeb 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 पैल pāeb 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 पैल pāeb this is generally done, and hence we get a root पैल pāev which forms the real conjugational base. The rules in § 118 for the shortening of the long
vowel of the root apply in this conjugation. Before त and ल, immediately following, this त is liable to be changed to धी, which ध it may be stated here is pronounced short, which accounts for the forms पालङ पाल and पालङ पाल, in which the ध remains long in spite of § 148. 1, according to which if ध was a long vowel we should expect पालङ पाल, and पालङ पाल. When, however, the धा ध is shortened to धा ष under § 148.2 or 3, this later coalesces with a following धी ध, and the two together become the diphthong धी ध। Thus we get, in order, for the 1st. sing. Past पालजळ, पाललाहः, पालङ पाललाहः and finally पालङ पालङ।

The forms containing ध पाल, are those in which the euphonic letter व (or व) has not been inserted. In these the धा ध of the root is first shortened under § 148.2 or 3, and then, combining with a following र ष, forms धार। Thus 1st Retro. Conditional is पा + प्रत्विष पाँ + तिलाहः पाँ। Then (§ 148) प्र + प्रत्विष पा + तिलाहः, then finally प्रत्विष पालिलाहः। In the Future and Past an र ष 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 र ध and धी ध, 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 ध, ध।

CHAPTER XIII.

THE PASSIVE VOICE.

§ 168. As in other Neo-Aryan languages the Passive voice is formed by subjoining the conjugated verb जाए जाए “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 देखि जाए देखि जाए “to be seen.”

§ 169. It is needless therefore to conjugate the passive verb throughout. As however जाए जाए is irregular in some of its forms, I here conjugate it in its more usual tenses.

§ 170. जाए जाए “to go”.

Root, जा. जा.
Present Participle, जात जात.
Past Participle, गत गत.
**Prospective Conditional.**

<table>
<thead>
<tr>
<th>Honorific</th>
<th>Non-Honorific</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st. P. जार्ड़ jāि,</td>
<td>—</td>
</tr>
<tr>
<td>2nd. P. ——</td>
<td>जाह् jāह,</td>
</tr>
<tr>
<td>3rd P. जार्ड़ि jāिि,</td>
<td>जतौ jatau,</td>
</tr>
</tbody>
</table>

**Future.**

| 1st. P. जार्ड़ jāि, | — |
| 2nd. P. —— | जैवच्छ jaibah, |
| 3rd. P. जेिताँच्छ jaitāh, | जायेत jāēt. |

**Imperative.**

| 1st. P. जाह्ड़ jāउ, | — |
| 2nd. P. —— | जाह्ड़ jāह, |
| 3rd. P. जाह्ड़ jाठि, | जतौ jatau. |

**Retrospective Conditional.**

| 1st. P. जेिताँच्छ jaitah'िन, | — |
| 2nd. P. —— | जेिताँच्छ jaitah', |
| 3rd. P. जेिताँच्छ jaitath', | जाह्ड़ जाइ. |

**Present.** जाह्ड़ की jāिि chhî, &c.

**Imperfect.** जाह्ड़ क्रमज़ jāिि chhalah'िन, &c.

**Past.**

| 1st. P. गेलाँच्छ gēlah'िन, | — |
| 2nd. P. —— | गेलाँच्छ gēlah, |
| 3rd. P. गेलाँच्छ gēlah, | गेल gēl. |

**Perfect.** गेलाँच्छ ऊष्म gēlah'िन achh', &c.

**Pluperfect.** गेल क्रमज़ gēl chhalah'िन, &c.
§ 171. Besides जाएँ jāē, already conjugated, I have noted the following important verbs as irregular.

करा््ब karab, “to do”,
धरा््ब dharab, “to seize”, “place”.
आएँ ēēb, “to come”;
दे़ deb, “to give”;
लेब leb, “to take”;
होएँ hoēb, “to become”;
मरा््ब marab, “to die”.

It is not necessary to conjugate them throughout, and the following tables, showing their principal parts, must suffice.

§ 172. a. करा््ब karab, “to do”.

Present Participle, कारैत karait,
Past Participle, कैल kail,
1st. P. Honorific Past, हां हाँम kailah’ēn,
3rd. P. Non-Honorific Past, को kailak.

Note also the conjunctive participle कै कै kai kah’ēn, or कय कय kay kah’ēn, “having done”.

b. धरा््ब dharab “to seize”, “place”, is conjugated exactly like करा््ब karab, “to do”, only substituting ध dē for क k throughout.

§ 173. आएँ ēēb, “to come”.

Present Participle, आवैत avait,
Past Participle, आएँ ēēl,
3rd. P. Non-Honorific Past, को आएँ o ēēl.
§ 174.  

*a.*  

**Present Participle,**  

देघ debating;  

**Past Participle,**  

देह del.

1st. P. Honorific Past, घम देघ ham del.  

(देघन delhn is seldom used)

3rd. P. Non-Honorific Past, बी देघक o delak.

Note, that the 2nd person Non-Honorific Imperative, is देह dah, and not देघह deah; also देघक dahak, देघहक dahik.

*b.*  

**Present** leb “to take”, is conjugated exactly like देघ deb, “to give”, only substituting l for d throughout.

Note that the 2nd Person Non-Honorific Imperative is बह lah, and not बेघह leah; also बेघक lahak, and बेघहक lahik.

§ 175.  

**Present Part.,** सुहल mait, or मरैत marait.  

**Past Part.,** सुहल mutl, or मरल maral.


"" Future,  

मरव marab.  

"" Imperative, मह marù.  

"" Retrosp. Cond., सुहल mutah’n, or मरितज़ maritah’n.

"" Present, मरैत की marait chhi.

"" Past, सुहल mutah’n, or मरलज़ mar’lah’n.

Adverbial Participle, सुहलचं mutah’n.

§ 176.  

**Present Part.,** भोगव hoèb, or भेघ haib, “to become,”  

**Past Part.,** भेघह bhal.

irregular verbs.
§§ 177—78.]  THE FORMATION OF ACTIVE AND CAUSAL VERBS.

Chapter XV.

THE FORMATION OF ACTIVE AND CAUSAL VERBS.

§ 177. As in other Gaudian languages the neuter verb in Maithili can be made active, and the active verb, causal.

§ 178. The active verb is generally formed by adding व बाब āv to the root, and the causal व बाब vāv, but there are many exceptions. The roots thus formed are then conjugated like the root चार pāv, the optional form of the root चार pā, ‘obtain’. See § 167. Note.

The following are examples of the regular adoption of the rule.


उठब uthab, to rise,  उठाव uthāvēb, to raise,  उठवाव uthvāvēb, to cause to rise.


§ 179. Monosyllabic roots containing a long vowel, generally shorten it in the active and causal forms; but unlike Hindi, the \textit{guna} diphthongs \(\text{o} \text{e} \text{o}\), and \(\text{o} \text{i} \text{o}\), are not shortened to their simple vowels \(\text{o} \text{e} \text{i} \text{o}\) respectively; they are, instead pronounced short, like \(\text{e}, \& \text{o}\); thus:

\begin{center}
\begin{tabular}{lll}
\textbf{Neuter} & \textbf{Active} & \textbf{Causal} \\
\hline
\textit{जाग} जाग, to be awake, & \textit{जागार्य} जागा, & \textit{जागवाय} जागवा; \\
\textit{बोक} बोक, to speak, & \textit{बोकार्य} बोका, & \textit{बोकवाय} बोकवा; \\
\textit{भीम} भीम, to be wet, & \textit{भीमार्य} भीमा, & \textit{भीमवाय} भीमवा; \\
\textit{घूम} घूम, to go round, & \textit{घूमार्य} घूमा, & \textit{घूमवाय} घूमवा; \\
\textit{दोळ} दोळ, to be shaken, & \textit{दोळार्य} दोळा, & \textit{दोळवाय} दोळवा; \\
\textit{लेट} लेट, to lie down, & \textit{लेटार्य} लेटा, & \textit{लेटवाय} लेटवा.
\end{tabular}
\end{center}

\begin{itemize}
\item But \textit{लेट} लेट, to lie down,
\end{itemize}

\begin{itemize}
\item \textit{लेटार्य} लेटा, \textit{लेटवाय} लेटवा.
\end{itemize}

\begin{itemize}
\item Note, that, unlike Hindi, monosyllabic roots, consisting of a consonant and a long vowel, do not form actives in \(\text{o} \text{a} \text{a} \text{w} \text{a}\), or causals in \(\text{o} \text{a} \text{w} \text{e} \text{a}\).
\end{itemize}

§ 180. The following are examples of monosyllabic roots of active verbs, which become doubly active and causal.
§§181—82. THE FORMATION OF ACTIVE AND CAUSAL VERBS.

<table>
<thead>
<tr>
<th>Active</th>
<th>Doubly Active</th>
<th>Causal</th>
</tr>
</thead>
<tbody>
<tr>
<td>देब deb, to give,</td>
<td>दिच्चाएव diāēb, दिच्चावाएव diāvāēb.</td>
<td></td>
</tr>
<tr>
<td>धोहब dhoab, to wash,</td>
<td>धोहबाएव dhoāēb or धोहबाएव dhoāvāēb.</td>
<td></td>
</tr>
<tr>
<td>पियब piab, to drink,</td>
<td>पियाएव piāēb or पियाएव piāvāēb.</td>
<td></td>
</tr>
<tr>
<td>सिखब sikhab, to learn,</td>
<td>सिखाएव sikhāēb, सिखावाएव sikhāvāēb.</td>
<td></td>
</tr>
<tr>
<td>Note also here,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>जियब jiab, to live,</td>
<td>जिच्चाएव jiāēb, जिच्चावाएव jiāvāēb.</td>
<td></td>
</tr>
</tbody>
</table>

§ 181. Many neuter verbs with a short vowel in the root simply lengthen it to form the active, and form the causal regularly with ओ व-व, thus,

<table>
<thead>
<tr>
<th>Neuter</th>
<th>Active</th>
<th>Causal</th>
</tr>
</thead>
<tbody>
<tr>
<td>काज katab, to be cut,</td>
<td>काज kātab, काजावाएव kājvāēb.</td>
<td></td>
</tr>
<tr>
<td>गढ़ gara, to be buried,</td>
<td>गढ़ gāra, गढ़ावाएव gārāvāēb.</td>
<td></td>
</tr>
<tr>
<td>मराब marab, to die,</td>
<td>मराब māra, मरावाएव mārāvāēb.</td>
<td></td>
</tr>
<tr>
<td>Wanting</td>
<td>पालाब pālab, to rear, पालावाएव pālāvāēb.</td>
<td></td>
</tr>
<tr>
<td>Wanting</td>
<td>लालाब lālab, to load, लालावाएव lālāvāēb.</td>
<td></td>
</tr>
<tr>
<td>But,</td>
<td>कुलाब kholab, कुलावाएव kholāvāēb.</td>
<td></td>
</tr>
</tbody>
</table>

§ 182. The following are irregular.

<table>
<thead>
<tr>
<th>Neuter</th>
<th>Active</th>
<th>Causal</th>
</tr>
</thead>
<tbody>
<tr>
<td>चहुताब chhutab, to go off,</td>
<td>चहोराब chhorāb, चहोरावाएव chhorāvāēb.</td>
<td></td>
</tr>
<tr>
<td>टुताब tūtab, to be broken,</td>
<td>टॉराब torāb, टॉरावाएव torāvāēb.</td>
<td></td>
</tr>
<tr>
<td>फाहाब phātab, to be rent,</td>
<td>फाराब phārāb, फारावाएव phārāvāēb.</td>
<td></td>
</tr>
<tr>
<td>अताब atāb, to be stopped,</td>
<td>अराब arāb, अरावाएव arāvāēb.</td>
<td></td>
</tr>
</tbody>
</table>
§ 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.

<table>
<thead>
<tr>
<th>Simple verb</th>
<th>Active</th>
</tr>
</thead>
<tbody>
<tr>
<td>कहाब kahab, to say,</td>
<td>कहाब kahāb, or कहाब kahāb, or</td>
</tr>
</tbody>
</table>

**Chapter XVI.**

**COMPOUND VERBS.**

§ 184. The compound verbs in Maithili, do not range themselves under such a simple classification as we find in Hindi. 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 Hindi 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;

- का जाए bhā jáēb, to eat up.
- पी लेब pi leb, to drink up.
- हो जाए ho jáēb, to become.
- हो रहाब ho rahāb, to be.
- येन्डा देव herā deb, to lose

Note here a kind of passive formed with पड़ब parāb, to fall. Example, मार पड़ब már parāb, to be beaten.
§ 186. (b) From the modified root.

युक्तारिचड़व pukār' uthab, to call out.
बनिँ जाँश्व ban' jāeb, to be made.
काटि डारब kāt' dārab, to cut off.
राखि लेब rākh' leb, to lay by.
सूति रचव sūt rāhab, to sleep on.
चलि जाँश्व chal' jāeb, 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.
दै सकब dai sakab, to be able to give.
लाई सकब lai sakab, to be able to take.
जाय सकब jāē sakab, to be able to go.

§ 188. III. Completes. Sometimes formed from the simple, and sometimes from the modified root. Examples are,—

खाचुकब khā chukab, to have done eating.
दैचुकब dai chukab, to have done giving.
मारि चुकब mār' chukab, to have done beating.

The foregoing modified form of the root, is really an additional form of the conjunctive participle, corresponding to the Bangāli conjunctive participle in °र्तथा. Thus काटि kāt' appears to correspond to the Bangāli बाटिया kātiya.
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 ब b; as देखन dekhāb, “seeing.” Its oblique form ends in भास बा, as देखना सैं dekh'ba* sā “from seeing,” देखनात dekh'bāk, “of seeing,” &c.

(2.) The Second form is made by substituting ल l for ब b in the first form, as देखल dekhal, oblique form देखला dekh'la. Its nominative or direct therefore generally, but not always (e.g. not in the case of जाएगो jāēgo “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 जाएगो jāēgo “to go” is जाएल jāēl, but the vulgar sometimes say जीह गेल, which is the form of the Past Participle. In the case of verbs whose roots end in भा a, the observations in § 168 (note) apply; so that we find forms like पाएँ पाएल páel 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 ए ai to the root. Thus Acc. Sing. देख कि dekhā (not dekh) kē, or देखै dekh'āi kē; and so on. The final ए ai is pronounced short thus dekhāi and does not affect a previous long vowel; cf. § 148. and § 167 (note). Thus we have the verbal noun पाठवैँ pathavāi, while the Present Participle in the Present tense is पाठवैँ (भी) pathavai (ehē) of पाठवाएँ pathāebeh, “to send”. When the root of the verb ends in भा a, this form of the verbal noun ends either in आवैँ ávāi as above, or in ए, as जाए jāē, जाए पाए pāē. In irregular verbs, as in the second variety, the vulgar use forms connected with the past participle, instead of the regular ones, as सुमु नुउँ, instead of भरे marāi from भरत marab, “to die.”

* See addenda.
§ 190. I. Desideratives, which are formed in two ways.

(a) By the phrase इच्छा धृतिः ichchhā achh' meaning "there is a desire" following the genitive of the first form of the verbal noun in ब्र. ।

(b) By the accusative, genitive, or simple oblique third form of the verbal noun with the verb चाहिओ chāhab, to wish:— Examples—

(a) देखनाक्र इच्छा धृतिः dēkhabāk ichchhā achh', there is a desire of seeing, i.e. I wish to see.

With this phrase, compare the Bangāli, देखिबार इच्छा धृतिः dekhitar ichchhā áchhi.

(b) हम देख कें चहैक्र hiṃ dēkha kē chahaichhi, I wish to see.

धा बाज चहैक्र o bāja chahaichhh', he wishes to speak.

धा बाज चहैक्र ghari bājā chahaichhal', the clock was about to strike.

धा जाए चहैक्र o jāe chahaichhath', he wishes to go.

धा मार (vulgarly मुर) चहैत धृतिः o mārā (vulgarly muā) chahait achhh', he is at the point of death.

धृतिः पोथिक कें पाह्न चाहिली ehh' pōthī kē pāhak chāhi, one should read this book.

धृतिः पोथिक कें पाह्न चाहिली toh'rá otaī jāek (or jāe or jāk kē) chāhi, you should go there.

§ 191. II. Permissives are also formed from the third form of the verbal noun. Examples are;—

धार देव jāe deb, to allow to go.

कच्चे देव kahār deb, or

हो धृतिक खाय देवकै o khrā khāe dēk'kuik, he allowed him to eat.
§ 192. III. Acquisitivces, are also formed from the same form. Example.

चो उठै नहिं पाबयि o uthāi nahi nā pábath', do not let him rise.

§ 193. III. Frequentatives, are formed with the direct form of the second variety of the verbal noun in च। Examples.

चाहल कारब áél karab, to come frequently.

कैल कारब kail karab, to do frequently,

चो जाहल करैचङ्क o kahal karaiachh', he speaks frequently

चो जायल करैचङ्क o jāél karaiachh', he goes frequently.

§ 194. IV. Inceptives. In Maithili these are formed with the oblique form of the third variety of the verbal noun. Examples are

का लागो kaha (not pronounced kah) lágab, to begin to speak.

दीब लागो dia lágab, to begin to give.

मारै लागल mārāi lágal, he began to beat.

बाघ खाए लागल bágh khāē lágal, the tiger began to eat.

C. Compound verbs formed from the present participle.

These are, as in Hindi, Continuatives and Staticals. Examples are;—

§ 195. I. Continuatives.

लिखैत जाएब likhāit jáēb, to continue writing.

पढैत जाएब parhāit jáēb, to continue reading.

बोलैत जाएब bōlāit jāēb, to continue speaking.
§§ 196—97.

COMPOUND VERBS.

1. Staticals.

**jáit rahab**, to continue going.

**pavait áeb**, to go on finding.

**páni bahait jáiachh',** the water keeps flowing away.

**nádi ker dhár bahait rahaiachh',** the stream of the river keeps flowing on.

§ 196. II. **Other compound verbs.**

1. The following idiom with the Past Participle, making quasi statical verbs may be noted,

**páni bhal jáit achh',** the water keeps flowing away.

**ek bágh paral phiraičhal,** a tiger was prowling about.

In connection with this note that the phrase **chála jána 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 **le jána le áná,** to bring, is **ánab, and to the Hindí le jána le jáná,** to take away, is the anomalous **lené jáéb.**
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.

| यখन | Now.         | दबैर | प्रातःकाल |
| लखन | 'Then.'      | चसुख | भोर |
| निधि या | When?       | कदांचत | कदापि |
| कखन | When.        | कधिच्यो | निदान |
| कधिच्या |            | आन | चन्द्रकाल |
| जखन |            | बिरिविरि | वारंवार |
| जधिच्या |            | श्रीश्र | तारकाल |
| आद | Today.      | तस्मादश | पश्चात् |
| काबिच्छ | Yesterday, tomorrow. | वाक्यात् | पावः |
| जाह जाबिच्छ | Now-a-days. | जैविरि | फेरि |
| परस | The day before yesterday, or the day after-tomorrow. | जैविरि | एकबैरि |

| प्रतिदिन | Every day. | तारकाल | पश्चात् |
| अनुबिन |          | तस्मादश | पावः |
| समधिन |          | जैविरि | फेरि |
| सदा | Always. | जैविरि | एकबैरि |
| सबैदा | Continually. | पश्चात् | पावः |

| निख | } Early, at dawn. | चन्द्रकाल | पश्चात् |
| परस | } Perhaps, sometimes. | बिरिविरि | वारंवार |
| प्रतिदिन | } At last. | बिरिविरि | वारंवार |
| अनुबिन | } Often. | बिरिविरि | वारंवार |
| समधिन | } Quickly. | बिरिविरि | वारंवार |
| सदा | } Instantly. | बिरिविरि | वारंवार |
| सबैदा | } Afterwards. | बिरिविरि | वारंवार |
| निख | } Once. | पश्चात् | पावः |
§§ 200—201.] Adverbs, Prepositions, and Conjunctions.

§ 200. II. Adverbs of Place.

Here. तेन्हर Thither.

There. लगपास On all sides.

Where? सभीय Near.

Where. यत्तिकात On this side.

There. चीत्तिकात On that side.

Hither. सबच ज Everywhere

Thither. समा Thither.

Whither? यार Across.

Whither. निकट Near.

§ 201. III. Adverbs of Manner.

Accidentally. रथ वाघ In vain.

Very. यना Thus.

Separately. कोना, कोन तरहें How?

At once. जेना, जै तरहें As.

Nevertheless लेना, तैं तरहें So.

Although. सब Truly.

Etcetera.

सच्च में देखादि, देखादि, Etcetera.
§ 202. IV. Adverbs of Affirmation and Negation.

Yes.
Certainly.
Doubtlessly.
Necessarily.

No, not.

§ 203. The following are examples of Compound Adverbs.

Sometimes.
Gently.
Till now, yet.
Till when?
How long?
Never.
On both sides, all round.
Indifferently.
Whenever.

Elsewhere.
Nowhere.
Hitherto.
If not, else.
Sometime or other.
Somewhere another.
Now and then.
Somehow or other.

§ 204. The following are examples in which adverbs take the signs of cases after them.

Now is the best time. (Lit. The time of now is good).

I have not seen you since then till today. (Lit. From that time today a (first) meeting has occurred.)

At last he came.
At length he came to his senses.

He puts off from today to tomorrow. (Lit. He calls tomorrow today.)

**Particles of Emphasis.**

§ 205. These are ए and ही or हँ, only, even, and शी and ए or एँ, also, even. They are always used enclitically, and when any of them is added to a word ending in शा, that शा is omitted. Examples, हमन्य mine only (हमन्य + एँ), or me only (हम्या + एँ); हमन्य or हम्या mine also, or me also. उतर, a reply, उतरी, even a reply. अपना, even one’s own.

**Prepositions.**

§ 206. The following is a list of the more usual Prepositions.

**Before.**

§ 207. The following are the more useful.

And.

Also, even.

Then.

Facing.

The above all govern the genitive case.

**Conjunctions.**

§ 208. Interjections, see § 24. Others as in Hindi.
ADDENDA ET CORRIGENDA.

INTRODUCTION.

I withdraw the remarks on Page 2 concerning the tract over which Maithili is spoken. In Champáran a form of Bhojpúri is spoken, with a strong Maithili 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 Champáran from the foot note, but at the same time we must add the figures for the whole of South Munger and South Bhágalpúr, for the Bařh Subdivision of Patna, and for part of Púrniyá, where subsequent investigations have shown me that Maithili in greater or less purity is spoken.

The corrected figures, therefore, for the foot note will run as follows.

<table>
<thead>
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<th>Place</th>
<th>Figures</th>
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<tr>
<td>Muzaffarpúr</td>
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<td>Darbhangá</td>
<td>... 21,03,337</td>
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<td>Munger</td>
<td>... 18,16,894</td>
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<tr>
<td>Bhágalpúr</td>
<td>... 20,00,000</td>
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<tr>
<td>Araríá Sub-division of Púrniyá</td>
<td>... 3,05,040</td>
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<tr>
<td>Bařh&quot; Patna</td>
<td>... 2,47,076</td>
</tr>
</tbody>
</table>

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 Bhojpúri dialect there was no other philological work from which I could obtain any help regarding the Bihár 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. Hœrnle's Gauḍian Grammar, has since become one of the commonplaces of Eastern Hindi Grammar. I allude to the existence of the short vowels ē, ō, ā, and āā. These vowels have no symbol in the alphabets of Bihár, being represented like their long congeners as follows; ए e or ē, ओ o or ē, ऐ ai or ā, ए ai or āā. The fact is, that just as the simple
vowels have each a short and a long form viz: a and á, ō and ō, &c, so also the diphthongs have each a short and a long form, viz: e and ē, o and ō, ai and ai and ã 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 एद्र, this, and श्रीिि, that, (§§ 85 & 86) are pronounced ëh’ and ōh’.

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 Hœrnle, for the shortening of vowels and diphthongs in words other than verbs, must be given here. As adapted to this Maithili Grammar it is as follows:

(1) As regards चा आ, this vowel is always shortened if it comes in the antepenultimate syllable or earlier in a word. Thus in the word चाँउर chaur, rice, the á is long, because á is only in the penultimate syllable; but the longer form (see § 17) is चूर्क人心 chañurá (or contracted चूर्क人心 chañurá) 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 रामेरा ram’erá, 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 ग ग or व व, 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 श्र o, this, makes its genitive श्रीिकः okar, with a long o, but its accusative is श्रीिकाः okāra with a short o, as this o falls in the antepenultimate and is followed by a consonant. So also the e in नेनिकः (see § 34) nēniá 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 श्रीिकः okar is only two syllables, while श्रीिकाः okāra is three syllables.

There is only one exception to this rule,—it is that the final syllable वि e of the instrumental case is not considered as part of the word, but as a separate word. Hence we have पानिव paniw, and not पानिि panii with the a short. The word, however, though written panié is pronounced panié with the a short.
§ 70. An optional form of the instrumental singular of रं ṭ, “this”, is रं ेः. I have not met any corresponding form for चो ो, “that”.

§ 85. For जोळ ेः ह and जोळ ुः ह are sometimes used.

§ 86. Similarly for जोळ ेः ह, we find जोळ ेः ह, and जोळ ुः ह.

§ 104. Note, as to spelling, that verbal forms containing रं आि, are frequently written with चरं आि. Similarly verbal forms in चोळ आि are frequently written with चरं आि. So that देखत देखाईत is sometimes written देखत देखाईत, and देखीत देखाईउ, sometimes देखित देखाईउ.

In poetry रं आि when final is frequently written आि आि: e.g. देखित देखाईउ is written sometimes देखित देखाईउ.

§ 111. I have omitted a common form for “he is”, रं आि. No other forms from this root are, so far as my experience goes, in use.

§ 117. Add present participle व्रक्षेत आच्छाईत “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 देख, देखी देखी, देख देख, देखी देखी (or देख देखी), and देखी देखी. So also in intransitive verbs.

§ 133. 3rd Future Hon.—An optional form for this person is देखित देखाईत, frequently, however, written देखत देखाईत.

§ 167. Past Tense.—The use of the diphthongs आि and आि in this tense is regulated by the following rules.

(1) Transitive verbs (including causals) generally take आि, and so also does गाप्य गाबे, “to sing”. Hence we have in the first person चान्य चापल अन, “I obtained”, चान्य चापल अन, “I sang”, चान्य चापल अन, “I caused to ascend”. The past participles of these verbs are चान्य चापल, चान्य चापल, and चान्य चापल. The principal exception which I have met is the verb चाप्य महे, “to eat”, which makes its past tense चापल महाल अन, and its past participle चाप्ल महाल: the form चाप्ल महाल, I have, however, met, once or twice, though said to be incorrect.

(2) Intransitive verbs as a rule use the diphthong आि. Thus चाप्य आहूं, “to be satiated”, past part. चाप्य आहूं, and its 1st pers. past, चापल आहूं, “I was satiated”, so also चाप्य चापल अन, “confused,” चाप्य चापल अन, “come”, and चाप्य चापल अन, “agitated”, from the intransitive verbs चाप्य अन, चाप्य अं, and चाप्य अं.

§ 180-3. The verbal noun (oblique form in रं ाि) of the verbs रं आि, to give, and वृं लेख, to take, inserts an रं म, thus, रं के आि, रं के लेख, gen. रं के अलेि &c. Verbs whose root ends in रं ि, insert a च ब in this form: E.g. च बे पिबाई from च म पिबाई, to drink.
<table>
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<tr>
<th>Deva Nagri</th>
<th>Kayathi</th>
<th>Maithili</th>
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</thead>
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<td>कु  कु  कु  कु  कु</td>
<td>कु  कु  कु  कु  कु</td>
</tr>
<tr>
<td>कु  कु  कु  कु  कु</td>
<td>कु  कु  कु  कु  कु</td>
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<td>कु  कु  कु  कु  कु</td>
<td>कु  कु  कु  कु  कु</td>
</tr>
</tbody>
</table>

The same vowel is not used by Kayathas in writing Maithili.
See § 4 APPENDIX NO.1.

A Sanskrit Sloka written in the three characters of Mithila.

ॐ सार्वभूतांतमात्रेयिं मिदं मेवासम प्रहमने • •
पर्यावरतियंत्र श्रीनामस्मृतं: सुवेदानिहितिः • •

ॐ समायंतमात्रेयिं मिदं मिदं मेवास्म‌क्रियाशिरस्वति • •
परावरतियंत्र श्रीनामस्मृतं: शं मिदं दर्शिविनी • •

The Kayathi character is not adapted for writing Sanskrit. It has no form for short medial । and has no semivowel ya.

ॐ अम्मा स्वाम्यंततां यं मिदं मेरामुद्ग्रहर्गो ते • •
दयानु रञ्जिणेक्ष्ठो नामस्मृतं: श्रीजिजित्वति • •
APPENDIX II.

The following is the Parable of the Prodigal Son, in three Languages, Hindi, Marathi, and Bangâli. The three versions are in parallel columns, and correspond as much as possible line for line.
ERRATA.

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.

<table>
<thead>
<tr>
<th>P.</th>
<th>L.</th>
<th>From/Top</th>
<th>For</th>
<th>Read</th>
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</thead>
<tbody>
<tr>
<td>5</td>
<td>2</td>
<td>bottom</td>
<td>Bengálí</td>
<td>Bangálí.</td>
</tr>
<tr>
<td>7</td>
<td>3</td>
<td>top</td>
<td>भ$p$</td>
<td>है</td>
</tr>
<tr>
<td>16</td>
<td>3</td>
<td>bottom</td>
<td>चा</td>
<td>धै</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Foot Note</td>
<td>Usualy</td>
<td>Usually</td>
</tr>
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<td>सिरंजीविन</td>
<td>chirañjīvin.</td>
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<td>chirañjībin.</td>
</tr>
<tr>
<td></td>
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<td>में</td>
<td>chirañjībin'.</td>
</tr>
<tr>
<td>or</td>
<td>सिरंजीविन्</td>
<td>chirañjī</td>
<td>or</td>
<td>chirañjīb'.</td>
</tr>
</tbody>
</table>

P. 21 L. 2 from bottom | máná | mányá |
| 22 | 2 from top | (suddh) | (s'uddh) |
| 23 | 5   | which is | which is not |
| 24 | 19  | तोँच | तोँच |
| 27 | Foot Note | पुछर्घ | पुछर्घ |
| 32 | 1   | लोक नि | लोक नि |
| 36 | 4 from bottom | janika | janiká |
| 43 | 11 from top | saah | sabh |
| 6  | from bottom | क्‌ि? what, | क्‌ि, what? |
|    | Last line | and क्र्‌ि, what? | क्र्‌ि, what? and क्र्‌ि |
|    |          | keo, any one, some one. |          |
ERRATA.

P. 44 L. 5 from top omit केहो keo, any one, some one, becomes नो kono.

,, ,, 9 after "कोन kono" insert "and केहो keo, any one, some one, under similar circumstances always becomes नो kono.

For

Read.

,, 45 ,, 5 from top lotā amot
,, ,, 16 ,, Likenses Likeness.
,, 46 ,, 2 from bottom like what like what?
,, ,, ,, ,, like the same like that.
,, ,, ,, ,, how much how much?
,, ,, Last line Numerals. pp. 47—49.

P. 50 L. 15 & 16 from top section

,, ,, 6 from bottom it has खच
,, 52 ,, 11 from top एत ait एत ait
,, ,, 12 ,, एल al एल al
,, ,, 14 ,, चाह chah चाह chah
,, 53 ,, 9 ,, Chapter VIII.
,, 54 ,, 4 ,, चह chah चह chah
,, ,, 6 from bottom आ o आ o
,, 55 ,, 3 from top केन्द्रिकि kendraī केन्द्रिकि kendraī
,, ,, 8 from bottom थिकैं thikaiन थिकैं thikaiन
,, 62 ,, 2 & 1 from bottom देखिी dekhāhīन देखिी dekhāhī or देखिी dekhāhīँ
<table>
<thead>
<tr>
<th>Page</th>
<th>Line</th>
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<th>From Top</th>
<th>For</th>
<th>Read</th>
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<td>देखिेत्</td>
<td>देखिेत्</td>
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<tr>
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<td>देखिेत्</td>
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<td>18</td>
<td></td>
<td></td>
<td>dehal'kai</td>
<td>dehal'kai</td>
</tr>
<tr>
<td>72</td>
<td>3</td>
<td></td>
<td></td>
<td>देखि दीनि</td>
<td>देखि दीनि</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>dekhal'thuik'</td>
<td>dekhal'thuik'</td>
</tr>
<tr>
<td>77</td>
<td>2</td>
<td></td>
<td></td>
<td>देखिल</td>
<td>देखिल</td>
</tr>
<tr>
<td>85</td>
<td>1</td>
<td></td>
<td></td>
<td>sut'liaik</td>
<td>sut'liaik</td>
</tr>
<tr>
<td>89</td>
<td>4</td>
<td></td>
<td></td>
<td>देखि</td>
<td>देखि</td>
</tr>
<tr>
<td>92</td>
<td>2</td>
<td>2nd line of footnote 2. Fut.</td>
<td></td>
<td>देखि</td>
<td>देखि</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td></td>
<td></td>
<td>or पाण्डु, omit, but see addenda.</td>
<td>or पाण्डु, omit, but see addenda.</td>
</tr>
<tr>
<td>95</td>
<td>10</td>
<td></td>
<td></td>
<td>euphonic</td>
<td>euphonic</td>
</tr>
<tr>
<td>99</td>
<td>5</td>
<td></td>
<td></td>
<td>होडवाँछा</td>
<td>होडवाँछा</td>
</tr>
<tr>
<td>100</td>
<td>10</td>
<td></td>
<td></td>
<td>bājāeb</td>
<td>bājāeb</td>
</tr>
<tr>
<td>101</td>
<td>4</td>
<td></td>
<td></td>
<td>after chhorab, insert or त्रावन chhārab</td>
<td>after chhorab, insert or त्रावन chhārab</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td>after arāeb insert, or चाडव्य अराब</td>
<td>after arāeb insert, or चाडव्य अराब</td>
</tr>
<tr>
<td>107</td>
<td>1</td>
<td></td>
<td></td>
<td>after jāeb insert or जेलेव जारब</td>
<td>after jāeb insert or जेलेव जारब</td>
</tr>
<tr>
<td>109</td>
<td>3</td>
<td>from top for चीताण read अत्य श्रीवि</td>
<td></td>
<td>अत्य श्रीवि</td>
<td>अत्य श्रीवि</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
<td></td>
<td>अत्य श्रीवि</td>
<td>अत्य श्रीवि</td>
</tr>
<tr>
<td>110</td>
<td>15</td>
<td></td>
<td></td>
<td>अत्य श्रीवि</td>
<td>अत्य श्रीवि</td>
</tr>
</tbody>
</table>
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OF THE

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3.—Temple, Rough Notes on the Distribution of the Afghan Tribes about Kandahar.—Brajanātha Bandyopādhyāya, Hamīr Rāsā, or a History of Hamīr, prince of Ranthambor.

4.—Barbe, Pali Derivations in Burmese.—Peal, A peculiarity of the river names in Assam and some of the adjoining countries.—Growse, Bulandshahr Antiquities.—Rājendralāla Mitra’s Note to the above.—Rodgers, Copper Coins of the old Mahārájas of Kashmir.—Rodgers, The Copper Coins of the Sultans of Kashmir.—Smith, Observations on some Chandel Antiquities.
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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.,
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of the
Northern Balochi
Language
Containing
A Grammar, Vocabulary
and
Specimens of the Language
by
M. Longworth Dames, C. S.

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INTRODUCTION.

1. The Balochi 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 Makrani 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 Bolan Pass in Kachi, and on the Upper Sindh and South Panjab frontiers. The tribes speaking this dialect are the Rinds, Dombkis, Maghasis, Jakraniis, Marris, Bugtis, Mazaris, Drishaks, Gorchaniis, Lasharis, Durkanis, Legharis, Hadyanis, Lunds, Khosas, Bozdaris, and Kaisaranis. These tribes come into contact with populations speaking Sindhi, Panjabi, Brahni, and Pashto. The Indian languages, Sindhi and Panjabi, have affected the Balochi Vocabulary considerably, Pashto very slightly if at all, while Brahni has probably borrowed considerably from Balochi. The Brahvis commonly understand Balochi, and it is the commonest medium of communication between them and the Balochi speaking tribes. The best Baloch is probably spoken among the Dombkis and Bugtis, the most corrupt perhaps among the Bozdaris. 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 Sarawan and Jahlawan tribes of Brahvis 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 sketch was commented on by Lassen in the "Zeitschrift für die Kunde des Morgenlandes" for 1841. Leech gives a small Vocabulary. Gladstone's Biluchi Manual (Lahore, 1873) and Bruce'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 Balochi 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 Balochi, 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 Derajat Frontier, and in the Sulaiman Hills, and for a short time in Sibi and Kachi.

3. Balochi 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 Sindhi or the South Panjabi dialect which is nearly akin to it. Correspondences are pointed out in the vocabulary, Indian words being generally marked as Sindhi, 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 Balochi has borrowed from Sindhi. Sometimes Sindhi may be the borrowing language, and in many cases both languages are indebted to modern Persian or Arabic. Though the numerical proportion of Sindhi 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 Balochi.

4. I prefix an outline of the grammar of Balochi. 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.
# BALOCHI GRAMMAR.

## TABLE OF BALOCHI SOUNDS.

<table>
<thead>
<tr>
<th></th>
<th>SURD. Mute</th>
<th>SURD. Aspirate</th>
<th>SONANT Mute</th>
<th>SONANT Aspirate</th>
<th>Nasal</th>
<th>Sibilant</th>
<th>Semi-vowels</th>
<th>Aspirate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guttural</td>
<td>k</td>
<td>kh</td>
<td>g</td>
<td>gh</td>
<td>c</td>
<td>...</td>
<td>...</td>
<td>s</td>
</tr>
<tr>
<td></td>
<td>h</td>
<td>...</td>
<td>j</td>
<td>...</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Palatal</td>
<td>ch</td>
<td>chh</td>
<td>j</td>
<td>jh</td>
<td></td>
<td></td>
<td></td>
<td>y</td>
</tr>
<tr>
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<td></td>
<td>...</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cerebral</td>
<td>t</td>
<td>th</td>
<td>d</td>
<td>dh</td>
<td></td>
<td></td>
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<td>t</td>
<td>...</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dental</td>
<td>t</td>
<td>th</td>
<td>d</td>
<td>dh</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>...</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labial</td>
<td>p</td>
<td>ph</td>
<td>b</td>
<td>bh</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

1880.]
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 ﷝ and ﷞ are retained to represent certain Balochí sounds corresponding, or nearly so, with their Arabic values, the representation of these sounds by ﷝ and ﷝ being insufficient and misleading. The other Arabic letters ﷝, ﷟, ﷠, ﷢, ﷤, and ﷥ 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 ﷸ or ﷹ following the aspirated consonant. The cerebrals are marked as in Urdu.

---

The Persian Alphabet as applied to Balochí.

<table>
<thead>
<tr>
<th>Persian</th>
<th>Roman</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>﷍</td>
<td>a, i, u, á</td>
<td>As in Persian, an initial introducing all vowels.</td>
</tr>
<tr>
<td>﷎</td>
<td>e, ai, o, au</td>
<td>With the short vowel marks — — — it forms a, i, u. With modda ﷍ it forms á. With ﷡ following it forms i, e, ai. With ﷥ following it forms ú, o, au. As a medial and final it is always á.</td>
</tr>
<tr>
<td>﷥</td>
<td>b</td>
<td>As in English and Persian.</td>
</tr>
<tr>
<td>﷥</td>
<td>bh</td>
<td>Aspirated b.</td>
</tr>
<tr>
<td>﷥</td>
<td>p</td>
<td>As in Persian and English.</td>
</tr>
<tr>
<td>﷥</td>
<td>ph</td>
<td>Aspirated p.</td>
</tr>
<tr>
<td>﷥</td>
<td>t</td>
<td>Dental t as in Persian.</td>
</tr>
<tr>
<td>﷥</td>
<td>th</td>
<td>Aspirated t.</td>
</tr>
<tr>
<td>﷥</td>
<td>th</td>
<td>As in Arabic, English th in breath, health.</td>
</tr>
<tr>
<td>﷥</td>
<td>t</td>
<td>Cerebral t pronounced as in Hindústání.</td>
</tr>
<tr>
<td>﷥</td>
<td>th</td>
<td>Aspirated t.</td>
</tr>
<tr>
<td>﷥</td>
<td>j</td>
<td>J as in English.</td>
</tr>
<tr>
<td>﷥</td>
<td>jh</td>
<td>Aspirated j.</td>
</tr>
<tr>
<td>﷥</td>
<td>ch</td>
<td>As in English church.</td>
</tr>
<tr>
<td>Persian</td>
<td>Roman</td>
<td>Value</td>
</tr>
<tr>
<td>---------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td>چ</td>
<td>chh</td>
<td>Aspirated ch.</td>
</tr>
<tr>
<td>خ</td>
<td>kh</td>
<td>An aspirate guttural as in Persian, pronounced without harshness as in Pashto.</td>
</tr>
<tr>
<td>د</td>
<td>d</td>
<td>Dental d as in Persian.</td>
</tr>
<tr>
<td>ط</td>
<td>dh</td>
<td>Aspirated d.</td>
</tr>
<tr>
<td>ث</td>
<td>d</td>
<td>Cerebral d as in Hindústání.</td>
</tr>
<tr>
<td>ج</td>
<td>dh</td>
<td>Aspirated d.</td>
</tr>
<tr>
<td>چ</td>
<td>dh</td>
<td>As in Arabic, or English th in brother, breathe.</td>
</tr>
<tr>
<td>ر</td>
<td>r</td>
<td>A clearly trilled r, as in Persian.</td>
</tr>
<tr>
<td>ز</td>
<td>r</td>
<td>Cerebral r as in Hindústání, and like it nearly connected in sound with ژ d.</td>
</tr>
<tr>
<td>ز</td>
<td>z</td>
<td>As English z.</td>
</tr>
<tr>
<td>ن</td>
<td>zh</td>
<td>As in Persian, or s in English measure.</td>
</tr>
<tr>
<td>س</td>
<td>s</td>
<td>As in Persian. English s.</td>
</tr>
<tr>
<td>ش</td>
<td>sh</td>
<td>As in Persian, the palatal sibilant. English sh.</td>
</tr>
<tr>
<td>گ</td>
<td>gh</td>
<td>As in Persian. A slightly pronounced guttural, not so harsh as in Arabic or Pashto.</td>
</tr>
<tr>
<td>ف</td>
<td>f</td>
<td>A pure labial f; not partly dental as English f.</td>
</tr>
<tr>
<td>ک</td>
<td>k</td>
<td>As English k without any palatalization as in Persian.</td>
</tr>
<tr>
<td>گ</td>
<td>g</td>
<td>G hard as in English and Persian without palatalization.</td>
</tr>
<tr>
<td>م</td>
<td>m</td>
<td>As English m.</td>
</tr>
<tr>
<td>ن</td>
<td>n</td>
<td>As English n. Also as a slightly pronounced guttural nasal, as in the final n of Persian or Hindústání plurals.</td>
</tr>
<tr>
<td>و</td>
<td>w, v</td>
<td>Either as English w or as a purely labial v, not as English v.</td>
</tr>
<tr>
<td>ه</td>
<td>h</td>
<td>As English h. Occasionally mute as a final. When so mute it is not represented in transliterations.</td>
</tr>
<tr>
<td>ی</td>
<td>y</td>
<td>As English y. Sometimes pronounced with a slight tendency to become zh.</td>
</tr>
</tbody>
</table>
BALOCHI SOUNDS.*

1.—Consonants.

\( \text{k} \) corresponds with Persian \( k \), which however more usually appears in Balochi as \( \text{kh} \) or \( \text{kh} \).

\( \text{kh} \) as an initial represents Persian \( k \) or \( \text{kh} \); e. g.,

- Balochi khush-agh
- B. khar
- B. khan-agh

As a final it sometimes represents \( g \); e. g.,

- B. gwánkh
- B. gurkh

\( \text{kh} \) seldom occurs initially, its place being taken by \( \text{kh} \). As a final it corresponds with Persian \( k \) or \( g \); e. g.,

- B. hákkh
- B. rekkh

\( g \) corresponds either with Persian \( g \) or \( b \). As an initial \( gw \) answers to \( b \) (original \( v \)); e. g.,

- B. gandím
- B. gist
- B. gwáthk
- B. gwaf-agh
- B. gěth

\( gh \) does not seem to occur in true Balochi words, but to be confined to words of Indian origin.

\( gh \) 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. jagkhar
- B. nígáh
- B. digkár
- B. jígh
- B. roshagh
- B. rágk

In the words sağhar ‘head,’ P. sar, and nağhan ‘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 participles, answering to the final h of the Persian, but it is not heard except in compound forms when followed by a vowel. Thus khutha, p. p. of khanagh means 'done,' but khutha-gh-ant 'they have done.'

\( \wedge n \) frequently occurs as a final, in the place of n or nt; e. g.,

khanagh - khanaghant.

Occasionally owing to a nasal style of pronunciation, \( \wedge n \)w stands for m, and \( \wedge n \) is interpolated as a final; e. g.,

nyánwán — nyámá

\( \wedge \) ch generally corresponds with the same letter in Persian.

\( \o \) chh also represents Persian ch; e. g.,

B. ehhältk  P. cháh
B. ehham   P. chashm

\( \o \) j corresponds either with original Persian j or z; e. g.,

B. jihán    P. jahán
B. jan      P. zan
B. júgh    P. zih

\( \o \) jh is only found in words of Indian origin.

The cerebral consonants are found almost entirely in words of Indian origin. Before a dental, \( \o \) r is occasionally pronounced \( \o \) r, as mard for mard, gartha for gartha; but this is not universal and has not been marked in the Vocabulary. Leech represents this by \( \o \), but I have never heard it so pronounced.

\( \wedge \) t represents an original t, which however more usually becomes \( \wedge \) th.

\( \o \) 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. thákkhta   P. tákkhta
B. thafar     P. tabar
B. árth       P. árad
B. khanth     P. kunad
B. burtha     P. burda

\( \wedge \) th (pronounced as in Arabic, 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. bráth      P. birádar
B. gwáth      P. bád
B. roth       P. rúda
B. roth       P. ravad
B. síth       P. súd
B. rasíthka   P. rasúda
Consonants.

\( d \) corresponds with Persian \( d \) as an initial and occasionally after a consonant; e.g.,

- B. dem
- B. khandagh

\( dh \) only occurs in words of Indian origin.

\( dh \) (pronounced like English \( th \) in \( mother \), \( breathe \)) never occurs initially. As a final and medial it corresponds with Persian \( d \); e.g.,

- B. dildar
- B. sadh
- B. rodh

In some verbs \( dh \) as a characteristic represents a consonant which is lost in modern Persian; e.g.,

- B. rudh-agh, p.p. rustha
- B. nyákh-agh
- B. shodh-agh

In madhak\( \) 'loest' \( dh \) corresponds with \( l \) in Persian malakh\( \).

In kághadh the Persian spelling is preserved, though \( \dot{d} \) is pronounced \( dh \) not \( z \).

In nádhr\( \) it represents Arabic \( ُ \) in نظر\( . \)

\( n \) corresponds with Persian \( n \).

\( p \) corresponds with Persian \( p \), also with \( f \) before a consonant; e.g.,

- B. hapt
- B. gwaptha

\( ph \) as an initial represents Persian \( p \) and \( f \); e.g.,

- B. phaneh
- B. phusht
- B. phur
- B. phráh

\( f \) seldom occurs initially, its place being taken by \( ph \). As a medial and final it commonly represents Persian \( b \); e.g.,

- B. thafar
- B. shaf
- B. áf

\( b \) corresponds with Persian \( b \) as an initial and when not preceded by a vowel.

\( bh \) is found only in words of Indian origin.

\( w \), \( v \), 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 Sindhi 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. khwáb

Combined with h, w is pronounced like English wh in which; wh and w alone often correspond with Persian khw خ or kh followed by a labial vowel (u, ú, o). The guttural is either preserved in the aspirate h or more frequently lost altogether (see h); e. g.,

- B. whán  P. khwán
- B. whår  P. khwár
- B. wash  P. khush
- B. wán-agh  P. khwán-dan
- B. war-agh  P. khur-dan

m corresponds with Persian m.

s corresponds with Persian s.

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-er 'from below.'

j 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 zi 'yesterday,' mazain '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 zarāgh z corresponds with the j of Sindhi jik and jaru, but these words may have been borrowed by Sindhi. Cf. Pashto zik.

*j zh corresponds with Persian sh, z and j; e.g.,

<table>
<thead>
<tr>
<th>English</th>
<th>Balochi</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. duzhman</td>
<td>P. dushman</td>
</tr>
<tr>
<td>B. azhmán</td>
<td>P. ásmán</td>
</tr>
<tr>
<td>B. drážh</td>
<td>P. daráž</td>
</tr>
<tr>
<td>B. wázhá</td>
<td>P. khwája</td>
</tr>
</tbody>
</table>

c,y, r, and l correspond with the same letters in Persian.

$s h$ generally represents an old Persian h, modern Persian h or $kh$; e.g.,

<table>
<thead>
<tr>
<th>English</th>
<th>Balochi</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. hushk</td>
<td>P. khushk</td>
</tr>
<tr>
<td>B. hon</td>
<td>P. k̄hun</td>
</tr>
<tr>
<td>B. hížh</td>
<td>P. k̄hák</td>
</tr>
<tr>
<td>B. phráh</td>
<td>P. farákh</td>
</tr>
</tbody>
</table>

Borrowed Arabic words beginning with $zh$ undergo a similar change, as:

<table>
<thead>
<tr>
<th>English</th>
<th>Balochi</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. hair</td>
<td>A. khair</td>
</tr>
<tr>
<td>B. hatar</td>
<td>A. khatar</td>
</tr>
</tbody>
</table>

The above noted correspondences may be tabulated as follows:

<table>
<thead>
<tr>
<th>Persian</th>
<th>Balochi</th>
</tr>
</thead>
<tbody>
<tr>
<td>$k$</td>
<td>as an initial</td>
</tr>
<tr>
<td></td>
<td>medial</td>
</tr>
<tr>
<td></td>
<td>final</td>
</tr>
<tr>
<td>$kh$</td>
<td>initial</td>
</tr>
<tr>
<td></td>
<td>medial</td>
</tr>
<tr>
<td></td>
<td>final</td>
</tr>
<tr>
<td>$g$</td>
<td>initial</td>
</tr>
<tr>
<td></td>
<td>medial</td>
</tr>
<tr>
<td></td>
<td>final</td>
</tr>
<tr>
<td>$ch$</td>
<td>initial</td>
</tr>
<tr>
<td>$t$</td>
<td>initial</td>
</tr>
<tr>
<td>$d$</td>
<td>medial</td>
</tr>
<tr>
<td></td>
<td>final</td>
</tr>
<tr>
<td>$p$</td>
<td>initial</td>
</tr>
<tr>
<td>$f$</td>
<td>initial</td>
</tr>
<tr>
<td>$b$</td>
<td>medial</td>
</tr>
<tr>
<td></td>
<td>final</td>
</tr>
<tr>
<td>$sh$</td>
<td>medial</td>
</tr>
<tr>
<td>$s$</td>
<td>initial</td>
</tr>
<tr>
<td></td>
<td>medial</td>
</tr>
<tr>
<td>$z$</td>
<td>initial</td>
</tr>
</tbody>
</table>
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 Brahui 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. asten P. hastand
B. am P. ham

II. VOWELS.

The vowel sounds in Balochi generally agree with those of Khurásání Persian. They may be arranged as follows:—

Long  ú,  i,  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 i, e for the labial series ú, u, o; e.g.,
B. sílk  P. súd
B. dír  P. dúr
B. seshín  P. sozan
B. gandím  P. gandum
B. bítka  P. buda
B. híkk  P. khúk
B. wasí  P. khusú
B. sírmukh  P. surma

A similar change sometimes affects borrowed Arabic words; e. g.,
B. málím  A. málúm
B. hír  A. húr

In a few cases the change is reversed; e. g.,
B. osht-agk  P. ist-ádan
B. súf  P. sev

Other variations from the Persian vowel system are rare.
THE NOUN.

I—Terminations.

1. Balochi nouns in their formation correspond closely with Persian. 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.

a. The majority of nouns ending in á are borrowed from Sindhi or Arabic. In the former case á sometimes represents Sindhi o, therein corresponding more nearly with Panjábi; e. g.,

<table>
<thead>
<tr>
<th>Ar. hatá, duá.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Si. bhá, jherá, thorá, trámá, velá.</td>
</tr>
</tbody>
</table>

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.,

<table>
<thead>
<tr>
<th>wázhá, pl. wázhahán, lords</th>
</tr>
</thead>
<tbody>
<tr>
<td>begá: abl. begahá, in the evening.</td>
</tr>
</tbody>
</table>

The borrowed noun velá time, is similarly treated. Other nouns ending in á take no inflections. Some Sindhi nouns as jherá, thorá have an alternative form in o which can be inflected.

1. This is a common termination being commonly used as in Persian to form abstractions as duzi, 'theft' from duz 'thief,' sakí strength from sak 'strong' &c., also as the termination of other abstract nouns not directly formed from Balochi bases as sháhdí 'rejoicing,' ziyáni 'injury.' It occurs also in other nouns as godá 'lady,' druhání 'pistol,' mavárákí 'assembly,' pahlí 'rib' (P. pahlu). A as a termination of borrowed words i is also found as in chári 'spy,' mehi 'buffalo,' phallí 'section of a tribe.'

O is of frequent occurrence both in pure Balochí and in borrowed words; e. g.,

<table>
<thead>
<tr>
<th>Balochi</th>
<th>dibhlo, mist (P. dúd).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balochi</td>
<td>sháthlo, dove</td>
</tr>
<tr>
<td></td>
<td>bathlo, mortar</td>
</tr>
<tr>
<td></td>
<td>nákho, uncle</td>
</tr>
<tr>
<td></td>
<td>gokho, span</td>
</tr>
<tr>
<td></td>
<td>mokho, spider</td>
</tr>
<tr>
<td></td>
<td>go, race, prize</td>
</tr>
<tr>
<td></td>
<td>jo, watercourse</td>
</tr>
<tr>
<td></td>
<td>gwando, alligator</td>
</tr>
<tr>
<td></td>
<td>duggo, eagle</td>
</tr>
<tr>
<td></td>
<td>jaddo, cave</td>
</tr>
<tr>
<td></td>
<td>phalo, direction</td>
</tr>
</tbody>
</table>
Borrowed

dadlo,  pony  Si. dradro
paraadlo,  echo  Si. parandro
ghoro.  a band of horse
shaddo  a turban
leko  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 (díthlo to jo inclusive) does not undergo this change. Go and jo are radical words, and the others end in the syllables lo and kho 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 classed 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
limúa, 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,

Agh. 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 Balochi generally corresponds with Persian h. Agh as a termination corresponds with the Persian termination ah in many other nouns; e. g., ramagh "a flock of goats," áhanjagh "a sash" &c. Some are verbal nouns in form as gwáznagh "a swing." The termination agh also forms collective nouns as murdánagh "the fingers," from murdán, phádagh "legs," from phádh.
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 thursaghh "to fear"; warokh "an eater," from waragh. These nouns of agency can be used and inflected as adjectives; e.g., mirokhh, a fighter
mirokhh uing, fighting dog.

Okh is occasionally found in other nouns besides those of agency as in gannokh 'fool.'

(b) Abstract Nouns.

1. This is the commonest termination for abstract nouns, which may be formed from other nouns, or adjectives; e.g., duzi "theft," sakmardi "valour," ghami "grief."

Adh. Used in forming abstracts from adjectives of dimension; as,
gwandadh, shortness
drzhadh, length
phrhadh, breadth.
útá; as azmútá 'examination' from ázmainagh.
ár; as didár 'sight,' raptár '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 janh.
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 janh woman
gwarakh lamb, from the base gwar—cf. gurand ram, and gwar-
papar flock of lambs.

kisanakh, very small, from kisain.

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 kisain 'small.' Possibly the termination lo in dítlo, sháthlo had originally the force of a diminutive. Compare also the adverbs khamro "a very little," from khan, and chiklo "a little."

4. Compound nouns and adjectives.

Compounds are numerous, and may be classed under the Sanskrit
divisions of Dwandwa, Tatpurusha, Karmadhārāya and Bahuvihi, 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-chori, 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 okh being occasionally but not often used; e. g.,

(1) When both members are nouns.

- jogin-dáir, a pestal (lit. mortar-stick).
- mazar-dumb, a plant (lit. tiger-tail).
- rosh-ásán, sunrise.
- chagá-hálwar, a matter of jest.
- eh-ham-plusht, eyelid.
- máh-jhumá, eclipse of the moon.

(2) When the first member is a noun and the latter a verbal root.

- shúrwár, milk-drinking
- rozh-gir, eclipse of the sun (sun-seizing).
- gohú-dín, udder-tearing (name of a plant).
- shav-khash, night-expeller (the planet Venus).
- mar-khusokh, 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).
- drúzdáir, a beam (longwood).
- mádhgor, female wild ass.
- ergvélah, the leeside (lit. downwind).
- chyár-gist, 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.
- phás-hádh, barefoot.
- swéth-rich, greybeard
- syáh-gwar, black-breast (e. g. the black partridge).
- phodhán-demi, the name of a flower (lit. thither-faced).
- dír-zánagh, far-knowing.
- dast-bastagh, hands joined.
5. Inflection of nouns.

The suffixes used in forming the different cases are á, ār, 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 uninflated 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 uninflated.

(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

An mard bachh, that man's son; but have 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 dáttha-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 roți-ár naghan khanun. In Balochí we call “roți” 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.,

An ki khái chí kádhirá
Bahr-khanání go hádhirá
Har shákhá házár shákh bítha
Har shákhá wathí gul bítha.

Whatever thing comes from God
That I will divide with my heart.
On every branch a thousand branches sprang.
On every branch its own flower.

(6). An. 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.
ADJECTIVES.

1. Adjectives are formed by the terminations i, en, ena, agh, o, and egh from nouns and adverbs; e. g.,

1. demi, former from dem
   phadhí, hinder " phadhá
   en, ena. marden, manly " mard
   nughraen, of silver " nughra
   nughraena,  
   agh. gandagh, bad " gand
   o. gwátho, windy " gwáth
   egh. daregh, wooden " dáí

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 jowáne, kisáne, and mazane.

3. Comparison. The comparative degree is formed by the suffix thar, thir, or tar; e. g.,

kisain comp. kisánthar and kasthar
burz " burzáthir
mazain " masthar
jowain " jowánthar
sak " sakthar,

the base being sometimes slightly modified. The word bathir (Pers. bihtar) 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 Baloebi.
"Than" in comparison is expressed by azh, whether the adjective is put in the comparative degree or not; e. g.,

Azh tho nchh en, he is better than thou.

There is no special superlative form. The comparative form may be used, or the adverbs sakía "extremely", huilhá "divinely" may be employed to give emphasis to the adjective. The phrase azh thewaghen or azh kullánn "of all", may also be used with the comparative to give a superlative sense; e. g.,

Azh thewaghen masthar, the greatest of all.

---

NUMERALS.

1. Cardinal Numbers.

<table>
<thead>
<tr>
<th>Numeral</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yak</td>
<td>One</td>
</tr>
<tr>
<td>Ya</td>
<td>Two</td>
</tr>
<tr>
<td>Do</td>
<td>Three</td>
</tr>
<tr>
<td>Sai</td>
<td>Four</td>
</tr>
<tr>
<td>Chyár</td>
<td>Five</td>
</tr>
<tr>
<td>Phanch</td>
<td>Six</td>
</tr>
<tr>
<td>Shash</td>
<td>Seven</td>
</tr>
<tr>
<td>Hapt</td>
<td>Eight</td>
</tr>
<tr>
<td>Hasht</td>
<td>Nine</td>
</tr>
<tr>
<td>Hazhd</td>
<td>Ten</td>
</tr>
<tr>
<td>Yázhdah</td>
<td>Eleven</td>
</tr>
<tr>
<td>Yázdah</td>
<td>Twelve</td>
</tr>
<tr>
<td>Dwázhdah</td>
<td>Thirteen</td>
</tr>
<tr>
<td>Dwázdah</td>
<td>Fourteen</td>
</tr>
<tr>
<td>Seázdah</td>
<td>Fifteen</td>
</tr>
<tr>
<td>Chyárda</td>
<td>Sixteen</td>
</tr>
<tr>
<td>Phánzdah</td>
<td>Seventeen</td>
</tr>
<tr>
<td>Shánzdah</td>
<td>Eighteen</td>
</tr>
<tr>
<td>Havdah</td>
<td>Nineteen</td>
</tr>
<tr>
<td>Hazhdah</td>
<td>Twenty</td>
</tr>
<tr>
<td>Nozd</td>
<td>Twenty-one</td>
</tr>
<tr>
<td>Gíst</td>
<td>Twenty-two, and so on regularly</td>
</tr>
<tr>
<td>Gíst-u-yak</td>
<td>Thirty</td>
</tr>
<tr>
<td>Gíst-u-do</td>
<td>Forty</td>
</tr>
<tr>
<td>Number</td>
<td>Urdu</td>
</tr>
<tr>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>15</td>
<td>Shashumi</td>
</tr>
<tr>
<td>16</td>
<td>Haptumi</td>
</tr>
<tr>
<td>17</td>
<td>Hashtumi</td>
</tr>
<tr>
<td>18</td>
<td>Nuhmi</td>
</tr>
<tr>
<td>19</td>
<td>Dalmi</td>
</tr>
<tr>
<td>20</td>
<td>Yazdami</td>
</tr>
<tr>
<td>21</td>
<td>Dwazdami</td>
</tr>
<tr>
<td>22</td>
<td>Senzdamí</td>
</tr>
<tr>
<td>23</td>
<td>Chyárdami</td>
</tr>
<tr>
<td>24</td>
<td>Phánzdamí</td>
</tr>
<tr>
<td>25</td>
<td>Shánzdamí</td>
</tr>
<tr>
<td>26</td>
<td>Havdamí</td>
</tr>
<tr>
<td>27</td>
<td>Hazhdamí</td>
</tr>
</tbody>
</table>

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 back from the nearest multiple; e.g.,

217 is sai kham yázhah-gist, i.e., three less eleven-twenties.
223 is yázhah-gist-o-sai, i.e., eleven-twenties and three.

2. Ordinal Numbers.

<table>
<thead>
<tr>
<th>English</th>
<th>Urdu</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>Pheshí</td>
</tr>
<tr>
<td>Second</td>
<td>Duhquí</td>
</tr>
<tr>
<td>Third</td>
<td>Saimí</td>
</tr>
<tr>
<td>Fourth</td>
<td>Chyárúmí</td>
</tr>
<tr>
<td>Fifth</td>
<td>Phanchehumí</td>
</tr>
<tr>
<td>Sixth</td>
<td>Hashumí</td>
</tr>
<tr>
<td>Seventh</td>
<td>Haptumí</td>
</tr>
<tr>
<td>Eighth</td>
<td>Hashtumí</td>
</tr>
<tr>
<td>Ninth</td>
<td>Nuhmi</td>
</tr>
<tr>
<td>Tenth</td>
<td>Dalmí</td>
</tr>
<tr>
<td>Eleventh</td>
<td>Yázdámí</td>
</tr>
<tr>
<td>Twelfth</td>
<td>Dwázdámí</td>
</tr>
<tr>
<td>Thirteenth</td>
<td>Senzdamí</td>
</tr>
<tr>
<td>Fourteenth</td>
<td>Chyárdámí</td>
</tr>
<tr>
<td>Fifteenth</td>
<td>Phánzdamí</td>
</tr>
<tr>
<td>Sixteenth</td>
<td>Shánzdamí</td>
</tr>
<tr>
<td>Seventeenth</td>
<td>Havdamí</td>
</tr>
<tr>
<td>Eighteenth</td>
<td>Hazhdámí</td>
</tr>
</tbody>
</table>
Nozdamí  Nineteenth
Gístumí  Twentieth
Súmí  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 (½)  nem
one-third (⅓)  saiak
one-quarter (¼)  páo, chyárak
one-fifth (⅕)  phanjak
three-quarters (¾)  sai-páo
one and a half (1½)  yak nem or deqʰ
with one half more  sáqʰoán

E.g.  four and a half (4½)  sáqʰoán chyár

With minuter fractions the word bahr is employed with the ordinal number, as Gístumí bahr, one-twentieth.


a. Multiples of quantity, expressed in English by the word "fold."

dírā  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.
**PRONOUNS.**

I.—**Personal Pronouns.**

*a.* First person.

**Singular.**

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nom.</td>
<td>man, mah</td>
<td>maní, main</td>
<td>manán</td>
<td>man</td>
<td>azh man, go man</td>
<td></td>
</tr>
<tr>
<td>Gen.</td>
<td>maígh</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dat.</td>
<td>maíán</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acc.</td>
<td>man</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instr.</td>
<td></td>
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<td></td>
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<tr>
<td>Abl.</td>
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</tbody>
</table>

**Plural.**

<table>
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<tr>
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<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Nom.</td>
<td>má</td>
<td>máíu</td>
<td>máígh</td>
<td>máíri, márá</td>
<td>máí</td>
<td>máí, máí, máí, máí</td>
</tr>
<tr>
<td>Gen.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dat.</td>
<td></td>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Acc.</td>
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<tr>
<td>Instr.</td>
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<tr>
<td>Abl.</td>
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</tbody>
</table>

The plural má is often used with a singular signification.

*b.* Second person.

**Singular.**

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Nom.</td>
<td>than, tha</td>
<td>thái</td>
<td>thará</td>
<td>than, tha</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gen.</td>
<td>thái</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dat.</td>
<td>thará</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acc.</td>
<td>than, tha</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instr.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abl.</td>
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<td></td>
</tr>
</tbody>
</table>

**Plural.**

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nom.</td>
<td>shawá, shá</td>
<td>shawáí, shuí</td>
<td>shawáígh</td>
<td>shawáí, shuí</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gen.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dat.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instr.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abl.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Case</th>
<th>Singular</th>
<th>Plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nom.</td>
<td>esh, e, i</td>
<td>esh, eshán</td>
</tr>
<tr>
<td>Gen.</td>
<td>eshí, eshiyá</td>
<td>eshání</td>
</tr>
<tr>
<td>Dat.</td>
<td>eshiyar</td>
<td>esháraya</td>
</tr>
<tr>
<td>Ace.</td>
<td>eshiyá, eshiyar</td>
<td>esháni, esháraya</td>
</tr>
<tr>
<td>Instr.</td>
<td>eshiyá</td>
<td>eshání</td>
</tr>
<tr>
<td>Abl.</td>
<td>'sh eshiyá, go eshiyá, &amp;c.</td>
<td>'sh eshání &amp;c.</td>
</tr>
</tbody>
</table>

An intensive form is used with the prefix ham, sometimes corrupted to haw, as hawe, hamesh, hameshiyá, hameshání &c., “this very one, by this one.”

2. Remote demonstrative pronoun.

<table>
<thead>
<tr>
<th>Case</th>
<th>Singular</th>
<th>Plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nom.</td>
<td>án</td>
<td>ánhán, án</td>
</tr>
<tr>
<td>Gen.</td>
<td>ánhí, ánhiyá</td>
<td>ánhání</td>
</tr>
<tr>
<td>Dat.</td>
<td>ánhiyar</td>
<td>ánháraya</td>
</tr>
<tr>
<td>Ace.</td>
<td>ánhiyá, ánhiyá</td>
<td>ánhání</td>
</tr>
<tr>
<td>Instr.</td>
<td>ánhiyá</td>
<td>ánhání</td>
</tr>
<tr>
<td>Abl.</td>
<td>'sh ánhiyá &amp;c.</td>
<td>'sh ánhání &amp;c.</td>
</tr>
</tbody>
</table>

This pronoun has also an intensive form with the prefix ham or haw, meaning “that one”, “that very one”, as hawán, hawániyá &c.
The compound forms imar and ánumar (for i-mard and án-mard) are frequently used in the sense of personal pronouns and are applied even to animals and inanimate objects.


These are frequently employed with the verb when the regular pronouns are not expressed. Those of the 3rd person, i “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 khushthaghántán “they did.” The 1st person has also a suffix án, 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 khushthaghántún “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:

har khas ki whoever
har ki who ever
har ehi ki whatever
án ki who, whoever, whatever
c. g.,
har khas ki hábbat, every one who comes
har ki thau gushe, whatever you say
áu ki khái’ ehi kádhirá, whatsoever thing comes from God.

IV.—Reflectives.

Wath, self.

Singular.

<table>
<thead>
<tr>
<th>Case</th>
<th>Form</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nom.</td>
<td>wath</td>
<td>self</td>
</tr>
<tr>
<td>Gen.</td>
<td>wathi</td>
<td>own, one’s own</td>
</tr>
<tr>
<td>Dat.</td>
<td>wathár</td>
<td>self</td>
</tr>
</tbody>
</table>

Plural.

<table>
<thead>
<tr>
<th>Case</th>
<th>Form</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nom.</td>
<td>wathán</td>
<td>selves</td>
</tr>
<tr>
<td>Gen.</td>
<td>wathání</td>
<td>own</td>
</tr>
<tr>
<td>Dat.</td>
<td>watháurá</td>
<td>selves</td>
</tr>
</tbody>
</table>
The words jind and but are also used in the sense of "self."

oneself, wathí wath

or  wathí jind

e. g.,

Awmar wathí jindär khushtha, he killed himself.

Jind is especially used in referring to one's own private property, as the Hindústání nij; e. g.,

hawc mádāín maní jindeghen, this mare is my own property.

The phrase pha-wathán is used for among themselves, ourselves, yourselves.

V.—Interrogatives.

Who, khái ?

<table>
<thead>
<tr>
<th>Nom.</th>
<th>who ?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gen.</td>
<td>whose ?</td>
</tr>
<tr>
<td>Dat. Acc.</td>
<td>whom ?</td>
</tr>
</tbody>
</table>

what ?

which, what (qualifying a noun) kithán thán

how much ______ chih, chikhtar, chikar

how many ? ______ (P. chi qadr ?)

VI.—Correlatives.

so much ______ īkhtar, ikar

so many ______ (P. in qadr ?)

just so much ______ hawīkhtar (P. hamín qadr ?)

that much ______ ānkhtar

just that much ______ hawaṅkhtar

VII.—Indefinite.

khase  any one, some one

har-khas  every one

khas nen  nobody

hech

hechí ______ any

'chi

har chí  everything

'chic  something

'chic-'chic  a little

bechí-na  nothing

'chí-na
báz    many
kham   few
geshtar more
kharde some
yak-áptiyá one another
thí     other, another
philí } some one else
thí khase something else
thí 'chie thí 'chí-na nothing else
theqhi } all
thewágheu }
drust
kull } the whole
las
kulkán-phajyá altogether
hardo both

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 báro. 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
kháith    he will come
nayáith    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:

<table>
<thead>
<tr>
<th>Singular</th>
<th>Plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. án</td>
<td>ún, om</td>
</tr>
<tr>
<td>2. e</td>
<td>eth, edh, e</td>
</tr>
<tr>
<td>3. th, íh, í</td>
<td>ant</td>
</tr>
</tbody>
</table>

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.

- khanagh, to do khanth
- janagh, to strike janth or jath
- giragh, to take gírth
- baragh, to take away bánth
- waragh, to eat wárth

In giragh, gír is the radical form of the verb. In baragh and waragh the radical vowel is lengthened. The following take th:

- biagh to be bíth, bí
- ravagh to go roth, ro
- deagh to give dáth, dá
- siagh to swell síth

The present participle used of a continued or repeated action is formed from the base by the termination ána; e. g.,

**Infinitive**

- biagh
- khanagh

**Present Participle.**

- biána
- khanána

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-i, he began to do (lit. he fell a-doing).

The present and imperfect are formed from the infinitive by the following terminations:

**Present.**

<table>
<thead>
<tr>
<th>Sing.</th>
<th>Plur.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. án</td>
<td>án, om</td>
</tr>
<tr>
<td>2. e</td>
<td>eth</td>
</tr>
<tr>
<td>3. en</td>
<td>ant, an, en</td>
</tr>
</tbody>
</table>

**Imperfect.**

| 1. athán | athán |
| 2. athé  | athé |
| 3. ath, eth | ath, eth |
The past participle is formed by the addition of the suffix tha or thá 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. án
2. e
3. —

**Pluperfect.**

1. athán
2. athe
3. ath, á

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 uninflccted; 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 uninflccted 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.**

<table>
<thead>
<tr>
<th></th>
<th>Sing.</th>
<th>Plur.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am</td>
<td>án</td>
<td>we are</td>
</tr>
<tr>
<td>thou art</td>
<td>e</td>
<td>you are e</td>
</tr>
<tr>
<td>he is</td>
<td>en</td>
<td>they are ant</td>
</tr>
</tbody>
</table>

**Past.**

<table>
<thead>
<tr>
<th></th>
<th>Sing.</th>
<th>Plur.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I was</td>
<td>athán</td>
<td>we were athán</td>
</tr>
<tr>
<td>thou wast</td>
<td>athe</td>
<td>you were athe</td>
</tr>
<tr>
<td>he was</td>
<td>ath</td>
<td>they were athant</td>
</tr>
</tbody>
</table>

The plural forms án, e, athán, athe, when used with a pronoun immediately preceding, take the prefix kh; e. g.,
má khún we are
má khathún 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 thiyá, thiyá or sometimes thíghá, thíghá.

The use of the four participles may be shown as follows:

Past

\[
\begin{align*}
\text{dáragh}, & \quad \text{to hold.} \\
\text{dásththa}, & \quad \text{held.} \\
\text{dástto}, & \quad \text{having held.} \\
\text{dásththiya} & \quad \text{or} \\
\text{dásththíghá}, & \quad \text{holding, continuing to hold.}
\end{align*}
\]

Present

\[
\begin{align*}
\text{dárána}, & \quad \text{holding (with intervals), keeping on taking hold.}
\end{align*}
\]

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., bashkagá “to give,” P. P. bashkatha. When a verb corresponds with a Persian verb in ñdan, a short i is sometimes inserted; e.g., rasagh, to arrive P. P. rasitka (P. rasidan).

thursagó, to fear P. P. thursitka (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.

<table>
<thead>
<tr>
<th>Infinitive</th>
<th>Past Participle</th>
</tr>
</thead>
<tbody>
<tr>
<td>áragh</td>
<td>to bring</td>
</tr>
<tr>
<td>ásagh</td>
<td>to rise</td>
</tr>
<tr>
<td>ashkhanagh</td>
<td>to hear</td>
</tr>
<tr>
<td>ágh</td>
<td>to come</td>
</tr>
<tr>
<td>Infinitive</td>
<td>Past Participle</td>
</tr>
<tr>
<td>-----------</td>
<td>----------------</td>
</tr>
<tr>
<td>aksagāh</td>
<td>akastha</td>
</tr>
<tr>
<td>ilagāh</td>
<td>isṭhāra</td>
</tr>
<tr>
<td>oshtagāh</td>
<td>osṭāthā</td>
</tr>
<tr>
<td>oshtalainagāh (causal of oshtagāh)</td>
<td>oshtalainthā.</td>
</tr>
</tbody>
</table>

(The above take the prefixes b, bi, and kh.)

<p>| bāṣagāh   | bāsthā         |
| bāgh      | bāithā         |
| baragāh   | būrthā         |
| bresagāh  | bresthā        |
| buskagāh  | buṅkthā        |
| bozhagāh  | boṅkthā        |
| bandagāh  | basthā         |
| biagāh    | bīthā          |
| phadēagāh | phadāthā       |
| phrusagāh | phrusthā       |
| phashagāh | phakkā         |
| thusagāh  | thūsthā        |
| thosagāh  | thosthā        |
| thashagāh | thākthā        |
| thāṣagāh  | thākthā        |
| jāgāh     | jāithā         |
| janagāh   | jāthā          |
| chinagāh  | chithā         |
| dinagāh   | dīrthā         |
| dosagāh   | dūsthā         |
| dosagāh   | dōkthā         |
| dogh      | dōthā          |
| deagh     | dāthā          |
| ravagāh   | shūthā, shudhā, rapthā |
| rudagāh   | rusthā         |
| radagāh   | rasthā         |
| ranagāh   | ruṭhā, runthā  |
| resīnaqāh | resinthā       |
| rīṣagāh   | rikthā         |
| zāgāh     | zāthā          |
| zānąagāh  | zānthā         |
| zinagāh   | zithā, zithā   |
| ziragāh   | zurthā         |
| susagāh   | suṅkthā        |
| soshagāh  | soṅkthā        |
| sindagāh  | sīstha         |</p>
<table>
<thead>
<tr>
<th>Infinitive</th>
<th>VERB.</th>
<th>Past Participle</th>
</tr>
</thead>
<tbody>
<tr>
<td>sīgh</td>
<td>to swell</td>
<td>sita</td>
</tr>
<tr>
<td>shudāgh</td>
<td>to hunger</td>
<td>shustha</td>
</tr>
<tr>
<td>shodāgh</td>
<td>to wash</td>
<td>shustha</td>
</tr>
<tr>
<td>shastāgh</td>
<td>to send</td>
<td>shastātha</td>
</tr>
<tr>
<td>shamūshāgh</td>
<td>to forget</td>
<td>shamushtha</td>
</tr>
<tr>
<td>shawashkāgh</td>
<td>to sell</td>
<td>shawakātha</td>
</tr>
<tr>
<td>khashāgh</td>
<td>to pull, turn out</td>
<td>khashātha</td>
</tr>
<tr>
<td>khisāgh</td>
<td>to cultivate</td>
<td>khasha</td>
</tr>
<tr>
<td>khushāgh</td>
<td>to kill</td>
<td>khushta</td>
</tr>
<tr>
<td>khafāgh</td>
<td>to fall</td>
<td>khatpa</td>
</tr>
<tr>
<td>khanāgh</td>
<td>to do</td>
<td>khatha</td>
</tr>
<tr>
<td>kizāgh</td>
<td>to allow</td>
<td>kishta</td>
</tr>
<tr>
<td>gāgh</td>
<td>to copulate</td>
<td>gātha</td>
</tr>
<tr>
<td>grādāgh</td>
<td>to boil</td>
<td>grāstha</td>
</tr>
<tr>
<td>gardāgh</td>
<td>to return</td>
<td>gartha</td>
</tr>
<tr>
<td>girāgh</td>
<td>to take</td>
<td>giptha</td>
</tr>
<tr>
<td>giregāgh</td>
<td>to weep</td>
<td>girentha</td>
</tr>
<tr>
<td>guzāgh</td>
<td>to pass</td>
<td>gwaṣtha</td>
</tr>
<tr>
<td>gushāgh</td>
<td>to speak</td>
<td>gwaṣṭha</td>
</tr>
<tr>
<td>galāgh</td>
<td>to praise</td>
<td>galāītha</td>
</tr>
<tr>
<td>gindāgh</td>
<td>to see</td>
<td>dhītha</td>
</tr>
<tr>
<td>gwafaqgh</td>
<td>to summon</td>
<td>gwāṣṭha</td>
</tr>
<tr>
<td>gwaragh</td>
<td>to rain</td>
<td>gwartha</td>
</tr>
<tr>
<td>gwafagāgh</td>
<td>to weave</td>
<td>gwaptha</td>
</tr>
<tr>
<td>gezhagāgh</td>
<td>to bear abortion</td>
<td>gikštха</td>
</tr>
<tr>
<td>gieshagāgh</td>
<td>to pay, pick out</td>
<td>gieshtха</td>
</tr>
<tr>
<td>láināgh</td>
<td>to touch</td>
<td>laītha</td>
</tr>
<tr>
<td>laghushagāgh</td>
<td>to slip</td>
<td>laghushtha</td>
</tr>
<tr>
<td>lawāshagāgh</td>
<td>to drink</td>
<td>lawāṣṭha</td>
</tr>
<tr>
<td>madhagāgh</td>
<td>to freeze</td>
<td>mastha</td>
</tr>
<tr>
<td>miragāgh</td>
<td>to die</td>
<td>murtha</td>
</tr>
<tr>
<td>miraygh</td>
<td>to fight</td>
<td>miratha</td>
</tr>
<tr>
<td>mizhagāgh</td>
<td>} to urine</td>
<td>mishtha</td>
</tr>
<tr>
<td>mezagh</td>
<td>to suck</td>
<td>mishtha</td>
</tr>
<tr>
<td>mishagāgh</td>
<td>to rub</td>
<td>mishtha</td>
</tr>
<tr>
<td>mushagāgh</td>
<td>to listen</td>
<td>nigoshta</td>
</tr>
<tr>
<td>nigoshagāgh</td>
<td>to sit</td>
<td>nishta</td>
</tr>
<tr>
<td>nindagāgh</td>
<td>to post</td>
<td>nyāṣtha</td>
</tr>
<tr>
<td>nyūdhaqgh</td>
<td>to read</td>
<td>wānthta</td>
</tr>
<tr>
<td>wānagh</td>
<td>to sleep</td>
<td>waptha</td>
</tr>
</tbody>
</table>
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—nishtainagh (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 vṛddhi, 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 zar bi or "down," vàn màn "in;" dar "out;" and zon 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.,

phajyá together. Aragh to bring.

phajyá áragh, to recognize.

phajyá kharíth, he will recognize.

phajyá nayártha, he did not recognize.

Compound phrases of a noun and a verb are common. The verb, khánagh "to do," déagh "to give," jánagh "to strike," and gíragh "to take" are most commonly used in this way; e. g.,
sar gíragh, to set out
dem déagh, 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 déagh, to let go
bilán déán, I will let go
ishtho dátha, he let go
tharagh bég, to come back
tharín khán, I will come back
thartho ákhthaghathán, 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 *i* 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
   *khutha*-i,
   ravagh*want*-i, they were going
   *jatha*-ish, they struck
   *hechi* nest*alk*-i, there was none of it (lit. anything it was not).

(2) *wa*th *gindith*-i, he will see himself
   *man* kharán-i, I will bring it
   hark*has* phaj*á*-khá*rik*-i, 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.,

gir*agh*, to take; giro*kh*, taker, creditor.
khush*agh*, to kill; khush*okh*, murderer.

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**ADVERBS.**

A great part of the Balochi 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**.

<table>
<thead>
<tr>
<th>Now</th>
<th>Ní, ní</th>
</tr>
</thead>
<tbody>
<tr>
<td>Then</td>
<td><em>hadhen, án-vakhtá</em></td>
</tr>
<tr>
<td>When?</td>
<td><em>khadhen</em></td>
</tr>
<tr>
<td>To-day</td>
<td><em>maroshi, mar’shi</em></td>
</tr>
<tr>
<td>Yesterday</td>
<td><em>zi</em></td>
</tr>
<tr>
<td>The day before yesterday</td>
<td><em>phairí</em></td>
</tr>
<tr>
<td>Three days ago</td>
<td><em>ph</em>isphairí</td>
</tr>
<tr>
<td>Last night</td>
<td><em>doshi</em></td>
</tr>
<tr>
<td>Night before last</td>
<td><em>pharandoshi</em></td>
</tr>
<tr>
<td>To-morrow</td>
<td><em>bánglá, bánghavá</em></td>
</tr>
<tr>
<td>The day after to-morrow</td>
<td><em>thí bánglí, phithá-roshe</em></td>
</tr>
<tr>
<td>In the evening</td>
<td><em>begahá</em></td>
</tr>
</tbody>
</table>
to-morrow evening  
now-a-days  
formerly  
first, before.  
afterwards  
hitherto  
henceforward
yet, till now, hitherto  
always, perpetually  
now and then  
at one time and another} 
one  
at one  
again  
then, again  
another time  
at last  
early  
at daybreak
bánghá-begahá, nawáshí-begahá  
ninavákhá, maroshí-nawáshí  
olá  
pheshá  
phadhá  
shedh-pheshá  
shedh-phadhá, shedh-demá  
dáiná, dání, dánkoh, daníkará  
harro  
damdame, dame dame  
yabare  
yabará  
agh, aghdi, aghathán  
gudá  
thibare  
áhirá  
phagen  
rosh-tiká
(2).—Adverbs of Place.

a. Rest in a place.

here  
there  
before, in front of  
behind  
near  
far  
out  
outside  
above  
below  
donw  
on, ahead  
where?  
on this side  
beyond, on that side  
everywhere  
nowhere  
elsewhere  
anywhere  
in the middle  
edh, edhá, hamedh, hamdihá  
odh, odhá, hamodh, hamodihá  
demá  
phadhá, dimá, pha-dimá  
nazi, nazíkh  
dir  
dar  
darrá  
kharghá, burzá  
jahlá, sher, buná  
er  
sará  
bakhú?  
inbará, shiíbará  
úbará, shábará  
harbandá  
thihandá  
hizhgarneu  
hizhgar.  
nyámá
b. Direction to or from.

hither
thither
hence
thence
whither?
whence?
in this direction
in that direction
from this direction
from that direction
in every direction
in what direction?
onwards, upwards
downwards
from above downwards
inwards
outwards

phedh, phedhá, ingo, āngwar
phodh, phodhá, āngo, āngwar,
phawángo
shedh, shedhá, shamodhá, shingo
shodh, shodhá, shamodhá, šāngo
thángo?
ashkho?
in-phalawá
an-phalawá
'shán phalawá
'shán-phalawá
har-phalawá
thán-phalawá?
sará
erá, sherí -pahnádhá
sará-erá
andará
darrá

(3).—Adverbs of Quantity.

much, many
few, little, less
a little
very little
more
enough
a great deal, any amount

báź
kham
chiklo
khamro
geshtar
gwas, bas
khór

(4).—Adverbs of Manner, &c.

From most adjectives an adverb of quality or manner may be formed by the suffix iyí, the adjective being sometimes slightly modified; e. g.,

gandağh, bad
gandağhiyá, badly
jowain, good
jowáníyá, well

Other adverbs of manner are:

very
sákía, sakíghá
together
phajía
quickly
zithen
There are few prepositions, properly speaking, in Balochi, as most of the particles 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).

<table>
<thead>
<tr>
<th>Preposition</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>go</td>
<td>with, together with, in company with</td>
</tr>
<tr>
<td>gwar</td>
<td>with, near, in possession of</td>
</tr>
<tr>
<td>pha</td>
<td>on, for, among</td>
</tr>
<tr>
<td>man, màn</td>
<td>in, into</td>
</tr>
<tr>
<td>đan</td>
<td>into, to, up to</td>
</tr>
<tr>
<td>azh, ash, shi</td>
<td>from, than</td>
</tr>
<tr>
<td>avr</td>
<td>on, into</td>
</tr>
</tbody>
</table>

From the above, some prepositional phrases are formed, of which the first member precedes, and the last follows the governed noun.

<table>
<thead>
<tr>
<th>Phrase</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>go—gon</td>
<td>in company with</td>
</tr>
<tr>
<td>go—phajyá</td>
<td>together</td>
</tr>
<tr>
<td>azh—siwá</td>
<td>except</td>
</tr>
<tr>
<td>azh—darrá</td>
<td>without</td>
</tr>
<tr>
<td>pha—randá</td>
<td>on the track of</td>
</tr>
<tr>
<td>azh—phalawá</td>
<td>away, from</td>
</tr>
<tr>
<td>azh—phadhá</td>
<td>behind</td>
</tr>
</tbody>
</table>

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.
CONJUNCTIONS.

on
on, upon
towards
on account of
along with
in
out of
near
before, in front of
behind, after
before (in time)
over
under
beyond
on this side of
for, on account of
in the presence of
in, in the middle of
like

Example.

khoh buná
khohání sará
go warí sardará
drogh pha ímáná khátáen
dast jant avr barziyá
eshiyá phadhá
thaú sángá
bozhí láfá

also, too
dí
dí, ðí
guðá

and
and, then

and (copulative between nouns)
when
whenever

wherever
vaâkhtá-ki
án-vaâkhtá-ki, har-vaâkhtá-ki,
har-velá-ki
har-handá-ki, handá-ki

Examples.

under the hill
on the hills
with his own chief
falsehood is a blot upon honour
she puts her hand into the bag
after this
on your account
in the boat
whithersoever
if
that
but
or
either, or
neither, nor
not
„, (with imperatives)
else, otherwise
lest
because, in order that
although
until
as, like as
har-phalawá-ki
ki
ki
lekin (rare)
ki, hai
hai, hai
na, na
na
na
na
choa-ki, ehaeohon-ki

INTERJECTIONS.

yes
yes, certainly
no
see there
behold
yes, sir
my lord
welcome!
all's well
well done
bismi'lláh
salám alaik, alaik salám
phrr
O
hau!
bale!
na, inná
gind
marvehí
wázhá!
wázhá maní, sún!
biyá durr sh'àkhte, biyáthái
mahairá
wáh
in God's name
greetings between Musalmáns
fie!
halloa,
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. ... Sindhi M. ... Masculine.
Skr. ... Sanskrit. F. ... Feminine.
V. ... Verb. Cf. ... Compare.
H. ... Hindi.

Note.—The Arabic letters ق ه د د are not used in this vocabulary, having no distinct pronunciation. They are represented by ك س and ى when they occur in borrowed words.
Vocabulary.

(Words beginning with vowels.)

آب, Ab, P. (metaphorically) honour, dignity. Not used in the meaning water. (Ab er-kanagh) to disgrace.

اببا, Abbá, A. Br. father, papa. (Used by children.)

أبا, Ubbá, Si. north.

ابتر, Abtar, hyæna, (P. kaftár.)

آبريشم, Abresham, P. silk.

ابناخ, Abnákh, P. honourable, worthy.

أبهرار, Ubbár, Si. raising. (Poet. in the phrase 'uchal-ubhár' lowering and raising.)

آپتيا, Aptiýá. Only in the phrase 'yak áptiýá,' among themselves.

أپورس, Apúrs, (P. ávran, árus) the Juniper tree. (Juniperus excelsa.)

إبهان, Aphán, a leather bag for flour.

ابيرغ, Aphinagh, p.p. áphirta, (Si. áphirjâ) to swell.

اث, was. 3rd pers. singular of past indef. of the verb to be. The complete tense is athán, athei, ath, athán, athei, athant or athan.

آجل, Úchál. S. See Ubbár.

اجا, Achá, (Si. achho) clean.

أجام, Ajám, (P. anjám) settlement, arrangement.


أخرا, Akhirá, A. utterly, extremely.
Adab, A. good manners.
Adit, 
Aditwár,  Si. Panj, Sunday.
Adagh, v., to pitch a tent, encamp.
Adın,  a mirror.
Azná, a masonry watercourse.
Ad-deagh, v., to lean.
Adñá, Si. Br. brother (familiarly).
Udragh, (Si udirnu,) to fly.
Udólní, Si. a white ant.
Adé, S. Br. sister (familiarly).
Aram, P. rest.
Arth (P. árad) flour.
Urd, an army. (P. urdú.)
Árzán, adj. P. cheap.
Ársi, adj. Si. idle.
Armán, pity. P.
Árokh, bringer. Verbal noun from áragh.
Árikh, gums.
Ázáb-deagh, A. Bi. to offend.
Ázad, free. P.
Ízboxht, the ajwain seed.
Azmán,  the sky. (P. ásmán.)
Azhmán, 
Azmáníagh, to examine. P.
Azmútá, examination.
Azh, from. (P. az. Pázand ezh.)
Azház, flint and steel. (Cf. P. azkhash.)
Azmán. See Azmán.
izhark, (Br. shark.) Rhayza stricta.

ás, fire. (P. átish).

ás-rokh, a platform erected where funeral ceremonies have been performed.

ás-koh, flint (lit. firestone).

ásán, easy. P.

asp, horse. (The generic term.) P.

uspust, lucerne grass.

isphulk, the spleen. Br.

astá, was. Parts of the defective verb to be, to exist.

astath, is, are. (P. bastan. Sk. As.)

astar, star. (P. sitára.)

istáng, razor.

ástagh, slowly. (P. áhista.)

istur, coarse, thick.

ástín, sleeve. P.

istín, a light cloud, cirrhus.

asr (a. ُر), impression.

asur, dawn, morning twilight. Si.

ásur (a. ُر), mercy.

isrár, mystery, secret. A.

ásrokh, the third day of mourning. A platform erected to commemorate it.


ásk, a deer (f.) (P. álhá.)

ásk-mahisk, a kind of fly.

asul (a. ُل), original.

asulá, from the first. Ásulá gannoâkh, a born idiot.

ásin, iron. (Cf. P. áhan.)
ashá, a. eight o’clock in the evening.

ash, from. (P. az)

ash-koh, whence?

ash-modhá (for azh hamodhá), thence.

ashmedhá (for azh hamedhá), hence.

ashtáfí, s. quickness. (P. shitábí.)


ishtha, p.p. of ilagh. q. v.

ushtagh. See oshtagh.

ag, adv. conj. again, then.

ágh, p.p. ákhthá, imp. biyá, fut. khán, (P. ámadan, biyá), to come.

phadk 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.

kárá-ágh, be of use.

ághábí, warning. (P. ágháh.)

ághdá, again. Also ágh agh. q. v.

aghar, if. (P. agar.)

agarchí, although (rare).

aghl (a. ñáll), intellect.

aghmá, effort, endeavour.

áf, water. (P. áb, Z. áfs.)

áf-áro kh, 

áf, water-bearer.

áf-biagh, to melt, thaw.

áf dárí, irrigation.

áf-deagh, to irrigate.
áf-shaf, slope, watershed.
áf-laghar, rapid, waterfall.
áf-murgh, waterfowl.
áf-drik, a kind of grass. (Panj. manihár.)
áfsin, pregnant. (Cf. P. ábista.)
áfsik, s. soup. (Cf. P. áb-zah.)
áfsin box for holding collyrium.
ásim, opium. (A. afyún.)
iíkar, so much, thus much. (? P. I'n kadr.)
ákak, envy.
ákag, p.p. akapta, fut. kaksi, imp. biakas, to sleep.
ákara, generally.
ál akal (a. qulq), intellect, wits.
ákén, proverb, anecdote. Si.
ákhar, buttermilk. Si.
ákhr, akher, nest. Si.
ákaiyá, in that way, of that sort.
ákila (a. qulq), celebrated.
ág, rate of sale.
ilaj, cure. (A. دْلاج علاج)
alálhida, separate. (A. دْلاح دْلاحة)
álasi, idle. Si.
ulkah, the world, the universe.
amb, mango. P.
ambázi, embrace. (P. ham, bázú.)
ambur, forceps. P.
ambrüh, servant, companion. (? P. hamráh.)
ambal, mistress, lover; companion.
ámdan, income. (P. ámdau, to come.)
imar, he, this man, this. For īn mard.
ūmar, age. (Ar. عمر).
āmur, slowly.
āmsaro, equal in age or otherwise.
amul, mistress (see ambal).
amsoān, grief. (Cf. P. afsos).
amnām, namesake. (P. hamnām.)
amīr, chief.
an, dem. pro. that, he.
意大利 Genitive of ān.
āhiyā. } Genitive of ān.
āhiyār. Objective and dative of ān.
anbar, } beyond, on that side.
anbarā, } on this side.
ānjir, s. fig; khohī ānjir, wild fig. P. see ānjir.
ānjir, } adv. inside.
āndemā, adv. thither, that side.
āndemā, adv. hither, this side.
insāf, s. justice. (A. ānṣaf.)
āzioni, s. a tear. P.
ānaktr, } so much, as much as that. (? P. ānqadr.)
ānkar, } ānqadr.
ānqadrā, Tuesday. Si.
angame, innumerable. Si.
āngo, thither, in that direction.
īngo, hither, in this direction.
anmāchā, an ammunition pouch. See āmāchā.
ānmar, he, that man, that. (For ān mard.)
ānū, egg. Si.
ānhālī, hot weather. Si.
anīshaghā, s. (P. anūsha), forehead; fate, fortune.
āwār, spoil, plunder.
VOCABULARY.

1880.

áwár, mixed. P. Áwar biágh, to mix with, join.

áwáz, voice. P.

obási, yawn.

obhar, east. Si.

otak, s. a halt; otak khanagh, to halt, encamp.

othar, s. a dust-storm.

otíq, s. a tank.

otí, s.

ojágho, awake. Si.

ojrí, stomach. Si. Paj. See saghindán.

ávdári, s. irrigation.

avr, on, upon, into. (Pázand, awar, on, over.)

odhá, adv. there.

auzar, tool.

iwází, revenge, substitute. (A. عوضی.)

awarzá, pleasing, agreeable.


oshtainaggh. Causal of oshtágh, to post, set up.

ogál, chewing the cud. (Si. Ogár.)

olá, adv. formerly. (From A. ول.)

olak, beasts of burden. (? Turkish wulágh.)

olah, west. Si.

ói, adj. former.

ondo, overturned. Si. Ondo khanagh, to upset.

auhsán-khatá, a puzzle.

ohí, flame.

ohil, aher, late. Si.

áh, in, ah! alas!

ahár, the hot weather, the month 'Asárl (Si. Panj. Ahar).

ahsán, mankind. (A. ahsán.)

áhanjagh, a sash, kamarband. P.
VOCABULARY.

e or i, prep, this.

er'gá, 

erangá, 

edh, 

edhá, 

er, adv. down, below. sh'er, from below. (Cf. P. zer, below.)

er-ágh, to come down.

er-baragh, to swallow.

er-janagh, to east down, abase.

er-shafagh, to go down, set (of the sun). p.p. er-shuṣṭha.

er-rovagh, to go down.

er-shaf, s. going down. Rosh-er-shaf, sunset.

er-khafagh, v. to descend, alight.

er-khanagh, v. to lay down, place.

er-gwáth, the lee-side; er-gwáthá, to lee-ward.

er-nindagh, v. to sit down.

esh, this. (Cf. Zend. aesha.)

imán, honour.

ín, pron. this.

aiv, spot, bolt. (A. عيب.)

ewakhá, alone. (Panj. hekwá.)

b B.

bádsháh, king. P.

bár, s. burden, load. P.

bár-bandagh, to load.

bár-er-khanagh, to unload.

báragh, adj. fine, thin, lean. (P. bárík.)

báro, 

báre, 

bárh, 3rd pers. sing. fut. of báragh.
báz, many, much.
bázen wájhá, of many sorts.
bázen barún, often.
bázen rangá, many coloured.
bázár, bazaar.  P.
bázú, limb.  P.
bázigar, juggler.
básag, v. to low (of cattle).
bág, s. a garden.  P.
bágh, v. p.p. báitha, to be killed.
bángár, s. a lizard.
báqi, adj. remaining.  A.
bál, s. flight.
bál-giragh, to fly, take flight.
bál-deagh, to let fly.
báládh, figure, shape, form.
báládhíyá, adv. from below, upwards.
bálagh, of age.  A.
bándú, s. a hostage.
báng, a voice, sound; cock-erow.  P.
bángá, s. the morning.  Bángawá, in the morning.
bángó, to-morrow.  Thá-bángá, the day after to-morrow.
bángohiná, in the early morning.
bándan, a rough table.
báut, refugee.
bátí, shelter, refuge.
báhir, s. a herd of donkeys.
báhrav, s. male calves.
bápá, baphá, scurf.  Si. bapho.
bút, but, self, oneself.  (Si. butú, the body).
bítár, the two stars (forming the tail of Ursa major).
bíthir, better, very good.  (P. bihtar.)
báthlo, wooden mortar.
bátirá, quail.  Si.
bij, seed. Panj.
bachh, son. P.
bakh, fortune. P.
badh, fortunate, generous, (used in addressing superiors).
bukhta, p.p. of bushkag. q. v.
bakhamal, velvet. (P. makhmal.)
bad, bad (only in Persian compounds).
badkh, ill-natured.
baddu, curse.
badshakl, ugly,
badrag, an escort.
badi, enmity. P.
(Si. budanu.)
badh, s. enemy. Generally in the plural baddhán. badhal, s. a debt.
bar, a time, a season. P.
yabar, once.
thalbare, again. Bāzen-barān, often.
bar, s. fruit.
bar, s. a desert. A.
birāth, s. brother. Birá maní, my brother!
barakh, coarse grass found in the lower Sulaiman Hills.
baradhar, s. brother (poet). P.
baradhari, s. brotherhood.
bruza, high, upper, lofty.
burz, burzā, burzāthir, adj. very lofty, higher or highest. Comp. of burz.
baradhar, s. brotherhood.
brāzākh, s. a nephew, (brother's son). P. brādharzāda.
barzí, s. a bag.
baragha, v. p.p. burthā, to carry away, bear off, remove.

P. burdan.

Er-baragha, to swallow.
Dar-beragha, to defend, save.

burqa, s. a veil. A.
birinj, s. husked rice. P.

baro, 2nd pers. sing. and plural Imperative of ravagh,
baroeth, 2nd pers. sing. and plural Imperative of ravagh,
baroth, s. moustaches. (Cf. Pashto bret.)

buzí, s. a spring.
baz, adj. thick, coarse.
buz, s. a goat. P.

bashám, the rains, the month of Sáwan.
bushk, s. a horse's mane.

baghā, s. coward, runaway.

baghi, s. in the phrase baghi giragha, to embrace. Ar.

baghair, except, without. Ar.

bukchá, horse's mane.
bakkal, a Hindú, a trader. Ar. bakhái.
bakhú, where?

bag, a herd of camels. Panj. bag. Si. vagu.
bil, imperative of ilagh. Bil-dai! let go!
bal, spear.
billá, s. medal.
balru, infant.
balgo, dirt.
bálughat, puberty. Ar.
VOCABULARY.


**ban**, exposed surface of a stratum of rock, sandstone.

**bun**, root, bottom. P.

**buná**, below, at the bottom.

**band**, an embankment. P.

**bundar**, the buttocks. Si. bundaru.


Saren-bandagh, to help.

Drogh-bandagh, to lie.

**bandīkh**, thread.

**bunagh**, baggage.

**banú**, an embankment round a field. Si. bando.

**binni**, a donkey's pack-saddle.

**bunyád**, foundation. P.

**bo**, s. smell. P.

Gand-bo, stink.

Náz-bo, pleasant smell.

**bot**, vermin.

**bútagh**, v. p.p. bútatha, to close (the eyes).

**búthagh**, bracelet.


**bodh**, a small tree producing Gágal gum, _Balsamodendron mukul_.

**bor**, chestnut (of a horse); poetically a mare, horse Si. boru.

**búr**, a bud.

**borehī**, a cook. Turkish.

**boz**, the Gágal tree, also the drug obtained from it, _Balsamodendron mukul_. See bodh.

**búz**, wild, savage.

**bozhagh**, p.p. božtha, to open, untie. (Cf. pázand, božhesn, release.)
bozhí, a boat.  A.
bogh, a joint in wood.
bof, a pillow, matress.
bokagh, (1) to bleat as a goat; (2) to be proud, frisky.
bolak, a tribe.
búli, beestings.
bóli, speech.
bohári, sweeping.  Si. buhári.
bohtár, a host, entertainer.
bohári, in front.
bohal, a barren, salt mountain.
bohára, a vault, cellar.
bhá, s. price.  Si. bahá. bhá-giragh, to buy.
bhá, v. the River Indus.
bhádhur, brave, a hero.
bhagya, rich, well off.  Si. bhágyo.
bhán, a filly.
bhándá, a fold, enclosure, pen.  Si. bhándo.
bhára, sale.
bhit, a wall.  Si.
bháutí, a kiln.  Si.
bahar, a share.  P. Bahar-khanagh, to deal, divide.
baharkhá, the month of Chait.  P. bahár.
bhuragh, p.p. bhuritha, to be crushed, burst.  Si. bhuraña
bhisht, heaven.  P.
bhólu, monkey.  Si.
bhorenagh, v. to break, burst (transitive).  Causal of
bhuragh.
Chham bhorenagh, to wink.
Khond bhorenagh, to kneel.
bhédi, s. the ankle.  Si. bhédi.
be, pr. without.  P.
VOCABULARY.

be-imán, faithless.
be-adab, rude.
be-árám, uneasy.
be-insáf, unjust.
be-akul, senseless.
be-akúli, senselessness.
be-phádlk, a snake, (lit. without feet).
be-dihán, thoughtless.
be-sanáti, useless.
be-sek, weak.
be-shak, doubtless.
be-shumár, innumerable.
be-fahmá, unintelligible.
be-kárá, unoccupied.
be-gunáh, innocent.
be-miyár, shameless.
be-hayá, shameless.
be-was, helpless.

bai. Imperative.

bíth, Past Part.

bair, revenge. Bair-girágh, to take revenge.
bairí, revenge, enmity.
berání, harm, damage.
ber-khanágh, to surround, encompass.
ber-deágh, to turn back.
berí, a boat. Si.

begáh, s. evening. Begahá, in the evening. P.
bílan, s. the small intestines.
bíl, (1) a friend; (2) a hoe. Si.

benágh, s. honey. Benágh-mahisk, a bee. (Cf. P. angubín.)

Pashto gabíná.
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.

bewán, wilderness. P. bayábán.


biagh v. to be, become, p.p. bítha.

Biagh-ravagh, p.p. bítho-shuțka, to become, to suffice.

pátár, a hole dug for roasting meat over.

pára, hog-deer. Si.

párat, charge, entrusting, confidence. Si.

pára, quicksilver. Si.

pád, root. Si.

pásná, a night attack.

pák, clean. P.

pákrá, camel's riding-saddle. Si. pákhiro.

pálo, frost. P.

pálenagh, to strain, sift, winnow.

pánjáli, yoke (of oxen). Si. panj.

páiná, lower, eastern. P.

pat, s. silk. Si.

pat, s. confidence, trust.

pat, s. a bare plain. Si.

patáfá, in the heat of the sun.

pital, brass. Si.

patang, s. a moth.

patzúkh, oath. Si.

paçul, curtain or side walls of a Baloch hut.

pukht, s. the Bhán tree (*Popuius Euphratica*). See phukht.
Vocabulary.

paraq̣av, s. ) echo. Si. parláu.
parlá, s.
parátá, adj. stale.
pazádagh, s. a step-son, (husband’s son).
pasháng, s. a wild man, savage, idiot.
paradav, s.
pashí, s. a berry.
pakar, adj. necessary.
pálán, camel pack-saddle. Panj.
palútá, eurse.
palíthagh, s. (p. falíta). The slow-match of a matchlock.
pindagh, to beg. Si. pínañu.
pindokh, beggar. Noun of agency from pindagh.
pawwar, (also mues-hawwar), the Pleiades.
por, s. a flood.
puru, v. to bury. Si. páranu.
poriyáh, wages. Si. porhyo.
post, s. poppy. Post-ñódá, poppy-heads.
póshagh, to dress. P.
póshenhagh, to clothe. (Causal of póshagh.)
pógó̄x, the gullet.
poh, understanding. (Pashto poh.)
póh-khãnagh, v. to explain.
póh-bíagh, v. to understand.
Pha-wathán, among themselves.
phádh, s. foot, leg. Demi-phádh, forefoot.
Be-phádh, footless; a snake.
P. pái. Z. pádha. Skr. páda.
phádh-ág, to arise.
phádh-plusht, instep.
phádh-guzá, shoes.
phádh-muelh, ankle.
phádh-murdán, toe.
phádh-murdánagh, toes.
phádh-nali, shin.
phádh-kí, ring worn on a woman's toe.
phádhag, wheel.
phár, leisure.
phárat, charge. See párat. Si.
phártogh, a tree, (*Tecoma undulata*).
phári, last year. P. pár-sál.
phárez, temperate. P. parhíz, safe.
phásh, bare; phásh-phádh, barefoot.
pháshan, the male márkhor. P. pázan.
phágh, turban. Met. The succession to a chiefship. Si. pág.
phávzdah, fifteen. P.
pháho, hanging; a noose. Si.
phíphar, lungs, lights. Panj. Si. phíphíru.
phút, hair.
phítkí, alum. Si.
phít, prickly-heat.
phútur, original, genuine, thorough.
phítagh, to turn sour. Si. phítañu.
phútak, short, stunted; a dwarf.
phátrík, a bush, (*Grewia populifolia*).
phíth, father. P. pídar. Pahl. píd.
phíth-phírá, forefathers.
phíthi, other, another. (In Kachi.)
phúkht. See pukht, (*Populus euphratica*).
pháji, with, in company with.
phájá, phájía.
phájía-aragh, to recognize.
phado, pocket.
phádímá, adv. behind.
phadhé, afterwards.

phadhí, hinder, coming after.

phar, prep. for, on account of.

phar, a wing, feather.  P. par.

phur, full.  P. pur.

pahrá, watch, guard.

phuráf, a young female camel up to 3 years old.

pharámagh, to deceive, deceit.

pahráwan, long coat.  Si.

phráh, broad.  P. farákh.

phráhádh, breadth.

phráhi, why? on what account?

phurz, tinder.  Si. purdu.

phirishtagh, an angel.  P. firishta.

phrushagh, p.p. phrushtha, to break, burst (intr.).

Cf. P. fursúdan.

pharmán, command.  P. farmán.

phurá, a moth.

phurí, a musquito or sand-fly.

phroh, grey.

phurí, a drop.  Si.

phroh, a plaut, (Sagaretia Theesans?).


phur, ashes.

phizádagh, step-son, (husband's son).

phazhm, wool.  P. pashm.

phas, a sheep or goat.  Pashto psah.

phaso, answer.  Pahl. pasukho.

phisphairí, two days before yesterday.  P. pas + phairí q. v.

phusagh, a son.  P. pisar.

phusht, the back.  P. pusht.
phushtí, a chaddar or sheet for wearing.


phaskk, a woman’s garment, bodice.

phakká, (1) ripe, cooked; (2) a boil.  H. pakká.

phakkí, anything reduced to powder, and taken down at a gulp with water.

phagarágh, to melt, thaw.

phagen, early in the morning.  P. pagáh, dawn.

phul, a flower.  Si. Panj.

puhal, a bridge.  P. pul.

phulát, steel.  P. púlád.

phullah, to rob, plunder, p.p. phullítha.  Si. phurañú.

phulkand, sugar.

phalo, direction, way, side.  Si. palau, edge, border.

Pashto, dittó.

phalwá, in a direction.

phulúh, nose-ring.  Si. bálo.

phallí, section of a tribe.

pahlí, rib.  P. pahlú.

phullí, the cap of a gun.

phálíthagh, match of a matchlock.  P. palíta or palíta.

phalít, unclean.  P. palíd or palíz.

phimbli, eyclash.  Si. pimbíñí.

pahnád, side, direction.

pahnál, flank.

phaneh, five.  P. panj.

phanjak, one-fifth.  (The share of plunder due to a chief.)

phanjáh, fifty.  P. panjáh.

pahwál, shepherd.

phuní, calf of leg.  Panj.

phander, curds, cheese.  P. panír.

phanserpuch, rennet.
Vocabulary.

TOCABULARY.

phawád, a mountain, a peak.

phúphi, paternal aunt. Si. H.

phodh, there, thither.

phodhán, there, thither.

phodhán-demí, the common white bindweed.

phor, a pipe made of clay, or a leaf of phish, Chamaerops ritchieana, twisted spirally.

phost, poppy. P. post.

phogh, s. chaff. (Cf. P. púk).

phog, s. a bush, Calligonum polygonoides. Si. panj.

phogri, s. a goat given as wages to a goatherd.

phol, s. search, enquiry, demand. Si.

phol-phurs, s. questioning. Si. P.

phol-khanagh, v. to ask, demand.

pholagh, v. to search for. Si. pholánu.

pholokh, v. one who demands, a robber.

phonz, s. nose. (Cf. Pashto, pazah. Brahoi, bámas.)


phíd, s. heel.

phedh, here, hither.

phedhán, here, hither.

phedhág, visible. P. paidá.

phedhághen, is coming. See ágh.

phídagh, a plant. A small species of Euphorbia found in the southern Sulaiman hills.

phír, s. an old man; phírand, an old woman; adj. old.

P. pir.

phír, s. the jál tree, Salvadora oleoides. Si.

phairári, adv. the year before last. P. pírár-sál.

phíruk, s. grandfather.

phír, s. old age.

phairí, adv. the day before yesterday. P. párí-roz.

phísagh, a small plant. See phídagh.
phísh, the dwarf palm, *Chamaerops ritchieana*.

phesh, first, before. P. pesh.

pheshi, adj. former, first.

pheshá, formerly, first; pheshá, bundainagh, to forestall.

phígh, fat, grease. P. píh.

phísh, a bush, *Daphne mucronata*.

phílá, complete, full, perfect.

phímáz, onion. P. piyáz.

phegh, to thrust; to enter forcibly. Si. pehañu.

phehi, a scaffold (for watching crops). Si.

piyádhagh, a footman. P. piyáda.

píðhar, a short grass found on the Sulaiman hills, growing between the coarse tufts or gasht.

pech, a screw. P.

paidáish, produce. P.

paíghán, a message. P.

**T.**

tábídár, obedient. A. P.


táj, a cock’s comb.

tár, wire. H.

tári, clapping of hands. Si. tári.

tázím, reverence. A.

táš, cup. (Rare.)

ták-khafagh, to flinch, shy (of a horse).

tálábálahá, putting off, postponement. Si. tálo.

tálán, a push. Tálán deagh, to push.

táló, the palate. Si. tárán.

táh, odd (in numbers, as opposed to even).

táhañ, inside.

táhath, true, right, correct.
tabiyat, temper.  A.
tapál, post.  Si. tapál.
tráth, a plant (called maitr in the Deraját), Anabasis multiflora.
trán, counsel.
tirtha, mad.
trash, harsh, sour.  P. tursh.
tarkágh, p p. tarkalha, to cackle.
trund, cruel, fierce, passionate.
tarhán, a young camel.
tri-zákht, a cousin (paternal aunt’s son).
trér, dew.  Si.
trít, s. bread steeped in milk or soup.
tushna, s. frog.
taghár, a small watercourse on low hills.
tak.
tap-khafagh.  See ták and ták-khafagh.
tikká, swift, sharp.  Si.
tal, mole.
talab, pay.  A.
talagh, v. to fry.  Si. taranu.
tillí, palm of hand; sole of foot.  Panj. tarý.
tamákú, tobacco.
tambelá, stable.  A.
tumho, a plant, Crotalaria Burhia.
tund, maimed.  Si. tuđo.
tankh, narrow.  P. tang.
tankh, a pass through a defile.  P.
tang, girth of a horse.  P.
ting-deagh, to drink up.
tung, a hole.  See tong.
tangagh, to hang.  Si. tanganu.
tawár, voice, call, speech. Si.
tawán, a vessel for baking bread. P. tábá.
tawán, battle, fight (poet).
tubá, a spring. Panj.
top, a cap. Si. topu.
totá, parrot. P.
toikh, a valley between two parallel ridges, a path through ditto.
taukh, voice, speech; taukh-tawár, conversation.
tauzh, adj. bitter, brackish.
tauzh, s. a bush, *Salvadora Persica*. 
tosagh, v. See thosagh.
tof, cannon. P. T. top.
tufak, gun, matchlock. P. tufang.
tawakul, dependence, confidence. A.
tong, hole. See tong.
thákh, leaf.
thár, dark. P. tár.
tháf, heat. P. táb.
tháf, waterless. (P. tah, low and áb, water?).
tháfagh, oven. P. tábah.
tháthi, s. galloping; Galagh-tháthi, horse-racing.
thála, s. a company.
thán, which? thango, whither? thán-rangá, how?
thán, s. a pack-saddle.
tháwán, s. damage.
thap, wound.
thar, moist. P. tar.
thurs,  
\begin{align*}
& \text{fear. P. turs.} \\
& \text{thars,}
\end{align*}
thursolh, a coward. Verbal noun from thursagh.
thursainagh. Causal of thursagh, to frighten.
thuragh, to return; p.p. thartha; tharagh-agh, to come back.
thurangal, hail.
tharainagh. Causal of tharagh, to give back, send back.
thusi, a small bird.
thusagh, v. p.p. thustha, to faint; to go out (of a lamp).
thash, an adze. P. tash.
thaghárshoz, a plant.
thaghhard, matting made of the leaves of the phish, (Chama-
fever, heat. P. tap.
thafer, an axe. P. tabar.
thafaqh, to become hot.
thal, a valley, an alluvial plain surrounded by hills.
thul, a fort.
thâláng, face of an exposed rock-stratum.
thâlthâ, v. to stammer.
thâlîshkh, broken edge of an exposed rock-stratum.

tham, ambush. Si.

Tham-bîagh, to lie in wait.

tuhmat, slander. A.

thun, thirst.
thanaâkh, thin, fine.
thango, gold. P. tanka, tanga.

thuâí, thirsty.

thau, thou, 2nd pers. pronoun sing. nom. P. tú. Pash-
thâ, to, tah.

thora, quarter (in fighting). Si.

tholagh, jackal.
tholag-kunar, a bush, *Zizyphus oxyphylla*.

thom, garlic. Si. Panj. Ar. *قمر*

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.

thír, bullet, arrow; thír-janag, to shoot. P. *تیر*

thír-dán, a bullet-pouch.

thír-gh, horse’s nose-bag.

thír, sharp, swift.

Thegháf, “swift water,” name of a stream.

thíghí, all.

thíl, age (used of animals).

thelagh, eyeball.

thewaghen, all, the whole.

thíh, a slave (male).

tírband, the constellation Orion.

tez, sharp. P.

tezgh, a melon.

tezghí-khoh, a hone, whetstone.

telán, a push, shove. Si. thelho.

Telán deagh, to push.

**T.**

ṭubí, advice. Si.

ṭapur, felt, namda. Si.

ṭráma, copper. Si. ṭrámo.

ṭrapagh, to drop, drip.

ṭrimagh, to drip. Si. ṭrimanu.

ṭrimu-áf, dripping well, or small waterfall.
VOCABULARY.

trakāq, to burst (used of boils).

traq, a firelock.

tilū, a bell.

ťindini, firefly. Si.

tobi, dive. See tūbī.

Tobī deagh, to dive.

ṭopū, hat. Si. ṭopu.

ṭonūn, turban, met. a great man.

ṭong, a hole. Si. ṭungu.

ṭhálinagh, to make, construct. Si. ṭhāhanu.

ṭher, a mountain peak. Panj.

ṭhīthal, female ravine deer.

ṭhilagh, eyeball.

ṭitūnā, the bulbul.

ṭīthīhar, the sand-piper, Tringa goensis.

J.

Jābah, quiver.

Jār, net. Si. jāru.

Jār, twins. Si. jāro.

Jāsūs, spy. A.


Jāgrū, watch. Si jāgū.

Jāgrū dáragh, to keep watch.

Jām, chief. Si.

Jān, body. P. jān, life.

Jān-jebho, body armour.

Jān-shoḏhag, to bathe.

Jān-khanagh, to dress.

Jāngoh, arms and armour, when girt on the body.

Jānwar, domestic animals. P.

Jāhil, lower, east. See jahl.

Jāizo, promise, engagement. A. jāiz.
jat, camel-driver. Si.
jahir, millstone. Si. jandru.
jalha, p.p. of janogh.
jukht, scabbard of a sword.
jukht, adj. even (in numbers, as opposed to odd). Pashto jukht.
jar, clothes, dress.
jarida, a poor man, pauper.
juzagh, to go, move.

juzagh, to walk (of a horse).

juzakh. Verbal noun from juzagh, moving, the pulse.

jist, zinc. P.
jagdal, s. a Jat.
jagdali, s. the language of the Jats, viz., Panjabi or Sindhi.
jagar, liver. P. jigar.
juft, a pair.

julah, an attack. Si. julah.
julob, julgav, a crowd.
jumá, Friday. Ar. jum’ah.
jamará, everlastinglly. Si. jamár.
jumb, moving, shaking.
jumla, collection, total, amount. Ar.
jan, s. woman. P. zan.
jan-gal, a band of women.

jannat, heaven. Ar. jin.
jantal, jauthir, a mill, millstone. Si. jandru.
jandar, jind, self, oneself. Si.

wathí jindeghen, one’s own.
tári janagh, to clap hands.
chapol janagh, to slap.
dápurá janagh, to stamp.
digkár 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.

jinkh, } s. a daughter. Dim. of jan. Cf. Pashto jinaí, janikh, } jínakaí.

jang, s. war. P. jung-bilá, a medal.

jo, s. a stream, canal. Pehl. jói. P. júí.
syáh jo, a perennial stream.

jau, s. barley. P.

jawáb, s. answer. A.

jawár, s. a pair, yoke of oxen mate. Hind.

jawán, good.

jawáníyá, adv. well.

jodh, a man, warrior.

jor, adj. well, strong, in health. Si. joru.

jaur, poison.

jaur, the oleander, Nerium olerum.

jozho, a small fly.

joragh, } to make, construct. Si. joranu.

jorainagh, }

jogh, yoke. Si. jog.

jufá, avarice, usury, A. Si. jyáfa.
júřákkhor, a usurer.

jogín, a wooden mortar for cleaning corn.

jogindár, stick or pestal for ditto.

júl, a large bag.

jauhán, a heap of corn at harvest.  P.

jhátí, a peep.  Si.

jáhár, s. a flock of birds.  Si. jhári.

jáház, a ship.  P.

jihán, the world.

dehá jiháná, in the whole world.

jhapa₇₇₇₇, to toss up.  Si. jhanu.

jhátkag₇₇, to sob.  (Cf. Si. jhatko, a fit of passion.)

jhur, clouds.  Si. jhuru.

jhári, of more than one colour.

jhag, foam, seum, froth, bubbles.  Si.

jhul, carpet.  Si.

jül, deep.

jühl, low.

jahl, below.

jahl-burz, ups and downs, inequalities.

jhallí, a pankha.  Si.

jhan, small bird (snipe?)

jhandá, a flag.  Si.

jherá, a quarrel,  Si. jhero.

jebho, s. armour.

jait, camel-saddle.

jedí } (f.) a companion, associate.

jedí } jedirí

jídh, s. pasture.

jýgh, s. bowstring.  P. zih.  Pushto, jai.  Si. jihu.

Ch.

cháb, short grass.

cháp jana₇₇₇₇, to clap hands.
chápol janagh, to slap.
cháth, a well. P. cháh.
chári, a guide, spy. Si.
chári ascent, Si. charhí.
chák-deagh, to split, rip up. P.
cháút, threshold. Si. cháutí.
chabha, sandals.
chup khanagh, to be quiet. Si.
chap, left. P.
chap-dust, left hand. P.
chap-chot, crooked.
chaprí, an English rupee.
chapí, adj. left, sinister, unlucky.
chit, woman's petticoat.
chat, roof. H.
chatá khanagh, to grasp, catch hold of with the arms.
chitar, matting.
chatagh, p.p. chattha, to lick. Si. Chatanu. Lab chatagh, to flash in the pan.
chatí, s. a fine. Si.
chachho, how?
char, a path hemmed in by precipices on each side.
chur, a small hill torrent.
charp, adj. fat. P.
charpi, s. fat, grease.
charaz, the houbara, (otis houbara). P.
charagh, to wander, go about. Si. charanu.
chiring, s. a spark. Si. chinig.
charo, merely, only.
charokh, wanderer, vagabond.
chirra, shot.
charainagh, to watch cattle, to graze. Causal of charagh.
charí, madman.
charagh, to ascend, climb. Si. charhanu.
chushma, a spring. P. chashma.
chishagh, p.p. chishatha, to sneeze.
chishan, the bábul bush, (*Acacia Jacouemontii*).
chughal, a spy.
chaghal deagh, to throw away.
chiktar, how much? How many? (Probably for chi chikar, qadr).
chikagh, to pull, drag. Si. chhikanu.
chukagh, to kiss.
chukh, a child.
chukchorí, children.
chakha, on, upon.
chagá, testing. Chagá-hálwar, a laughing matter.
chil, forty. P. chihal.
chillagh, to peel, scrape. P. chalídan.
chillar, peel, bark, scales.
chilkagh, to shine, glitter. Si. chhikanu.
chalgadh, bat.
chulumb, s. earring. (Cf. Si. chumbulu.)
chalo, s. a ring. Si. chhalo.
chamb, a spring.
chambo, ball of foot, claw. Si.
chamra, bat. Si. chamiro.
chamagh, a spring, fountain. P. chashma. See chhamagh.
chaná, opinion. (Cf. P. chanidan.) Main chaná, in my opinion.
chinjú, crowbar.
chund, point of the compass.
chundrá, chundaró, chundara, to pick up, gather, collect. P. chídan.
vocabulary.

chang, banjo or guitar.  B.

chot, adj. crooked, bent.

Chot khanagh, to bend, tr.

Chot biagh, to bend, intr.

Chot chham, squinting.

choto, a horse-fly.

chawá, jest.

chawágar, jester.

chúch, little finger.  Si. chích.

chaupher, round.

choro, boy.  Panj.

chorí, orphan.  Si. chhoro.

chúrí, chicken.


chhatth, a well.  P. cháh.  Z. chirtha, pit.

chih, what?

chhil, forty.  P. chihal.

chhilav, cold weather (Jan. Feb.).

chham, the eye.  P. chashm.

chham bhorainagh, to wink.

chham plusht, eyelid.

chhatar, s. joke.

chí for hechí, anything.  P.

chí, s. a thing; chí-chíe, somewhat.

chyár, four; yake chyár, foursfold.  P. chahár.

chyár gist, 80; chyár kund, four-cornered.

chyár gist dah, 90.

chyár phádh, four-footed.

chyárdah, fourteen.

chyáramí, fourth.

chebar, news.

chít áragh, to be crushed.  Si. chitáranu.

chetagh, to repair, mend.  Si. chetanu.
chedlagh, a cairn erected to commemorate any notable event.
chiklo, a little.

Kh.

Kházg, dirt.
Kházg-barokh, sweeper.
Kházgo, dirty.
Khán, chief. See Hán.
Khánadán, family.
Khidmat or Khízmat, service.
Khár, a donkey (female).
Khargoshk, a hare.
Kharch, expenses.
Khámis, Thursday.
Khojá, eunuch.
Khush, happy. See wash.
Khushí, happiness.

D.
Dar, wood.
Dáрагh, v. p.p. dáshta, to have, hold, hold in.
Dáshtiyá quietly! P. dáshtan, dár.
Dásh, a grass-knife; sickle.
Dágh, brand, spots, blemishes. P.
Dághán, brand, spots, blemishes. P.
Dálá, thick.
Dán, corn. P. dána.
### Vocabulary

<table>
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<td>دانا</td>
<td>dáná,</td>
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<td>دانکه</td>
<td>dánkoh,</td>
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<td>دانی</td>
<td>dání,</td>
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<tr>
<td>دانکهندی</td>
<td>dáhanthí,</td>
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<td>دئین</td>
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<td>دهن</td>
<td>dán,</td>
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<td>دینه</td>
<td>dán, complaint. Si. dánh.</td>
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<td>دیما</td>
<td>dáima, for ever. A.</td>
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<tr>
<td>داوارگر</td>
<td>dáwágar, s. champion.</td>
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<tr>
<td>دهان</td>
<td>dathán, s. tooth. P. dandán.</td>
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<tr>
<td>دانکهندی-دوزه</td>
<td>dāhan-dor, toothache.</td>
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<tr>
<td>دیک</td>
<td>díkh, s. spindle. P. dúk.</td>
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<tr>
<td>دیغ</td>
<td>didhagh, p.p. dakhta, to brand.</td>
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<tr>
<td>درب</td>
<td>dar, prep. out, outside. (P. dar, door.)</td>
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<tr>
<td>دار-باغ</td>
<td>dar-baragh, to defend.</td>
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<tr>
<td>دار-خفاخ</td>
<td>dar-khafagh,</td>
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<td>دار-اغ</td>
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<td>دار-راغ</td>
<td>dar-ravagh,</td>
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<td>دار-شفاغ</td>
<td>dar-shafagh,</td>
</tr>
<tr>
<td>دار-خاناغ</td>
<td>dar-khanagh, to put out, expel.</td>
</tr>
<tr>
<td>دار-ساراغ</td>
<td>dar-saragh, to protect.</td>
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<tr>
<td>دار-چاغ</td>
<td>dargezhagh, to look out.</td>
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<tr>
<td>دارا</td>
<td>dará, adv. outside.</td>
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<td>دراک</td>
<td>drákh, s. vine. Si. drák.</td>
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<tr>
<td>دراز</td>
<td>drázh, adj. long. P. daráz.</td>
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<td>درازتیز</td>
<td>drázhádžh, s. length.</td>
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<tr>
<td>درازهی</td>
<td>drázhi,</td>
</tr>
<tr>
<td>درآه</td>
<td>duraá, well, in health.</td>
</tr>
<tr>
<td>درابی</td>
<td>durábi, health.</td>
</tr>
<tr>
<td>دراهیا</td>
<td>daráhiyá, a promise.</td>
</tr>
<tr>
<td>دیر</td>
<td>durr, good, excellent.</td>
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<tr>
<td>دیر</td>
<td>durr, an earring worn in the lobe of the ear (P. durr, pearl).</td>
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<tr>
<td>درج</td>
<td>dirjagh, see dinagh, to burst.</td>
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<tr>
<td>درد</td>
<td>dard, pain. P.</td>
</tr>
</tbody>
</table>
VOCAEULAET. 73

درست drust, all, the whole. (Pashto drast.)
درشخ drishagh, p.p. drishtha, to bite.
درشخ drishagh, p.p. drushtha, to grind.
دارشک darashk, tree. P. dirakht.
دریغ diragh. See dinagh, to tear. P. daridan.
درمان đarmán, s. medicine, spirits, gunpowder. P. đaru, đarmán.
درنزاغ dranzagh, to go swiftly (poet).
درگ drang, precipice.
درشپد drosham, front, foremost part, shape, countenance.
دریغ drogh, false. P.
دریغ-بانداغ drogh-bandagh, to lie.
دریغ-bandokh, liar.
دریغ رنده droghvand, lying, deceit.
دره droh, false. Si.
دره druh, all.
درهاتی druhání, pistol.
دری darrí, out, outwards.
دریس drís, a Baloch dance, at weddings, and also (called jhamar,) rejoicings, accompanied with shouting or groaning.
درین drín, rainbow.
دز duz, thief. P. duzd.
دزاغ duzagh, to steal. P.
دزاوک daz-wág, bridle. (For dast-wág.)
دزراهی duzwáhi, friendship.
دژی duzí, theft. P.
دژک dazhak, s. a snipe.
دژمی duzman, enemy. P. dushman.
Cf. Zend. duzh, in duzhda, evil, &c.
دژمینی duzhmaní, enmity. P.
دست dast, s. hand. P.

dast-âygh, 

dast-khafaqgh, 

dast-láinagh, to touch.
dast-lath, walking-stick.
dast-khâtt, signature.
VOCABULARY.

dastagh, handle. P. dasta.
dastur, custom. P.
dasht, a barren plain or tableland. P.
du'a, prayer. A.

nakh-du'a, blessing.
bad-du'a, curse.
dighar, land, ground, level country. P. dïhär.
dighar-wâzâh, landlord.
dighar-janagh, to dig the ground.
daf, s. mouth.
daf-janagh, to boast.
daf-dâragh, to be silent.
dafâ-dár! be silent!
dafâr, mouthful.
dawar, 
dafatar, bard. P.
davtar, 
dafsar, cover, lid.
dak, join, mending.
dakjanagh, to solder.
dukh, needle's eye.
dukh, trouble. Si.
dukhyâ, with difficulty.
dag, road. Si. dagu.
dag-janagh, to rob on the highway.
duggav, s. eagle.
dil, s. heart, zeal. P.
dil-janagh, to retch.
dil-shûthî, retching.
dil-gîr, sorrowful.
dalagh, s. boiled rice.
dalko-deagh, to threaten.
dil, dilo, an earthenpot, gha'â. Si. dilo.
dum, dumb, tail. P. dum.
mazâr-dumb, tiger's-tail (a plant).
dambiro, a Baloch banjo or guitar.

dambul, a cairn erected in irony to commemorate a shameful action. P.

dan, a tax levied by Baloch chiefs. See ðan.

danakārā, till then.

dinaghi, diragh, { p.p. dirtha, to tear. P. darīdan, din.
dirjagh, danz, dust. (Cf. Si. daj.)
danīkar, till now.
dunyā, the world, people. A.
do, two. P.

do-gist, forty. See chil.
dawār. See dafār.
dwázdah, twelve. P.
dwázdamī, twelfth.
dobar, the chest.
dobarān, twice.
davtar, bard, reciter of genealogies. P. daftar.
dor, pain. { dathān-dor, tooth-ache.
dorān, double. Si. dhuuro.
dorokh, ill, in trouble or pain.
dozakh, { hell. P. dozakh. Z. duzazha. Pashto dozakhī.
dozhī, dozha, Z.

dost, friend. P.
doshaghi, p.p. dokhta, to sew. P.
doshaghi, p.p. dushtha, to milk. P.
doshī, last night. P.
dogh, p.p. dotka, to fetch water.
doghūn, pregnant.
daulat, wealth. A.
dúmandíl, with two turbans, i. e., a man of distinction.

duíhon, smoke. Si.

dah, ten. P.

dihán, thought, consideration. Si. dhyánu.

dhak, hurt, injury. Si. dhaku.

dahagh, to get, touch.

dhul, drum. Panj. dhol.
dahmi, tenth.
dhing, powerful.
dhúr, dust. Si. dhúri.
dahús, bastard, a term of abuse.
dhúliyá, dust. Si.
dí, also. Dí—dí. Both—and.
deb, thumb.
díhlo, mist. (P. dúd, smoke.)
díkk, spindle. P. dúk.
dedh, an earthen pot. See dez.
didh, sight. P. didár, did.
didáhir, didár, didáhir, eyeball.
dír, far, apart, separate. P. dúr.
dír-zánagh, far-seeing, wise.
der, while, time. P. der.
dez, pot.
deghí, large pot. P.
dem, face. P. adíma. Z. daema.
demá, before, in front.
dím, back.
dímá, behind.
deh, country, land, tract, territory. Si. déhu. P. déh.

Z. данha. Skr. deśa.
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.

3 D.

dáto, dust.
dachí, a female camel. Si.
ddí, grandmother. Si.
dádepotre, descendants of the same ancestor. Si.
dán, desert.
dändigí, a winnowing-sieve.
dání, time, a certain time. Si.
dáh, alarm, war news. Si.
did, frog. Si. dédaru.
didar, }
dáddav, pony, nag. Si. draadro.
drink, jump, spring.
drák, to jump.
drákan, carpenter. Si. drakhanu.
dragagh, to canter. (Si. drak).
droh, falsehood, lie. Si.
drohra, false, dishonest.
dasagh, v., p.p. dasatha, to show, point out. Si. dasanu.
dukál, dearth, famine. Si. dukáru.
digh, pice, copper coin.
dan, by force, violently. Si. dán.
danphúr, a forcible contribution.
dandwar, a tooth-brush.
dang, sting. Si. dangu.
dang-janagh, to sting.
dodá, poppy-heads.
VOCABULARY.

dad, framework, bones. Panj.
hushkân dad, a dry skeleton.
dor, a pond. Si. dhoro.
dol, a bucket. Si. dolu.
daulâ, the forearm. Si. doro.
dolo, cooked.
dolo biâgh, to be crooked.
dom, bard, minstrel. Si.
domb, mirage (connected with a legend of a minstrel's death).
dong, bottle.
dungâ, deep. Panj.
doh, sin, offence. Si. dohu.
doi, spoon. Si.
dhâburâgh, p.p. dhâburtha, to stumb.
dhâl, shield. Si. Panj.
dhakan, cover. Si.
dhakanî, knee-pan. Si. dhakînî.
dhûnd, skeleton. Si.
dhûng, crane.
didar, muscles, biceps.
der, husband's younger brother. Si. deru.
dir, body, form, shape. Si. dilu.
dil, body, form, shape. Si. dilu.
delhû, fruit of the khaler (capparis aphylla). Si. delho.
dembhû, wasp. Si.
dio, lamp. Si. dio.
dîhav, leopard.

R.

ráchî, camel-driver.
ráza, painter.
raست, true.  P.

raستي, truth.  P.

راک, cheek-bone.

ران, thigh.  P.

راه, road.  P.

رهايي, fate, death.

رهاز, head of a band of robbers.  P.

رحک, cultivator.  Panj.

رب, God.  A.

رپنا, p. p. of ravagé, used in the sense of began, begun; its place in the meaning went, gone being supplied by shu^sta.  P.

رختها, p. p. of rishagh.  q. v.

رها, f. sheep (small-tailed).  Si. ri^h.

رداحگ, p. p. rastha, to tear up the ground.

رداحگ, to be beaten, to lose (in war or play).


رژان, p. p. razainagé, to make.

رس, juice, sap.  Si. rasu.

رسير, rastar, wild beasts, game.

سياهن rastar, wild swine.


رسنگ, Causal of rasagé.

رسنک, liece.

رسغ, pulse.  P. rag, vein.

رغلام, collection of clouds, threatening weather.

رناذر, paces.  P.

رک, s. lip.

رکجب, stirrup.  P. rikab.

رگ, vein, pulse.  See rag.

رگ, rug, precipice.

رلغ, ralagh, to mix, join.  Si. ralanu.
rumb, a run.

rumb ziragh, to run, hurry.

rumbagh, to run away, gallop, race (on foot).

rambo, chisel. Si. rambo.

rumál, towel. P.

ramagh, flock of goats. P. ramah.

run, married woman. Panj. rand.

rand, track, path. Si. randu.

sar-rand, comb.

randagh, to comb, part the hair.


ro, contracted from roth, 3rd per. aor. of ravagh, will go, goes, may go.

ro, contraction for rosh, day, sun.

har-ro, every day, always.

ro-táf, heat of sun, glare.

rohask, s. a fox (uncommon). P. rúbáh.

rohagh, a loud noise.

róbarú, in the presence of. P.

roth, entrails. P. rúda.

rodár, bowstring, fiddlestring.

rodh, high bank of a torrent or stream. P. rúd.

rodagh. See rudhagh.

rodhin, madder.

rochhairagh, to bring up, educate.

ror, calf.

ror-gal, herd of calves.

rozh-gir, eclipse of the sun (from rosh and giragh).

rosh, day, sun. P. roz.

rosh-ásán, sunrise.

rosh-er-shaf, sunset.

rosh-tiká, daybreak.

roshe-roshe, day by day.

roshe-veláé, from time to time.
roshāgh, a fast.  P. roza.

roghān, clarified butter, ghī.  P.


dar-ravāgh, to escape.

mān-ravāgh, to enter.

biāgh-ravāgh, to become.

rofro, a fox.  P. rūbāh.


romast, chewing the cud.

rūngrá, a narrow hill path.

rūh, soul.  A. rūh.

rahab, edge, edge of knife.

rahnāgh, edge or bank of river.

riband, fringe or horse’s forehead.

rit, custom.  Si. riti.

rekh, sand.  P. reg.

sar-rekh, cold in the head.

rer, rags.

ril, rags.

rez, a rope (made of cotton thread).

rezam, blight (of corn).

resagḥ, p.p. restha, to spin, twist.  Pashto reshal.

resināgh, to pursue, chase; p.p. resinthā.

rish, beard.  P.

resh, gall (on the back of a horse or beast of burden).

rishāgh, p.p. rikḥṭha, to pour, spill, scatter, sow (seed).

P. rikhṭan.

rishaināgh.  Causal of rishāgh.

rem, grass.

rem, matter, pus.  P. rīm.

riāgh, cacare.
z

ز zá, abuse, bad language.
زات zát, tribe, caste. A.
زات zát, coloured cloth.
نکلوزákht, nephew (son of paternal uncle).
تریزákht, nephew (son of paternal aunt).
wasarzákht, brother-in-law.
زاد zád, many-coloured, variegated.
زال zál, woman. P.
زامر zámur, s. name of a tree.
زامین zámin, surety. A.
زامین گیری zámíngírí, bail, security.
زان zán, thigh.
زانثو zántho, a., p.p. of zánagh, knowingly.
Skr. jná.
زادمر zánumur. See zámur.
زانفیه záifa, a woman. A.
زنخ zákhm, a wound. P.
زج zádhágh, wounded. (P. zada.)
زار zar, money. P.
زار zarágh, leech. (Si. jaru.)
زرتیه zurtí, jowrth, jowar. (Cf. Pehl. júrdák, corn.)
زرد zard, yellow. P.
زردو zardo, yolk of an egg.
زردی zardoi, bile.
زید zirde, heart (poet.) Skr. hridi. Zend. zaredhaya.
Pashto zrah.
زار zárúr, necessary. A.
زیز zirih, armour. P.
zirih, a well.

zaghar, adj. fresh, quick.

zaghran shir, fresh milk.

zik, a bag or "maskina" for holding ghil. (Si. jik. Pashto zik).

zamstán. See zawistán, winter. P.

zanaákh, jaws. (P. zanakh, chin.)

zanáwar, animal. P. jánwar.

zanjír, chain. P.

zindaghi, living. P. zinda.

zinaghi, v., p.p. zitha, zintha or zitha, to snatch, take away forcibly.

zang, s. turnip.

zang, rust.

zangál, rust.

zor, force, might, violence, wrong. P.

zivir, rough, not smooth. (Cf. Pashto zig.)

zorákh, powerful, violent.

zorwálá, oppressor, tyrant.

zawádh, scent, smell. P. zabád.

zawár, pebbles.

zawár, rider, horseman. (P. sawár).

zawál, s. injury.

zawán, tongue. P. zabán.

zawistán, winter. P. zamistán.

zah, kid.

zah-gal, flock of kids.

zahr, anger. P.

zahr-girayh, to be angry.

zahr, bitter.

zahrak, the gall-bladder. P. zabra.

zahm, sword.

zahm-band, swordbelt.
zahm-janokh, swordsman.
zahm-hand, scar of a sword wound.

زبیر zabír, lonely, a stranger.  A.
زی zí, yesterday.  P. dí-rúz.
زیان ziyání, harm, injury.  Pehl. ziyán.
زیارت ziyárat, shrine, place of pilgrimage.  A.
زیث zith, quick.  P. zúd.
زیTHEN zithen, quickly.
زاکا zaikhá, s. ferns, moss, &c.
زیراغ ح-اراغ ziragh-áragh, to fetch.
lashkar ziragh, to lead an army.
ساح ziragh, to draw breath.
rumb ziragh, to run, saughan ziragh, to swear.

زن zín, scorpion.
زن zen, saddle.  P. zín.
زن-كاناغ, to saddle.

ژ Zh.
زه nga zhangagh, v. to bray.
ژالوک zhalokh, adj. yellow.
ژالدین zhalá deagh, v. to let go.  (See ilagh.)
ژمارا zhamará, for ever.  See jamára.
ژنگه کھانagh zinga khanagh, to erect the tail (of a horse).
ژنگ zing, adj. erect, perpendicular. Also the name of a Baloch sub-tribe.

س S.
سابل sábín, soap.  Portuguese.  Ar.
ساث sáth, a káfila.  Si. sáthu.
ساد sád, honest.  (P. sádá, plain (?)).
ساده sádhe, rope (of múnj or dwarf-palm leaves).
سارت sárth, cold.  P. sard.
ساري sári, rice growing or in husk.  P. sháli.
sáz-kanagh, to play (a musical instrument).

sákhi, oath. Si.
sákh, oath. Si.
ság, potherb. Si.
ságí, that very one, the original. Si.
sál, a year. P.
sálagh, parched corn.
sálokh, bridegroom.
sámagh, to favour, nourish. Si. sámbanu.
sán, stallion, bull. Si. sánu.
sáng, betrothal. Si. sangu.
sángí, spear. Si. sángi.
sáb, shade. P. sáya.
sáb, breath, life. P.
sáb-zíagh, to breathe.
sáhdár, domestic animals.
sání, a pause, breathing space, fallow.
sání-deagh, to let land lie fallow.
sáín, sir, master. Si. Skr. swámi.
sánagh, v., p.p. sántha, to shave.

Imperative, sá, sará sa, shave the head.

subí, autumn.
síppí, shell. Si.
satth, a deputation to ask pardon.
sutí, a musquito.
sijjí, roast meat.
síkh, barren land.
sidhá, straight. Si. sidho.
súdh, knowledge, understanding. Si. sudhi. Pashto sud.
sadh, a hundred. P. sad.
sar, a man. Pashto, sárí.
sar, s. head, front. P.
VOCABULARY.

sar-giragh, to set out.
sar-deagh, to send away.
sar-dar, bareheaded. (Pashto, sadar.)

saran, s. chief.
sar-dar, sar-dar, sar-pooos sarposh, covering.
sar-rek, cold in the head.
sar-rek, sar-rek, cold in the head.
sar-rek, sar-rek, cold in the head.
sar-návagh, the morning star (poet.).
srá, adv. and prep. above, upon, ahead, in front.
sará-bai, go in front.
sará-era, adv. from above, downwards.
sará-eri, upper.
sarbari-pahnádhá, on the upper side.
surphadh, s. (Ar. سرفلت), understanding.
surpho, surpho, surphadh biah, to understand.
sarjah, pillow.
suridá, provisio, forage. Si. surását.
saragh, p.p. sarítha, to remember.
siragh, to leap, prance. Si. siranu.
siragh, to move. Si. suranu.
sarak, sarakh, a kneading-trough.
surgo, speech, song.
saral, a yearling colt. Si. sarlu.
surum, hoof. P. sum.
sarínk, saring, a track. Si. suringh.
saring-jañagh, to track.
sarái, a woman’s chadar.
sarín, loins.
sarén, saren-bandagh, to gird up the loins, help.
saren-bandí, assistance.
sarindá, s. a sort of fiddle with seven strings of sheep’s
sarindo, gut played with a horsehair bow. Si. surundo.
sarina, upper; western. P.
sarodh, music.
sarosh, elbow.
sarak, road. Hindī.
sazá, punishment. P.
sustí. See sustí.
sushagh, p.p. sukhtha, to burn. (Intransitive.)
sagkár, adj. white-faced (of a horse).
saghdatta, a small thorny plant.
saghar, head.
sagharkha, a wild species of sinapis.
saghan, dung of cattle.
saghindán, paunch, stomach.
sak, strong, stiff, hard. P. salkht.
sakatar, a kind of partridge.
sakal, beautiful.
sakmardí, manliness, strength.
sakaní, Wednesday.
sikhagh, to learn. Sī. Sikhānu.
sikhainagh, to teach. Causal of sikhagh.
saki, extreme, excess.
sakyā, very, extremely.
sakíghá,
sag, skill, ability. Sī. sagh.
silband, brick-maker. Panj.
salam, salutation.
salám-alaik, (Ar. سلام إلَيْكَ), salutation on meeting.
silhe, arms. A. salah.
silhe-gal, arms and accoutrements.
samá, understanding. Sī. samáu.
samb, a hole, boring.
sumb-janagh, to bore.
VOCABULARY.

sambaráí, preparation, readiness.

sambarag[h], to prepare, be ready. Si. sambhiranu.

sumbag[h], stitch in the side.

samundar, sea.

sand, barren (of offspring). Pashto shand. Si. shandhi.

sand, a joint. Si. sandhu.

sund, a basket of matting. Si. sundu.

sindán, anvil.


P. shikastan, shikan.

sanj, harness. Si. sanju.

sanj-khanagh, to saddle, harness.

sang, stone (uncommon). P.

sangband, related by marriage (used of two tribes).

sangati, companions, following. Si.

sangad, companions, escort.

saní, hemp. Si. siní.

sanghar, necklace. Si.

sawá, except, without. P.

sawád, sight, show.

sawárak, breakfast.

sawás, Baloch sandals, made of the leaves of the dwarf palm.

sawál, question. A.

sawáh, morning. A. sabáh.

sobh, victory. A.

súd, interest. P.

sor, salt, brackish, saltpetre. P. shor.

soren-áf, brackish water.

saudá, bargain. P.

súrah, hero, warrior. Si. Súrihu. Z. súra, strong.

savz, green. P. sabz.

sosha[g], v., p.p. sokhta, to burn. P. sokhtan, soz.

saughan, oath.
sangkan-zirah, to take an oath.

Sufr suf, apple. A.

Sawakk sawak, light (in weight).

Sol, the kanda or jhand tree. (Prosopis spicigera.)

Somar somar, Monday. Si.

Sonaro sonaro, goldsmith. Si.

Sohán sohán, file.

Sohná, beautiful. Panj.

Sohav sohav, guide, acquaintance.

Savav savav, account, reason. A. sabab.

Savava, on account of.

Sawethh, white. P. safid.

Saharál saharal, skilful.

Suhag, young unweaned camel up to six months old (f.)

Suhbat suhbat, society. A.

Sihari, an awl. Si, síráí.

Sahthh, jewels.

Suhr, red. P. surkh. Pashto sûr.

Silhr, magic. P.

Sihr-khánokh, magician.

Sahra, manifest, known, evident. A.

Suhv, morning. Ar. subh.

Suhv-astár, morning star.

Suhel, autumn. The month Assú or Asoj. A. (Sept. or Oct.)

Sí, thirty. P.

Sai, three. P. sih.

Sai-bará, thrice.

Sai-kona, triangle.

Sai-gíst, threescore.

Syád syád, relation.

Syál, relation, guest, enemy, equal. (Pashto síál, equal.)

Syáldári, relationship.

Syáh, black. P.
syáh-áf, perennial stream of water.
syáh-jó, snake.
syáh-már, snake.
syáh-gwar, “black breast.” The black partridge.

syáhi, ink.
sebak, wholesome.
síth, profit, advantage. P. súd.
ser, full, satisfied.
seráf, satisfied. P. seráb.
sír, marriage.
sír-khanagh, to marry.
sír-bíagh, to be married.
sír-wájih, marriageable.
serab, shaving.
sírmugh, collyrium for the eyes. P. surma.
sístán, custom.
šesí, the chakor, also the sísi or Ammo Perdix Bouhalmi.
síshin, needle. P. sozan.
saíak, one-third.
síkun, porcupine.
síkhun, porcupine-quill.
selhí, necklace of shells worn by mares, camels, oxen, &c. Si.
sím, boundary.
símádur, neighbour.
símsún. See sesí.
saimí, third.
sínd, hissing. (Si. sindh, whistling.)
síndá khanagh, to hiss.
senz, whistling.
senzár janagh, to whistle.
senzdah, thirteen. P.
seragh, breast. P. sina.
VOCABULARY.

سِرَال sewál, s. rubbish left by a flood.

سَيْح síh, spit. P. síkh.

tufak-síh, ramrod.

سِيِّها síhá, lead. Si.

سَهْنَغ sehnagh, v. to bear, endure. Si. sahnu.


ش Sh.

شَا shá. See shawá, you. P.

شَتَلْو sháthlo, dove.

شَاه shákh, branch. P.

شَانْدَي shádhí, rejoicing, merry-making. P. shádí.

شَار shár, (Ar. شُعر), poem.

شَاغ shágh, a small tree (Grewia Vestita).

شَاغَا shághá, guitar or banjo. See dambíro.

شَال shál, blanket. P.

شَام shám, the evening meal. P.

شَان shán, power, powerful, honourable. Ar.

شَأَنْ 'shán, for ashán, from that.

'شَأْنَ-جٰو, thence.

'شَأْن-فَحْلَوْلár, from that direction.

شَانْد shánd, sign.

شَانْزِدَاه shánzdah, sixteen. P.

شَانْغ shánagh, backbone, nape of neck. P. shána.

شَانْکَه shánkh, stony ground at foot of hills.

شَا sháh, horn.

شَة sháh, king. P.

شَاء sháh-murdán, forefinger.

شَاكْرَت sháhkaptar. See shaíkástir.

شَاهْد sháhid, witness. Ar.

شَاهْدِي sháhidí, evidence.

شَاهْي sháhi, a 2-anna piece. P.

شَايْر sháir, (Ar. شاير), poet.
shabchirágh, firefly. P.

shaddat, disputing, argument. Ar.

shaddo, a turban (poet). Si. shado.

shudhagh, v., p.p. shudhá, to hunger.

shudhagh, v., p.p. shudhá, to wash, intr.

shudhi, adj. hungry.

sharr, good, fine, beautiful.

shart, gambling. A.

shurdo, a small species of Dianthus found on the Sulaiman
Range.

shará, a law-case. A.

sharm, shame. P.

shurú, beginning. A.

sharik, partner. A.

shist, sight of a gun. P.


shash, six. P.

shashumí, sixth.

shár, poem. A.

shagbar, sharp, harsh (in speech).

shaghán, scorn, mockery.

shighín, upside down, topsy-turvy.

shighín-báagh, to be upset.

shaf night. P. shab.

shaf-chirágh, firefly.

shaf-kástír, a plant. Sophora Griffthii.

shaf-khor, nightblind.

shafánkh, shepherd, goatherd. P. shabán.

shafák, s. iron peg on which a mill stone revolves.

shakk, doubt. A.

shikár, hunting, sport. P.

shikári, hunter.

shukr, thanks. A.
shakbal, tamarisk sugar. (The manna produced in the hot weather on *Tamarix articulata* and *Tamarix gallica*).

P. shakar.

shakbal, adj. sweet, fair.

shalwar, the loose trousers worn by Balochis.

shalwar, gwáth-shalwar, puffed up, proud.

sham, boundary, water-parting.

shamb, branch.

shamushag, p.p. shamushta, to forget. Cf. P. fará-

shamúshag, moshidán.

shamol, water-parting.

shinz, the camel-thorn. (*Alhagi Maurorum.*)

Cf. Pashto, zoz.

shanikh, kid (f.)

shaw-kash. For shaf-kash, the night-expeller, *i. e.* Venus, the morning star.

shawá, you. P. shumá.

shá, P. shumá.

shawánkh. See shafánkh, shepherd.


ján-shodhag, to bathe.

shoragh, saltpetre. P. shora.

shawashkagh, v., p.p. shavakhta, to sell. (Cf. P. farokh-

tan).

shúkagh, to smell.

shúm, miser, avaricious. Ar.

shúház-khanagh, to like, prefer.

shahr, town, village. P.

shahúr, good manners. Ar.

shá. Contraction for ash-í, from this.

sh-í phalawá, from this direction.

shídí, a negro. Ar.

shedh, hence, from here. (For ash-edh.)
shezh-phaḥā, henceforward.
shedḥā, hence.
šīḵhan, s. cloth in which the flour from the mill is collected.
šīr, milk. P.
šīr-wār, suckling, unweaned.
šīr-deokkh, milk.
šīr-doshokkh, milker.
šīr-dān, bladder.
šīr, under, from under. (P. zer.)
šīr-phalavā, from the underside.
šīr-gwāṭh, leeward.
šīr-tharagh, to be crushed beneath.
šēzirk, a low furze-like shrub, (Caragana sp.)
šēf, slope. P. šīb, nishib.
āf-šēf, watershed, slope of a drainage basin.
šēfaḡh, pin or rod for applying collyrium to the eyes.

gharragh, to snore.
gharib, poor, inoffensive. A.
ghalat, mistake, false statement. A.
ghulām, a slave. A.
gham, grief, sorrow. A.
ghamnāk, sorrowful. A. P.
ghamī, mourning. A.

fál, an omen. Ar.
fáida, advantage, profit. P.
firishtagh, angel. See phirishtagh. P.
fark, difference. Ar.
fasl, harvest. Ar.
falási, carpet, Ar.
fulána, certain, such a one. Ar.

K

kábil, able. A.
kátar, dagger.
kár, work, business. P.
kárch, knife. P. kárad.
kárehe, káreha, knife. P. kárad.
kári, basket. See khári.
kárez, underground aqueduct.
kárigar, ox.
kází, the Qází. A.
kása, a measure of corn, one-sixth of a harwár. Contains about 6 sers, 9 chitáks Indian weight.
káshid, messenger. A.
kághadk, letter. P.
káfir, unbeliever. A.
kák, Baloch bread baked round a heated stone.
kálra, flea. Si. káriro.
kambání, sling.
kán, mine. P.
kánderí, thistle. Si. kánderí.
káwní, cormorant.
káosh, the month of Asoj.
káhi, ditch. See khálí.
kabr, tomb. A.
kabúl, acceptance, agreement. A.
kubba, a domed building.
kaptagh, v. to attack.
kapainagh, to expend.
kut, blunt.
kut, lap.
kutakhaneh, to adopt.
katár, string of camels. A.
kutb, the North Pole.
kutb-astár, the polestar.
katre, a little while. A. qadr.
kuttigh, thorn.
kuttanokh, thorny bushes. Two or three species of Caragana.
kath, spinning. Si.
kithán, which? what?
kutí, death.
kutraigh, to gnaw.
katagh, to dig, conquer, overcome.
kutagh, to thrash. Si. kutanu.
katakar, sand-grouse. Si. katangar.
kithán. See kithán.
kajagh, v., p.p. kajatha, to cover. Si. kajanu.
kajal, coarse flood grass.
kach-khanagh, to measure. Si. kachh.
kuchtoe, a plant.
kachehri, an assembly, darbar. H.
kudál, a mattock. Si. kođari.
kadah, a cup. P.
kudhám, s. nest.
kadhen, when?
kur, a stable, Si. kurhi.
karrá, ring, link of a chain. S. karó.
karpás, cotton. Skr. karpásā.
karkut, noise, rattling, clashing.
kurtá, long coat. Si. kurto.
kurtí, short coat. Si. kurtí.
karthagh, mongrel, of mixed breed.
kirishk, a slip, stumble.
kirishkah, to slip, stumble. Si. khiskanu.
karkávagh, a thorny plant.
karkaní, a kind of grass.
kirm, insect, worm. P.
karmsák, blackguard, a term of abuse.
karveli, the caper bush. (Capparis spinosa.) Si. kalavári.
See godhán-din.
karrí, an earring. Si.
kirí, a Baloch hut. Si. Pashto.
kireh, hire, wages. P. kiráya.
kir, ashes. Si. kiri.
kizagh, p.p. kishtha, to leave.
kas, any, any one. P. kas.
    kase, some one.
    har-kas, every one.
kus, vulva.
kisání, little, small. P. kih, kihár.
kisán, kisának, very small.
kissa, story. A.
kashk, kaurí.
kshik, dog (m.)
kashkol, faqír’s begging dish.
kil, a wart.
kull, all, the whole. A.
kullá-phajjá, altogether.
kal, knowledge, skill. Si.
kilát. (Ar. قلعة), a fort.
kalái, tin. P.
kaltrí, a saw.
kaldár, of European manufacture, as a gun, a rupee.
Kulishk, a kind of grass.
Kullagh, to cough. See khullagh.
Kulaf, lock. P. kufl.
Kulo, a small earthen pot. See khulo.
Kulla, cap.
Kulla, a warning.
Kam, little, few. P. (Also kham.)
Kambalbat, unlucky. P.
Kumb, tank, pool, rock hollow containing water.
Kambar, variegated, stained. See khambar-kambar khanagh, to write.
Kumbigh, s. mushroom. S. khumbi.
Kamina, mean, low. P.
Kunt, blunt.
Kuntagh, thorn.
Kunjari, prostitute. Si.
Kunj, key. Si.
Kunchitha, a plant.
Kunchith, sesamum. See kwenchigh. P. kunjid.
Kund, near. See khund.
Kandagh, a mountain pass. See khandagh.
Kand, necklace.
Kundi, a hook. Si.
Kindagh, p.p. kindatha, to spread out. Si. khandanu.
Kan, kunar, the ber-tree, jujube-tree. P.
Dig-kunar, Zizyphus jujuba.
Khokar-kunar, Z. nummularia.
Tholagh-kunar, Z. oxyphylla.
Kany, a virgin. Si. kanyā.
Kawāt, a young male camel up to 3 years. Si.
Kowan, bow. Share of spoil taken in a raid. P. kamán.
Kwantaog, to stoop.
Kotila, young camel from 6 months to 1 year old.
kúch, s. pommel of saddle.

kódí, metal cup for drinking.

kódál, mattock. See kúdál.

kor. See khor.

kaur, the phaláhi-tree (Acacia modesta).

koro, whip. H. korí.

korkí, trap, snare. Si.

koshka, Baloch shoes. P. kafsh. Pashto, kośha.

kov, the chakor. P. kabk.

kómir, an aromatic plant; (Grontea, sp.) Si.

kotá, a bush. (Grewia, sp. ?).

kotá, a pigeon. P. kabútar.

konnar, the fruit of the dwarf palm (Ohamcerops ritchie-cana).

koh, mountain; stone. P.

koh-gurágh, raven.

kohí, the female márkhor.

kwenchí, til (Sesamum indicum). P. kunjid.

kunchí, kahá, cause, reason.

khádi, chin. Si.

khári, a basket. Si.

khárikar, an ox.

khál, a species of salsola. Also the sajji or barilla manu factured from it.

kháhi, a ditch. Si.

khaptagí, to attack.

khatri, a washerman. Si.

khatí, bedstead, charpoy. Si.

khat-phađhagh, the four stars forming the body of Ursa Major.

khají, the date palm (Phomix dactylifera). Si.
khaḍ, hole, pit. Si.
khar, ass (f.). P. khar.
kahar, auger, curse. Ar.
khar, deaf. P. kar.
kharphaz, a mattock.
khard, separate.

khard-bīaḥ, to be separated.
khurdaḥ, to be scattered.
kharde, some. (Cf. A. P. qadre).
khuragh, a colt.
kharyā, above.
harag, the āk-bush, (*Calatropis procera*).
hargaz, the vulture. Pashto, gargas.
hargoshk, the hare. P. kharosh.
haro-bīaḥ, to stand up. Si. B.
khurī, heel, hoof. Si. khuri.
khur, stable.
khas. See kas. P.
khishālā, difficulty, trouble.
khisār, cultivation, crops.
khisār, slaughter.

phost-khashagh, to flay.
phor-khashagh, to smoke a pipe.
hon-khashagh, to bleed, tr.
līkh-khashagh, to draw a line.
gwāṭk-khashaghān, the wind is blowing.

khafah, v., p.p. khaptha, to fall, lie down. To begin (qualifying another verb in the gerund).
khanagh khafah, to begin to do.
er-khafagh, to descend, come down, alight.
dar-khafagh, to come out, issue.
daryá dar-khaptha, the river has risen in flood.
khakhar, wasp. (Sindhi. See gwamz).
khakhar-mánáro, wasp's nest.
khil, peg or axle on which a millstone revolves.
khullagh, to cough.
khalgar, stony ground; large stones.
khulo, an earthen pot or lôta.
khalf, a small water skin (kid's skin) carried on journeys.
(Si. khalirí, skin).
khalero, wild asparagus.
khali, a small water skin (kid's skin) carried on journeys.
(Si. khalirí, skin).
khaler, the Capparis aphylla.
khaleró, wild asparagus.
kham, little, less. P. kam.
khumb, pool in a stream. See kumb.
khambar, variegated, striped, spotted, piebald, stained, (of animals).
khanáva, a sword, (poet.). Si. khano.
khund, adv. near. S. A piece of ground enclosed by a bend in a torrent bed.
khandagh, s. a pass over a crest or ridge.
khanagh, v., p.p. kutha, to do. P. kardan, kun. To be able, can (qualifying a preceding verb in the past participle); e. g., kutha 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.
VOCABULARY.

gur-khanagh, to run away.
much-khanagh, to collect.

kahnagh, old clothes, rags.
khanokh. Verbal noun from khanagh, doer.

kahna and kuhna, old.  P.

kahne, s. pigeon.
kuhne, s. hip.
khopar, skull.  Si. kopirí.
khoprá. The *Withiana coagulans* used for curdling milk.
khokkar, a kind of wild turnips (*Brassica*, sp.)
khudagh, a tripod for cooking.

khaur, a large hill torrent.  (Cf. Pashto *khwar.*)
khor, blind.  P.
khorí, pursuit.

khosá, fever.  Panj.

*khofagh*, shoulder.

*khofagh* juzainagh, to shrug the shoulders.

*khofaghá*, the shoulder muscles.

*khaulú*, a fawn.

khontar, a bush, (*Carissa diffusa*).

khawinjar, a partridge.

khond, the knee.

khond bhorainagh, to kneel.

khai,  who?
khaiyen,  whose?

khair, ox.

kahúr, the kanda or jhand tree, *Prosois spicigera*.  See also Sol.

kher, the penis.  P. kír.

khaizán, perhaps, may be.

khísagh, pouch, pocket.  P. kísa.

khín, the anus.

khíná-phur-biokh, a breechloader.
khíndar, naked.
kígho, a ball. Si. kheno.
kítaq, a water-melon.
kígho, itch, mange. Si kháji.
kílar, unripe fruit of *Chamaerops Ritchieana*.
kíneg, envy, grudge. P. kína.
kíva, in exchange.

gádí, pad, cushion. Si.
gár, lost, destroyed.
gár-bíagy, to be lost.
gár-khanaq, to lose, make away with.
gár. See gál, speech. Si.
gará, quarrel.
gágh, v., p.p gátha, coire.
gál, speech. Si. gálu.
gálwar, conversation, matter of discourse.
gál, a visit.
gálí, bedding.
gám, a pace.

gáná juzagh, to walk (of a horse).
gap, quicksand, quagmire. Si.
gaplu, a piece, bit. Si. gapalu.
guttáni, retreating.
githá, cheek.
gat, chasm, precipice.
güthí, the kidney.
gatúr. See ghatúr.
gúth, the throat.
gúthí, bridle.
gatí, wooden handcuffs. Si.
gaj, a wooden arrow.
guch, the colocynth gourd, bitter apple. *Cucumis Colocynthis.*
gadikh, kernel.
gadobar, maize.
gudi, a toy-kite.
gad, female uriál. (See guránd). (Cf. Pashto, gad ʿam).
gudá, then, again, and.
gudagh, to chop, to kill animals, to butcher. Si. gudanu.
gadí, the middle finger.
gudh, cloth.
gar, a pimple, boil.
gur, s. kaurí.
gur, running.
gur-khanagh, to run away. Cf. Pehl. girikht, fled.
gárá, piebald, skewbald (of a horse).
grádhagh, v., p.p. grástha, to boil.
gírǐth, a span (with the thumb and 3rd finger).
guragh, crow.
koh-guragh, raven.
girán, heavy, dear. P.
guránd, a ram. The male uriál. (*Ovis cycloceros*).
girání, weight, dearth. P.
granz, nostril.
gurbará, in a whisper. Si. gurburi.
gurphugh, small-pox.
garphul, a whirling cloud of dust or "devil."
girjagh, to catch, seize, p.p. girjitha.
gardan, neck. P.
gardainagh. Causal of gardagh.
gradhagh, v., p.p. grastha, to cook.
bál-giragh, to fly.
bo-giragh, to smell.
hal-giragh, to hear news.
zahr-giragh, to be angry.
sar-giragh, to set out.

garragh, to roar or bellow.
gurkagh, to growl. Si. guranu.
gurkh, wolf. P. gurg.
gurkh, the Wolf, i. e., the last star in the tail of Urša major. See under Guránd.
garm, hot, warm. P.
granch, a knot.
garand, thunder.
guránd, (1) ram; (2) the male urial (Ovis cycloceros).

Guránd, the Ram, i. e., the first star of the three forming the tail of Urša 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.

girokh, s. lightning.
girokh. Verbal noun from giragh, a taker, creditor.
giroh, s. fife, pipe.
gari, speech, song.
gari, bald.
garí, piebald, skewbald (of a mare).
grih, voice, sound.
zor-grihá, in a loud voice.
gar, a precipice, sudden descent, chasm. Pashto, garang.
gaz, tamarisk. Especially *Tamarix gallica*.
gith-gaz, *Tamarix articulata*. P.
gaz, a yard.
gazar, makeshift.
guzrán, maintenance.
gazaren, ought, is necessary.
guzagh-ravagh, to pass by.
gazir, miser.
gisar, mistake, forgetting. Si. bisiranu.
gisar-biagh, to forget.
gasúr, s. anger.
gasht, coarse long grass on the hill side, not eaten by cattle.
gushagh, v., p.p. gushtha and gwastha, to speak, say, tell, sing, recite. (Skr. vach).
gushokh, singer, reciter.
gugh, owl. P. buh.
guf-tar, speech, song. P.
gufagh. See *gufgh* to weave.
gal, cheek. Si. galu.
gal, a number, quantity. Used in composition to form nouns of quantity as jan-gal, a band of women.
gil, clay, earth. P.
gul, a flower. P.
galagh, p.p. galáitha, to praise.
gulálakh, long curls worn by Balochis.
galphán, a groom, syce.
galatha, rotten. Hindi, galá.
gullar, dog’s pups. Si. guliru.
galagh, a band of mares, or of horsemen.
galâgh-tháší, horse-racing.

gulgul, water with which the mouth is rinsed after eating.
galo, door.
galo, a káfila, caravan. Si.
galí, a street. Si.
galím, a rug or blanket. P.
gunás, (rare) fault, sin. P. gunáh.
gunáh, (common) gunáh, crease, wrinkle. Si. gunyu. Pashto gunjah.
gunjí, a measure of corn.
gand, s. a branch water-course.
gand, s. filth, manure. P.
gand-bo, stink.
gund, testicles.
gundi, an entire horse.
gandákh, Indian rue (Peganum harmala).
gandraf, sulphur. Si.
gandgâh, bad.
gandgâh, v., p.p. gandatha, to join.
gindgâh, v., p.p. déth, imp. gind, to see. P. bin, didan.
gandal, s. felt, namda.
gandi, a short fodder grass in the lower Sulaimán and plains. Si.
gandım, wheat. (P. gandum.)
gand, Adam’s apple.
gannokk, fool, idiot.
asulá-gannokk, a born idiot.
go, prep. with. P. bá.
go, s. race, prize.
go-bër, a race-winner.
gwáth, air, wind. P. bád.
gwáth-má, climate.
er-gwáthlá, on the leeside.
gwáth-shalwar, puffed up.

| gwáthgh | a gelding. |
| gwátho | windy. |

gwáthen hálwar khanagh, to talk big.

gwárish, rain.  P. bárish.
gwáz, bark of a tree.
gwásh, ground at the foot of a hill.
gwáfaqh, v., p.p. gwáptha, to call together, summon.
(Cf. P. guftan.)
gwághá, immediately.
gwálahq, pack-saddle for oxen, bags.
ganda-gwálahq, (lit. spoil-bags), the small red ant. Also the name of a Baloch sub-tribe.

| gwámesh | buffalo.  P. gáv-mesh. |
| gwámisht | a small plant used in washing. |
| guwán | doubt, hesitation.  P. gumán. |
| gwánzagh | a swinging cradle. |
| gwánkh | voice, sound.  P. báng. |

| gwánkh-janaq | to call out. |
| gwán'-janaq |  |

| go-bar | a horse that has won a race. |
| got | bridegroom.  Panj. |
| goj | a large lizard, "go-sámp."  Si. |
| gwach | a buffalo-calf.  Si. vachhi.  Skr. vatsa. |
| gokh | an ox, cow.  P. gáv. |
| gaukh | nape of the neck. |

| gokhránd | dung-beetle. |
| gokho | a span with the thumb and forefinger.  Si. goňkú. |
| godur | a plant. |
| godí | mistress, lady. |
| godh | menstruation. |

| gwadhán or godhán | udder. |
Vocabulary.

gwadhan-din, the caper-plant. *Capparis spinosa.*
(lit. udder-tearer).

godhar, wasp’s nest.
gwar, adv. near.  P. bar.
gwará, nearly.
gor, wild ass.  P.
gor-dil, *Daphne mucronata* (so called from its red berries).
gor, tomb.
govistan, tomb.
gwar, woman’s breast.  P. bar.
gwar-sar, nipple.
gwarán dir khanugh, to wean.
gwar-ambázi, embracing.
goránd, a ram, male urial.
gwarband, path leading round the foot of a hill.
gwarpahar, flock of lambs.
P. báridan.
gwarakh, a lamb.
gorkhá, a kind of coarse grass called in Sind and the S. Panjáb sin or sain, good for fodder.
goram, a herd of cattle.  (P. gáv, rama.)  (Si. goramu.)
gur, gur or coarse molasses.
gwazagh.  See *guzagh* to pass.  P. guzashtan.
gožhd, flesh, meat.  P. gosht.
gwas, enough.  P. bas.
goskarí, crystal, felspar; fossils in rock.
gosh, car.  P.
gosh-deagh, to listen, attend.
goshá, s. the pan of a matchlock.
gwashagh.  See *gushagh,* to say.
goghrá, s. a snore.  Goghrá janagh, to snore.
VOCABULARY.

gwa\-fg, v., p.p. gwaptha, to weave. (P. báftan.)
gokurd, sulphur. P.
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.

gwamz, a wasp.
gon, with, together with.
gon-deagh, to overtake.
gon-khafa, to meet.
gwan or gon, the wild pistachio. *Pistacia khinjuk.*
gwand, short.
gwandádh, shortness.
gwando, an alligator.
gondosh, s. a large needle.
gung, dumb. Si.
gúgrú, turnip. See zang. Si.
go, a large lizard. Si.
gohár, sister. P. khwáhar.
gwahar, cold.
goil, s. breakfast-time.
ghat, inaccessible place, precipice.
ghattag, v. to smother.
ghatúr, a lamb or young sheep suitable for eating. (Cf. Si. ghaţo, ram).
guhan, adj. See göm gwahar.
ghuriáí, s. a stranger.
gharí, hour. Si.
ghal, a band, a raiding party, a raid. Si. ghali.
ghah, a pledge. Si. gahno.
ghoro. A band of horsemen. (Si. ghoro, horse.)
gíauchi, a small bird found in sandy parts of the country, called Malála in the Deraját.
getra, a kind of melon.

geth, the willow, Salia acmophylla. P. bed.

gethishk, the Sinetta or Bog-myrtle. Dodonae viscosa.

geth-gaz, a kind of Tamarisk. T. articulata.

gidh-mahisk, house-fly.

gir, Imp. of giragh, take.

gir, s. memory.

gir, áragh, to remember.

girár déagh, to remind.

girá, dove. Si. gero. (See shállo)

geshagh, v., p.p. gikhla, to bring forth dead offspring.

gist, twenty, saí-gist, 60, chyár-gist, 80. P. bist.

gistamí, twentieth.

gish, s. a female kid.

gishtar, a shrub, Periploca aphylla.

geshtar, many, more. P. beshtar.

geshin, a sieve.

gikár, belch.

gelar, a squirrel. Hindi galerí.

gín, life, breath.

do-gín, pregnant.

géhá, great, good.

gíeshagh, v., p.p. gíeshtha, to pick out, to pay.
láf-dor, bellyache.  
láf-ser, bellyful.  
lákagh, to bark.  
lál, ruby.  P.  
lánav, lana, (Salsola sueca).  Si. láno.  
lándav, adj. fat.  
lánsk, a waistcloth, dhoti.  Si. láng.  
láwará, young of animals.  
láinagh, v., p.p. láitha, to touch, apply.  Si. láinu.  
láb lab, the priming of a gun.  Si. labu.  
lab-chatagh, to flash in the pan.  
labz, promise.  
labh, obtaining, getting.  Si.  
látaragh, to rub off, dismiss, get rid of.  Si. látáranu.  
lath, stick, rod, flail.  Si. lañhi.  
lath, embankment.  Panj.  
látñá, bag for drugs.  
laj, shame.  Si.  
luch, wretch, profligate.  Si. luchu.  
lad, horse-dung.  Si.  
ladagh, v. to run away.  
ludagh, to move.  See lodağh.  Si. lañanu.  
ladagh, p.p. lañatha, to lade beasts of burden, to March,  
start.  Si. lañanu.  
ladh, jungle.  
ladgh, kick.  P. laghät.  
ladagh janagh, to kick.  
lar, a branch of a tree.  
lar, a sword.  
larzagh, to tremble.  P.  
p.p. larzitha.  
larkagh, to hang (intr.).  Si. lañkanu.  
larkainagh, to hang (tr.).  
las, all, the whole.
lashkar, army. P.
lagham, horse’s bit. P. lagám.
ladhāk, kick. See لذخ لadhagh.
laghar, ál-laghar, a rapid or water-fall.
laghor, adj. wretched, mean, cowardly, poor.

laghoren dighár, poor ground.
laghoren daqdaq, a wretched pony.
lak, a hundred thousand. P.
likagh, to hide (intr.). Si. likanu.
lakauri, butterfly.
likhagh, to write. Si. likhanu.
likainagh, to hide, conceal. (Causal of likagh.)
llalla, s. lisping.
lalla khanagh, to lisp.

lammá, south. Panj.
lamb, a branch.
lambí, s. a kind of grass, (Cenchrus ciliaris?)
lanj, blood.
lang, adj. lame. P.
lang, s. a torrent.
lawáshagh, v., p.p. lawáshtha, to drink.

hon-lawásh, bloodthirsty.
mar-lawásh, cannibal.

lop, s. branch of a valley; a small alluvial plain in the bend of a stream.
loth, s. a bag.
lothāgh, v., p.p. lottha, to demand, to want.
lodaghy, v., p.p. lodatkhā, to move, shake, (intr.). Si. lodanu.
lodainagh, to shake (tr.). Causal of lodaghy.
lūr, s. hot wind.
lawar, s. a stick.
lúraháf, s. a stream which runs occasionally. Flood irrigation as distinguished from perennial stream irrigation.

logh, s. home, household; (met.) family, wife.
logh-wázhá, goodman, master.
logh-bánukh, housewife, mistress.

laundrí, s. the temples. Si. laundírí.
loch, s. hot wind. Si. lúh.
lohígh, s. a small pond.
lahar, s. a hill-torrent.
lahm, adj. timid, bashful.
lihef, s. a blanket, quilt. P. liháf.
letagh, v., p.p. lettha, to lie, recline. Si. letanu.
leço, s. a male camel (full-grown).
likh, s. a line. Si. lik.
likh khashagísh, to draw a line.
lekgah, v., p.p. lekhtá, to count, reckon. Si. lekhanu.
lekho, s. account, reckoning. Si.
lihlá, a bush, *Daphne mucronata*. (See phífial, gordil).
limú, s. lemon. A.
lebo, lev, s. play, sport. A. la'b. Pashto lobah.
lev khanagh, to play.

má, pro. we, plural of mau.
mátún, s. stepmother.
máth, s. mother. P. mádar. Pohl. mád.
máth-phíth, parents.
mákhta, adv. immediately.
mách, adj. female. P. máda.
mádhín, s. mare. P. mádián.
már, s. snake. P.
már-val, a kind of creeper.

márifatá, prep. by means of. A.
márí, a house with an upper storey. Si. márí.
mážáth, s. a two-year-old camel. (Cf. Si. májádu.)
másí, s. maternal aunt. Si.
másh, s. dál. P.
máshagh, s. the hammer which holds the match of a matchlock. Si. másho.
mákúrá, s. vermin. (Cf. Si. mákoro, black ant.)
mál, s. cattle. A.
máldár, cattle-owner. P.
málím, known, clear. A. málím.
mámá, maternal uncle. Si. mámo.
mán, prep. in, into.
mán-ágh, to be applied, touch, reach (lagná).
mán-deagh, to apply (lágáná).
mán-rashagh, to attack.
mán-ravagh, to enter.
mán-khanagh, to put in.
mán-guzáragh, to meet together.
máh, s. a month; the moon. P.
máh-ghumá, eclipse of the moon.
máhi, an udder.
mákán, s. the moon.
mahkání shaf, a moonlight night.
máhlo, early in the morning.
máhi, fish. P.
matbal, meaning, selfishness. (Ar. matlab.)
matbalí, selfish.
math, death.
mathagh, v. to shake (a churn). Si. mathanu.
mat, equal. Si. maṭu.

maṭānağh, v. to exchange, barter. Si. maṭānu.

majál, power. Used as an expression of apology or repentance. A.

majális, society. (A. majlis.)

much, assembled. (Si. muchu, a heap.)

much-khanagh, to assemble, bring together.

much-biąagh, to assemble, come together.

muchh, joint.

phādh-muchh, ankle.

dast-muchh, wrist.

muchí, assembly.

makhta. See mákhta, immediately.

mudd, season, time. (A. muddat.)

madrik, bead.

madí, goods and chattels. Si.

madkhakh, locust. P. malakhk.


mar, man. P. mard.

mar-khushokk, murderer.

mar-khushi, murder.

mar-lawāsh, ) cannibal, man-eating.

mar-wár, )

murād, aim, object. A.

marái, gums.

murján, pepper.

mard, man. P.

murdán, s. finger.

sháh-murdán, forefinger.

nyámaghí murdán, middle-finger.

murdánagh, the fingers.

phādh-murdánagh, the toes.

mardum, a man, human being. P.
marden, human, belonging to man.
mardenā, marzī, pleasure. A.
murgh, bird. P.
markā, s. a deputation.
markhāv, a horse. P. markab.
margāvī, curse.
murvādhir or murwhādhir, pearl. P. marvarīd.
morāgh, to twist. Si. marōanu.
marvehī, see! behold! (an expression of astonishment).
maroshī, to-day. P. imroz.
mirānd, mirāo, fight, battle.
marāi, however.
miragh, v., p. p. miratha, to fight. (Cf. Si. mīdana, to meet.)
mīrokī, s. a fighter.
mazāgiragh, to taste. P.
māzār, tiger, &c. Pashto mzarai.
mazār-trap, tiger’s leap! The name of a game resembling draughts played on a board.
mazān, mizil, stage, march. P. manzil.
muzh, mist after rain.
mīzagh, v., p.p. mishtha, to piss.
Cf. Pashto mītal. Imp. mizhah.
mazhg, brain. P. maghz.
mizhguzh, a small plant found in the Sulaimān range.
mizhagān. See mishāsh.
mas, ink. Si.
mastar, large, greater. (Comp. of mazain.)
mastagh, curds. (From masta, p.p. of madhagh.)
musti, coarse sugar or molasses, gur. Si.
masará, in front.
misk, s. musk. P. mushk.
misk. See mahisk, fly.
masít, mosque. A. masjid.
musti, coarse sugar or molasses, gur. Si.
mashádhá, s. show.
mishásh, eyelashes.
mashál, torch. A.
musht, s. fist. P.
musht, s. hilt of a sword.
mashar, celebrated. (A. mashhúr.)
mishagh, v., p.p. mishta, to suck. (Cf. Ar. mizz.)
mushagh, v., p.p. mushta, to rub. (Cf. A. muzz.)
mashk, water-bag, mussuck. P.
mushk. See múshk.
mikráz, scissors.
makherná, fringe over horse’s eyes. See réiband. B.
malámat, rebuke, punishment, curse. A.
maláikh, angel. A.
malandrí, warrior. (Poet.)
mam, the black bear.
mán, I. P.
máná, forbidden. Ar. mana.
minná, ease, security. (Poet.)
minniyá, ease, security. (Poet.)
manán, to me, me.
minnat, entreaties, supplication. A.
mind, daughter (among the Marris).
mund, spring of water.
mundí, ring. Si. mundí.
mundo, altogether, entirely.
mandil, turban, lungí.
du-mandil, a respectable man.

munsif, just. A.

managh, v., p.p. manitha, to attend, mind. Si. mananu.

maní, my. See also main.

mavarkí, congratulations.

mavári, moth, star on the forehead of a horse.

mavá, moth, moth. (Dál). (Phaseolus Aconitifolius) Si.

mochí, a leather worker. Si.

mokho, spider.

mokho-logh, spider's web.

mor, ant. P.

morband, spotted.

mozhágh, a boot, legging. P. moza.

mosim, season. A. mausim.


Pashto mazhak.

moshí, butter.

moká, leave, permission to depart. A.

mokalínahgh, to take leave. Old Hindí mukkalná.

molíd, a female slave.

momrez, spur.

momand, merciful.

mah, I. See man.

mihrván, friendly, kind. P. mihrbán.

muhari, foremost, in front. Si. muháro.

mahar, corpse.

mahisk, fly. (Cf. P. magas).

benagh-mahisk, bee.

bíng-mahisk, horse-fly (lit. dog-fly).

gídh-mahisk, house-fly.

ásk-mahisk; blow-fly (lit. deer-fly).

mahl, patience, leisure. A.

mahlá-dár, be patient.
VOCABULARY.

muhlat, time, while, opportunity. A.
mihmán, guest. P.
mihmání, entertainment. P.
mahairá, in welfare, all's well. Answer to the salutation biyá durr’shákhtágei.
míyá, mayár, shame.
mích, mech, hint, making signs. Si. mechh.
dast-mechdeag, to beckon.
mékhmár, mallet. Si.
mézh, goat's hair or beard.
médh, a boatman.
méri, mero, s. assembly.
mézhg. See mizhag.
mésmé, mesk, a small plant, also a kind of soap made from it, used in cleaning jewellery.
mésh, mesh, sheep. Especially dumbas.
máighi, pregnant.
mikagh, to mew.
még, megar, flock of sheep.
mél, mel, meeting. Si.
mézhdagh, mentagh, wet.
mén, mainar, a kind of grass.
mínž, mízhav, a tree. The wild horseradish tree, Moringa Con-
canensis.
miívar, a bush, (Grewia villosa?).
mevo, a chief, leader.
meva, fruit. P.
meh, peg. P. mekh.
mehar, flock of sheep.
méhí, buffalo. Si.
mán, main, my. See maní.
نا, not, (un —, in composition).

نا-باليغ, minor.

نا-پاءد, uncommon.

نا-دری, ill.

نا-ساهی, unknown.

نا-کامار, helpless, under compulsion.

نا-لایک, unworthy.

نا-واش, unhappy.

نا-رگایین, a little.

نا-خنگ, nail. P.

نا-خو, uncle (paternal).

نا-خراتخت, cousin. (Paternal uncle's son.)


نا-ز, s. a horn (to blow).

نا-ز, pleasant, pretty. P.

نا-زبی, sweet scent. P.

نا-زک, delicate, tender. P.

نا-ش, snuff. Si. ناس.

نا-فاغ, the navel. P. ناف.

نا-ل, horse shoe. A.

نام, name. P.

ام-نام, namesake.

نانا, maternal grandfather. Si.

نانی, maternal grandmother. Si.

ناباریش, anything eaten as a relish with bread.

نابی, prophet, A.

نAPT, s. lightning. (Met.) a gun. (P. نافت, naphtha.)

نپراغ, v., p.p. نپراثا, to wring. Si. نپرانع.

ناث, s. face.

نکرم پرکح, s. bedclothes; clothes given by a host to a guest.
nakhib, slave.
nadhkh, lemon-grass, (*Cymbopogon iwarancusa*).
nar, male.  P.
nar, fife, pipe.  Si. nari.
narm, soft.  P.
nirawär, justice, decision of a disputed case.  Si. nirwáru.
naryán, a horse (m.).
naz-khanagh, v. to close, bring together.
nazí, } near.  P. nazdík, nizd.
nazicky, } nazík,  
nishár, brother’s wife; daughter-in-law.  Skr. snushá.

Pashto, nzhor.
nishán, mark, standard.  P.
nishtejání, bedding.
nishtainagh, to spread out.  Causal of nindagh.
nashk, mark, sign, distinction.  A. naqsha.
nigháh, sight, show.  P. nigáh.
nighur.  See noghar.
nighra, silver.  P. nukra.
nughraená, of silver.
nagban, bread.  P. nán.
nighor, side, direction.
nghoshagh.  See nigoshagh.
nafá, profit.  A. nafá‘.
nafuskh, stepdaughter.
nukrá, white (of a horse).  P.
nikragh, to separate, part (intr.).
nakl, imitation, copying.  A. naql.
nakl-khanagh, to imitate.
nakh, } old woman.
nakho, } ditto.
nigáh, care.  P.
nigáhbní, carefulness.
VOCAETTLABT.

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nigoshagh, to listen, attend. Cf. Pashto, nghwatal.

p.p. nigoshtha.

nali, s. the forearm. Si. nari.

phādhl-nali, the shin.

nali, s. the barrel of a gun. Si.

namāsh, prayers. P. namáz.

nambo, the būi plant, **Crotalaria burhia**.

nambí, s. fresh feeling in the air after rain.

namak, in namak-harám, traitor. P.

namúna, pattern. P.

nang, honor, dignity. P.

nangár, plough.

nangár bahagh, to plough.

nindag, v., p.p. nishtha, to sit, dwell, stay.

P. nishastan, nishún. Pashto, nástal.

er-nindag, to sit down.

nawásag, grandson, granddaughter. P. nawása.

nawashí, to-morrow.

nawashí-begá, to-morrow evening.

nawán, perhaps.

nautirej, a game resembling gobang, played on a board.

nokh, new. The new moon, the moon. P. nau.

naukh, a bride. Pashto, náve.


nodh, rain clouds, rain.

nor, mungoose, ichneumon. S. noru.

núra, silver.

navz, pulse. A. nafs.

núzd, nineteen. P.

núzdah, nineteen. P.

noghar, or skirt of the hills.

nughrur,
Vocabulary.

نوك - nok, beak of a bird. P.
نواکر - naukar, servant. P.
نواکری - naukari, service. P.
نا - nah, no, not. P.
نہ - nub, nine. P.
نہر - nahar, canal. A.
نہرم - nahram, ugly.
نہمات - nahmat, intention. A.
نهمی - nimap, ninth.
نی - nii, now. Pázand nua. Pashto nan.
نین - nīn,
نیام - nyám, middle. P. miyán.

نیامہ, in the middle.

نیاچجی - nyámjí, one who goes between, arbitrator.
نیامغ - nyámagh, middling, in the middle.
نیانوان - nyánwan, in the middle, in (from nyámá).
نیست - niyat, object, desire. A.
نیک - nekh, good. P. nek.

نکHEN - du‘á, prayer.

نرموش - nermosh, noon (for nem-rosh). P. nem-roz.
نیر - nir, s. roast meat.
نزغ - nezagh, spear. P. neza.
نیستا - nestá, } was not.
نیستست - nestath, } was not.
نیستین - nesten, is not.
نیستکار - nestkár, poor, destitute. P.
نیش - nesh, tooth. (Si. Pashto, nesh, tusk.)
نیغار - neghár, in the direction of. See nemgha.
نیک - nékah, marriage ceremony. A. nikáh.
نیلاغ - nilagh, blue.
نیم - nem, half. P.
nem-ráh, halfway.
nem-shaf, midnight.
nemagā, butter.
nemghā, in the direction of, towards.
nímón, lemon.  A.
nen, no, not.
níná, modern, belonging to the present time.
níná-vakhat, now-a-days.  See ní.

W. V.

wájá, like, resembling.
wájh, wár.  (In composition) eater.  P. khór.
mar-wár, man-eater.
shír-wár, suckling.
wáris, heir.  A. wáríth.
wázhá, lord, master, sir.  P. khwája.
díghár-wázhá, landlord.
logh-wázhá, goodman.
vágú, a large lizard, alligator.  (S. vághé, alligator.)
vágt, that very one.  S.
wám, debt.
wámdár, debtor.
vánij-vápará, give and take, buying and selling (uncommon.)  Si.
wändá, leisure.  Si. wándo.
rahm, wálhú, outery, the alarm.
raha, wábáh, cholera.  (Ar. wábá, pestilence.)
wat, wick.  Si. wáti.
waṭá, stone.  Panj.
víthí, space, interval.  Si. víthí.
waṭhi, one's own, own.
vakhī, vakhī time. Ar. waqt.
wād, increase.
vaḍainag, to increase. Panj. vaḍāwan.
vaḍri, leather strap. Si. vaḍhi.
vaḍri, bribery. Si. vaḍhi.
wadh. See waṭ, self. P. khud.
wadhī, birth.
wadhī khanag, to foal.
warbariyyā, excellently, stoutly.
war, ward, food.
P. khurān. Skr. bhar.
wor, warnā, youth, young man. P. barnā.
warū, beam. Si. waro, rafter.
warinag, causal of waragh, to feed.
was, strength. Si. wasu.
be-was, helpless.
wasar, wild onion. See whasar.
wastād, master of a subject, skilful. P. ustād.
wāsārik, father-in-law. P. khusār.
wāsāriyyā, in front, foremost.
wāsam, inhabited. Si. wasawān.
wash, sweet, happy. P. khush. Skr. swādu.
washkī, male of any beast of chase.
washū, sweetmeats.
vakīl, agent. A.
val, | reaper. Si. vali.
valān, |
vanni, bride. Si.
vanní, name of a plant.

vaníjagh, v. to yield up.

vinyainagh, v. to spoil. Si vinyánu.

whádlh or wahádlh, salt.

whár, dirty, foul. P. khór.

whán, tray, dish. P. khwán.

wháv, sleep. P. khwáb. Z. qafna.

whárd, food. P.

whasár, the wild onion, *Allium rubellium*. A.

ves, clothing. Si. vesu.

velá, time. Si. velo.

vehí, street. Panj.

hájí, pilgrim. A. حاج.

hálk, earth, clay. P. khák.

hádhír, heart. Ar. khátír.

háragh, dates. P. khákír.

házír, present, Ar. حاضر.

hásh, double tooth. (Cf. Pashto ghásb).

hághá, awake.

hál, circumstances, new. A. حال.

hálá dai! give the news!

hálwar, conversation.

hámagh, raw, unripe, uncooked. P. khám.

hán, khán, chief. P. khán.

hásí, (عابي عاباسي), an eight-anna piece.

habár, discussion, conversation. P. khabar.

habkagh, v. to stutter. Si. habak.

hapt, seven. P. haft.

haptagh, a week. P. haftá.
baptumí, seventh. P.
hatar, danger, apprehension. Ar. khaṭar.
hat, shop. Si. haṭu.
halū, the wild olive, *Olea cuspidata*. P. zaitūn.
huch, horse's hough. Si. khuch.
hachbo, thus, so. P.
hachí, any. Often contracted to 'ehí. P. hech.
ḥadīragh, to chop up.
ḥad, bone. Si. haḍu. Pashto, ḥad.
ḥidkí, hicough. Si. hidží. Pashto ḥatkaí.
ḥudḥá, ḥudḥáí, } God. P. khudá.
ḥadḥen, then.
ḥir, a young male camel up to six months.
ḥar, 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 vakhtá, } always.
har-velá, } always.
har-handá, everywhere.
ḥur, adv. apart.
ḥur-janagá, to drag apart.
ḥarb, jawbone.
ḥartál, arsenic. (Si. hartálú, yellow orpiment.)
ḥartél, large saddle bags.
ḥurjín, saddle bags. P. khurjí.
ḥirdik, squirrel.
ḥardhát, metal. Skr. dháту.
ḥirs, avarice. A.
harsh, a cubit.
harsha, s. an infirm person.
harragh, s. a saw.
harf, letter. Ar.
harmada, bastard, scoundrel. A. P.
harwd, a measure of corn containing nearly 10 maunds Indian weight. P. kharwd.
harrí, mad (of dogs).
harriyá, s. hazdah, eighteen. P.
hizgar, anywhere.
has, an ornament, a “hassi” or silver necklace. Si. hasu.
hasr, mule.
hastr, eight. P.
hushtur, camel, (the generic term). P. shutur.
hashtumí, eighth.
hushagh, p.p. hushtha, to dry (intr.).

hushken dod, skeleton.

hishki, scarlet.
hak, rights.
hakal, drawing.
hakalagh, v., p.p. hakalatha, to drive, to urge on.
hukm, (A. ġukm), order.
hal, melting; hal biagh, to melt, thaw.
hi, a kite. Si.
hulás, free. P. khulás.
halk, village, collection of huts. (Cf. Ar. khalt, khaltat.)
haldh, spices.
haleni, adv. undoubtedly.
hambacha, ammunition pouch. Si. hambácho.
hambár, a collection of corn, and enclosure round it.

P. ambár.

hamodhá, there, in that very place.

hamedhá, here, in this very place.

hamesh, this very one.

hameshiya phar, on this account.

han, neighing, whinnying.

han-khanagh, to neigh, whinny.

hinjri, the shoulder-blade. See bardast. Si. hanjhi.

hinjir, fig. (P. anjir.)

hanchho, thus, so. P.

hand, s. place, dwelling. (P. khána.) (Si. handhu.)

handá, in place, instead.

thi-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.

nind, bitch.

hindí, weapon.

handainagh, to be useful.

hunar, skill.

hinkagh, to neigh.

hangar, charcoal. (Cf. Sindhi angaru.)

hingalo, variegated. (Si. hingulú vermilion.)

hau, yes.

hawán, that. (P. ham-án.)

hawan, as much as that.

hawango, thither.

hot, hero, warrior.
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haud, tank. Ar.

havdah, seventeen. P.

hodadár, official (for P. uhdadár).

hod, hole, cave, den.

haur, rain. Si. horu.

hurjín. See hurjín. Saddle bags.

hosh, sense. P.

hoshagáh, s. an ear of corn. (P. khošha.)

hoshyáár, skilful. P.

hauf, leprosy; a severe illness, violent fever.

hol, hol-posh, armour, accoutrements. Si.

hom, the air-plant.

bon, blood. P. khun.

hawesh, this, this one.

hawen, adj. this.

hi. See hídhishk.

hai, or.

hai hai, either, or. (P. khwáh, khwáh.)

hayá, shame. A.

be-hayá, shameless.

hait, camel's pack-saddle.

híth, green corn, khasil. P. khawíd.

hech, any. P.

hechí, anything.

hechí na, nothing, none, not at all.

hechí na, nothing, none, not at all.

híth, swine. P. khúk.

hedh, sweat. (Skr. svid. P. pa-sína.)

hídhishk, the khip bush, Orthanthera viminea.
hir, a houri. (Ar. húr.)

hair, welfare, (Ar. khair.)

hair khanagh, to salute.

ma-hairá, all’s well.

hirán, dish, plate.

hair, welfare, (Ar. Mair.)

khana, to salute.

ma-haira, all’s well.

hirán, dish, plate.

hiráth, fine, thin.

haiza, cholera.

hízhokh, a waterfall.

hèis, hes, rust, dirt.

hèil, hope.

helák, tame, subdued, accustomed. Si. heráku.

hèilwènd, hopeful.

hèinz, a leather churn.

hínzár mathagh, to churn.

hínea, weak. Si. híno.

yázdhah, eleven. P.

yázhdumí, eleventh. P.

yatim, orphan. A.

yakín, certain. A.

yak, one. P.

yak-áptiyá, one another.

yake, only one.

yake-chyár, fourfold, } &c.

yake-sai, threefold,

yala deagh, to let loose. See ilagh deagh.

Pashto, yalah.

yamará, for ever. See jamará.

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.

I.

The Wanderings of the Rind Balochis.

[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 Nihál 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 guzárá
badsháh mulka waıthen
Thí jihán khák o gilo bí
Heku nindo wash-dilá.
Má aulád Mír Hamzáigh-ún
Sob dargáhá gur en
Azh Halabá phádh kháyán
go jazíán jherocu
Masará Mírcn Jalál Hán
chhil-o-chýär bolak en
Kalabalá Bompúr ma-nyáuwán
shahr Shístán mízile
Khákhtún Hárína bandá
Kech rásten phalawá
SPECIMENS OF THE

Makuráná Hot nindí
    Khosagh man Kech-dehá
Azh Halábá Chandiyeghá
    Kalamthí e logh pha-guren
Jo mitigation bahr-khanána
    Kul sardár Shaihak en
Man Naliyá Noh nindí
    Jistkání pha-guren
Phuzh, Miráli, Jatoí
    Drust man Seví Dhádará
Dríshak Khán, Mazárí
    E go Rindá yagazar en
Azh bunyádá Phuzh Rinde
    Sar go Mír en Chákur en
Golo, Gopáng, Dashti
    Rind thaliyá dar-ant
Thí Baloch báé bisháre
    Drust man Rindá manahá
Nashk-daúr pha Gorgezán
    E man Thaliyá dehá
Noh koráí áwáre
    E go Rindá yagzsaren
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 shiddat en
Shaihak o Sháhdád dání
    Las sardár Chákár en
Chhil hazár kháí Mír gwáankhá
    Thewaghán dárde-potar en
Hol-posh dast-káláyá
    Druh khawán o jábah en
Paθ pechá go khawá
    Phádh lálen mozhagh en
Káreh kárar nugaræná
    Dast mundrí thangaven
Bakar o Gwaharám Rámëna
    Zar-zuwál Nodeh bandagh en
Phuzhán Járo jaur-jawáv en
    Hadden Diane brádhíen
Pheroz o Bijar Rehán
Mirán Rindán zahm-jan en
Sohbá, Míhán, Ali,
Jám, Sahák o Alan en
Haivtán Bivargh man Rindán
Mir Hassan go Brahim en
Sháir ki sherán jori
Mir 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 Mir Hamza; victory is in the worship of God. From Halab do we arise, there are fights with the unbelievers. Foremost is Mir Jalál Khán, there are four and forty tribes. By stages (we march) from Kalabalá (Karbala?) to Bompúr and the cities of Sístán. We came to Hárún’s band, on the right side of Kéech. The Hots settle in Makrán, the Khosas in the land of Kéech. From Halab come the Chándyas, near the home of the Kalamthis. Dividing out running water and dry land, the chief of all is Shaihak.

In Nálí the Nohs settle, close to the Jistkánís. The Phuzhes, Míralís and Jatoís, all in Seví and Dhadár. The Drishaks, Kháns and Mazárís are one with the Rinds. In origin the Phuzhes are Rinds, they were with Mír Chákár. The Golos, Gopángs and Dáshís 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 Thálí. The Nohs and Koráis are mixed together, they are one with the Rinds. The Rinds settle in Shorán, the Lashárís 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 Shaihák and Sháhdád, Chákár was chief of the whole. Forty thousand come at the Mir’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 Gwaharán 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 Mirán, the swordsmen of the Rinds. There were Sohbá, Míhán, Ali, Jám, Ishák and Alan; Haibat Hán and Bivargh of the Rinds, and Mír Hassan with Bráhim.

It is the poet that composes the songs, and Mir Jalál Khán comprehends them.
II.

Poems relating to Mîr Châkar.

Mîr Châkar is the great legendary hero of the Rind Baloehes. He is represented as having led them into the countries they now occupy from Makrân, and as having founded a kingdom with its capital Seví (Síbí). He waged war with the Turks under Humáú Chugháâtá. On the civil war between the Rinds and Lashâris breaking out, the Turks under their leader Zunú joined the Rinds, and the Lashâris were defeated. The Turks seized the Lashâri women, but released them on the expostulation of Châkar, who said that Baloehes would be disgraced by being accomplices in such a deed. At one time Châkar was a prisoner to Humáú, who called him up and asked him "What is the best of all weapons?" Châkar replied, "Anything that a man can lay hold of in a fight." The king then had Châkar brought unarmed into a narrow street, and a savage elephant turned loose at the other end. As it rushed upon Châkar, 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. Châkar 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 Panjâb. His name has been given to several places in Baloehistán, among them Châkar-mârí 'Châkar's upper storey,' a hill near Sangsíla in the Bugtí country, from which he is said to have taken his last look back at Síbí. This is a physical impossibility, but Châkar was a 'godlike man' (Hudâ'í mard), and could do things which the present generation is not capable of. Another place, named after him, is Châkar Tankh 'Châkar's defile' in the Marrí country.

It is difficult to say how far any part of Châkar's adventures are historical. Baloehes began to arrive at Multán and the neighbourhood from Makrân in the time of Hússain 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 Mîr Châkar Rind. He obtained a jágir in Uchh from Jám Bâyázûd (Ib. p. 396).

This Mîr Châkar 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 Panjâb as far north as Bahrah and Khusháb on the Jehlum. (Erskine's Baber, p. 256.)

This irruption of Baloehes into the Panjâb was probably caused by the pressure on them of the Turks or Mughâlâs who were then under the Aýrghân's invading Kachhí and Sindh. Shâh Beg, son of Zúlmán Beg Aýrghân, took Síbí first in A. D. 1479 and a second time about A. D. 1511. This occupation may have been the cause of Châkar's emigration. Shâh
Beg made Sibi his capital for some time, and it is probable that he and not Chakar really built the old fort there (Erskine's Baber and Humayún. Ed. 1854, Vol. I, pp. 342, 347, 348.) There is no record of any collision between Humayún 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 Humayún, Vol. II. p. 266) and again fell in with them between Kandahár and Sistán (p. 271). This is perhaps sufficient for the introduction of his name into the legends. Zunú, the Turk leader, perhaps stands for Zúlnún Beg in whose name Sháh Beg fought.

**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.]


Yád khanán náme Iláhí
  man awwal sar-návaghán
Háidár o phusht o phañáh
  sar hazrate ákbir-zamán
Biyá lóri go sawáhá
  zír maní guftáraghán
Bar gwara belán dileghá
  no salátí brádhárám.
Mangehá Rinda pha Bompur
  Kech bághé Makurán
Mastaren logh Domkí en
  man Baloehi meraván
Rínã Láshári áwárú
  trán bastha pha-wathán
'Biyáçth, shedhá bilaqún
  bilún giyáfén ulkahán
Jo mítáfá bi-katún
  bahr-khanún bi pha wathán.
Ráji ráná kadh ma lekún'
   biyákhthán dan logh githán
Hukní tónde nakhfán
   nokh khuthantesh ádimán
Bozh borún báraghená
   kotwání andará
Saj khane bázen bháná
   nhu-hazárí markhaváḥ
Biyárún bagán girdaghéná
   azh Naliya khaor dafá
Gwáñkh-jatkh jodhán bi kádhán
   'er-khafe azh Chajúa
Khash gáli o palangá
   jhul suhren kamalán
Bauf morbanden lihefán
   hingalóen manjaván
Sikh o táshán bijoré
   Makurání kadahán
Chakuri deh na nindí.
   ro watlí diáren ámilán,'
Phoshitka Rindán watlí dír
   pha khawáh o shaddaván
Phádh lálen mozhaghán
   Rind kásathant pha Deraván
Dhádar o Seví gwáfthá
   Dan Jhal o Nilábá dafá,
Hab, Pháb, Moh, Máli
   dan Nálí khaour dafá
Gáj shahra basthaghená
   Dan Marágahó dehá
Sangar o khoh Sulemá
   Gwáfthaghen sher-naráñ
Sáng Mundálú dhaníyá
   Đan pá bi Methirá
Bághchaen Kácho Símá
   Dan Dharí o Dhanará
Nangare Bijár theghá
   Jám Sulemána lurá.
Gohar láúti ki ákhthá
   gwar Nawáve Chákurá
   'Mál maní othiya bag en
   hande phe-dáre manán'
Chákurá dír-zánághená
gwash bi durren Gohará
'Barav o Során joá
Kaehrákí phalavá,
He-miuná bagá bícháren,
nind be-anden shafá.'
Rosh azh Gwaharám shahrá
raftaghant kharde charián
Báraghen borún zawárant
pha shiká o sailahán.
Hir khushthant juftahiyá
phar watkí láf-serihañ
Ráj bundáthant hazári
azh du-demí ziánehá
Kahrává thekán khañáthant
pha hadhen kirdáraghán
'Shin-gurá Gwaharám theghá
'shán-gurá Mír Chákurá
Phílaven sí sál jang atí
Gohara bir phadhá
Sar galóí báíthaghantí
nesh rikhθhant azh dafá
Márá dí ekhawá dí ishtha
pha Húdhäi ásurá
Gudá Sultáne Balochá
sahl khuthá bi pha wathán
Chákur azh bráthí gasurá
Gwastha Satten Gharán.

Translation.

Kiláti son of Habíb says: to the lofty Ghulám Bolak Rinds he says: about the quarrel between Chákár 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 Bompur, to Keh and fertile Makrán, the greatest family was the Domki in the Baloch assemblies.

The Rinds and Lasháris met together, they took éounsel 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 Nali." The men called to the women "Come down from Chajú, take out your wrappings and beds, carpets and red blankets, pillows, and spotted rugs, and many-coloured bedsteads, moulded cups in abundance, and Makrán 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 Dádár and Seví, in Jhal and the mouth of the Nílah; Hab, Phab, Moh and Mali in the mouth of the Nálí torrent. They stayed at the city of Gáj in the land of Marágah. The tigers of men assembled Sangar and the Sulaimán mountains, the rulers of Sáng and Mundábí 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 exerise.

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 Mir 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.
Chákar's denunciation of his foes on leaving Sibi.

Chákár Shaihak gushí: sarí Rind Bádsháh gushí: án rosh ki Seví khilí kharde gál gushí: Gwaharánmár phasave dáth gushí.

Bilán mar-lawáshen Seví
Gauren sadhaní margáví
Jáme Nindavá bhattiýá
Sai-roshán Baharám neghá
Sí-sál uvt o uzhmárá
Ján-jebhaván jangiyá
Thegh azh balgává honená
Chotán eho kamándí boghán
Jukhtán na nashant làrená
Warnáyan du-mändilená.
Laḍ ma ñcraván na rusthaut
Misk ma barútán na mushthaut
Whard dumbaghán meshání
Karwálí sharáb sharr joshant
Sháhán pha nishán yakhe nest
Drustán wärthaghán hindiyán
Shartán dáthaghán shímenání
Bachaki lawar bánziyá
Gwaharám muzhen Gandávagh
Singhe ma ziríh phirenthá
Máchíya lawáshta lanjaíth
Ali o Walí druhr-dárán
Yákí kilátà beronen
Hágh kávalí Turkánání
Rind bárqhen boráníñ
Gwaharám azh dude hande bí
Ne Gor bí ne Gandávagh.

Translation.

Chákár son of Shaihak says: the exalted Ruler of the Rinds says: on the day he leaves Sibi 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; Ali and Wali 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.

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 Humáí Chugháttá king of the Turks (*i.e.* the Bádsháh Humáyún), Chákar was forced to consent to give up some Rind maidens to Humáí, 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 98, 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 Chákar 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 impend-
ing marriage of Shiren, 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 Shiren. He was immediately recognized by Shiren, 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 Shiren’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 Shiren 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.

Zangi maní badero
Gwaharán maní jám o bel
Whántkár Shihane Sháhiye
Saughan pha thiá risháná
5 Nokhí-ákhthagben masáná
Síghen gor-khusheu syáhárá
Áfa na wárth Báb neghá
Kikh o Karjalán Sindeghián
Lotí báhirán Dashteghán
10 Lotí wadh-maháren jólhún
Phitokh dafá mádh-gorún
Þorí phur kumáren áfá
Sutí phurí kháiván
Whává kárá nelán
15 Mágwárí jawán zivirenán
Marde azí Hurásán akhtha
Legbár chádar o humboen
Bár rodhanání gonath
Hurjín maidben bhangání
20 Sarbár Kandahári miskant
Phaíghám gón-áthí Rindání
Tahkiken shalán Shírenee.
Nodhán shanz-jatha Konárá
Dasht-o-dámana Mungáchar
25 Sanniya nugbor humboen
Đor phurant-i amrezán
Larzant cho gwanání thálkhán
Chotant cho kawándí boghán.
Ładí mãechnaka máldárán
30 Meshí buzi whántkárán
Mezbdr Sahák Yárán
Bumbár basthaghán búnukhán
Sarbár láříthan gwáneehán
BHáwanar khandagh o Nágáhú
35 Khondán phrushthaghán zardoán
Lokán phashavi katárán
Kádán go himáren phálkhán
Shírenea jatha srádhen kul
Ma Narmukh geáven rejá.
40 Mesh azh draniná ser khan
Buz azh gwáriglá láł phulá
Rind azh maídhen gandimá
Pahawál azh phanir ponebá
Lahri azh gwan photohákha
45 Gwán' janth dilsaren dáiyá
Zirí kadahe mețéí
Ro da shakhalen nokhálú
Malgor shusthaghén mablijá
Randíth mushí malgorán
50 Khaithí da wathí chyár-kulá
Kullá darríya bandí
Shiskant thaghár nishthent i
Jhul phalavá lețení
Dast janth avr barziyá
55 Khashí nughraen áđená
Era Kamálú sar záná
Gindi droshamá heriyá
Gregh khant lumáren ehhama
Anzí ríshant pha dramá
60 Jígh sar katiká mená
Mueh ban janán jedí gobár
Sharren somaren ehbil-o-chyár
Biáyant o gwara er-nindant
Shár phalavá lețená
65 Phursant-i dilá o hálá.
  'Pharche khunat khordema
  Subrán man maká o niláná
  Bríkh tháí bambaven danzená'
  Gregh bith, janán telánk dáthk

70 'Dír bith, o janán, jawán e ná
  Dír bith, o janán, dír nínde
  Bilán khunal o khor-demá
  Subrán man maká o nilá bant
  Bríkh o bambaven danzen bant

75 Dost shume phakár nen
  Amar ki jána dozwálá
  Suhrá réa darkárá
  Dítha harraghen bad-duáyan
  Turkán azh harel gwázentha

80 Ma zar-joshen Arandá shahrá
  Sunjén isp-tah'alén láfá,'
  Dúng bant janíkh Ríndání
  Malání phadhá shef ban,
  Kháyant khargázi kámáná

85 Nekhen-niyaten gwandáná.
  Maurán azh kurmán sindáná
  Phatán gwárghá láphulán
  Nem jamaven jígha jant
  Nem khunal o sar-hosháñ

90 Nem pha sammaén khauliyá
  Yakhe pha maní niyátá
  Chitho ma wathá musht khan'
  Ba phusht azh badhán jaurena
  'Shíth daz-goháár jegliyá

95 Dastán pha Hudhá burzáre
  'Alláh ki biyár Malik Dostená
  Sauten sammaën khauliyá
  Eshiyá ná, hawání oliyá
  Bor pha lammaghán sheriyán

100 Baro misilán dírená
  Biyár wázhá amírená
  Nínd-o nyáádd phith-o-máthání
  Dínná shakhalen bráthání
  Rozí bá Malik Dostená

105 Didár khasha rozí bá.
Translation.

Zangi 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 Phitokh 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 Sanni.

The pools are filled to over-flowing, (the water) trembles like the leaves of the gwan-tree (*Pistacia khinjuk*), and bends like joints of sugar-cane. The graziers have given the word to march, the owners of the sheep and goats, Mezhdár, Sahák and Yár Khán; the housewives have tied up their bundles, the camel-drivers have loaded their bales. On the hill-passes of Bhánnar and Nágáhnú, the yellow-camels bend their knees, the male camels 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 dranin-grass, the goats on red-flowered gwárígh, the Rinds on wheaten flour, the shepherds on eurds, and the Lahrís on gwan-berries.

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 loeks 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 uncleaned, 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 bodices 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 closed hand; and, secretly from my bitter foes, my own sister and love says, with hands raised up to God. "May God bring back Malik Dosten, according to his true promise, not this one, but the old one. Swiftly, tiger-like chestnut mare, bear him southwards, come by long stages, bring 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.

NOTES ON THE TEXT.

The text of this poem is taken from two versions, one recited by a Shambání, the other by a Marrí. There are some variations which are noted below, the Shambání version being marked (a), the Marrí version (b). The Shambání version is the base of the text. A fragment marked (c) from a Gurčíí 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 mehlaúání 'spices.'

Line 27. Larzant is from (b). (a) reads drafshtant.

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 Majnún. Lines 56 and 57 are from (b).

(a) reads: 'phul/en zán sará er-khant
Gíndi azh wath o gonáfá

Line 62 is from (b). (a) reads 'Hírth jádéri ehhil o ehyár'

Line 68. For dánzēná (b) reads be-zauk-an, 'unornamented.'

Line 69. For gregh bith 'weeps' (b) reads zahr girth '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
Ganjin ispahan phár bíttha
the meaning of which is not clear. Also after l. 81 (b) inserts,
Bakhta mir jañeghá khushtha
Dost o ispahana bokšttha,
which is equally unintelligible.
Line 99. For pha 'towards' (b) reads phalav 'direction.'
Line 100. From (b) (a) reads:
Khosárá dethán direná
'Swiftly to his distant country.'

IV.
The Rise of the War between the Rinds and Lasháris.

[This poem is another fragment of the Chákár eyele, giving an
account of the spoiling of Gohár's camels by the Lasháris, and Chákárs' 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 hospi-
tality. Rehán and Járo the Rind warriors mentioned were sister's sons to Chákár. Dódá who is mentioned at the end is Dódá Gorgez, celebrated for the revenge he took for the spoiling of Samnú's cattle.]

Whazh-gushen Lori biyár wathí shághár
Má sará charen bairame phágír
Jawán mard dátárá gire dádhá
Zí azh Sanníá giyáféná
Ládithá durren Gohár shodhá
Akhthaghá bautí gwara Mírá
Chákárá shirá zí gawar-zírá
Gohárá durrená hawar dátthá
"Bagavo Milhá avan dánén
Go má Láshári jherave mánen'"
Gohárá lađe sar-jamagh dáshítha
Dástá Gohár man Kaeharak nyástha
Rapthaghant Shoráná pharé sailá
Chakurá Mírí bandane shahrá.
“Má tháshún dan baghchaen Gájá
Gohar dáchí ma behaván danzént
Máighá shír dan náfaghán shanzánt”
Chákurá phurs’ azh Malaven jatá,
“Zíth khan jat, de manán hálá,
Cho khútha khaí go Gohara málá?”
Cho jawáb dátha Malaven jatá,
“Akhthaghá Láshári hame chindrí
Khushtaghá hír cho khenaghá mardí
Chham jatha durrghoshen Mahériyá
‘Jat, hame gálá bile sheriýá
Phu tense Rínd ma deraván druáh ant
Dáchí pha hírán hardame záhant’ ”
Badh burtha Reháná Nawávená
Phuzh Járvá jaur-jáwávená
“Má phara durren Gohará hírán
Havbará shámálo janún shírán
Shart khanúa haisí chotavá bírán’”
Bágár Jatóí jawáb dátha
“Ba-khú-án durren Gohara Samní
Hótá pha báután niyath khamí.
Shah Hussain cheravá roshá
Bibarí pheshá nishtá ma loghá.
Dar-shuuthá bághár azha gedá
Choraván ilgá bokhtha pha díñá (or pha randá)
Gur-khanána dan medhíra loghá ;
Demá dar-khaptha mardume jawáncen
Sharr kalánc ant cho dushthaghent shírá
Dholant oshíshe karáiyán.
Kiúmahá minnate khútha-í bázen
‘Choraván, bághár bül, maní shámên
I-katar márá phar wáthí námén’
Na-jáñen joracjáven jatán
Kálíhánu bághár khushtha pha látán
Odh niya’ loghá Sammáven sólo
Dast kauliyá phijatha dááhí
‘Agú phara bághárá na-ro bái
Man thai bhen, tho maní bhái’
Hot mirání dará ákhthá
Súríchá pha demá jawáb dátha

1881.]
Balochí Language.
No Amul-máín, no Amul-máín! 
Yarbare bosht, gal mayá gona.
Man phara bághára khanán choná 
An díghár shalmí bith azh honá
Shingurá shast shángurá phanjáb 
Drust pha bághára bithaghá yag-jáh
Omará nashke ishtha pha kaulá
Hon gire Bálácha phara honá
Súrih Dodá phara gokhán.

Translation.

Nodh son of Bahram sings: to the fierce Rashkáni 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 Sanni, marched the fair Gohar: she came for shelter to the Mír, to Chákár ever-victorious with the sword. Then spake fair Gohar "The Lashárís are set on quarrelling with me, they let not my camels remains in the Miláh pass."

He collected all Gohar's camp and goods and placed her in the valley of Kacharák. Then they (i.e. the Lashárís) came wandering to Shorán; to a town under Mír Chákár'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.

Chákár 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 Lashárís 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 Kinds 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 Jatoí 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-máün! hear Amul-máín; 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.

V.

The Competition between the Poets Sobhá and Gáhí.

Part I. Sobha addresses Gáhí on the question of the Lághári 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 Lághári draw comparisons between their tribes and chiefs, challenging each other's claim to have come in with the original settlers under Mír Chákár, and taunting each other with failing in the exercise of the cardinal Baloch virtue, hospitality to refugees. Relán the Dom minstrel is commission 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 Lágháris and Khosas are old enemies, and their hostility still smoulders after thirty years of British rule.]

Sobha Thegh Álí gushí : Jarwáren Baloch, gushí : Khosagh Kaloí karákutá gushí : Lághári báutiyán kharde gal gushí :

Whazh-gushen Reláná shádhíhání shághá bare
Maín salámú bi sháíren Gáhiyá diye
Nishtho droghání záváná wash khane,
Ewakhí será go manán chaehhon tule?
Bhúchari Dálán kilát núm gire
Nuh-manen báránná wathúr kans diye
Jawának ńrdání rág/házá roshe khafé
Ahin shar háthí raghásá chít árthaghé
Sher chápulá azh Kharrá thalá guze
Go manán hair bí, zamíná jáhí lahe
Phesh guđá máin sailavání depánthave
Agh thará wahn bí zamíná jáíz khane
Dar-chären zahnání ná-washen jáhá rase
'Shingura 'shángur lashkarán dem-o-dem khothe
Zahranen mardán nodh-dilá seráfá jathe,
Jawának urdání tawáren goshán khaúfí
Har-chyá démá ghoravání dáto rulhí
Cho tháí bachhání dafání gonáf hushi
Nodhí beráína beghavá biyáyan thánahi.
Biyá, O Lashárí, azh gwareyádar-khathaghé;
Guđe Zunuwá ghoravá roshá gár athe
Sailhí Míren Chákurá phauzhán ruthaghé
Rind nar-borán azh zamíná resinthaghé
Khusthaghá Rámen damámio charenthaghé.
Dai manán nashkán tho kithán rosh khard bíthaghé,
Bakar O Rámeni kithán laḍá gon athe?
Ghoravo urdán phelahtho Turkání rukk ath
Doshí ma Jhalá Turk ghoráyán grandaghá
An demá Gandávagh Hudaí màin dem bithaghá
Turkán shád kámá Rind 'shamedhá zahr gíthaghant
Hon azh chamání chimáká dar-khathaghant
Gwasitha Nayáníyí 'Main huddábund go-khathaghant?
Lajavo, Shorániyán grán bithaghant
Bijar, Phuzh, Chákar Shahdhár ákthaghant
Allan o Miskání Sahák Màdán athant
Bagavo lajjání sará katár dáthaghant
Asp go sonáén zariyá bashkáthaghant
Rind azh nokh-zemén biháná er-khathaghant
Piyádkaghá Rind azh takht Shoráná ákthaghant
Thorave Rindára olí Láshárí war adth
Mir go Phulá azh Kawárá drikbentaghant,
Whazh-ghushen Relán shádkhiái shághár bizír
Mard pha báútávn ehoshat, sardáre maní
Gáwar o Hánen Sáhib áná jag-sahí
Gwar Nawáv Hán kúk burtha bázen barí
Gorisháníyíá sángat o Káhan Marri
Bürzás go Summenzáiyíá brúdhargarí
Ákthá gwar Hánen Jawánaká báútán tháí
'Khosagháhí, ki man neyánon Ladhári khadlí'
Go má chyá rálá níshthaghá báutí sharíkh
Translation.

Sobha son of Theghi Ali sings: to the Jarwär 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 Bhúchari and Dálán, you are placing nine-maund weights upon yourself. In the face 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 Kharr. 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 Lashári, where did you originate from? You were missing on the day of Zunú's horsemen; did you reap (a harvest) of Mir 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 Shahdbár 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 Lasháris also showed kindness to the Rinds, when they let Mir (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 Sáhib Khán 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 Legháris." 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 Pir 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). Zirá 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 Simurgh strikes a hawk on the plain, so did the Khán call Arzá and his companions. The Khosas shod their horses, the troop made a rattling. Your chiefs were ashamed, as when the Simurgh 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 : Sobhá phasave dáth gushí.

Whazh-gushen Relán shádhibhání shághá biyár
Kaunsh bángavá gwar maní báładhá bidár
Chambare sá kán, malgí dílá ghám guzár
Jangí katárá dél macheđe : jawáán bí sár
Nishthaghe satá whash nish námúdh-tawár
Azh wáljání khashtthaghe raud o kissawán
Hair phadhá : ráí-háa rosh ant, jang syáhen shaf ant,
Jang phadhá mard o markhaván jawáín rosh nayant
Gáhwáren hindí bingaven hotáñ charant
Dhauráven koṭání sawádá zel khanant
Chandeăn warná pha dafá gozán janant
Jangavo ninja bí, phadhá palnádh girant
Bingaven hotání raqhámá ambráh nayant
Azh phadhá gúdá nishthó amsódh warrant
Go doen dastún sár o záná janant
Jangáí dáhiká har-eyár khundáán phirant
Gwadilén mar go gindaghá goriyá trahant
Ashikání káren medháná ravan
Taukal beiyá dilár telánká dian
Malgí dilá pha zirih o zirih-phosh khanant
Kadaháin zahrená sharábi nosh-khanant
Ma saghárání thasthaghien jhorán khafant
Gáhwaren theghá phar wathí námúdh jauant
Go wathí kháné Methirá miski zar ant.

—— Whazh-gusheń Relán sha’dhiháiní shághá bare
Mańa salámá bi sháiřen Sobhár diye
Methirá randá zír ki Bompurá khái e
Man dilá zán ki tho Khosagha máthí brúth naye
Sov labán nyámaghí dáráń sushe
Armáná ! zánant azh sadhen sálán gwasthaghe
Hai gannokh e hai zha thána kisthaghe
Bakar o Rámení shaghána mára jane
Tho khithán roshí Rind Lashári bíthaghe,
Ki man daryáyání lahravo chaírán gár-athe
Beghavá míren Chákurá chaukdídar athe
Má wathí shán cho mastháren Rindán pholathka
Ewakhí ser go manán har-ro tolatha
Man thai háthí mağhazá shon dián
Biya medháná chambavá simurýh bián janán
Xrava mardán Sáwano lahrí rasthaghe
Nokh-nochán phágh phíthí mardum basthaghe
Mark násenthe, pha chihán roshe shádehá
Shán phirenthe, gandaqhen gín dostehá
Man dilá zán ki maut thará nelí dášara
Dodáí dáng bithen man bawren chádhará
Medh Máchiya Hamzahá jórí na be
Khosagha Rindá manavo máríya dare
Phuturen Rindán cho khutha báut phadhá
Gohare hirání sara cho khutha Míren Chákurá
Sammíya gokhání phadhá Dodá lurá
Khoń sardemá keháren márí lurá
Sar wathí dáthaí garímo né múl sará.

Translation.

Gáhí 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 awarer 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 Lashári?

For you were lost in the waves of the river's flood, you were Mír Chákár'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 Simúrg, I will strike you down with my talons, as in Sáwan (the rains) the torrent sweeps away the men of Aro. 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 Máchis 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 Chákár 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.
III.—*Sobhā’s rejoinder, going over the legendary adventures of the Rinds, and asking what share the Kalois took in them.*

Sobhā Thegh Alí gushí: Jarwáren Baloch gushí: Gáhiyá phasave dáth gushí.

Kádir námá har sawáhá yád khanán
Sag-satáren bandaghí ardláse manán
Relání Lori biyá hadísání durr-gehán
Sáz-khane shághá gwash Balochání nugdahán
Dáimá nyádhe bithen go Sultání sarán
Rind o Láshári ma buná bráthkán dáimá
Má khutha Láshári Baloch khatpha pha shakhán
Mehna e zánki roth Panjgúra dehán
Kech Panjgúr kissavú gosh dári kí gushán
Má hawán Rind ún, azh Hálabá phákh-ákhtthaghún
Dubarán jangi go jazízá mán-ákhtthaghún
Dem rosh-ásán saríná er-kaththaghún
Hamzáí aulád sobh rasúlá bashkáththaghún
Hári mañhána rúhí sháh-dágá kaththaghún
Ungúrí dastá thíbare jangá gíptthaghún
Pha Karím sáz kuzrátán shodhrá gwastthaghún
Shahr Istámbo go Imámá wath charththaghún
Ma Jághíná gwar Sháms-dín Sháh ákhtthaghún
Shódhá Hárimá pha turá jangi khashtthaghún
Ungúrí Kech Makuráná bahr báshtthaghún
Shahr Sístáñá o khamáná bahr báshtthaghún
Shédh pha demá má Baloch tálá báshtthaghún.
Shédh pha demá tho wathí naskhán de manán:
Rind máñ Kechá; Kech thán demá nishthaghé?
Chil o chýár halkán; go khái laðá gon-áthe?
Ní kí laðána khaurí sarhaddá ákhtthaghún
Las-Bélá o Kalmatíyá giwar-thaghún
Habb Báráná pha muvárík she-báshtthaghún
Pheshá Núhání azh Nalíyá er-kaththaghunt
Jistkání má Gáj siiáf ákhtthaghunt
Lak Salárí Chándeh azh Káchá kaphthaghunt
Rind Láshári Narmukh rej bákhtthaghunt
1880.]

BALOCHÍ LANGUAGE. 150

Rinde Dhaḍarā sarinā er-khapthagant
Lāshār pha Gandávagh sarāerā bithaghe
Jalikān Loī the khīthān joān bahr athe?
Gind! nawān Gāhī the radhiyā gon khapsaghe
Arna Háırin basthaghen baldān gon athe
Tho havān roshe be-mayārī ākhtaghe
Sāhib rosh zurthaghen, zarān ārthaghe
Sherā mán-dātha pha do-bandā khard bithaghe
Zindaghe o druāhā mān dighārā sar-bithaghe
Phurse Gāhīyā, tho chi maskīfī zindaghe
Wapthaghen mardānī tafākhān go man gane?
Tho go dah loghā ākhtho bāūt bithaghe
Hān miriyā pha barātān ehārī athe
Tūpak daste Umar Háin bashkāthaghe
Man dilā zān ki tho mazāin shān mat niye
Tho rāj āhan-e, ān thāi sultānī sar-ant
Gwar manī mirā ākhto bāūt bithaghe
Har chyār khundān har hamū Rājān dīthaghe
Kumbhī gokhānī shaghānā mára jāne
Khoh phīsh-buren, ambarānī sifat khane
Gwashthaghe nālān Gāhī, tho saharāl na be
Medhira randā zīr pha Bompurā khāyant
Mānika halkā hon avo lajjān rikhthaghe
Dan phadh-o-pheshī ehedhaghī nashk oshtāthghant.

Translation.

Sobha son of Theghi 'Ali sings; to the Jarwār Baloches he sings; in answer to Gāhī he sings.

Every morning I remember the Creator's name, my trust is in the service of God.

Come, minstrel Relān with your beautiful legends, play on your guitar; chant the praises of the Baloches. You have ever been a dweller with kings, Rinds and Lashāris from the first have ever been your brethren.

I who called the Lashāris Baloches am scorned by you. Know that the scorn will travel to the country of Panjgūr. Attend, then, while I tell you the stories of Kehf and Panjgūr. We are those Rinds who arose from Halab, 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-din Sháh.

Thence we rapidly drove out Hárin 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 Bárán. First the Nuháníš descended by the Náli pass. The Jutkáníš came to the running water of Gáj. The Chándehs descended from Káoh by the Lak and Silári passes. The Rinds and Lasháríš pitched on the irrigated lands of Narmukh. The Rinds descended from the west to Dhádar, the Lasháríš came from above down to Gandáva. In Jálíkán and Loí what streams did you share in? Look! Gáhi, perhaps you were with us by mistake. Or perhaps when Hárin 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 phis on the hills. (The leaves of the phish or Chamaeops ritchiana 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.

IV.—Gáhi’s final answer, following up the Rind legend, and taunting Sobha with cowardice.

Gáhi Gorish guslu: Kaloén Baloch gushí: Sobhár phasave dáth gushí.

Biyá o Relán shádhihání
Sháhgházi chárávání
Majlis jawāne sarānī
Zir manī guftār-galān
Bar gwar jang-dosten syālān
Band-bozh galān dahena
Phasavān sar pha sarena
Gondalān serān manena
Bar dan Sobhān nighoshī
Olī guftārān shanooshī
Zūrī randā phirakghā
Bahr khanī milkā phitēghā
Chi gushān man shāirāra
Dil-harīfēn sugharāra
Khashī Rindānī shaghāna
Yād khan' olī jihāna
Gosh sobha mangihānī
datta'ī e Khosaghānī
Rand zurthe Makurānī
Rind Lāshār dehānī
Rind Lāshārī āwārā
Rafthaghant azh Kech shahrā
'Ākthaghant Harūn malāna
Mulk mītāfā girāna
Brāth-yārī bahr-khanānā
Bīthaghūn bahr khamānā
Mā ki Jatoī yagsar athūn
Sīm jōū pha-do athūn
Mulk shahrā nemanagh athūn
Roz bahr pha thir-dārān
Chyārakhe ma Ḍhādur athant
Sermā ma Khānpur athant
Hand ma Rej deh athant
E manī perā o rand-en
Phuturen Rindānī hand-en
Nām ma rāǐn buland-en
Agh tharā itibār na-bitha
Khasā go chamān na-ditha
Khatte kuhnē gwar niyāthen
Gawāh shāhid kadh niyāthen
Kissavānī kissav-āthant
Har-khase 'shī lanēosh-athant
Man sāhiyān Sobha, kāp kāte
Ne pha rand perowāte
SPECIMENS OF THE

Sov drapá Jawánakeghá
Júfo jhatá wathiyá
Drogh bande zahiriyá
Rást gushaghráj rást riwáh-en
Drogh pha ímáná khatá-en
Ar pha guftáre tayár be
Shedh-demá gawáhiyá de,
Khatte mára khash phe-de,
Biyá, azh shairán karár khan,
Ólí Rindán pha-phadhá khan
Nínавáhta kissavá khan
Surphadhení pha-gwará khan
Main hadísán man dilá khan
Sobha khapthaghe azh drikh-bálán
Thái nighwárí sher nálán
Sunya thái Túví dálán
Zurthiyá jangá maniyá
Zulm-zará sahibiyá
Phrushtaghrá bé-ronaghíyá
Zurthaghe mardán gihaná
Chandehá juhl-khenaghíená
Rúnghan Bádor yárán
Sanghar ládí mazarán
Shán hilálen khobištáná !
Muhammad Hán dru-h-gihaná
Zeb Buzdárá hilál-an
Shaddav o khes go khawáhán
Nind-uyádh gwar Umaráhán.
Hál khárhán hánkasará
Gwar maní Sardár Hána
Gwar má báutí ki ákhthá
Azh thái jangá rahelka
Rúnghan o Kándor Bádor
Shángo Sanghar dan Siríyá
Band Bázen Bákharía
Ráj alhant sínán dariyá
Drust khákhthághant whazh-dilíyá
Gwámkh Leghár charíyá
Phurs, Sobha shairára
Saghár o lekhí wathára
Wházhá 'shí mēdhùrára
Wházhá thái dem ma shustáí
Lashkarán Jáme ma khushtáí
Shakula ber shamushte
Manghí shair pha hisív-ant
Gál pha uzhmárá o kitáv-ant
Majlís ma meráván bánt
Dan nighshán nishthaghén sat
Khthaghén báut ki kháiyant
Gírd sardárán gihená
Dostant cho chhamán doená
Azh bachh-brátháá bingoená.
Shá pha báutáñ wathiyá
Lajj neshtha pha-phadhiyá
Bakhóa shwáí mane go sháán
Kadh na khant ehmo ma Balochán
Khthaghhe lajján wathiyá
Khashthaghkant gudr lavílán
Mál madí go galímán
Basth-kháarthant mane vakílá
Azh thaí koṭá garhená
Thái mehdhirá dír-zánaghená
Díthka go chhamán doená
Gosh Sobha o niyáži
Esh maní guftárá-báži
Tho ki guftáre kahitha
Man dú pha goshán sunítha
Tápaka dánga ganítha
Chi ma sháána sar-ákhthá?
Phurse' sardará wathiyyá
Jawánaká be-ámilená
Bakhtmal o bor go khawáhán
Dáthaghén maín Umará Hán
Hán Balochána Nawáva
Nukarí bokhtha azh tháná
Dátha hoten Jawánakára
Pholáthi olí ba-níndán
Bíthaghhe báut go Rindán
Khoh phish-burea nhíngan'
Phish phara khohú shaghán nest.

Translation.

Gáhi, 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 Hárin, 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 Rúngah 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 Rúngah, 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-cutters 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 Jáím Durrak a Dombki, 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 Samán be-phursá bihishtiye
Azh latífá nemaghí khaíye
Man gulá dema mail khaíhe doshé
Bairamo ási sár khutho mátos
Bo azh brikkán rapthaghán whasheń
Hijr manán monín jaunánt pásán
Cho kahírání úrven ásán
Be-karár-án ma nemshafí pásán
Pha whashí o dost hubbo iklásán
Zillatán sáhsáre deáé jánuá
’Nah’ na khanán pha dost pharmáná
Cho isparán dempán maní jáne
Chábuk o chashm díd paikáne
Kahr amulání girgiren názant
Dadame gár-ant dadame báz-ant
Nain dafá gir kí gál khanan roshen
Nain manán kurzat mazál chosh-en
Pha dafá mahlijá dí ján áyán
Nishtho dúa go hawán roshe
Wa hudhá mephán man dilá shefí
Er-khañ dost azh thangáven thakhtá
Biáí rodhána cho chyárdahí máhán
Masaron bí cho Akbare Sháhán
Gudá azh durr-chíren dafá phursán
‘O badhashkání grán bahá lálen
Mára thai loghwáren saren saughan
Irmirí gon-khatpon annágháí
Phar thai sahthi sakalen nyádhán
Hon bahá ban pha sakalen khulkán.’

Another Song by Jám Durrak.
Doshi dil-raváhen jání
Sartáj o samand khádáni
Gwasathom pha dafí phanání
Osá thau machar haívání
Gird-i áräván phirwání
Chandí áshkárrá ziyání
Kulfo phrushthaghána shakání
Ishk o manítha hakání
Gwasathom keghadheen súzárá
durchíno hazár názará
Phulkand o shakar guptará
O hál i fakíre esh-an
Zirde azh phirádhán resh-an
Án ki málik dozdár-an
Án azh munkirán bezár-an
Jám jámaván kháksár-an
Harzátá darúd kár-an
Sháhen 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 Kahir-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-enchanting 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 wiles 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 Júm 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.

_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 Bráhin 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  
Duzhmáneá resentha-ish khashtha  
Bánghavá pahre ráh sará gwastha  
Go minnat mephán niyadh dastá  
E bujhárat Bráhimá bastha.

**Bozh.** Warnáí.

*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 back again. Bráhim composed this riddle.

*Answer.*—Youth. (The enemy is old age.)

2. *Bujhárat.*—Hudháí kurzat o kárá  
Zamín nestath o dígárá  
Be khishthaghén khishhárá  
Hudháí kurzat o kárá  
Sabz o phul bahárá  
Pha phashaghá dí tayárá.

*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 corn growing on the beam across the mouth of a well.

3. *Bujhárat.*—Bráhimá pairí gwashtbaghá gále  
Díthaghún 'chíe ranghá be hále  
Rangén kojhá andaren lále  

**Bozh.**—Askhohe.

*Riddle.*—Last year Brahim said 'I saw something of an indescribable sort. Its appearance was foul, but there was bright red within.

*Answer.*—A flint.

4. *Bujhárat.*—Ya shai jawain ulkahá yaká  
Go jherave jangán sadhbarak saká  
Har-khase kháíth, jathí wathí chaká  
Man na gindáuí jagahe dbakká  
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 attened and guess it right.

Answer.—A well.

5. *Bujihurat.*—Ya drashke joreutha páken hudháyá
   Ma zamín phushtá pha jindén razáyá
   Bund yáken-í lámb-en duáyá
   Yake rekhir bitha, 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. Talábí naukarant kharde ajab bhat
   Kadam pha lekhav-ant-ish kár o khidmat
   Hame fauj dhurá be hathyár en
   Phithí phoshindaghán yák o tawár 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 dithom pha nakhbar
   An shahr be sáh watan
   Ahání adh jang o jadal
   Nyámíjí nawant yake digar.

   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 kisánakee taiyár-en
   Na rothi máth, baékh olá sawár-en
   Phithí nesténi, phírük haiyáit-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 Sindhi. The name of the country Dadar 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 Hauri, the mother's Gauri, meaning in Sindhi light and heavy. The son's name Gháibí, and the grandfather's Haiyat explain themselves.

9. Hudhá pakko kuzraten bandá pálith
Rusul Muhammad en ummatwálí
Hazáren bandagh yaken tháli
Chamodhá khas no roth horg o kháli
Hamodhá giptho harchí dú wártha-ish
Hamá whán zurtho loghá dú ártha-ish
Guđá jatko bhorentho tháli újártha-ish
After an invocation 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 carry it home,
And having thrown it down and broken it they leave it bare.

Answer.—This contains a pun on tháli, 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. Dárki sháhá parwaren khaptha man logh buná
Ní ki bandaghn razentha bitha pha husn o pharáñ
Wash hadith o khush lisán
Roth go phuleń ambalán
As long as God had charge of him he lay at home;
Now that men have constructed 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 phureń dítha májáí
Nishtaghá lálo nestábí dáí
Pyáláe wártho lál shahíd bitha
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.
1880.]

**BAŁOČHĪ LANGUAGE.**

*Answer.—* The flame of an oil-lamp which goes out after having drunk up the oil.

12. Do gohárán dístha ambáží
    Ajab khus¹ ant gwar ambáží
    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. Phairi khákhtán pha gidhár
    Man Bakri shahr gwara
    Bolí athí washen ūawár
    Dástán giptí 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 litír o phíren zál
Warná sará sár-bár.
Old shoes and an old wife
Are the burden of a young man’s life.

Savžen eho hítken, charpí 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*).

Khatán sokkhta áfá phúkí wárth.
One burnt by hot milk will not drink even water without blowing on it.

This corresponds with the Hindustání proverb ‘Dúdh ká jalyá cháneleh hí píwat phúnk,’ or the English. ‘A burnt child dreads the fire.’

Málá sar-daí várá dosh.
Let the cattle go and milk the hedge.

This answers to ‘Penny wise and pound foolish.’
ERRATA.

Page 3, line 8, read 锸 for j

5, 33, pronounced for pronounced.
7, 9, nyánuwán for nyáyuwán.
7, 40, rasída for rasúda.
8, 19, nadhar for nádrá.
10, 2, add and jawarah after zik.
13, 18, read phalo for phale.
13, 29, límu, a " límúa,
16, 33, shákhá, shákhá.
17, 8, marde " mardá.
24, 18, kithán, than for kithán than.
25, 35, biyár for riýár.
32, 14, see it himself for see himself.

33, 38, transpose {nowhere hizhgaren.
{elsewhere thíhandá.
37, 25, read welcome for welcome.
42, 20, phádh-ágh for Pádh-ágh.
43, 21, bili for kili.
44, 7, annám for annám.
44, 10-14, án — " án—
46, 16, leeward " lee-ward.
47, 12, bákí " báqi.
47, 34, baterá " baterá.
49, 5, baragh " beragh.
49, 10, dele P. burú, Skr. bhrú.
49, 10, after برويت baroeth add barwán, s. the eye-brow.
P. burú, Skr. bhrú.
54, 13, read páñwar 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, "darágh for dáragh.

" 85, " 20, " sará sá " sará sa.
" 87, " 32, " sumb " samb.
" 93, " 13, " Maurorum for Mauroram.
" 95, " 13, " sixtieth " sixth.
" 105, " 13, " Gırán for Gırán.
" 105, " 31, " giryán " gírgán.
" 108, " 21, after Gwánkh insert Gwánkh, a camel driver.
" 108, " 33, read Qozan for Qozan.
" 109, " 26, " flesh " físh.
" 110, " 3, " Góm for Góm.
" 110, " 34, after giánth insert giánth, giyáf, fertile, extensive.
" 111, " 2, read Salix for Salia.
" 114, " 24, " man " mau.
" 115, " 16, " mán-deagh for man-deagh.
" 115, " 27, " Hákhání " hákhání.
" 117, " 21, " leap " leap.
" 119, " 31, " mahisk " mahisk.
" 124, " 30, " Négá " neghár.
" 124, " 31, " níkah " nekah.
" 125, " 8, " vakhtá " vakhat.
" 125, " 16, " P. Khwája " P. Khwaja.
" 127, " 6, after Whán insert Whántkár, master, owner.
" 127, " 26, read Ubási for Ubási.
" 129, " 33, after Himání insert Himár, tender, delicate, beautiful.
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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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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 grandieria 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 Proboscidia 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 duvancellii.

p. 35. After Lutra paleindica, there should be mentioned the probable occurrence of a second Siwalik species.

" The name Cliff, in place of Falconer and Cautley, should be appended to Mastodon latidens.

" After the name Chalicotheicum sivalense add (F. and C.)

p. 37. Line 8 from top; after Megaloscelornis sivalensis (Lydy.) add S.

" 21 from top; after Colossochelys atlas (F. and C.) add S. I.

p. 49. For EI$O_1 + 0.04775 P_{01}$ read EI$O_1 + 0.04775 P_{01}$

also $P_{01} = 0.009947$  $P_{01} = 0.009956$

p. 52. Line 22, for "resect" "result."

" 23, " P_1 " P_6 in one place.

p. 53. " 23, " W " 0

" 23, " W_1 " O_1

p. 63. " 5, from bottom for "read "—"

" Last line for "SG" read "SG"

p. 69. Last line, $0.6475 P_{03}$ read $0.6475 P_{03}$.

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.

Diff.

\[ \begin{align*}
\text{Diff.} \\
\text{+ 0.020194} & \equiv 0.275 R_1 \\
\text{should read} & \\
\text{+ 0.020194} & \equiv 0 \\
\text{275} & \equiv 0 \\
\end{align*} \]

ADDITIONAL ERRATA.

Page 182, line 27 from top, for Five read Two.

186, 8 from top, "angulata-lunaris" read "angulato-lunaris." 

186, 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 "Sitala" read "Sitala".

192, bottom line, for "ponsa" read "ponsa".

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.
"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, Asiatic 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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<td>VII.—Synopsis of the Species of Choeradodis, a remarkable Genus of Mantodea common to India and Tropical America.—By J. Wood-Mason, Officiating Superintendent of the Indian Museum, and Professor of Comparative Anatomy, Medical College, Calcutta,</td>
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Title-page and Index to Vol. XLVIII, 1879.
1.—On a Simple Method of using an insignifiant 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-oerstedts, of which not more than 3 milli-oerstedts 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-oerstedts would (as a maximum) have to be tapped off from the main current of 30,000 milli-oerstedts. 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-oerstedts which a dynamo-electric machine is able to produce, can be expressed as follows:—

\[
C = E \left\{ 1 - \frac{e}{r + \frac{v}{r + m}} \right\} \times 1000
\]

* In India we use positive signalling currents.
E and κ are two constants for any dynamo-electric machine. E is an electromotive force in volts; κ 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

\[
\frac{Cr}{R+r} = E \left\{ \frac{1 - \frac{K}{r+m}}{\frac{r+m}{r+m}} \right\} \times \frac{1000 r}{R+r}
\]

and this current, in the case of the Indian lines, should not be less than 6 milli-oerstedts. Hence we have the following equation:

\[
E \left\{ \frac{1 - \frac{K}{r+m}}{\frac{r+m}{r+m}} \right\} \times \frac{1000 r}{R+r} = 6
\]

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-oerstedts).

*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-oerstedts; 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 Nepal or Ladakh 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 tusk. Again, the same traveller‡ mentions the occurrence of the same animal in eastern Tibet, probably somewhere near the longitude of Lhasa, 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 Tsânpû river near Shigâtse 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 Ladâks as Lá) is found in Tibet as well as in Kashmir.

During the past summer, I met in Lahul with a Tibetan who had formerly occupied a high official position at Lhâsa, and who informed me,

* Markham, 'Tibet.' Int. p. cxxii, p. 197.
† Hodgson 'Trade of Nepal.'
‡ Cunningham. 'Ladak,' p. 242.
§ Markham, loc. cit., p. 114.
that the Musk-Deer was of common occurrence on the Tsánpú river in the
neighbourhood of Lhásá.

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 Lhásá, 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 Lhásá,
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. mosche-
férus. 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 Mis-
sion* (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.
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 Kashmir and Tilel (Kishenganga valley), on the pass between Tilel and Drás, and on both sides of the Zoji-Lángi, 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 Maidán, 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).

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† 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 Gondwâna 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. Noticable among these are the names of Buckland, Crawford, and Clift. Crawford, 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. Peutland, 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 Brahmattherium, by Mr. Bettington and Professor Owen, to the ‘Journal of the Royal Asiatic Society.’ A few Siwalik fossils collected by the Messrs. Schlagnintweit 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 Rütimeyer, 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

* Scr. 2, Vol. II.
vertebrate paleontology 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, Stoliezka, 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. (Jamma Bones); Cantor, T. (Siwalik fish-skull); Carter, Dr.; Colebrooke, Sir T. (Tibet Tertiary Mammals); Dawe, W. (Tertiary Vertebrates); Dean, E. (Jamma 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 (Archeosaurus from Bijori); Hügel, Baron (Perim Fossils); Ewer, W. (Siwalik Vertebrates); Lush, Dr. (Perim Vertebrates); Ousely, Col. (Narbada Mammals); Pepper, Miss (Perim Mammals); Phayre, Sir A. (Ava Mammals); Prinsep, J. (Tertiary Mammals); Rivett-Carnac, H. (Archeosaurus from Bijori); Royle, (Siwalik Mammals); Sim, Lieut. (Archeosaurus 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
batraebians, 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
sutures, and it, therefore, seems probable that many other species must have
left similarly scattered remains throughout the strata of India, which from
their extremely local distribution have hitherto escaped detection.

No distinctly recognizable traces of mammals have been as yet de-
tected 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 mam-
malian 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 once 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 *Poeicilodus*, under the name of *P. paradoxus*, is of the flattened eustraciont 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 *Psemmodus*, characteristic of the Carboniferous. A fourth tooth is referred to the European genus *Petalarhynchus*, with the specific name of *P. indicus*: it is extremely doubtful whether *Petalarhynchus* 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. gigan-
teus*. 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 *Thaumatacanthus blanfordi*.

As far as the evidence of these fishes goes, we find that the eustracion-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 Ganoidei 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 Srípermátiir 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

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* 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 Rhaeto-triasic of those of the latter.

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 oelobranchs, ranged under the genera *Corax, Enchodus, Lamna, Odontaspis, Otodus, Oxyrhina, Ptychodus,* and *Sphærodon,* 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 Nummulite rocks of Port Blair, in the Andamans, and Rāmri 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 Rāmri 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 Thatyuño, eyeloid fish-scales have been obtained,|| but are not generically determined.

From the Nummulities 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 Nummulities 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

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* Palæontologia Indica, Ser. IV, part 2.
† Ibid., Cretaceous Fauna of S. India, Vol. IV.
§ R. G. S. I. Vol. XIII, part I.
** Ibid. Vol. XIII, part I.
Capitodus was previously only known from the Miocene 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 proceed 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 Pinelodus: 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, Hetero-branchus, 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 vertebrae, 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 vertebrae 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.
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 Gondwana 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

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* 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.
|| Palaeontographica, Vol. VI, pl. XI, fig. 5.
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, Bothriecops; the genus seems to me to be also closely allied to Tuditanus 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. Stoliczka,† from the absence of vomerine teeth and from the structure of the limbs, referred the species to the genus Oxylossus, 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 Dicyonodontia (Anomodontia), and occur in the presumably Triassic rocks of Panchet near Raniganj, in the horizon known as the "Panchet group." The Dicynodon 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 Dicynodon. 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

‡ M. G. S. I. Vol. VI, p. 387.
|| 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 Gondwâna 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 (Caëbh), there has been obtained (Châri 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 Trichinopoli, 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 *Cotiosaurus*, 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.*

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* Pal. Ind. Scr. IV, part 3.
‡ Ibid. XXV, p. 151.
|| Pal. Ind. Scr. IV, part 3.
¶ Ibid.
** Ibid.
blanfordii. 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 Crocodilia, 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 vertebrae 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 Emydidae. 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 Nummulitics of the Punjáb, remains of Crocodilia 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 Nerbadas, a considerable number of reptilian remains have been obtained, but, in many cases, have not yet been described. Remains of Crocodilia 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 Crocodilus, a Siwalik species has been identified with the living C. palustris (bombifrons, Gray).§ Remains of a crocodilian have

* Pal. Ind. Ser. IV. part 3.
† Ibid.
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 Manchhiars of Sind also belongs to this species. Another long-jawed Siwalik crocodile 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 vertebrae, much like those of the genus *Python*, obtained from the Siwaliks of the Punjab and Sind; these vertebrae 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 existence 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.

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Theobald* under the name of *B. sivalensis*. This species, according to Mr. Theobald, is very closely allied to *B. crassicolHs*, which, according to the same writer,† inhabits Tenasserim, Siam, and Sumátra. The other living species (*B. nuchalis*) inhabits Jáva. Another carapace of a Siwalik emydie, 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 *Damonia (Emys) hamiltonii*, now inhabiting Lower Bengál: the generic name of the fossil should probably be *Damonia*. An imperfect carapace, collected by Mr. Theobald in the Siwaliks of the Punjab, and now in the collection of the Indian Museum, seems to belong to *Emys* proper. Mr. Theobald has lately described,‡ under the name of *Caudena annuliger*, a gigantic Siwalik emydie, 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 *Bataguridae*, Dr. Falconer determined the identity of a Siwalik emydie 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. dhammeroka*, 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 Rürki 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-

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† Catalogue of Reptiles of India, p. 10.
‡ R. G. S. I. Vol. XII, p. 186.
* 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 Punjab, 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 (*Hydrospis*) 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 comparative-
ly 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 tarsometatarsus is considered by Mr. Davies to belong to
a cormorant, possibly of the genus *Graculus.*‡ A species of pelican (*Pele-
canus 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 *Mega-
oscelornis*; it makes some approach to the humerus of *Plotus*. A
species of adjutant has been named by Milne-Edwards *Argala falconeri.*§

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* R. G. S. I. Vol. XII, p. 52.
‡ 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 emu (*Dromaeus 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 emu 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.

*Miö-Pliocene.*—The Tertiary ossiferous rocks of Perim Island, Sind, the Punjáb, 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 Crawfurd 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 fossiferous beds are of Miocene, 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 *Palaeanthropus sivalensis*;‡ this

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* 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 (Macharodus), 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. paleindicus. The genus Pseudaelurus, 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. cautilcyi), 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. paleindicus,¶ remains of which have been obtained from Sind and the Punjáb. The bears are known by a single undescribed eranium of Ursus in the Indian Museum, and by the remarkable genus Hyænarctos, 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

‡ 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.
|| Ibid. p. 32.
¶ Pal. Ind. Scr. 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 \textit{H. paleindicus},* is known only by an upper jaw, not yet figured; the upper molars of this species have triangularly shaped crowns, somewhat like those of \textit{Amphicyon}. Of the subursoid Carnivora, we have the living Indian and African genus \textit{Mellivora}, represented by \textit{M. sivalensis},† apparently very closely allied to the living Indian species. A species of badger (\textit{Meles}) is indicated by one lower jaw collected by Mr. Theobald.‡ Of the otters, one species of \textit{Lutra} (\textit{L. paleindica}) 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. \textit{Enhydriond}|| is a genus peculiar to the Siwaliks, and is allied to the living sea-otter (\textit{Enhydris}) now inhabiting the shores of the North Pacific; the Siwalik genus was not improbably a river-dwelling form.

Of the Proboscidia, now represented only by the Indian and African elephants, there were a large number of Siwalik species, belonging to the genera \textit{Elephas}, \textit{Mastodon}, and \textit{Dinotherium}. Of the first-named genus, there were three sub-genera living in Siwalik times, \textit{viz.}, \textit{Elephas}, \textit{Loxodon}, and \textit{Stegodon}. \textit{Elephas} was represented by \textit{E. hysudricus}, provided with simpler molars than the living representative of the sub-genus; \textit{Loxodon} was represented by \textit{L. planifrons}, remarkable for being the only species of elephant in which premolars are known to have been developed. The sub-genus \textit{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 \textit{S. ganesa}, \textit{S. insignis}, \textit{S. bombifrons}, and \textit{S. cliftii}. 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 \textit{S. cliftii} 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 \textit{S. sinensis} and \textit{S. orientalis}, which appear to be respectively the same as \textit{S. cliftii} and \textit{S. insignis}|| Of the mastodons, five species, \textit{M. sivalensis}, \textit{M. latidens}, \textit{M. perimensis}, \textit{M. pandionis}, and \textit{M. falcouteri}, 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

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† Ibid. p. 102; named in \textit{F. A. S.' Ursitaxus}.
§ P. A. S. suppl. pl. Pl.
|| Ibid.
Miocene genus *Dinotherium*, three species, *D. indicum*, *D. pentopotamiae*, and *D. sindiense*, have been described from the Indian Miocene-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 Miocene-Pliocene. Of *Rhinozeros* there are four named species, *R. iravadiens*, *R. sivalensis*, *R. palaeindicus*, 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. indicus*; *R. sivalensis* and *R. palaeindicus* were unicorn, and *R. platyrhinus* was bicorn. Bones of one species have also been obtained from Tibet. The hornless rhinoceroses were represented by *Acerotherium pere-menense*, 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 'Palaeontological Memoirs.'§ The genus *Listriodon‖* is represented by two species, *L. pentopotamiae* 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 *Palaeotherium*. The horses are represented by the genera *Equus* and *Hipppotherium* (*Hippalion*). *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 Proboscidia, see F. A. S. and Pal. Ind. Ser. X, Vol. I, pt. 5 (in the press); a jaw of *D. pentopotamiae* was described as *Anotetherium* by Falconer.
‡ Some molars of this species were described by myself under the name of *Rhinozeros planidens*. *R. Sivalensis* has lately been made the type of a new genus *Zalabis* by Prof. Cope, but on insufficient grounds.
‖ 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.
** Professor Huxley (Q. J. G. S. L. 1870, Presid. Address) remarks that some of the Siwalik horses show traces of a "larmial" 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 ease with *H. antilopinum*, but it is certainly not so with the larger *H. theobaldi*, of which there is a nearly complete triaenotyle foot in the Indian Museum. *H. theobaldi* has not yet been fully described; it is very like *H. gracilis*, to which species some Siwalik molars were referred by H. von Meyer‡ under the name of *Equus primigenius*.

Of the artiodactyle 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. iravadianus* and *H. sivalensis*), both belonging to the hexaprotodont sub-genus. A Siwalik bunodont (*Tetraconodon magnus*)§ 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. hysudriensis*, 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. *Hippophyus* 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 Mioocene genus *Hyotherium* 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 selcendont teeth, we have, among the forms with five eusps on the molars, a species of *Anthrotherium* (*A. silistrense*)†† from Sind, the Punjab, and Sylhet, and a species of *Hypopotamus* (*H. sindiense*)‡‡ from Sind: among the forms characterized by having only four eusps on the molars, we have four genera, *Merycopotamus*, *Charonoryx*, *Hemimeryx*, and *Siameryx*; all peculiar to the Sind and Punjab 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 et Géologie de l’Attique" p. 231.
‡ Palaontographia, Vol. XV, p. 17.
|| 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. punjabiensis*.
||| Falconer in a ms, note described some teeth of *Dorcatheirium*, under the name of *Merycopotamus nasus*. (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 *Dorcatherium* 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 Kâshmir 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 Pikerim 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 iravadien* 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 Punjab, 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 (*Tetraeroceros*), 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 megaceiros* and *Aloes*: 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 cervicorn ruminants, and that they probably

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† 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.
‖ Vol. IV, p. 506.
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 Rütimeyer under the name of Bucapra daciei. 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. 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 Probobalus, Amphibos, and Peribos; the synonymy will be found in the first volume of the tenth series of the 'Palæontologia Indica,' where all the other Indian fossil ruminants are noticed. Part of this volume is still in the press.
culiarity 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 Camelidae; 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 perissodactyle 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 proboscidians. 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 *Hemitobos*), 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.

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 Jamna 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 Pen-ganga 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. ganes a* 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

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* 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.
‡ Faun. Ant. Siv. *E. paleonius* 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. palaeindicus*) is tetraprotodont, like the larger living species;* H. palaeindicus* 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) duvaucelii*. 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 palaeindicus* of the same authors, very closely allied to the living wild Indian buffalo, also found in the Jamna alluvium; and *Leptobos frazeri* of Professor Rütmeyer. 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 (*Charopsia*) 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.**


Macacus rhesus. Gúlpara and Madras.

Proboscidea. Euelephas indicus. India and Burma.


Sus indicus. Madras.

Cervus. Kattiawar.

Antilope cervicapra. Ganges Valley. (?)

Bos. sp. Kattiawar and Plains.

Reptilia. Chelonia.

? (plates) Calcutta.

Other undetermined remains of, probably, recent species.

2. **Pleistocene.**

Mammalia. Primates. Homo. sp. Narbada (weapons) and Madras (weapons and bones).


? Mastodon pandionis. (Falc.) Deccan.

Ungulata. Rhinoceros deccacensis. (Foote.) Deccan.

? indicus. (Cuv.) Narbada.


Sus giganteus. (F. and C.) Narbada.

Cerus sp (? ducanellii) (Narbada).

Bubalus palaeindicus (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. Crocodilia. 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.

Pseudalurus 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.

Hyænartos 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.**  Eulephas 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.
— eliiñii.  (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.
— pentapotamie.  (Falc.) S.
— sindienœ.  (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 perimensis.  | (F. and C.) P. Sd. S. I. |
|—— Listriodon pentapotamie.  | (Falc. sp.) |
|—— theobaldi.  | (Lyd.) S. |
|—— sp.  | Tibet. |

| Hippotherium antilopinum.  | (F. and C.) S. |
|—— theobaldi.  | (Lyd.) P. S. Sd. |
|—— sp.  | Tibet. |

| 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. |

<p>| Sanitherium schlagintweiti (Myr.) S. |
|—— Hyotherium sindiene (Lyd.) Sd. |
|—— Anthracotherium silistrense.  | (Pent.) S. S. Sd. |
|—— Hyopotamus palæindicus.  | (Lyd.) Sd. |</p>
<table>
<thead>
<tr>
<th>MAMMALIA. UNGULATA.</th>
<th></th>
</tr>
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<tbody>
<tr>
<td>Merycopotamus dissimilis.</td>
<td>(F. and C.) S.</td>
</tr>
<tr>
<td>Charomeryx silistrensis.</td>
<td>(Pom.) Sy.</td>
</tr>
<tr>
<td>Hemimeryx, sp. (Lyd.) Sd.</td>
<td></td>
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<tr>
<td>Sivameryx, sp. (Lyd.) Sd.</td>
<td></td>
</tr>
<tr>
<td>Cervus triplidens.</td>
<td>(Lyd.) S.</td>
</tr>
<tr>
<td>— sivalensis.</td>
<td>(Lyd. Mss.) S.</td>
</tr>
<tr>
<td>— simplicidens.</td>
<td>(Lyd.) S.</td>
</tr>
<tr>
<td>— (?) latidens.</td>
<td>(Lyd.) S.</td>
</tr>
<tr>
<td>Dorcatherium majus.</td>
<td>(Lyd.) S.</td>
</tr>
<tr>
<td>— minus.</td>
<td>(Lyd.) S.</td>
</tr>
<tr>
<td>Paleomeryx, sp. (Lyd.) S. Sd. (?)</td>
<td></td>
</tr>
<tr>
<td>Camelopardalis sivalensis.</td>
<td>(F. and C.) S. P.</td>
</tr>
<tr>
<td>— sp. S.</td>
<td></td>
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<tr>
<td>Hydaspitherium grande.</td>
<td>(Lyd.) S.</td>
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<tr>
<td>— leptognathus.</td>
<td>(Lyd.) S.</td>
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<tr>
<td>— megacephalum.</td>
<td>(Lyd.) S.</td>
</tr>
<tr>
<td>Bramatherium perimense.</td>
<td>(Falc.) P.</td>
</tr>
<tr>
<td>Sivatherium giganteum.</td>
<td>(F. and C.) S.</td>
</tr>
<tr>
<td>Vishnutherium iravadium (Lyd.) I. S. (?)</td>
<td></td>
</tr>
<tr>
<td>Antilope palaeindica.</td>
<td>(F. and C.) S.</td>
</tr>
<tr>
<td>— patulicornis.</td>
<td>(Lyd.) S.</td>
</tr>
<tr>
<td>— porrecticornis.</td>
<td>(Lyd.) S.</td>
</tr>
<tr>
<td>— sivalensis.</td>
<td>(Lyd.) S.</td>
</tr>
<tr>
<td>? Palseoryx, sp. (Lyd.) S.</td>
<td></td>
</tr>
<tr>
<td>Portax, sp. (Lyd.) S.</td>
<td></td>
</tr>
<tr>
<td>Hemibos occipitalis.</td>
<td>(Falc. sp.) S.</td>
</tr>
<tr>
<td>— acuticornis.</td>
<td>(Falc. sp.) S.</td>
</tr>
<tr>
<td>— antilopinus.</td>
<td>(Falc. sp.) S.</td>
</tr>
<tr>
<td>Leptobos falconeri.</td>
<td>(Rüt.) S.</td>
</tr>
<tr>
<td>Bubalus platyceros.</td>
<td>(Lyd.) S.</td>
</tr>
<tr>
<td>— palaeindicus.</td>
<td>(F. and C.) S.</td>
</tr>
<tr>
<td>Bison sivalensis.</td>
<td>(Falc. MSS.) S.</td>
</tr>
<tr>
<td>Bos acutifrons.</td>
<td>(Lyd.) S.</td>
</tr>
<tr>
<td>— planifrons.</td>
<td>(Lyd.) S.</td>
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<tr>
<td>— platyrhinus.</td>
<td>(Lyd.) S.</td>
</tr>
<tr>
<td>Bucapra daviesii.</td>
<td>(Rüt.) S.</td>
</tr>
<tr>
<td>Capra perimensis.</td>
<td>(Lyd.) P.</td>
</tr>
<tr>
<td>— sivalensis.</td>
<td>(Lyd.) S.</td>
</tr>
<tr>
<td>— sp. (Lyd.) S.</td>
<td></td>
</tr>
<tr>
<td>? Ovis, sp.</td>
<td>(Blyth.) S. T.</td>
</tr>
<tr>
<td>Camelus sivalensis.</td>
<td>(F. and C.) S.</td>
</tr>
</tbody>
</table>
MAMMALIA. Rodentia. Mus. sp. S.
Rhizomys sivalensis. (Lyd.) S.
Hystric sivalensis. (Lyd.) S.

Edentata. Manis sindiensis. (Lyd.) Sd.

AVES. Carinatæ. Graculus (?), sp. (Dav.) S.
Pelecanus cautleyi. (Dav.) S.


Ratitæ. Struthio asiaticus. (M. Ed.) S.
Dromæus sivalensis. (Lyd.) S.
Gen. indet. (Brit. Mus. Col.) S.

REPTILIA. Crocodilia. Crocodilus palustris (Less.) S. P.


Lacertilia. Varanus sivalensis. (Fale.) S.

Ophidia. Gen. indet. S. Sd.

Chelonia. Colossochelys atlas. (F. and C.)
Testudo (?), 5 sp. S.
Bellia sivalensis. (Theo.) S.


PISCES. Elasmo-
branchii. Careharias, sp. I.
Lamna, sp. Sd.


Teleostei. Chaca (?), sp. S.


2. Eocene (Intratrappean and Nummulitic).

(artiodactyle astragalus) Punjáb.
III. SAUROZOIC (MESOZOIC).

1. CRETACEOUS SERIES.


2. JURA-TRIASSIC SERIES.

REPTILIA. DINOSAURIA. Ankistrodon indicus (Hux.) Panchet gp. CROCODILIA. (amphicaelian sp.) (Lyd.) Chari gp.
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REPTILIA. Crocodilia. Parasuchus, sp. (Hux.) (hislopii. MSS.) Maleri gp.

—— ? sp. (Lyd.) Denwa gp.

Lacertilia. Hyperodapedon, sp. (Hux.) Maleri gp.

Dicerodon. Dieynodon orientalis. (Hux.) Panchet gp.

——— sp. Panchet gp.

Plesiosauria. Plesiosaurus indicus (Lyd.) Umia. gp.

BATRACHIA. Labyrinthodontia. Brachyops latieeps. (Ow.) Mangli. gp.

Dipnoi. Gonioglyptus longrostris. (Hux.) Panchet gp.

Pachygonia ineurvata (Hux.) Panchet gp.

Arehigosaurus (?) 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.

——— calcaratius. (Eg.) Kota gp.

——— deeeanensis. (Eg.) Kota gp.

——— longiceps. (Eg.) Kota gp.

——— paehylepis. (Eg.) Kota gp.

Tetragonolepis analis. (Eg.) Kota gp.

——— oldhami. (Eg.) Kota gp.

——— rugosus. (Eg.) Kota gp.


IV. Ichthyozoiic (Palaeozoic).

1. Carboniferous.

PISCES. Ganoidei. Sigmodus dubius. (Waag.) Salt-range.

Elasmobranchii. Poeiilodus paradoxus. (Waag.) Salt range.

Psephodus indicus. (Waag.) do.

Helodopsis elongata. (Waag.) do.

——— abbreviata. (Waag.) do.

Psammodus, sp.

Petalorbyneus 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
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.

(Read 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 PS. 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 grammes 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 \( \cong \) 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 40½ 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 O₁ with EI it is necessary to have a density of O₁: I have determined that of O₃ and assumed it to be the same as that of O₁ and of the other O weights.

It appears from the papers received from the Standards Office that O₃ = 3 Troy ounces = 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 O₃ in water, having been hung by a fine wire of platinum so as to be immersed in distilled water; O₃ was placed in the pan in air, and counterbalanced with weights. O₃ being then placed in the hook, and all air bubbles carefully removed, it was found that; X being about 1490·2 grains:

\[ x \approx O_3 \text{ in water (temp. = 84°. 1) + hook &c. in water + (O}_3 + O_{04} + O_{005} + O_{001}) \text{ in air + } \frac{R^2}{10} \text{ at 10'02 divisions of the scale—} \]
then, removing $O_3$ from water, carefully drying it, and placing it in the pan, I found after adding 180 minims of water

$$X = O_3 \text{ in air + hook &c. in water} + 2.72 \frac{R_3}{10} \text{ at } 10.02 \text{ divisions.}$$

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°.5; this gives $\Delta O_3 = 8.5649$.

Again on July 7th, I found in the same way.

\begin{align*}
(A) \quad X + 5 \frac{R_1}{10} &\approx O_3 \text{ in water + hook &c. in water} + 167.54 \text{ grains + } 3 \frac{R_2}{10} \text{ at 13.30 Div.} \\
(B) \quad X + 5 \frac{R_1}{10} &\approx O_3 \text{ in water + hook &c. in water} + 167.54 \text{ grains + } 6 \frac{R_2}{10} \text{ at 4.72 Div.}
\end{align*}

and, after adding 169 minims of water.

\begin{align*}
(C) \quad X + 5 \frac{R_1}{10} &\approx O_3 \text{ in air + hook &c. in water} + 7 \frac{R_3}{10} \text{ at 14.80 Div.} \\
(D) \quad X + 5 \frac{R_1}{10} &\approx O_3 \text{ in air + hook &c. in water} + 9 \frac{R_3}{10} \text{ at 8.35 Div.}
\end{align*}

Temp. water 84.25 F.

Bar. 29.445.

Temp. 85.7 F.

Bar. 29.445.

Hence by interpolating between (A) and (B)

$$X + 5 \frac{R_1}{10} \approx O_3 \text{ in water + hook &c. in water} + 167.54 \text{ grs. + } 4.14 \frac{R_2}{10} \text{ Temperatures}$$

\begin{align*}
&\text{Water 84.25 F.} \\
&\text{Air 85.7} \\
&\text{Bar. 29.445}
\end{align*}

and from (C) and (D)

$$X + 5 \frac{R_1}{10} \approx O_3 + \text{ hook &c. in water + 8.49 } \frac{R_2}{10} \text{ Bar. 29.445}.$$ 

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 Weights.

I have adopted a uniform system of weightment 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 O₁ 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 P₁ was added to the left side and the resting point became 15·81 Div. Each resting point is deduced from 4 readings, two low l₁ and l₂, and two high h₁ and h₂. 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, \(\frac{l₁ + 2l₂ + l₃}{4}\) and \(\frac{h₁ + 2h₂ + h₃}{4}\) 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 \(\frac{l₁ + h₃ + 3(l₂ + h₁)}{8}\):

of course, when \(h\) comes first, the \(h\)'s take the place of the \(l\)'s in these formulae, and vice versa.

We thus have two "partial weighments"

\[EI \approx O₁ + 1·2 \times \frac{R₂}{10} \] at 7·54 divisions and

\[EI + P₁ \approx O₁ + 1·2 \times \frac{R₂}{10} \] at 15·81 divisions
from which I get, by interpolation, as a result of the "weighment"

\[ EI = O_1 + 1.2 \frac{R_2}{10} - P_{01} + \frac{2.46}{8.27} \text{ or } O_1 + 1.2 \frac{R_3}{10} - 0.297 P_{01} \]

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

\[ 4 EI = 4 O_1 + 0.191 P_{01} \text{ or } EI = O_1 + 0.4775 P_{01} \]

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 O1, 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 \( P_{21} \) 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 \( 479.05979 \) 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 O1 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 $O_1$ which is entered in the type form; in it, $v \frac{EI}{\Delta EI} = \frac{479.95979}{21.41\frac{1}{2}} = [1.35051]$

similarly $v \frac{O_1}{\Delta O_1} = \frac{479.99760}{8.5669} = [1.74842]$

May 24th, 1879 A. M.

Commenced at 6 h. 4s m. Ended at 7 h. 33 m.

<table>
<thead>
<tr>
<th>Dry Bulb 8.5 9 F.</th>
<th>Dry Bulb 8.5 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet do. 81 0</td>
<td>Wet do. 80 1</td>
</tr>
<tr>
<td>Vapour Tension</td>
<td>Vapour Tension</td>
</tr>
<tr>
<td>Diff. 4.9</td>
<td>in.</td>
</tr>
<tr>
<td>0.993 in.</td>
<td>5.3</td>
</tr>
</tbody>
</table>

Mean of Thermometers 85.5 Mean Red. Barometer 29.605

Correction 0.00 0.189(0.993 + 0.960) = 0.369

Mean Temperature 85.50 h. = 29.236 log 1.46592

log $v \frac{EI}{\Delta EI}$ 7.05597

(Tab. III.) log $(1 + E F t)$ 0.00035

Air displaced by $EI$ log 8.40683

Air displaced by $O_1$ log 8.80505

grains.

Weight $EI$ in Vacuum = 479.95979 of P S.

Air displaced

$$EI = 479.934273$$

Air displaced by $O_1$ = 0.063834

$$O_1 = EI - 0.000475*$$

$$O_1 = 479.997632$$

* In section IV, I found $EI = O_1 + 0.1775 P_{o1}$ and (Sec. VI) $P_{o1} = 0.009947$ grains.
Abstract of Comparisons.

1879 May 24, \(O_1 = 479.997632\) P S. grain.

" 28, " \(\cdot 997489\) "

" 30, " \(\cdot 996732\) "

" 31, " \(\cdot 997266\) "

" June 1, " \(\cdot 996311\) "

Mean \(O_1 = 479.997206 \pm 0.000115\) 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,... 29.787
- Temperature,............ 79.0 F.
- Humidity,................. 0.76 percent.

Hence I have weight of \(O_1 = 479.997206\) grains of P S.

Deduct displaced Standard Air = \(-0.065178\)

Add Standard Air for \(\frac{4.80}{7.000}\) W = \(+0.068571\)

\[O_1 \equiv 480.000599\] 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 \(O_1\) and \(O_{10}\) there are, in all English bullion sets, weights \(O_5, O_4, O_3,\) and \(O_2\); so between \(O_{10}\) and \(O_{100}\) come \(O_{20}, O_{30}, O_{50},\) and so on.

Between these weights we may make comparisons giving the following equations:

\[O_{10} \equiv O_5 + O_4 + O_1 + x_1 \pm e(a)\]
\[\equiv O_5 + O_3 + O_2 + x_1' \pm e(b)\]
\[\equiv O_4 + O_3 + O_2 + O_1 + x_1'' \pm e(c)\]

\[O_5 \equiv O_4 + O_1 + x_2 \pm e\]
\[O_5 \equiv O_3 + O_2 . + x_3 \pm e\]
\[O_4 = O_3 + O_1 + x_4 \pm e\]
\[O_3 = O_2 + O_1 + x_5 \pm e\]

Hence we have \(O_3 \equiv 2O_1 + x_4 - x_3 + x_2 \pm e\sqrt{3}\)
\(O_3 \equiv 3O_1 + x_5 + x_4 - x_3 + x_2 \pm e\sqrt{4}\)
\(O_4 \equiv 4O_1 + x_5 + 2x_4 - x_3 + x_2 \pm e\sqrt{7}\)
\(O_5 \equiv 5O_1 + x_5 + 2x_4 - x_3 + 2x_2 \pm e\sqrt{10}\)
\[ O_{10}^1 \equiv 10 O_1 + 2x_5 + 4x_4 - 2x_3 + 3x_2 + x_1 \pm e \sqrt{34} \text{ from (a)} \]
\[ O_{10}^1 \equiv 10 O_1 + 2x_5 + 4x_4 - 3x_3 + 4x_2 + x_1' \pm e \sqrt{46} \text{ from (b)} \]
\[ O_{10}^1 \equiv 10 O_1 + 2x_5 + 4x_4 - 3x_3 + 3x_2 + x_1'' \pm e \sqrt{59} \text{ from (c)} \]

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 \( O_{10}^1 \), on the accuracy of which we are dependent for continuing the upward series; thus the mean value of \( O_{10}^1 \) from (a) and (c) will be

\[ O_{10} = 10 O_1 + \frac{1}{2} (4x_5 + 4x_4 - 5x_3 + 6x_2 + x_1 + x_1'') \pm e \sqrt{3.3.3} \]

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 \( W_{10}^1 \).

1st. Descending through (a)

\[ O_5 = \frac{5}{10} O_{10} + \frac{x_3 - x_1}{2} \pm e \sqrt{\frac{5.0}{10}} \]
\[ O_4 = \frac{4}{10} O_{10} + \frac{1}{10} (2x_5 + 4x_4 - 2x_3 - 2x_2 - 4x_1) \pm e \sqrt{\frac{4.5}{10}} \]
\[ O_3 = \frac{3}{10} O_{10} + \frac{1}{10} (4x_5 - 2x_4 - 4x_3 + x_2 - 3x_1) \pm e \sqrt{\frac{3.5}{10}} \]
\[ O_2 = \frac{2}{10} O_{10} - \frac{1}{10} (4x_5 - 2x_4 + 6x_3 - 4x_2 + 2x_1) \pm e \sqrt{\frac{3.8}{10}} \]
\[ O_1 = \frac{1}{10} O_{10} - \frac{1}{10} (2x_5 + 4x_4 - 2x_3 + 3x_2 + x_1) \pm e \sqrt{\frac{3.4}{10}} \]

Again descending through (b)

\[ O_5 = \frac{5}{10} O_{10} + \frac{1}{10} (x_3 - x_1') \pm e \sqrt{\frac{5.0}{10}} \]
\[ O_4 = \frac{4}{10} O_{10} + \frac{1}{10} (2x_5 + 4x_4 + 2x_3 - 6x_2 - 4x_1') \pm e \sqrt{\frac{4.7}{10}} \]
\[ O_3 = \frac{3}{10} O_{10} + \frac{1}{10} (4x_5 - 2x_4 - x_3 - 2x_2 - 3x_1') \pm e \sqrt{\frac{3.8}{10}} \]
\[ O_2 = \frac{2}{10} O_{10} - \frac{1}{10} (4x_5 - 2x_4 + 4x_3 - 2x_2 + 2x_1') \pm e \sqrt{\frac{3.7}{10}} \]
\[ O_1 = \frac{1}{10} O_{10} - \frac{1}{10} (2x_5 + 4x_4 - 3x_3 + 4x_2 + x_1') \pm e \sqrt{\frac{3.6}{10}} \]

Also descending through (c)

\[ O_5 = \frac{5}{10} O_{10} + \frac{x_3 + x_2 - x_1''}{2} \pm e \sqrt{\frac{5.5}{10}} \]
\[ O_4 = \frac{4}{10} O_{10} + \frac{1}{10} (2x_5 + 4x_4 + 2x_3 - 2x_2 - 4x_1'') \pm e \sqrt{\frac{4.8}{10}} \]
\[ O_3 = \frac{3}{10} O_{10} + \frac{1}{10} (4x_5 - 2x_4 - x_3 + x_2 - 3x_1'') \pm e \sqrt{\frac{3.9}{10}} \]
\[ O_2 = \frac{2}{10} O_{10} - \frac{1}{10} (4x_5 - 2x_4 + 4x_3 - 4x_2 + 2x_1'') \pm e \sqrt{\frac{3.5}{10}} \]
\[ O_1 = \frac{1}{10} O_{10} - \frac{1}{10} (2x_5 + 4x_4 - 3x_3 + 3x_2 + x_1'') \pm e \sqrt{\frac{3.9}{10}} \]

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.

\[
\begin{align*}
O_5 & \equiv \frac{5}{10} O_{10} + \frac{1}{10} (x_3 + x_2 + x_1 + x_1') \pm e \sqrt{\frac{3}{10}} \\
O_4 & \equiv \frac{4}{10} O_5 + \frac{1}{10} (4x_3 + 8x_2 - 8x_2 - 4x_1 - 4x_1') \pm e \sqrt{\frac{3}{10}} \\
O_3 & \equiv \frac{3}{10} O_4 + \frac{1}{10} (8x_3 - 4x_2 - 5x_3 - x_2 - 3x_1 - 3x_1') \pm e \sqrt{\frac{3}{10}} \\
O_2 & \equiv \frac{2}{10} O_3 + \frac{1}{10} (8x_3 - 4x_2 + 10x_3 - 6x_3 + 2x_1 + 2x_1') \pm e \sqrt{\frac{3}{10}} \\
O_1 & \equiv \frac{1}{10} O_2 + \frac{1}{10} (4x_3 + 8x_2 - 5x_3 + 7x_2 + x_1 + x_1') \pm e \sqrt{\frac{3}{10}}.
\end{align*}
\]

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.

\[
\begin{align*}
P_{10} &= P_6 + P_3 + P_1 + x_1 \\
P_6 &= P_3 + P_2 + P_1 + x_2 \\
P_3 &= P_2 + P_1 + x_3.
\end{align*}
\]

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 decades.

\[
P_2 = P_1 + P_1' + x_5 \text{ and } P_1 = P_1' + x_5
\]

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)

\[
\begin{align*}
P_1' &= P_1 - x_5 \pm e. \\
P_2 &= 2 P_1 - x_5 + x_5 \pm e \sqrt{2} \\
P_3 &= 3 P_1 - x_5 + x_3 + x_3 \pm e \sqrt{3}
\end{align*}
\]

* I use the term \(\text{decad}\) 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 \(\text{decad}\).
\[ P_6 = 6 P_1 - 2x_5 + 2x_3 + x_3 + x_3 + e \sqrt{10} \]
\[ P_{10} = 10 P_1 - 3x_5 + 3x_3 + 2x_3 + x_3 + x_3 \pm e \sqrt{24} \]

While descending, we have
\[ P_6 = \frac{6}{10} P_{10} - \frac{1}{10} (2x_5 - 2x_3 + 2x_3 - 4x_2 + 6x_1) \pm e \sqrt{\frac{6\sqrt{10}}{1}} \]
\[ P_3 = \frac{3}{10} P_{10} - \frac{1}{10} (x_5 - x_3 - 4x_2 + 3x_2 + 3x_1) \pm e \sqrt{\frac{5\sqrt{10}}{1}} \]
\[ P_2 = \frac{3}{10} P_{10} - \frac{1}{10} (4x_5 - 4x_3 + 4x_3 + 2x_2 + 2x_1) \pm e \sqrt{\frac{6\sqrt{10}}{1}} \]
\[ P_1 = \frac{3}{10} P_{10} - \frac{1}{10} (3x_5 - 3x_3 - 2x_3 - x_2 - x_1) \pm e \sqrt{\frac{5\sqrt{10}}{1}} \]
\[ P_1' = \frac{3}{10} P_{10} - \frac{1}{10} (7x_5 + 3x_3 + 2x_3 + x_2 + x_1) \pm e \sqrt{\frac{6\sqrt{10}}{1}} \]

**Section VII.**

I now proceed to the determination of the actual values of the weights below \( O_{11} \), 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:

\[
\begin{align*}
O_1 & = O_{05} + O_{05} + O_{01} - 0.213325 R_1, & \text{Difference} = 2600 \\
O_1 & = O_{05} + O_{03} + O_{02} - 0.288825, & \text{"} & = 1450 \\
O_5 & = O_{04} + O_{01} - 0.001800, & \text{"} & = 350 \\
O_5 & = O_{03} + O_{02} - 0.124325, & \text{"} & = 500 \\
O_4 & = O_{03} + O_{01} - 0.002913, & \text{"} & = 825 \\
O_3 & = O_{02} + O_{01} - 0.011113, & \text{"} & = 275 \\
O_1 & = O_{005} + O_{004} + O_{001} - 0.030320 R_1, & \text{Difference} = 200 \\
O_1 & = O_{005} + O_{003} + O_{002} - 0.042213, & \text{"} & = 2925 \\
O_{05} & = O_{004} + O_{001} - 0.0020938, & \text{"} & = 475 \\
O_{05} & = O_{003} + O_{002} - 0.032138, & \text{"} & = 1475 \\
O_{04} & = O_{003} + O_{001} - 0.030838, & \text{"} & = 775 \\
O_{03} & = O_{002} + O_{001} - 0.035763, & \text{"} & = 475 
\end{align*}
\]

\[ O_{01} = O_{005} + O_{004} + O_{001} - 0.012263 R_1 \]  Difference = 425
\[ O_{01} = O_{005} + O_{003} + O_{002} - 0.021500 \]  " = 150
\[ O_{005} = O_{004} + O_{001} \]  " = 1625
\[ O_{005} = O_{003} + O_{002} \]  " = 1725
\[ O_{004} = O_{003} + O_{001} \]  " = 675
\[ O_{003} = O_{002} + O_{001} \]  " = 100
\[ O_{025} = O_{002} + O_{005} \]  " = 16100 R_1  Difference = 200

From these equations I deduce

\begin{align*}
O_5 & = 240.000300 + 0.056006 R_1 = 240.005927 \quad p. c. = 0.000064 \\
O_4 & = 192.002140 + 0.127762 \quad = 192.013076 \quad " \quad 0.000060 \\
O_3 & = 144.000318 + 0.100631 \quad = 144.010290 \quad " \quad 0.000047 \\
O_2 & = 96.000120 + 0.081700 \quad = 96.008328 \quad " \quad 0.000048 \\
O_1 & = 48.000060 + 0.030044 \quad = 48.003078 \quad " \quad 0.000037 \\
O_{0.5} & = 24.000030 + 0.020606 \quad = 24.002100 \quad " \quad 0.000033 \\
O_{0.4} & = 19.200021 + 0.015888 \quad = 19.201620 \quad " \quad 0.000040 \\
O_{0.3} & = 14.400018 + 0.021269 \quad = 14.402155 \quad " \quad 0.000033 \\
O_{0.2} & = 9.600012 + 0.031475 \quad = 9.603180 \quad " \quad 0.000042 \\
O_{0.1} & = 4.800006 + 0.025537 \quad = 4.802574 \quad " \quad 0.000035 \\
O_{0.05} & = 2.400003 + 0.030932 \quad = 2.403111 \quad " \quad 0.000033 \\
O_{0.04} & = 1.920002 + 0.065261 \quad = 1.926559 \quad " \quad 0.000040 \\
O_{0.03} & = 1.440002 - 0.018011 \quad = 1.431989 \quad " \quad 0.000033 \\
O_{0.02} & = 0.960001 + 0.033130 \quad = 0.963329 \quad " \quad 0.000042 \\
O_{0.01} & = 0.480001 + 0.042634 \quad = 0.484234 \quad " \quad 0.000035 \\
O_{0.025} & = 12.000015 + 0.036101 \quad = 12.003612 \quad " \quad 0.000077
\end{align*}

The two largest weights \( P_{24} \) and \( P_{24}^* \) of the \( P \) set are each approximately equal to 24 grains and their sum is of course nearly \( = O_{01} \) but they are of platinum while \( O_{01} \) 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 \( O_{01} \) so that the deduced value of \( P_{24} + P_{24}^* \) 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 \( O_{01} = P_{24} + P_{24}^* + 0.050238 R_1 \).

\begin{align*}
\text{The value of } O_{01} \text{ is } & = 48.000060 + 0.030014 R_1 \\
\therefore \text{in actual air } & P_{24} + P_{24}^* = 48.000060 - 0.020194 R_1 \\
\text{and the correction to standard air is } & = 0.000063
\end{align*}

Hence in standard air \( P_{24} + P_{24}^* = 47.999997 - 0.020194 R_1 \).
I shall for convenience write M for 47999997 grains and place the equations so far as they are necessary to determine the weights down to $P_1$ in a form suitable for use thus—

\[
\begin{align*}
\text{Diff.} & - M + 0.020194 R_1 = 0.275 R_1 \\
& - 0.006138 R_1 = 0.1125 R_1 \\
& + 0.000125 R_1 = 0.050 R_1 \\
& + 0.010138 R_1 = 0.000 R_1 \\
& - 0.008500 R_1 = 0.25 R_1 \\
& - 0.018400 R_1 = 0.1700 R_1 \\
& - 0.004813 R_1 = 0.0125 R_1 \\
& + 0.000125 R_1 = 0.000 R_1 \\
& + 0.005525 R_1 = 0.000 R_1 \\
& - 0.004675 R_1 = 0.000 R_1 \\
& + 0.005525 R_1 = 0.000 R_1 \\
& - 0.005813 R_1 = 0.000 R_1 \\
& + 0.005525 R_1 = 0.000 R_1 \\
\end{align*}
\]

I have tried various ways of dealing with these equations but, when the probable errors are wanted, the method of least squares is the easiest. I thus get—

\[
\begin{align*}
P_{24} & = 23.999999 - 0.006997 R_1 = 23.999996 p. c. = 0.000042 \\
P_{24} & = 23.999999 - 0.003185 R_1 = 23.999997 p. c. = 0.000042 \\
P_2 & = 19.999999 - 0.014515 R_1 = 19.999994 p. c. = 0.000050 \\
P_{16} & = 15.999999 - 0.006007 R_1 = 15.999996 p. c. = 0.000049 \\
P_{16} & = 9.999999 - 0.009026 R_1 = 9.999992 p. c. = 0.000043 \\
P_6 & = 6.000000 - 0.015331 R_1 = 6.000000 p. c. = 0.000013 \\
P_3 & = 3.000000 - 0.006300 R_1 = 3.000000 p. c. = 0.000035 \\
P_2 & = 2.000000 + 0.001371 R_1 = 2.000000 p. c. = 0.000050 \\
P_1 & = 1.000000 + 0.008077 R_1 = 1.000000 p. c. = 0.000039 \\
P'_{1} & = 1.000000 + 0.002161 R_1 = 1.000000 p. c. = 0.000043 \\
\end{align*}
\]

Further $P_1 = P_6 + P_3 + P_1 + 0.000038 R_1$ Diff. $725 R_1$

\[
\begin{align*}
P_6 & = P_3 + P_2 + P_1 + 0.005525 R_1 \\
P_3 & = P_2 + P_1 - 0.004675 R_1 \\
P_2 & = P_1 + P'_{1} + 0.006963 R_1 \\
P_1 & = P'_{1} + 0.005813 R_1 \\
\end{align*}
\]

Whence $P_6 = 0.600000 + 0.002673 R_1 = 0.600269 p. c. = 0.000056$

\[
\begin{align*}
P_3 & = 0.300000 + 0.0035647 R_1 = 0.300567 p. c. = 0.000035 \\
P_2 & = 0.200000 + 0.002832 R_1 = 0.200255 p. c. = 0.000042 \\
P_1 & = 0.100000 + 0.0005641 R_1 = 0.100056 p. c. = 0.000028 \\
P'_{1} & = 0.100000 - 0.004971 R_1 = 0.099501 p. c. = 0.000045 \\
\end{align*}
\]
By weighing the riders against the nearly equal weight $P_1$, I have

$$R_1 \equiv P_1 + 0.008813 R_2$$  Diff. 425
$$R_2 \equiv P_1 + 0.000875 R_1$$  ,, 600

Substituting successively for the value of $R_1$, of $P_1$, and of $R_2$ we get

$$R_1 \equiv 0.100314 + 0.000817 R_1 \equiv 0.100466$$  grs. $p. e. = 0.000062$
$$R_2 \equiv 0.100000 + 0.001217 R_1 \equiv 0.100122$$

Also—$P_1 \equiv P_{0.6} + P_{0.3} + 0.089038 R_2$  Diff. 825
$$P_{0.6} \equiv P_{0.3} + P_{0.2} + 0.104750$$  ,, 1550
$$P_{0.3} \equiv P_{0.2} + 0.105075$$  ,, 900
$$P_{0.2} \equiv 0.099438$$  ,, 137

Whence

$$P_{0.6} \equiv \frac{2}{3} P_1 - 0.053467 R_2 \equiv 0.060769$$  grs. $p. e. = 0.000047$
$$P_{0.3} \equiv \frac{1}{3} P_1 - 0.029571$$  ,, 0.000034
$$P_{0.2} \equiv \frac{1}{3} P_1 - 0.134646 R_1 \equiv 0.01981$$  ,, 0.000047
$$P_{0.1} \equiv 0.099438$$  ,, 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

$$\frac{\Sigma a}{n} = \text{the mean of errors}$$

and $p. e.$ of an equation $= e = 0.8454 \frac{\Sigma a}{n}$; 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

$$\text{mean of errors} = \frac{\Sigma v}{\sqrt{m (m-1)}}$$

$m$ being the number of complete comparisons

and probable error $= 0.8454 \frac{\Sigma v}{\sqrt{m (m-1)}}$

Applying this to any one determination we shall have its probable error

$$= 0.8454 \frac{2a}{\sqrt{2 \times 1}} = 0.8454 \sqrt{2a} = 1.955 a$$
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

\[
p.\ e. \ of \ any \ one \ determination \ is \ 1\cdot1955 \frac{\sum a}{n}
\]

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

\[
\frac{\sum a}{n} = 463\cdot53 \ R \quad p.\ e. = 554\cdot16 \ R = 55\cdot651 = e \ of \ Section \ VI
\]

in which \( R \) is taken \( 0\cdot100461 = \frac{36 R_1 + 5 R_2}{41} \)

Hence \( e^2 \) is 3097.0

The probable error of any determination as of that of \( O_{o_3} \) 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 \( 0\cdot000115 \) grains from the determinations; but there is also a portion dependent on \( P_{o_1} \), which is involved in determining the difference between it and \( EI \), the mean factor of \( P_{o_1} \) being \( 0\cdot0877 \). It is necessary, therefore, to start our evaluations with values of the probable errors of \( R_1, R_2 \) and \( P_{o_1} \); and, fortunately, these are readily determined.

Let \( E \) be the \( p.\ e. \) of \( P_{o_1} \) from all sources except \( R_1 \)

\( e \) as before the \( p.\ e. \) of one determination

\( e \) 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.

Hence \( (p.\ e. R_1)^2 = e^2 \)

\[
= (1\cdot003813)^2 E^2 + (0\cdot000842)^2 e^2 + e^2
\]

\[
= 764\cdot0 + 0\cdot0000007 e^2 + 3097\cdot0 = 3861\cdot0
\]

\( \therefore e = 0\cdot000062 = \frac{1}{10^6} \sqrt{3861\cdot0} \)

8
again \( p. e. R_2 = \sqrt{E^2 + e^2 + 0.000375^2 e^2} = \frac{1}{10^6} \sqrt{3861.0} = 0.000062 \)

\( p. e. P_{0.01} = \sqrt{e^2 + 0.009438^2 (R_2)^2} = \sqrt{3135.2} = 0.000056 \)

**Determination of Probable Errors.**

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<th>Probable error.</th>
<th>Total.</th>
<th>From</th>
<th>From</th>
<th>From</th>
<th>From</th>
<th>From</th>
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<td>( ... )</td>
<td>( ... )</td>
<td>3138.4</td>
<td>( ... )</td>
</tr>
<tr>
<td>( P_{0.1} )</td>
<td>1114.9</td>
<td>13.1</td>
<td>( ... )</td>
<td>( ... )</td>
<td>( ... )</td>
<td>1249.1</td>
<td>( ... )</td>
</tr>
<tr>
<td>( P_{0.0} )</td>
<td>1734.6</td>
<td>59.6</td>
<td>( ... )</td>
<td>( ... )</td>
<td>( ... )</td>
<td>1794.2</td>
<td>( ... )</td>
</tr>
<tr>
<td>( P_{0.1} )</td>
<td>743.3</td>
<td>14.9</td>
<td>( ... )</td>
<td>( ... )</td>
<td>( ... )</td>
<td>758.2</td>
<td>( ... )</td>
</tr>
<tr>
<td>( P_{0.0} )</td>
<td>1982.1</td>
<td>14.9</td>
<td>( ... )</td>
<td>( ... )</td>
<td>( ... )</td>
<td>1997.0</td>
<td>( ... )</td>
</tr>
</tbody>
</table>
Also \( p. e. P_{06} = \frac{1}{10^6} \sqrt{2064.6 + 169.5 + 13.6} = \frac{1}{10^6} \sqrt{2241.7} = 0.000047 \)
\[ p. e. P_{08} = \frac{1}{10^6} \sqrt{1032.3 + 84.2 + 13.3} = \frac{1}{10^6} \sqrt{1129.8} = 0.000034 \]
\[ p. e. P_{02} = \frac{1}{10^6} \sqrt{2064.6 + 84.2 + 70.0} = \frac{1}{10^6} \sqrt{2218.8} = 0.000047 \]

**Section IX.**—Determinations of the Weights \( O_2 \) to \( O_{10} \) and also Prinsep's Bronze Troy Pound.

The comparisons of the weights from \( O_2 \) to \( O_{10} \) have been made with the balance Oertling No. 2. Three complete comparisons were made in each case, and the weight \( P_{03} \) has been always used for valuing the scale. I have deduced the following equations of condition:

\[
O_3 = O_2 + O_1 - 0.37200 P_{03} + 0.000000 - 0.37200 P_{03}
\]
\[
O_4 = O_3 + O_1 + P_{06} + 0.74542 P_{03} = O_3 + O_1 + 0.060769 + 0.74542 P_{03}
\]
\[
O_5 = O_3 + O_2 + P_{11} + 0.37867 P_{03} = O_3 + O_2 + 0.100058 + 0.37867 P_{03}
\]
\[
O_6 = O_4 + O_{12} + P_{02} + 0.60467 P_{03} = O_4 + O_{12} + 0.019881 + 0.60467 P_{03}
\]
\[
O_7 = O_5 + O_4 + O_1 - P_{11} - P_{06} + 0.45742 P_{03} = O_5 + O_4 + O_1 - 0.160834 + 0.45742 P_{03}
\]

Whence I deduce by the Formulae in Sec. VI.

\[
O_2 = 2O_1 + P_{06} + P_{02} - P_{11} + 0.97142 P_{03} \equiv 960.011294 \text{ grs.}
\]
\[ p. e. = 0.000757 \]
\[
O_3 = 3O_1 + P_{06} + P_{02} - P_{11} + 0.59942 \equiv 1440.000584
\]
\[ p. e. = 0.000900 \]
\[
O_4 = 4O_1 + 2P_{06} + P_{02} - P_{11} + 1.34484 \equiv 1920.054613
\]
\[ p. e. = 0.001194 \]
\[
O_5 = 5O_1 + 2P_{06} + 2P_{02} - P_{11} + 1.94531 \equiv 2400.123435
\]
\[ p. e. = 0.001438 \]
\[
O_{10} = 10O_1 + 3P_{06} + 3P_{02} - 3P_{11} + 3.75167 \equiv 4800.061733
\]
\[ p. e. = 0.002795 \]

In the last Section, I have given a general formula for finding a probable error of observation. In this case, I have \[ \sigma (o) = 3941.2 \frac{P_{03}}{10^3} \]

whence the probable error of one equation of condition will be

\[ = 0.5454 \frac{3941.2}{\sqrt{3.2}} \frac{P_{03}}{10^3} = 0.0004135 \]

The probable error of each determination of a weight depends—

1st, on the error derived from \( O_1 \) 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 $P_{0.3}$ 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.

<table>
<thead>
<tr>
<th>Weights</th>
<th>$O_1$</th>
<th>Equil. Weights</th>
<th>$P_{0.3}$</th>
<th>Weighments of Series</th>
<th>Total</th>
<th>Probable Error $\times 10^6$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$O_2$</td>
<td>52900</td>
<td>5225</td>
<td>1179</td>
<td>514116</td>
<td>573420</td>
<td>757</td>
</tr>
<tr>
<td>$O_3$</td>
<td>119025</td>
<td>5225</td>
<td>449</td>
<td>685488</td>
<td>810187</td>
<td>900</td>
</tr>
<tr>
<td>$O_4$</td>
<td>211600</td>
<td>119025</td>
<td>2259</td>
<td>1199600</td>
<td>1425427</td>
<td>1194</td>
</tr>
<tr>
<td>$O_5$</td>
<td>330625</td>
<td>18624</td>
<td>4747</td>
<td>1713720</td>
<td>2067716</td>
<td>1438</td>
</tr>
<tr>
<td>$O_{10}$</td>
<td>1922500</td>
<td>47022</td>
<td>4588</td>
<td>1199600</td>
<td>7813751</td>
<td>2795</td>
</tr>
</tbody>
</table>

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 case, on which case is stamped $\{\text{J. Prinsep}\}$, and in ink is written

\[
\text{J. Prinsep. \quad Std. 1 lb.}
\]

On the weight itself is engraved—

\[
\text{British Troy Pound.}
\]

\[
= \quad 5760 \quad \text{grains.}
\]

\[
\text{Royal Mint.}
\]

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—

\[
\text{Prinsep’s Pound} \equiv O_{1.0} + O_2 + P_1 + P_{0.3} - 0.487 \cdot P_{0.3}
\]

\[
\equiv 5760.148354 \text{ grains},
\]

from a single complete comparison.
To find the probable error of this we must substitute in the above equation
the symbolic values of \( O_{10} + O_2 \) and thus we have—
Prinsep's Pound \( \equiv 12 \ O_1 + P_{-01} + 4 \ P_{-02} + 4 \ P_{-06} - 3 \ P_1 + 4 \ \times \ 23606 \ P_{-03} \)
from which the probable error will (when the errors generated in deter-
mining \( O_2 \) and \( O_{10} \), 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 \( W_{10} \) 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 tolahs 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 modifi-
cation 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 modi-
fication 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 decad. If this number be alone used, then the probable errors of \( W_{10} \) derived from \( W_1 \) will be

\[
\begin{align*}
\text{English Grain System} & : e \sqrt{24} \\
\text{Bullion} & : e \sqrt{34} \\
\text{Metric} & : e \sqrt{38} \\
\text{Original Metric} & : e \sqrt{26}
\end{align*}
\]

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 decad, 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 tolah. 0.10 tolahs. 0.010 tolahs.

<table>
<thead>
<tr>
<th>Weight</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>0:60</td>
</tr>
<tr>
<td>300</td>
<td>0:30</td>
</tr>
<tr>
<td>200</td>
<td>0:20</td>
</tr>
<tr>
<td>100</td>
<td>0:10</td>
</tr>
</tbody>
</table>

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 adopted to Fahrenheit’s Thermometer.**

This Table gives $10 + \log$ 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 then log sq. of air = $A_t + \log (B - 0.238 V)$.
The value of \( A_t \) at sea-level in latitude 45° can be got from these numbers by adding 0.000785.7 to each and thence the value for any other place.

<table>
<thead>
<tr>
<th>Temp.</th>
<th>( A_t )</th>
<th>( \Delta(1)A_t )</th>
<th>Temp.</th>
<th>( A_t )</th>
<th>( \Delta(1)A_t )</th>
<th>Temp.</th>
<th>( A_t )</th>
<th>( \Delta(1)A_t )</th>
</tr>
</thead>
<tbody>
<tr>
<td>30°</td>
<td>5.6366164</td>
<td>8848</td>
<td>35°</td>
<td>5.6322104</td>
<td>8759</td>
<td>40°</td>
<td>5.6278486</td>
<td>8671</td>
</tr>
<tr>
<td>1</td>
<td>6.357316</td>
<td>8830</td>
<td>45°</td>
<td>5.6235302</td>
<td>8585</td>
<td>45°</td>
<td>5.6235302</td>
<td>8585</td>
</tr>
<tr>
<td>2</td>
<td>6.318486</td>
<td>8812</td>
<td>2</td>
<td>6.269815</td>
<td>8654</td>
<td>2</td>
<td>6.269815</td>
<td>8654</td>
</tr>
<tr>
<td>3</td>
<td>6.339674</td>
<td>8794</td>
<td>3</td>
<td>6.252524</td>
<td>8619</td>
<td>3</td>
<td>6.252524</td>
<td>8619</td>
</tr>
<tr>
<td>4</td>
<td>6.330880</td>
<td>8776</td>
<td>4</td>
<td>6.243905</td>
<td>8603</td>
<td>4</td>
<td>6.243905</td>
<td>8603</td>
</tr>
<tr>
<td>5</td>
<td>6.3322104</td>
<td>8759</td>
<td>5</td>
<td>6.243905</td>
<td>8603</td>
<td>5</td>
<td>6.243905</td>
<td>8603</td>
</tr>
<tr>
<td>6</td>
<td>6.318486</td>
<td>8812</td>
<td>6</td>
<td>6.269815</td>
<td>8654</td>
<td>6</td>
<td>6.269815</td>
<td>8654</td>
</tr>
<tr>
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<td>8812</td>
<td>7</td>
<td>6.269815</td>
<td>8654</td>
<td>7</td>
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<tr>
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<td>8794</td>
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<td>8619</td>
<td>8</td>
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<td>8619</td>
</tr>
<tr>
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<td>8603</td>
<td>9</td>
<td>6.243905</td>
<td>8603</td>
</tr>
</tbody>
</table>

\[ J. \ F. \ Tennant—On \ Standard \ Weights. \]
**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.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>30°</td>
<td></td>
<td></td>
<td>55°</td>
<td>0.0002400</td>
<td>+302</td>
<td>80°</td>
<td>0.0014313</td>
<td>639</td>
</tr>
<tr>
<td>1</td>
<td>0.0000546</td>
<td>-143</td>
<td>6</td>
<td>0.003702</td>
<td>318</td>
<td>1</td>
<td>0.0014952</td>
<td>650</td>
</tr>
<tr>
<td>2</td>
<td>0.000404</td>
<td>-121</td>
<td>7</td>
<td>0.003355</td>
<td>350</td>
<td>2</td>
<td>0.0016261</td>
<td>670</td>
</tr>
<tr>
<td>4</td>
<td>0.000283</td>
<td>-99</td>
<td>8</td>
<td>0.003705</td>
<td>367</td>
<td>4</td>
<td>0.0016981</td>
<td>679</td>
</tr>
<tr>
<td>35°</td>
<td>0.0000184</td>
<td>-78</td>
<td>60</td>
<td>0.0004072</td>
<td>381</td>
<td>85</td>
<td>0.0017610</td>
<td>688</td>
</tr>
<tr>
<td>6</td>
<td>0.000106</td>
<td>-56</td>
<td>1</td>
<td>0.004453</td>
<td>397</td>
<td>6</td>
<td>0.0018298</td>
<td>698</td>
</tr>
<tr>
<td>7</td>
<td>0.000050</td>
<td>-35</td>
<td>2</td>
<td>0.004850</td>
<td>412</td>
<td>7</td>
<td>0.0018906</td>
<td>706</td>
</tr>
<tr>
<td>8</td>
<td>0.000015</td>
<td>-15</td>
<td>3</td>
<td>0.005262</td>
<td>426</td>
<td>8</td>
<td>0.0018702</td>
<td>715</td>
</tr>
<tr>
<td>9</td>
<td>0.000000</td>
<td>+06</td>
<td>4</td>
<td>0.005688</td>
<td>441</td>
<td>9</td>
<td>0.0020417</td>
<td>723</td>
</tr>
<tr>
<td>40°</td>
<td>0.0000006</td>
<td>+27</td>
<td>65</td>
<td>0.0006129</td>
<td>455</td>
<td>90</td>
<td>0.0021440</td>
<td>732</td>
</tr>
<tr>
<td>1</td>
<td>0.000083</td>
<td>47</td>
<td>6</td>
<td>0.006384</td>
<td>469</td>
<td>1</td>
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<td>0.0026311</td>
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</tr>
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<td>3</td>
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<td>8</td>
<td>0.007536</td>
<td>497</td>
<td>3</td>
<td>0.0023358</td>
<td>754</td>
</tr>
<tr>
<td>4</td>
<td>0.000232</td>
<td>165</td>
<td>9</td>
<td>0.008033</td>
<td>509</td>
<td>4</td>
<td>0.0024112</td>
<td>762</td>
</tr>
<tr>
<td>45°</td>
<td>0.0000337</td>
<td>124</td>
<td>70</td>
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<td>523</td>
<td>95</td>
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<tr>
<td>6</td>
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<td>0.003065</td>
<td>535</td>
<td>6</td>
<td>0.0025612</td>
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<td>548</td>
<td>7</td>
<td>0.0026417</td>
<td>782</td>
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<td>8</td>
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<td>3</td>
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<td>560</td>
<td>8</td>
<td>0.0027199</td>
<td>787</td>
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<tr>
<td>9</td>
<td>0.000917</td>
<td>198</td>
<td>4</td>
<td>0.004708</td>
<td>572</td>
<td>9</td>
<td>0.0027986</td>
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</tr>
<tr>
<td>50°</td>
<td>0.001145</td>
<td>216</td>
<td>75</td>
<td>0.0011250</td>
<td>584</td>
<td>100</td>
<td>0.0028780</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0.001361</td>
<td>234</td>
<td>6</td>
<td>0.001864</td>
<td>596</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0.001595</td>
<td>251</td>
<td>7</td>
<td>0.002460</td>
<td>607</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0.001816</td>
<td>269</td>
<td>8</td>
<td>0.003067</td>
<td>617</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0.002115</td>
<td>285</td>
<td>9</td>
<td>0.003684</td>
<td>629</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table III.

Logarithms for facilitating the Calculation of the Cubical Expansion of Metals.

Log. \((1 + EM_t.)\)

<table>
<thead>
<tr>
<th></th>
<th>Gold</th>
<th>Silver</th>
<th>Platinum</th>
<th>Baly's metal</th>
<th>Brass</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>339.14</td>
<td>441.41</td>
<td>208.32</td>
<td>394.98</td>
<td>398.27</td>
</tr>
<tr>
<td>1</td>
<td>0 000010598</td>
<td>0 000013791</td>
<td>0 000006510</td>
<td>0 000012343</td>
<td>0 000012446</td>
</tr>
<tr>
<td>2</td>
<td>21196</td>
<td>27588</td>
<td>13020</td>
<td>24686</td>
<td>24892</td>
</tr>
<tr>
<td>3</td>
<td>31794</td>
<td>41382</td>
<td>19530</td>
<td>37029</td>
<td>37338</td>
</tr>
<tr>
<td>4</td>
<td>42392</td>
<td>55176</td>
<td>26040</td>
<td>49372</td>
<td>49784</td>
</tr>
<tr>
<td>5</td>
<td>52990</td>
<td>68970</td>
<td>32550</td>
<td>61715</td>
<td>62230</td>
</tr>
<tr>
<td>6</td>
<td>63588</td>
<td>82764</td>
<td>39060</td>
<td>74058</td>
<td>74676</td>
</tr>
<tr>
<td>7</td>
<td>74186</td>
<td>96558</td>
<td>45570</td>
<td>86401</td>
<td>87122</td>
</tr>
<tr>
<td>8</td>
<td>84784</td>
<td>110352</td>
<td>52050</td>
<td>98744</td>
<td>99588</td>
</tr>
<tr>
<td>9</td>
<td>95382</td>
<td>124046</td>
<td>58590</td>
<td>111087</td>
<td>112014</td>
</tr>
</tbody>
</table>

This table is founded on the supposition that up to 100° of Fahrenheit's Thermometer; log expansion for \(n° = n \times \log\) 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

<table>
<thead>
<tr>
<th>(\text{Br 50°} )</th>
<th>0.00062230</th>
<th>or (\text{Br 80°} )</th>
<th>0.00099568</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>37.34</td>
<td>5</td>
<td>62.23</td>
</tr>
<tr>
<td>0.3</td>
<td>3.73</td>
<td>0.3</td>
<td>3.73</td>
</tr>
<tr>
<td>0.05</td>
<td>0.62</td>
<td>0.05</td>
<td>0.62</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Const.</td>
<td>398.27</td>
</tr>
<tr>
<td></td>
<td>0.00066399</td>
<td></td>
<td>0.00066399</td>
</tr>
</tbody>
</table>
**May 24th, 1879.**

**Comparisons of EI with O₁.**

<table>
<thead>
<tr>
<th>Weight on left side</th>
<th>Weight on right side</th>
<th>Scale Readings</th>
<th>Deduced Mean</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI</td>
<td>O₁ + 1·2 R₂/10</td>
<td>Low.</td>
<td>5:7</td>
<td>9:5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High.</td>
<td>6:1</td>
<td>9:2</td>
</tr>
<tr>
<td>EI + P₁₀</td>
<td>Do.</td>
<td>13:6</td>
<td>18:0</td>
<td>15:81</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13:7</td>
<td>17:8</td>
<td></td>
</tr>
<tr>
<td>O₁ + P₀₁</td>
<td>EI + 1·2 R₂/10</td>
<td>13:1</td>
<td>17:4</td>
<td>15:21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13:4</td>
<td>17:2</td>
<td></td>
</tr>
<tr>
<td>EI</td>
<td>O₁ + 1·2 R₂/10</td>
<td>12:8</td>
<td>18:9</td>
<td>15:99</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13:3</td>
<td>18:5</td>
<td></td>
</tr>
<tr>
<td>EI + P₀₁</td>
<td>Do.</td>
<td>3:0</td>
<td>11:9</td>
<td>7:61</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7:61</td>
<td></td>
</tr>
</tbody>
</table>

**Remarks.**

Hence EI = 0₁ + 1·2 R₂/10 - 2·46/8·27 P₀₁, EI = 0₁ - 1·2 R₂/10 + 3·05/8·26 P₀₁, EI = 0₁ - 1·2 R₂/10 + 3·40/8·43 P₀₁, EI = 0₁ + 1·2 R₂/10 - 2·39/8·38 P₀₁.

**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.**

Comparisons of $O_1$ with $O_{.5} + O_{.4} + O_{.1} = S$.  

<table>
<thead>
<tr>
<th>Weight on left side.</th>
<th>Weight on right side.</th>
<th>Scale Readings</th>
<th>Deduced Mean</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Low.</td>
<td>High.</td>
<td></td>
</tr>
<tr>
<td>$O_1 + 5 \frac{R_1}{10}$</td>
<td>$S_1 + 4\cdot2 \frac{R_2}{10}$</td>
<td>6\cdot3</td>
<td>10\cdot2</td>
<td>8\cdot34</td>
</tr>
<tr>
<td>$O_1 + 6 \frac{R_1}{10}$</td>
<td>$S_1 + 4\cdot2 \frac{R_2}{10}$</td>
<td>6\cdot6</td>
<td>10\cdot0</td>
<td></td>
</tr>
<tr>
<td>$S + 0\cdot6 \frac{R_1}{10}$</td>
<td>$O_1 + 4\cdot2 \frac{R_2}{10}$</td>
<td>3\cdot0</td>
<td>10\cdot6</td>
<td>6\cdot88</td>
</tr>
<tr>
<td>$S + 1\cdot6 \frac{R_1}{10}$</td>
<td>$O_1 + 4\cdot2 \frac{R_2}{10}$</td>
<td>3\cdot3</td>
<td>10\cdot3</td>
<td></td>
</tr>
<tr>
<td>$S + 0\cdot6 \frac{R_1}{10}$</td>
<td>$S + 4\cdot2 \frac{R_2}{10}$</td>
<td>4\cdot1</td>
<td>17\cdot9</td>
<td>14\cdot40</td>
</tr>
<tr>
<td>$S + 1\cdot6 \frac{R_1}{10}$</td>
<td>$S + 4\cdot2 \frac{R_2}{10}$</td>
<td>4\cdot4</td>
<td>17\cdot4</td>
<td></td>
</tr>
<tr>
<td>$O_1 + 6 \frac{R_1}{10}$</td>
<td>$S + 4\cdot2 \frac{R_2}{10}$</td>
<td>6\cdot0</td>
<td>17\cdot9</td>
<td>15\cdot40</td>
</tr>
<tr>
<td>$O_1 + 5 \frac{R_1}{10}$</td>
<td>$S + 4\cdot2 \frac{R_2}{10}$</td>
<td>6\cdot2</td>
<td>17\cdot9</td>
<td>7\cdot99</td>
</tr>
</tbody>
</table>

Hence $O_1 \approx S + 4\cdot2 \frac{R_2}{10} - \left(5\cdot0 + \frac{1\cdot66}{7\cdot56}\right) \frac{R_1}{10} \approx S + 4\cdot2 \frac{R_2}{10} - 0\cdot5226 R_1$.

$O_1 \approx S - 4\cdot2 \frac{R_2}{10} + \left(0\cdot6 + \frac{3\cdot12}{7\cdot52}\right) \frac{R_1}{10} \approx S - 4\cdot2 \frac{R_2}{10} + 0\cdot1015 R_1$.

$O_1 \approx S - 4\cdot2 \frac{R_2}{10} + \left(0\cdot6 + \frac{3\cdot02}{7\cdot51}\right) \frac{R_1}{10} \approx S - 4\cdot2 \frac{R_2}{10} + 0\cdot002 R_1$.

$O_1 \approx S + 4\cdot2 \frac{R_2}{10} - \left(5\cdot0 + \frac{2\cdot01}{7\cdot41}\right) \frac{R_1}{10} \approx S + 4\cdot2 \frac{R_2}{10} - 0\cdot5272 R_1$.

$\therefore 4 \cdot O_1 \equiv 4 \cdot S - 0\cdot8481 R_1 \text{ or } O_1 \equiv O_{.5} + O_{.4} + O_{.1} - 0\cdot212025 R_1$.  

### Type Comparison III.

**October 22nd, 1879.**

Oertling No. 2.

Comparisons of $O_5$ with $O_1 + O_3 + P_{.02} = S$.

<table>
<thead>
<tr>
<th>Weight on left side.</th>
<th>- Weight on right side.</th>
<th>Scale Readings</th>
<th>Deduced Mean</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Low.</td>
<td>High.</td>
<td></td>
</tr>
<tr>
<td>$S$</td>
<td>$O_5$</td>
<td>9.5</td>
<td>14.1</td>
<td>11.91</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9.9</td>
<td>13.8</td>
<td></td>
</tr>
<tr>
<td>$S + P_{.03}$</td>
<td>Do.</td>
<td>15.0</td>
<td>22.7</td>
<td>18.73</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15.5</td>
<td>22.2</td>
<td></td>
</tr>
<tr>
<td>$O_5$</td>
<td>$S + P_{.03}$</td>
<td>12.0</td>
<td>14.6</td>
<td>13.34</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12.2</td>
<td>14.3</td>
<td></td>
</tr>
<tr>
<td>Do.</td>
<td>$S$</td>
<td>16.3</td>
<td>23.0</td>
<td>19.55</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16.7</td>
<td>22.6</td>
<td></td>
</tr>
<tr>
<td>Do.</td>
<td>Do.</td>
<td>16.1</td>
<td>23.3</td>
<td>19.58</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16.6</td>
<td>22.8</td>
<td></td>
</tr>
<tr>
<td>Do.</td>
<td>$S + P_{.03}$</td>
<td>12.2</td>
<td>14.1</td>
<td>13.21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12.4</td>
<td>14.0</td>
<td></td>
</tr>
<tr>
<td>$S + P_{.03}$</td>
<td>$O_5$</td>
<td>15.4</td>
<td>21.0</td>
<td>18.13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15.7</td>
<td>20.7</td>
<td></td>
</tr>
<tr>
<td>$S$</td>
<td>Do.</td>
<td>10.8</td>
<td>13.0</td>
<td>11.91</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10.9</td>
<td>12.8</td>
<td></td>
</tr>
</tbody>
</table>

Hence $O_5 \approx S + \frac{3.09}{6.82} P_{.03} \approx S + 0.453 P_{.03}$.

$O_5 \approx S + \frac{4.55}{6.21} P_{.03} \approx S + 0.732 P_{.03}$.

$O_5 \approx S + \frac{4.58}{6.21} P_{.03} \approx S + 0.737 P_{.03}$.

$O_5 \approx S + \frac{3.09}{6.22} P_{.03} \approx S + 0.497 P_{.03}$.

$O_5 \approx S + 2.419 P_{.03}$ and $O_5 \equiv S + 0.60475 P_{.03}$.

$\equiv O_1 + O_3 + P_{.02} + 0.64475 P_{.03}$. 
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 Euro-
pean 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 that 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 commer-
cial purposes) of the much smaller variations with respect to such weight
as may be compared with it.

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 Nanuowry at
the Nicobars, shew that, at these insular stations, the excessive pressure was
of greater duration and more persistent and intense than at any continen-
tal 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
The single exceptional station, which shows 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 \(0.0332\); or, since the first rise took place in August 1876, the mean of the whole unbroken period of 25 months’ excess was \(0.0379\). On the plains of Bengal, the mean excess (average of six stations) was only \(0.0298\) on the 28 months and \(0.0354\) 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 shows 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 shows, 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 show 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 '0681' or \( \frac{1}{15} \) of an inch of the barometer. At Melbourne, during the same period, it averaged '0387" and was less prolonged. For Sydney, I have registers only up to September 1878, and these show 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 '0293".

The register of Batavia affords evidence very similar to that of Singapore. Here also from November 1869 to August 1878, 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 '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.

\[
\begin{align*}
\text{Gangetic plain} & +0.0191'' \ldots \text{Punjab} & +0.0132'' \\
\text{Chutia Nagpur} & +0.0298'' \text{& Bundelkand} & +0.0281'' \\
\text{Abins and Sind} & +0.0215'' \\
\text{Nagpur and} & +0.0219'' \text{Bombay} & +0.0196'' \\
\text{Orissa} & +0.0164'' \text{& Ceylon} & +0.0103'' \\
\text{Bharat} & +0.0127'' \text{W. Coast} & +0.020'' \\
\text{Dakhan} & +0.0199'' \\
\text{Carnatic} & +0.020''
\end{align*}
\]

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.
H. F. Blanford—On High Atmospheric Pressure

Table I.—Deviation of pressure in each month from the

<table>
<thead>
<tr>
<th>Year</th>
<th>Month</th>
<th>Punjab</th>
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average of the month and place.

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<td>+0.057</td>
<td>+0.006</td>
<td>+0.196</td>
<td>+0.204</td>
<td>+0.285</td>
</tr>
<tr>
<td></td>
<td>July</td>
<td>+0.067</td>
<td>+0.013</td>
<td>+0.005</td>
<td>+0.137</td>
<td>+0.163</td>
<td>+0.090</td>
</tr>
<tr>
<td></td>
<td>August</td>
<td>+0.052</td>
<td>+0.050</td>
<td>+0.015</td>
<td>+0.065</td>
<td>+0.087</td>
<td>+0.118</td>
</tr>
<tr>
<td></td>
<td>September</td>
<td>+0.038</td>
<td>+0.010</td>
<td>+0.024</td>
<td>+0.077</td>
<td>+0.152</td>
<td>+0.162</td>
</tr>
<tr>
<td></td>
<td>October</td>
<td>+0.034</td>
<td>+0.060</td>
<td>+0.030</td>
<td></td>
<td>+0.121</td>
<td>+0.101</td>
</tr>
<tr>
<td></td>
<td>November</td>
<td>+0.020</td>
<td>+0.029</td>
<td>+0.004</td>
<td></td>
<td>−0.002</td>
<td>+0.081</td>
</tr>
<tr>
<td></td>
<td>December</td>
<td>−0.015</td>
<td>−0.003</td>
<td>−0.008</td>
<td></td>
<td>+0.011</td>
<td>+0.003</td>
</tr>
<tr>
<td>1878</td>
<td>January</td>
<td>+0.015</td>
<td>+0.020</td>
<td>+0.045</td>
<td></td>
<td>+125</td>
<td>+114</td>
</tr>
<tr>
<td></td>
<td>February</td>
<td>+0.043</td>
<td>+0.037</td>
<td>+0.079</td>
<td></td>
<td>+0.064</td>
<td>+0.092</td>
</tr>
<tr>
<td></td>
<td>March</td>
<td>+0.039</td>
<td>+0.035</td>
<td>+0.080</td>
<td></td>
<td>−0.018</td>
<td>+0.013</td>
</tr>
<tr>
<td></td>
<td>April</td>
<td>+0.020</td>
<td>+0.026</td>
<td>+0.052</td>
<td></td>
<td>−0.039</td>
<td>−0.025</td>
</tr>
<tr>
<td></td>
<td>May</td>
<td>+0.025</td>
<td>+0.009</td>
<td>−0.015</td>
<td></td>
<td>+0.072</td>
<td>+0.104</td>
</tr>
<tr>
<td></td>
<td>June</td>
<td>+0.022</td>
<td>+0.007</td>
<td>−0.001</td>
<td></td>
<td>−0.099</td>
<td>+0.014</td>
</tr>
<tr>
<td></td>
<td>July</td>
<td>0</td>
<td>−0.010</td>
<td>+0.020</td>
<td></td>
<td>−0.155</td>
<td>−0.161</td>
</tr>
<tr>
<td></td>
<td>August</td>
<td>−0.049</td>
<td>−0.003</td>
<td>+0.033</td>
<td></td>
<td>−0.076</td>
<td>+0.003</td>
</tr>
<tr>
<td></td>
<td>September</td>
<td>−0.083</td>
<td>−0.009</td>
<td>−0.058</td>
<td></td>
<td>−0.115</td>
<td>−0.133</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Years</th>
<th>Wolf's sun-spot numbers</th>
<th>Batavia</th>
<th>Singapore</th>
<th>Colombo</th>
<th>Port Blair</th>
<th>Akyab</th>
<th>Chittagong</th>
<th>Calcutta</th>
<th>Darjeeling</th>
<th>Bombay</th>
</tr>
</thead>
<tbody>
<tr>
<td>1867</td>
<td>8.8</td>
<td>+0.006</td>
<td>...</td>
<td>...</td>
<td>+0.009</td>
<td>-0.017</td>
<td>+0.022</td>
<td>-0.008</td>
<td>+0.015</td>
<td>(1)</td>
</tr>
<tr>
<td>'68</td>
<td>36.8</td>
<td>+0.020</td>
<td>... (1)</td>
<td>...</td>
<td>+0.029</td>
<td>+0.003(4)</td>
<td>-0.019</td>
<td>+0.006</td>
<td>-0.019</td>
<td>(2)</td>
</tr>
<tr>
<td>'69</td>
<td>78.6</td>
<td>+0.011</td>
<td>-0.018</td>
<td>...</td>
<td>+0.06</td>
<td>+0.012(5)</td>
<td>-0.019</td>
<td>+0.006</td>
<td>-0.019</td>
<td>(3)</td>
</tr>
<tr>
<td>'70</td>
<td>131.8</td>
<td>-0.023</td>
<td>-0.044</td>
<td>...</td>
<td>-0.042</td>
<td>-0.001</td>
<td>-0.026</td>
<td>-0.011</td>
<td>-0.009</td>
<td>(4)</td>
</tr>
<tr>
<td>'71</td>
<td>113.8</td>
<td>-0.009</td>
<td>-0.011</td>
<td>...</td>
<td>-0.006</td>
<td>-0.013</td>
<td>-0.008</td>
<td>-0.008</td>
<td>-0.007</td>
<td>(5)</td>
</tr>
<tr>
<td>'72</td>
<td>99.7</td>
<td>-0.020</td>
<td>-0.023</td>
<td>-0.020</td>
<td>-0.020</td>
<td>-0.017</td>
<td>-0.001</td>
<td>+0.004</td>
<td>+0.009</td>
<td>(6)</td>
</tr>
<tr>
<td>'73</td>
<td>67.7</td>
<td>-0.010</td>
<td>-0.017</td>
<td>-0.005</td>
<td>-0.013</td>
<td>-0.021</td>
<td>+0.007</td>
<td>-0.008</td>
<td>+0.001</td>
<td></td>
</tr>
<tr>
<td>'74</td>
<td>43.1</td>
<td>-0.006</td>
<td>+0.018</td>
<td>+0.003</td>
<td>-0.007</td>
<td>+0.001</td>
<td>+0.023</td>
<td>+0.005</td>
<td>+0.008</td>
<td>(5)</td>
</tr>
<tr>
<td>'75</td>
<td>18.9</td>
<td>-0.011</td>
<td>+0.018</td>
<td>-0.004</td>
<td>-0.006</td>
<td>-0.008</td>
<td>+0.002</td>
<td>-0.008</td>
<td>+0.009</td>
<td></td>
</tr>
<tr>
<td>'76</td>
<td>...</td>
<td>-0.002</td>
<td>+0.019</td>
<td>+0.002</td>
<td>+0.010</td>
<td>-0.009</td>
<td>-0.003</td>
<td>-0.009</td>
<td>+0.006</td>
<td>(6)</td>
</tr>
<tr>
<td>'77</td>
<td>...</td>
<td>+0.012</td>
<td>+0.037</td>
<td>+0.026</td>
<td>+0.036</td>
<td>+0.039</td>
<td>+0.044</td>
<td>+0.035</td>
<td>+0.037</td>
<td></td>
</tr>
<tr>
<td>'78</td>
<td>...</td>
<td>-0.001</td>
<td>-0.002</td>
<td>0</td>
<td>+0.010</td>
<td>+0.012</td>
<td>+0.022</td>
<td>+0.014</td>
<td>+0.012</td>
<td>-0.011</td>
</tr>
</tbody>
</table>

(1) Last eight months.  
(2) Last six months.  
(3) January, February and last six months.  
(4) Winter February and December.  
(5) Winter January.  
(6) Winter six months only.
Table III.—Annual variation of pressure at Calcutta and Bombay.

<table>
<thead>
<tr>
<th>Years</th>
<th>Calcutta</th>
<th>Bombay</th>
<th>Years</th>
<th>Calcutta</th>
<th>Bombay</th>
</tr>
</thead>
<tbody>
<tr>
<td>1847</td>
<td>...</td>
<td>-0.012</td>
<td>1858</td>
<td>-0.003</td>
<td>+0.003</td>
</tr>
<tr>
<td>'48</td>
<td>...</td>
<td>-0.004</td>
<td>'59</td>
<td>+0.009</td>
<td>+0.004</td>
</tr>
<tr>
<td>'49</td>
<td>...</td>
<td>-0.011</td>
<td>'60</td>
<td>-0.019</td>
<td>-0.005</td>
</tr>
<tr>
<td>'50</td>
<td>...</td>
<td>-0.001</td>
<td>'61</td>
<td>-0.023</td>
<td>-0.012</td>
</tr>
<tr>
<td>'51</td>
<td>...</td>
<td>-0.013</td>
<td>'62</td>
<td>-0.017</td>
<td>-0.026</td>
</tr>
<tr>
<td>'52</td>
<td>...</td>
<td>-0.004</td>
<td>'63</td>
<td>-0.024</td>
<td>-0.017</td>
</tr>
<tr>
<td>'53</td>
<td>-0.013</td>
<td>+0.005</td>
<td>'64</td>
<td>-0.011</td>
<td>+0.023</td>
</tr>
<tr>
<td>'54</td>
<td>-0.002</td>
<td>-0.005</td>
<td>'65</td>
<td>+0.018</td>
<td>+0.002</td>
</tr>
<tr>
<td>'55</td>
<td>+0.005</td>
<td>+0.015</td>
<td>'66</td>
<td>+0.004</td>
<td>+0.013</td>
</tr>
<tr>
<td>'56</td>
<td>-0.014</td>
<td>-0.003</td>
<td>'67</td>
<td>+0.022</td>
<td>+0.015</td>
</tr>
<tr>
<td>'57</td>
<td>-0.013</td>
<td>-0.001</td>
<td>'68</td>
<td>+0.022</td>
<td>+0.027</td>
</tr>
</tbody>
</table>

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.
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 Tillis 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.

<table>
<thead>
<tr>
<th>Years</th>
<th>Wolf's sun-spot numbers</th>
<th>St. Petersburg</th>
<th>Dogolovsk</th>
<th>Ekaterinburg</th>
<th>Slatoust</th>
<th>Barnaul</th>
</tr>
</thead>
<tbody>
<tr>
<td>1847</td>
<td>97.4</td>
<td>+ 0.45</td>
<td>-0.34</td>
<td>+ 0.22</td>
<td>+ 0.97</td>
<td>-0.11</td>
</tr>
<tr>
<td>'48</td>
<td>124.9</td>
<td>+ 0.14</td>
<td>-0.27</td>
<td>+ 0.49</td>
<td>+ 0.78</td>
<td>+ 0.23</td>
</tr>
<tr>
<td>'49</td>
<td>95.4</td>
<td>+ 0.03</td>
<td>+ 0.53</td>
<td>+ 0.11</td>
<td>+ 0.33</td>
<td>-0.17</td>
</tr>
<tr>
<td>'50</td>
<td>69.8</td>
<td>-0.02</td>
<td>-0.09</td>
<td>+ 0.06</td>
<td>+ 0.97</td>
<td>+ 0.11</td>
</tr>
<tr>
<td>'51</td>
<td>63.2</td>
<td>+ 0.03</td>
<td>+ 0.23</td>
<td>+ 0.14</td>
<td>-0.05</td>
<td>+ 0.02</td>
</tr>
<tr>
<td>'52</td>
<td>52.7</td>
<td>-0.12</td>
<td>-0.12</td>
<td>-0.15</td>
<td>-0.18</td>
<td>+ 0.19</td>
</tr>
<tr>
<td>'53</td>
<td>38.5</td>
<td>+ 0.05</td>
<td>+ 0.59</td>
<td>+ 0.65</td>
<td>-0.74</td>
<td>+ 0.23</td>
</tr>
<tr>
<td>'54</td>
<td>21.0</td>
<td>-0.01</td>
<td>-0.03</td>
<td>-0.32</td>
<td>-0.09</td>
<td>-0.13</td>
</tr>
<tr>
<td>'55</td>
<td>7.7</td>
<td>+ 0.05</td>
<td>-0.03</td>
<td>-0.23</td>
<td>-0.24</td>
<td>-0.13</td>
</tr>
<tr>
<td>'56</td>
<td>5.1</td>
<td>-0.19</td>
<td>-0.07</td>
<td>-0.08</td>
<td>-0.09</td>
<td>-0.24</td>
</tr>
<tr>
<td>'57</td>
<td>22.9</td>
<td>+ 0.04</td>
<td>-0.32</td>
<td>-0.29</td>
<td>+ 0.09</td>
<td>-0.40</td>
</tr>
<tr>
<td>'58</td>
<td>56.2</td>
<td>-0.10</td>
<td>-0.02</td>
<td>-0.16</td>
<td>-0.04</td>
<td>+ 0.15</td>
</tr>
<tr>
<td>'59</td>
<td>90.3</td>
<td>-0.22</td>
<td>-0.16</td>
<td>-0.04</td>
<td>+ 0.15</td>
<td>+ 0.08</td>
</tr>
<tr>
<td>'60</td>
<td>91.8</td>
<td>+ 0.01</td>
<td>+ 0.16</td>
<td>+ 0.16</td>
<td>+ 0.28</td>
<td>+ 0.55</td>
</tr>
<tr>
<td>'61</td>
<td>77.7</td>
<td>-0.05</td>
<td>-0.04</td>
<td>-0.32</td>
<td>-0.23</td>
<td>-0.62</td>
</tr>
<tr>
<td>'62</td>
<td>61.0</td>
<td>+ 0.06</td>
<td>+ 0.22</td>
<td>+ 0.96</td>
<td>-0.21</td>
<td>-0.55</td>
</tr>
<tr>
<td>'63</td>
<td>45.1</td>
<td>-0.19</td>
<td>-0.04</td>
<td>-0.31</td>
<td>-0.23</td>
<td>-0.62</td>
</tr>
<tr>
<td>'64</td>
<td>45.2</td>
<td>+ 0.21</td>
<td>-0.14</td>
<td>-0.34</td>
<td>+ 0.21</td>
<td>+ 0.13</td>
</tr>
<tr>
<td>'65</td>
<td>31.1</td>
<td>+ 0.18</td>
<td>-0.18</td>
<td>-0.34</td>
<td>+ 0.25</td>
<td>+ 0.08</td>
</tr>
<tr>
<td>'66</td>
<td>11.7</td>
<td>-0.77</td>
<td>-0.04</td>
<td>-0.52</td>
<td>-0.36</td>
<td>-0.17</td>
</tr>
<tr>
<td>'67</td>
<td>8.8</td>
<td>-0.73</td>
<td>-0.52</td>
<td>-0.53</td>
<td>-0.35</td>
<td>-0.03</td>
</tr>
<tr>
<td>'68</td>
<td>30.8</td>
<td>-0.07</td>
<td>-0.17</td>
<td>+ 0.08</td>
<td>+ 0.17</td>
<td>+ 0.09</td>
</tr>
<tr>
<td>'69</td>
<td>78.6</td>
<td>-0.34</td>
<td>-0.19</td>
<td>+ 0.71</td>
<td>+ 0.82</td>
<td>+ 0.59</td>
</tr>
<tr>
<td>'70</td>
<td>131.8</td>
<td>+ 0.23</td>
<td>-0.01</td>
<td>+ 0.30</td>
<td>+ 0.25</td>
<td>+ 0.02</td>
</tr>
<tr>
<td>'71</td>
<td>110.8</td>
<td>-0.12</td>
<td>-0.29</td>
<td>-0.09</td>
<td>-0.07</td>
<td>-0.11</td>
</tr>
<tr>
<td>'72</td>
<td>39.7</td>
<td>+ 0.07</td>
<td>+ 0.30</td>
<td>+ 0.17</td>
<td>-0.12</td>
<td>-0.20</td>
</tr>
<tr>
<td>'73</td>
<td>67.7</td>
<td>-0.09</td>
<td>-0.33</td>
<td>-0.38</td>
<td>-0.04</td>
<td>-0.01</td>
</tr>
<tr>
<td>'74</td>
<td>43.1</td>
<td>-0.08</td>
<td>-0.06</td>
<td>+ 0.06</td>
<td>-0.20</td>
<td>-0.13</td>
</tr>
<tr>
<td>'75</td>
<td>18.9</td>
<td>+ 0.01</td>
<td>+ 0.02</td>
<td>-0.07</td>
<td>-0.88</td>
<td>+ 0.09</td>
</tr>
<tr>
<td>'76</td>
<td>...</td>
<td>+ 0.03</td>
<td>+ 0.15</td>
<td>+ 0.05</td>
<td>+ 0.80</td>
<td>-0.01</td>
</tr>
<tr>
<td>'77</td>
<td>...</td>
<td>+ 0.08</td>
<td>+ 1.21</td>
<td>+ 0.95</td>
<td>+ 0.010</td>
<td>+ 0.088</td>
</tr>
</tbody>
</table>
in Relation to the Sun-spot Cycle.

(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 North-west 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.
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 Orthodoreas, which its young ‘larvae’ 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 Mérián, 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).
— — Fabr., Ent. Syst. ii, 1793, p. 18, no. 21.
♀ cancellata, Fabr., l. c., 23.
— — ——, Stoll, Spectres et Mantes, pl. xi, fig. 42, ♀.
Choradodis cancellata, Serville, Hist. nat. des Orthopt. 1839, p. 206, ♀.
Cnurusa cancellata, Burmeister, Handb. d. Entom. 1839, Band ii, p. 542, (Syn. Serv. et Stoll. fig. 75, exclu.)

Hab. Cayenne (♀, Serville); Surinam (♀, Mérián, 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 peruana, 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 ungual 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.


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 ungual groove, and is followed by a marginal row of small black points.


In the females of the next two species, and in all probability in those of *Os. rhomboides* also, the posterior angles of the pronotal lamella are rounded-angulate and produced backwards so that the hinder end of the primitive pronotum projects in the bottom of an angular emargination.


Choeradodis laticollis, Serville, Revue p. 24; Hist. nat. des Orthopt. 1839, p. 208, pl. iv, fig. 2, ♀.

strumaria, Id., ibid. p. 18, ♂.

laticollis, Stål, Syst. Mant. 1877, 17, ♀.

The blotch is situated, in both sexes, just beyond the ungual groove, is oblong-rhomboideal 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 stigmatal spot of the tegmina; and the antero-lateral margins of the pronotal lamellae 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 stali, n. sp.

Differs from the preceding in the shape of the blotch (which is pointed at both ends and commences in the ungual 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 lamellae 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.


_Choeradodis squilla_, Saussure, Mél. Orthopt. t. i, 3me fasc. p. 161, pl. iv, figs. 3, 3a, ♂ et nymph.


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. Cheennell).

Obs. A specimen of this species in the British Museum is erroneously marked “Brazil.”

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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 excreta! 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

the same water; cooking water is used scantily, or more than once; habita-
tions 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 remark-
able 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 diarrhoea; 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 pur-
poses above enumerated is 25 gallons per head of population per day. Thus taking some of the largest towns in England and including Paris, each in-
habitant receives 27½ 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 20½ gallons per inhabitant.

Let us now see the amount of water available in Calcutta during cer-
tain 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 No-
ember to April, the whole of the water which fell could be collected and
Water supplies of Calcutta.

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 ½ gallons of fresh water per day during the hot season of the year. In the Coomar-tolle 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 diarrhoea 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. Hâgler, 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 diarrhea, 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.
Wafer supplies of Calcutta.

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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.

<table>
<thead>
<tr>
<th>Description of Water.</th>
<th>Total Ammonia parts per million of water.</th>
<th>Chlorine parts per million of water.</th>
</tr>
</thead>
<tbody>
<tr>
<td>London water, Kent Company,</td>
<td>...</td>
<td>0.03</td>
</tr>
<tr>
<td>&quot; New River Company,</td>
<td>...</td>
<td>0.08</td>
</tr>
<tr>
<td>Glasgow water from Loch Katrine,</td>
<td>...</td>
<td>0.08</td>
</tr>
<tr>
<td>Edinburgh town water,</td>
<td>...</td>
<td>0.07</td>
</tr>
<tr>
<td>Manchester town water,</td>
<td>...</td>
<td>0.07</td>
</tr>
<tr>
<td>Chester (Dee) town water,</td>
<td>...</td>
<td>0.07</td>
</tr>
<tr>
<td>Oxton (Birkenhead) town water,</td>
<td>...</td>
<td>0.02</td>
</tr>
<tr>
<td>Guildford water,</td>
<td>...</td>
<td>0.01</td>
</tr>
<tr>
<td>Caterham water from deep spring,</td>
<td>...</td>
<td>0.04</td>
</tr>
<tr>
<td>Deep spring at Dorking,</td>
<td>...</td>
<td>0.01</td>
</tr>
<tr>
<td>Deep Well at Chatham,</td>
<td>...</td>
<td>0.06</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>No. of days of Analysis.</th>
<th>No. of days when transparent and colorless.*</th>
<th>No. of days when not perfectly filtered.</th>
<th>Total ammonia in parts per million.</th>
<th>Chlorine in parts per million.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average 1876,</td>
<td>...</td>
<td>155</td>
<td>137</td>
<td>18</td>
</tr>
<tr>
<td>&quot; 1877,</td>
<td>...</td>
<td>104</td>
<td>72</td>
<td>32</td>
</tr>
<tr>
<td>&quot; 1878,</td>
<td>...</td>
<td>103</td>
<td>75</td>
<td>28</td>
</tr>
<tr>
<td>&quot; 1879,</td>
<td>...</td>
<td>103</td>
<td>91</td>
<td>12</td>
</tr>
<tr>
<td>Sums,</td>
<td>...</td>
<td>465</td>
<td>375</td>
<td>90</td>
</tr>
<tr>
<td>Average,</td>
<td>...</td>
<td>116</td>
<td>94</td>
<td>22</td>
</tr>
</tbody>
</table>

* 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.

<table>
<thead>
<tr>
<th>Description of Water</th>
<th>Total ammonia parts per million of water</th>
<th>Chlorine parts per million of water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unfiltered Thames water at Hampton Court,</td>
<td>...</td>
<td>0·32</td>
</tr>
<tr>
<td>&quot; Thames water at London Bridge,</td>
<td>...</td>
<td>0·36</td>
</tr>
<tr>
<td>Well at Leck Workhouse (Staffordshire),</td>
<td>...</td>
<td>1·28</td>
</tr>
<tr>
<td>Well in Windsor,</td>
<td>...</td>
<td>0·84</td>
</tr>
<tr>
<td>Well in Eton,</td>
<td>...</td>
<td>6·31</td>
</tr>
<tr>
<td>Pump in Drapers Hall, London,</td>
<td>...</td>
<td>7·75</td>
</tr>
<tr>
<td>&quot; Bishopsgate St., London,</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>&quot; Goodge St., London,</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>&quot; Oxford Market,</td>
<td>...</td>
<td></td>
</tr>
<tr>
<td>Sample of Sewage,</td>
<td>...</td>
<td></td>
</tr>
</tbody>
</table>

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.
<table>
<thead>
<tr>
<th>Date</th>
<th>Locality</th>
<th>Section</th>
<th>Reason why water was submitted to analysis</th>
<th>Description</th>
<th>Total Ammonia parts per million</th>
<th>Total Chlorine parts per million</th>
<th>Whether condemned for domestic purposes or not</th>
<th>What was done to the Tank</th>
</tr>
</thead>
<tbody>
<tr>
<td>March 1</td>
<td>No. 19, Goa Bagan Street, North Tank.</td>
<td>C</td>
<td>For cholera death in neighbourhood.</td>
<td>Yellowish green color, very turbid. Full of life.</td>
<td>18:52</td>
<td>582:00</td>
<td>Condemned</td>
<td>Filled up</td>
</tr>
<tr>
<td></td>
<td>No. 19, Goa Bagan Street, South Tank.</td>
<td>C</td>
<td>Do.</td>
<td>Yellowish green color, very turbid. Full of life.</td>
<td>26:20</td>
<td>639:00</td>
<td>Do.</td>
<td>Filled up</td>
</tr>
<tr>
<td></td>
<td>Name of locality not clearly ascertained.</td>
<td>A</td>
<td>Do. and complaint</td>
<td>Filthy state.</td>
<td>24:80</td>
<td>568:00</td>
<td>Do.</td>
<td>Filled up</td>
</tr>
<tr>
<td></td>
<td>Niharapurah.</td>
<td>A</td>
<td>Do.</td>
<td>Greenish color. Full of animal life.</td>
<td>18:00</td>
<td>550:25</td>
<td>Do.</td>
<td>Filled up</td>
</tr>
<tr>
<td></td>
<td>Nundoram Sen's Street.</td>
<td>B</td>
<td>Do.</td>
<td>Brown white color. Very turbid. Full of life.</td>
<td>10:00</td>
<td>399:50</td>
<td>Do.</td>
<td>Filled up</td>
</tr>
<tr>
<td></td>
<td>Krupanath's Lane.</td>
<td>B</td>
<td>Do.</td>
<td>Tolerably clear. Full of life.</td>
<td>2:40</td>
<td>43:75</td>
<td>Do.</td>
<td>Filled up</td>
</tr>
<tr>
<td></td>
<td>Beloram Ghose's Street.</td>
<td>A</td>
<td>Do.</td>
<td>Greenish color, very turbid. Full of life.</td>
<td>2:00</td>
<td>51:75</td>
<td>Do.</td>
<td>Filled up</td>
</tr>
<tr>
<td></td>
<td>Raja Rajbullah Street.</td>
<td>A</td>
<td>Do.</td>
<td>Rather clear; small floating worms.</td>
<td>2:00</td>
<td>51:75</td>
<td>Do.</td>
<td>Filled up</td>
</tr>
<tr>
<td>May 2</td>
<td>7, Grey Street.</td>
<td>C</td>
<td>Filthy state.</td>
<td>Yellowish green color, stinks horribly, full of suspended matter and animal life.</td>
<td>20:00</td>
<td>710:00</td>
<td>Do.</td>
<td>Filled up</td>
</tr>
<tr>
<td></td>
<td>Kerr's Lane.</td>
<td>M</td>
<td>Do.</td>
<td>Green color, stinks horribly, full of sediment, animal life</td>
<td>13:75</td>
<td>319:50</td>
<td>Do.</td>
<td>Do</td>
</tr>
<tr>
<td></td>
<td>141, Dhurrumtollah Street.</td>
<td>K</td>
<td>Do.</td>
<td>Whitish green color, rather strong stink, full of animal life.</td>
<td>9:60</td>
<td>263:25</td>
<td>Do.</td>
<td>Do</td>
</tr>
<tr>
<td></td>
<td>102, Jaun Bazar Street.</td>
<td>N</td>
<td>Do.</td>
<td>Green color, stinks horribly, full of life, animal and vegetable.</td>
<td>9:60</td>
<td>284:00</td>
<td>Do.</td>
<td>Do</td>
</tr>
<tr>
<td>Aug. 15</td>
<td>Presidency Jail Tank.</td>
<td>Q</td>
<td>Do.</td>
<td>Of greenish color, slightly turbid.</td>
<td>1:30</td>
<td>46:15</td>
<td>Do.</td>
<td>Filled up</td>
</tr>
<tr>
<td>Sept. 19</td>
<td>Alipore Jail Tank.</td>
<td>D</td>
<td>Do.</td>
<td>Yellowish color, slightly turbid.</td>
<td>0:68</td>
<td>33:50</td>
<td>Do.</td>
<td>Filled up</td>
</tr>
<tr>
<td></td>
<td>Sookea's St. Thana, North Tank.</td>
<td>D</td>
<td>Do.</td>
<td>Brownish color, contains suspended matter and considerable amount of animal life.</td>
<td>1:62</td>
<td>184:60</td>
<td>Do.</td>
<td>Filled up</td>
</tr>
<tr>
<td></td>
<td>Sookea's St. Thana, South Tank.</td>
<td>D</td>
<td>Cholera death in neighbourhood.</td>
<td>Almost colorless, contains suspended matter, little if any animal life visible.</td>
<td>35:14</td>
<td>120:00</td>
<td>Do.</td>
<td>Filling</td>
</tr>
<tr>
<td></td>
<td>Tank Harco Tollaha.</td>
<td>N</td>
<td>Do.</td>
<td>Greenish white color, very unpleasant smell, very turbid, full of animal life.</td>
<td>7:65</td>
<td>372:75</td>
<td>Do.</td>
<td>Filling</td>
</tr>
<tr>
<td></td>
<td>D Tank Water.</td>
<td>N</td>
<td>Do.</td>
<td>Of a whitish color, turbid, contains animal life, but apparently not in large quantity.</td>
<td>0:60</td>
<td>31:95</td>
<td>Do.</td>
<td>Filling</td>
</tr>
</tbody>
</table>
### Tank Waters, 1877.

<table>
<thead>
<tr>
<th>Date</th>
<th>Locality</th>
<th>Section</th>
<th>Reason why water was submitted to analysis</th>
<th>Description</th>
<th>Total Ammonia parts per million</th>
<th>Ant. of Chlorine parts per million</th>
<th>Whether condemned for domestic purposes or not</th>
<th>What was done to the Tank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan. 9</td>
<td>Godai Khansama’s Lane, Colinga.</td>
<td>O</td>
<td>Filthy state.</td>
<td>Greenish white color, turbid, and full of animal life.</td>
<td>3.06</td>
<td>156.20</td>
<td>Condemned.</td>
<td>De-watered.</td>
</tr>
<tr>
<td>Jan. 12</td>
<td>Gopal Mitton’s Tank in Brindabun Mullick’s Lane.</td>
<td>D</td>
<td>Cholera death in neighbourhood.</td>
<td>Of a greenish color, turbid, and full of animal life.</td>
<td>2.52</td>
<td>475.70</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td>Jan. 16</td>
<td>Dhanikth Tank, Colvin’s Boustee.</td>
<td>Q</td>
<td>Filthy state.</td>
<td>Of a whitish color, turbid, and full of animal life.</td>
<td>16.00</td>
<td>170.40</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td>Feb. 23</td>
<td>Tolley’s Nullah.</td>
<td>R</td>
<td>Filthy state.</td>
<td>Of a whitish color, and turbid.</td>
<td>10.00</td>
<td>71.00</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td>Feb. Mar. 6</td>
<td></td>
<td>R</td>
<td>Do.</td>
<td>Of a whitish color, and turbid.</td>
<td>10.00</td>
<td>65.67</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td>Mar. 13</td>
<td>42, Haroopara Lane.</td>
<td>N</td>
<td>Do.</td>
<td>Whitish brown color, smells badly, very turbid.</td>
<td>61.28</td>
<td>355.00</td>
<td>Do.</td>
<td>Filled up.</td>
</tr>
<tr>
<td>Mar. 15</td>
<td>32, Neogipukea East Lane.</td>
<td>N</td>
<td>Do.</td>
<td>Green color, suspended matter, stinks, turbid.</td>
<td>24.00</td>
<td>142.00</td>
<td>Do.</td>
<td>No. 33, Filled up.</td>
</tr>
<tr>
<td>Mar. 16</td>
<td>30, Haroopara Lane.</td>
<td>N</td>
<td>Filthy state.</td>
<td>Brownish color, faint smell, slightly turbid.</td>
<td>24.00</td>
<td>230.75</td>
<td>Do.</td>
<td>Filled up.</td>
</tr>
<tr>
<td>Mar. 17</td>
<td>16, Neogipukea W. Lane.</td>
<td>N</td>
<td>Do.</td>
<td>Greenish white color, faint colour, very turbid, green suspended matter.</td>
<td>120.00</td>
<td>337.25</td>
<td>Do.</td>
<td>Filled up.</td>
</tr>
<tr>
<td>Mar. 18</td>
<td>19, Okur Dutt’s Lane.</td>
<td>K</td>
<td>Cholera death in neighbourhood.</td>
<td>Greenish white color, faint smell, turbid.</td>
<td>12.84</td>
<td>159.75</td>
<td>Do.</td>
<td>Filled up.</td>
</tr>
<tr>
<td>Mar. 19</td>
<td>18, Holodhur Buukkan’s Lane.</td>
<td>K</td>
<td>Filthy state.</td>
<td>Brown almost black color, stinks, very turbid, full suspended matter.</td>
<td>40.80</td>
<td>319.50</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td>Mar. 20</td>
<td>15, Takoor Doss Paulit’s L.</td>
<td>K</td>
<td>Do.</td>
<td>Brownish white color, stinks, excessively turbid.</td>
<td>16.00</td>
<td>248.50</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>Locality</td>
<td>Section</td>
<td>Reason why water was submitted to analysis</td>
<td>Description</td>
<td>Total Ammonia parts per million</td>
<td>Ammon of Chlorine parts per million</td>
<td>Whether condemned for domestic purposes or not</td>
<td>What was done to the Tank</td>
</tr>
<tr>
<td>------</td>
<td>---------------------------</td>
<td>---------</td>
<td>---------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>---------------------------------</td>
<td>-------------------------------------</td>
<td>------------------------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>Mar 20</td>
<td>10, Okur Dutt’s Lane</td>
<td>K</td>
<td>For Cholera death in neighbourhood</td>
<td>Brownish or blackish white color, stinks, excessively turbid.</td>
<td>24</td>
<td>266</td>
<td>25</td>
<td>Condemned</td>
</tr>
<tr>
<td></td>
<td>15, Ooriahpara Lane</td>
<td>K</td>
<td>Do.</td>
<td>Do.</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>Do.</td>
</tr>
<tr>
<td></td>
<td>21, 16, Cornwallis Street</td>
<td>D</td>
<td>Do.</td>
<td>Greenish white color, stinks, turbid.</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>Do.</td>
</tr>
<tr>
<td></td>
<td>22, Sunkur Ghose’s Lane</td>
<td>D</td>
<td>Do.</td>
<td>Brownish white color, stinks, slightly turbid.</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>Do.</td>
</tr>
<tr>
<td></td>
<td>22, 36, Sankaritollah Lane</td>
<td>K</td>
<td>Do.</td>
<td>Brownish white color, stinks, excessively turbid.</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>Do.</td>
</tr>
<tr>
<td></td>
<td>103 &amp; 104, Serpentine Lane</td>
<td>K</td>
<td>Do.</td>
<td>Greenish brown, stinks horribly, excessively turbid.</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>Do.</td>
</tr>
<tr>
<td></td>
<td>23, 2 &amp; 3, Holodhur Baddan’s Lane</td>
<td>K</td>
<td>Do.</td>
<td>Brownish white color, slightly turbid, little suspended matter.</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>Do.</td>
</tr>
<tr>
<td></td>
<td>21, Jalliapa Lane</td>
<td>K</td>
<td>Do.</td>
<td>Almost transparent, little suspended matter.</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>Do.</td>
</tr>
<tr>
<td></td>
<td>8, Ukur Dutt’s Lane</td>
<td>K</td>
<td>Do.</td>
<td>Brownish color, smells, turbid.</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>Do.</td>
</tr>
<tr>
<td></td>
<td>8, Kisto Laha’s Lane</td>
<td>K</td>
<td>Complaint.</td>
<td>Stinks horribly, excessively turbid, full of bright green suspended matter.</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>Do.</td>
</tr>
<tr>
<td></td>
<td>26, 9, Serpentine Lane</td>
<td>K</td>
<td>Cholera death.</td>
<td>Whitish green color, stinks, very turbid.</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>Do.</td>
</tr>
<tr>
<td></td>
<td>90, Chipatore Road</td>
<td>G</td>
<td>On H. O.’s report.</td>
<td>Yellowish brown color, no smell, slightly turbid with suspended matter.</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>Do.</td>
</tr>
<tr>
<td></td>
<td>28, 7, Grey Street</td>
<td>C</td>
<td>For Cholera death in neighbourhood</td>
<td>Yellowish brown color, smells, opalescent, little suspended matter.</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>Do.</td>
</tr>
<tr>
<td></td>
<td>115, Upper Chipatore Road</td>
<td>G</td>
<td>Do.</td>
<td>Brownish color, smells, opalescent, suspended and animal matter.</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>Do.</td>
</tr>
<tr>
<td></td>
<td>29, 22, Musjedbarree Street</td>
<td>C</td>
<td>Do.</td>
<td>Bright green color, stinks horribly, extremely opalescent, suspended matter.</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>Do.</td>
</tr>
<tr>
<td></td>
<td>30, 63, Hurry Ghose’s Street</td>
<td>C</td>
<td>Do.</td>
<td>Brownish almost black color, stinks, suspended matter.</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>Do.</td>
</tr>
<tr>
<td></td>
<td>5, Fuquer Chand Chatterjee’s Street</td>
<td>C</td>
<td>Do.</td>
<td>Brown color, stinks horribly, extremely opalescent, much suspended matter.</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>Do.</td>
</tr>
<tr>
<td></td>
<td>31, 27, Tarak Chatterjee’s Lane</td>
<td>C</td>
<td>Do.</td>
<td>Brown color, smells, opalescent, suspended matter.</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>Do.</td>
</tr>
<tr>
<td></td>
<td>31, Darjeeparah Street</td>
<td>C</td>
<td>Do.</td>
<td>Yellow color, smells, suspended matter.</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>Do.</td>
</tr>
<tr>
<td>Date</td>
<td>Location</td>
<td>Complaint of ragging cholera</td>
<td>Description</td>
<td>Date</td>
<td>Value</td>
<td>Comment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>------------------------------------</td>
<td>------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------</td>
<td>--------</td>
<td>-----------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>April 10.</td>
<td>28, Goan Bagan W. Goallpara.</td>
<td>C</td>
<td>Complaint of ragging cholera.</td>
<td>Do.</td>
<td>6:49</td>
<td>426:00 Condemned.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>16, Do.</td>
<td>C</td>
<td>Bright green color, stinks, excessively opalescent, full of suspended matter.</td>
<td>Do.</td>
<td>20:96</td>
<td>337:25 Do.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>12, Double Tank, Komadar Bagan, Joratolla.</td>
<td>O</td>
<td>Foul state.</td>
<td>Do.</td>
<td>3:90</td>
<td>177:50 Do.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>16, Tank A.</td>
<td>N</td>
<td>Yellowish color, unpleasant smell, slightly turbid, suspended matter &amp; also animal life.</td>
<td>3:55</td>
<td>Lost.</td>
<td>74:50</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tank B.</td>
<td>N</td>
<td>Almost colorless and smells unpleasantly; much suspended matter.</td>
<td>2:20</td>
<td>3:20</td>
<td>81:60 Do.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aug. 7.</td>
<td>75 &amp; 76, South Colinga St.</td>
<td>O</td>
<td>Stinks of sulphuric acid, becomes opalescent on exposure, much suspended matter.</td>
<td>2:36</td>
<td>2:36</td>
<td>159:75</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10, 24, Baranose Ghose's St., Singhie Bagan.</td>
<td>F</td>
<td>Yellow color, smells slightly, contains suspended matter.</td>
<td>2:15</td>
<td>2:68</td>
<td>142:00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oct. 9.</td>
<td>10 &amp; 12, Elliot's Road.</td>
<td>O</td>
<td>Water of a yellowish color, faint unpleasant smell, much animal life.</td>
<td>3:15</td>
<td>4:29</td>
<td>71:00</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10, 6, Hill's Lane.</td>
<td>O</td>
<td>Yellowish color, stinks, opalescent, contains animal life.</td>
<td>3:15</td>
<td>3:95</td>
<td>142:00 Do.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>26, 62, Machooa Bazar Street.</td>
<td>I</td>
<td>Yellowish color, smells slightly, slightly opalescent, animal life.</td>
<td>2:20</td>
<td>4:40</td>
<td>213:00</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>27, 44, Musgearbary Street.</td>
<td>C</td>
<td>Greenish black color, stinks, opalescent, full of suspended matter.</td>
<td>2:20</td>
<td>2:50</td>
<td>266:25</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>30, 38, Nilmoneky Mitter's St.</td>
<td>C</td>
<td>Filthy state.</td>
<td>9:00</td>
<td>9:00</td>
<td>301:75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nov. 2.</td>
<td>7, Sookea's St., Bye-Lane.</td>
<td>D</td>
<td>On Tank Committee's report.</td>
<td>3:40</td>
<td>3:40</td>
<td>185:25</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3, 11, Carey's Church Lane.</td>
<td>I</td>
<td>Yellowish green color, slight smell, slightly opalescent, small quantity suspended matter, full of animal life.</td>
<td>12:00</td>
<td>12:00</td>
<td>185:25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Tank Waters, 1877—Concluded.

<table>
<thead>
<tr>
<th>Date</th>
<th>Locality</th>
<th>Section</th>
<th>Reason why water was submitted to analysis</th>
<th>Description</th>
<th>Total Ammonia parts per million</th>
<th>Amot. of Cholera parts per million</th>
<th>Whether condemned for domestic purposes or not</th>
<th>What was done to the Tank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov. 8</td>
<td>Colvin Bustee Tank.</td>
<td>Q</td>
<td>Cholera death in neighbourhood.</td>
<td>Greenish white color, stinks, opalescent, full of green suspended matter and animal life.</td>
<td>13.00</td>
<td>196.25</td>
<td>Condemned</td>
<td>Filled up</td>
</tr>
<tr>
<td></td>
<td>9, Shampuker Street.</td>
<td>A</td>
<td>Do.</td>
<td>Greenish color, slight smell, slightly opalescent, full of green suspended matter and animal life.</td>
<td>9.84</td>
<td>181.05</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>85, Maahoo Bazar Street.</td>
<td>D</td>
<td>Do.</td>
<td>Yellowish brown color, slight smell, opalescent, full of green suspended matter and animal life.</td>
<td>11.30</td>
<td>159.75</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6, Emambang 2nd Lane.</td>
<td>J</td>
<td>Complaint.</td>
<td>Green color, faint smell, much suspended matter, and animal life.</td>
<td>3.00</td>
<td>113.60</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>75, Jaun Bazar Street.</td>
<td>N</td>
<td>Cholera in neighbourhood.</td>
<td>Greenish yellow color, stinks, rather opalescent, small quantity of suspended matter, full of animal life.</td>
<td>2.76</td>
<td>202.35</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td>Dec. 10</td>
<td>46, Kally Prosad Dutt's St.</td>
<td>C</td>
<td>Do.</td>
<td>Dark green brown color, on being kept a few days stinks horribly, full of green suspended matter, and animal life.</td>
<td>28.56</td>
<td>205.90</td>
<td>Do.</td>
<td>No. 64, Filled up.</td>
</tr>
<tr>
<td></td>
<td>104, Upper Circular Road.</td>
<td>C</td>
<td>Do.</td>
<td>Whitish brown color, when kept a few days has a very bad smell, full of green suspended matter, contains animal life.</td>
<td>23.52</td>
<td>262.70</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12, Nuzur Nuzubullah's Lane.</td>
<td>O</td>
<td>On the report of Tank Committee.</td>
<td>Greenish white color, has unpleasant smell, moderate amount of suspended matter, much animal life.</td>
<td>8.40</td>
<td>181.05</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>18, Hardeepa Lane, and 15, Neogipuker West Lane.</td>
<td>N</td>
<td>Filthy state.</td>
<td>Green color, stinks most horribly, much suspended matter, full of animal life.</td>
<td>11.16</td>
<td>244.95</td>
<td>Do.</td>
<td>Filled up</td>
</tr>
<tr>
<td>Date</td>
<td>Locality</td>
<td>Section</td>
<td>Reason why water was submitted to analysis.</td>
<td>Description</td>
<td>Total Ammonia parts per million</td>
<td>Chloride parts per million</td>
<td>Whether condemned for domestic purposes or not</td>
<td>What was done to the Tank.</td>
</tr>
<tr>
<td>------</td>
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<td>---------------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
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<td>---------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Jan. 2</td>
<td>54, Raja Rajbullub Street</td>
<td>A</td>
<td>Cholera death in neighbourhood.</td>
<td>Deep yellowish color, very unpleasant smell, full of suspended matter and animal life.</td>
<td>21.30</td>
<td>475.70</td>
<td>Condemned.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>3, Fukeer Chand Mitter’s Lane</td>
<td>D</td>
<td>Do.</td>
<td>Yellowish green color, unpleasant smell, little suspended matter, contains animal life.</td>
<td>3.46</td>
<td>92.30</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>129, Cornwallis Street</td>
<td>C</td>
<td>Do.</td>
<td>Bright green color, stinks, much suspended matter, much animal life.</td>
<td>21.06</td>
<td>280.45</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>4, Fukeer Chand Mitter’s Lane</td>
<td>D</td>
<td>Do.</td>
<td>Water yellowish color, some suspended matter.</td>
<td>12.00</td>
<td>149.10</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>21, Do. Do. Do. Do.</td>
<td>D</td>
<td>Do.</td>
<td>Yellowish green color, unpleasant smell, slightly opalescent, little suspended matter, animal life.</td>
<td>4.70</td>
<td>127.80</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>81, Shampookur Street</td>
<td>A</td>
<td>Do.</td>
<td>Yellow color, slight smell, little suspended matter, much animal life.</td>
<td>2.72</td>
<td>142.00</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>27, Noyau Chunder Dutt’s Lane</td>
<td>C</td>
<td>Do.</td>
<td>Yellow, stinks, small quantity suspended matter, no visible animal life.</td>
<td>1.47</td>
<td>124.25</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Karhala tank water</td>
<td>C</td>
<td>Do.</td>
<td>Has a brown color, unpleasant smell, contains suspended matter, animal life.</td>
<td>1.49</td>
<td>276.90</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td>Feb. 27</td>
<td>162, Bow Bazar.</td>
<td>I</td>
<td>Do.</td>
<td>Yellow brown color, stinks, opalescent, much suspended matter, no life.</td>
<td>40.66</td>
<td>266.25</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>1, Nc moo Gosain’s Lane</td>
<td>B</td>
<td>Do.</td>
<td>Brown color, stinks badly of sulphuretted hydrogen, opalescent, much suspended matter, animal life.</td>
<td>23.20</td>
<td>479.25</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>2, Manicktollah Street</td>
<td>J</td>
<td>Do.</td>
<td>Brownish color, stinks, very opalescent, much suspended matter, animal life.</td>
<td>38.74</td>
<td>461.50</td>
<td>Do.</td>
<td></td>
</tr>
</tbody>
</table>
**Tank Waters, 1878—Continued.**

<table>
<thead>
<tr>
<th>Date</th>
<th>Locality</th>
<th>Section</th>
<th>Reason why water was submitted to analysis</th>
<th>Description</th>
<th>Total Ammonia parts per million</th>
<th>Chlorine parts per million</th>
<th>Whether condemned for domestic purposes or not</th>
<th>What was done to the tank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mar. 11</td>
<td>222, Cornwallis Street.</td>
<td>J</td>
<td>Cholera death in neighbourhood.</td>
<td>Greenish color, stinks, very opalescent, animal life.</td>
<td>3.52</td>
<td>248.50</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>26, Prossunno Coomar Tagore's Street.</td>
<td>E</td>
<td>Do.</td>
<td>Bright green color, stinks horribly, very opalescent, full of green suspended matter, full of animal life.</td>
<td>17.00</td>
<td>319.50</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>22, Hero Lall Mitter’s Street.</td>
<td>A</td>
<td>Do.</td>
<td>Brownish color, bad smell, very opalescent, small quantity suspended matter, animal life.</td>
<td>7.68</td>
<td>301.75</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>45, Shampookur Lane.</td>
<td>A</td>
<td>Complaint.</td>
<td>Yellowish white color, stinks, large quantity suspended matter, visible animal life.</td>
<td>3.02</td>
<td>230.75</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td>26.</td>
<td>Mirzapore Public Tank.</td>
<td>I</td>
<td>Do.</td>
<td>Greenish color, faint smell, small quantity suspended matter, animal life.</td>
<td>1.31</td>
<td>102.95</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Badoorbagan Tank, 83, Upper Circular Road.</td>
<td>D</td>
<td>Do.</td>
<td>Greenish color, stinks, green suspended matter in large quantity, animal matter in quantity.</td>
<td>2.16</td>
<td>220.10</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td>April 27</td>
<td>Dhurumtollah Public Tank.</td>
<td>M</td>
<td></td>
<td></td>
<td>0.80</td>
<td>24.80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>May 10</td>
<td>Wellesley Street.</td>
<td>M</td>
<td></td>
<td></td>
<td>0.34</td>
<td>147.68</td>
<td></td>
<td>Do.</td>
</tr>
<tr>
<td></td>
<td>Palmer’s Bridge.</td>
<td>R</td>
<td></td>
<td></td>
<td>0.17</td>
<td>2378.5</td>
<td></td>
<td>Do.</td>
</tr>
</tbody>
</table>
## 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.                         |                             |
| Jan. 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        | Do.                                         | 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.                                |                             |
| July 5.  | 22, Durga Churn Mukerjen's Street. | A        | Do.                                         | Brownish color, stinks badly, much suspended matter.                        | 3.72                                      | 213.00                          | Do.                                |                             |
| July 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, Jorapukor Lane. | F        | Cholera.                                    | Blackish brown color, stinks badly, very opalescent, large quantity of suspended matter. | 77.60                                     | 177.50                          | Do.                                |                             |

### 1880.

<table>
<thead>
<tr>
<th>Date</th>
<th>Locality</th>
<th>Section.</th>
<th>Reason why water was submitted to analysis.</th>
<th>Description</th>
<th>Total Ammonia parts per million of water.</th>
<th>Chlorine parts per million of water.</th>
<th>What was done to the tank.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>Locality</td>
<td>Section</td>
<td>Reason why water was submitted to analysis</td>
<td>Description</td>
<td>Total Ammonia parts per million of water</td>
<td>Chlorine parts per million of water</td>
<td>Whether condemned for domestic purposes or not.</td>
</tr>
<tr>
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<td>----------------------------------------------------------------------------</td>
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<td>-----------------------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td></td>
<td>31, Elliott's Road</td>
<td>O</td>
<td>Do.</td>
<td>Green color, slight odour, much green suspended matter, animal life.</td>
<td>4:00</td>
<td>159:75</td>
<td>Do.</td>
</tr>
<tr>
<td></td>
<td>35, Elliott’s Road</td>
<td>O</td>
<td>Do.</td>
<td>Green color, stinks abominably, much suspended matter, animal life.</td>
<td>6:00</td>
<td>142:00</td>
<td>Do.</td>
</tr>
<tr>
<td></td>
<td>Radhanath Bose’s Lane.</td>
<td>C</td>
<td>Do.</td>
<td>Green color, unpleasant smell, suspended matter, much animal life.</td>
<td>6:30</td>
<td>355:00</td>
<td>Do.</td>
</tr>
<tr>
<td>May 29</td>
<td>31, Bachoo Chatterjea’s Street.</td>
<td>D</td>
<td>Do.</td>
<td>Green color, stinks badly, very turbid, suspended matter, animal life.</td>
<td>8:00</td>
<td>401:15</td>
<td>Do.</td>
</tr>
<tr>
<td>July 5</td>
<td>South of Park Street old Cemetery.</td>
<td></td>
<td></td>
<td>Slight yellow color, no smell, almost clear and transparent, small quantity of animal life.</td>
<td>0:16</td>
<td>255:60</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Birju Tank, south of Cathedral.</td>
<td></td>
<td></td>
<td>Greyish color, no smell, rather turbid, small quantity of animal life.</td>
<td>0:09</td>
<td>13:81</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Elliot’s Tank, north of Cathedral.</td>
<td></td>
<td></td>
<td>Slight greyish color, no smell, rather turbid, small quantity of animal life.</td>
<td>0:10</td>
<td>8:16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>General’s Tank opposite Bengal Club.</td>
<td></td>
<td></td>
<td>Grey color, no smell, rather turbid, small quantity of animal life.</td>
<td>0:10</td>
<td>32:66</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Monohar Dass’s Tank opposite Lindsay Street</td>
<td></td>
<td></td>
<td>Almost colorless, no smell, almost clear and transparent, very small quantity of animal life.</td>
<td>0:07</td>
<td>16:68</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tank opposite Esplanade.</td>
<td></td>
<td></td>
<td>Almost colorless, no smell, almost transparent, small quantity of animal life.</td>
<td>0:11</td>
<td>24:14</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>Locality</td>
<td>Section</td>
<td>Reason why water was submitted to analysis</td>
<td>Description</td>
<td>Total Ammonia parts per million</td>
<td>Ammonia Chloride parts per million</td>
<td>Whether condemned for domestic purposes or not</td>
</tr>
<tr>
<td>-------</td>
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<td>--------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
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<td>-----------------------------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>May 8</td>
<td>5, Jorabagan.</td>
<td>E</td>
<td>Cholera death in neighbourhood.</td>
<td>Greenish black color, stinks horribly, slightly opalescent, full of suspended matter.</td>
<td>1.68</td>
<td>177.50</td>
<td>Condemned</td>
</tr>
<tr>
<td></td>
<td>9, 1, Horo Lall Doss's Lane.</td>
<td>E</td>
<td>Filthy state.</td>
<td>Slight brownish color, no smell, little suspended matter.</td>
<td>0.80</td>
<td>248.50</td>
<td>Do.</td>
</tr>
<tr>
<td></td>
<td>10, 16, Burrabazar Moydapaty.</td>
<td>G</td>
<td>Do.</td>
<td>Almost colorless, no suspended matter.</td>
<td>0.40</td>
<td>213.00</td>
<td>Do.</td>
</tr>
<tr>
<td></td>
<td>11, Jambazar Bustee.</td>
<td>M</td>
<td></td>
<td>Yellowish color, no smell, traces of suspended matter.</td>
<td>8.20</td>
<td>514.75</td>
<td>Do.</td>
</tr>
<tr>
<td></td>
<td>12, 24, Jorabagan Street.</td>
<td>E</td>
<td>Filthy state.</td>
<td>Almost colorless, faint smell, small amount of suspended matter.</td>
<td>0.62</td>
<td>621.25</td>
<td>Do.</td>
</tr>
<tr>
<td></td>
<td>13, 6, Jorabagan Street.</td>
<td>E</td>
<td>Do.</td>
<td>Brownish color, faint smell, small amount of suspended matter.</td>
<td>0.50</td>
<td>248.50</td>
<td>Do.</td>
</tr>
<tr>
<td></td>
<td>14, 7, Horo Lall Doss's Bustee.</td>
<td>E</td>
<td>Do.</td>
<td>Brownish color, nasty smell, opalescent, suspended matter.</td>
<td>1.76</td>
<td>142.00</td>
<td>Do.</td>
</tr>
<tr>
<td></td>
<td>15, 9, Shama Bye's Gully.</td>
<td>E</td>
<td>Do.</td>
<td>Slight yellowish color, faint smell, small amount of suspended matter.</td>
<td>0.90</td>
<td>426.00</td>
<td>Do.</td>
</tr>
<tr>
<td></td>
<td>16, 30, Burtollah Street.</td>
<td>E</td>
<td>Do.</td>
<td>Almost colorless, faint smell, small amount of suspended matter.</td>
<td>0.50</td>
<td>39.50</td>
<td>Do.</td>
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<tr>
<td></td>
<td>17, 145, &quot;Burrabazar Buncaputty.</td>
<td>G</td>
<td>Do.</td>
<td>Brownish color, faint smell, suspended matter.</td>
<td>0.40</td>
<td>177.50</td>
<td>Do.</td>
</tr>
<tr>
<td></td>
<td>17, 145, &quot;Hookaputty.</td>
<td>G</td>
<td>Do.</td>
<td>Yellowish color, faint smell, much suspended matter.</td>
<td>0.30</td>
<td>710.00</td>
<td>Do.</td>
</tr>
<tr>
<td></td>
<td>18, 3, Hanspookur Gully.</td>
<td>E</td>
<td>Filthy state.</td>
<td>Strong yellowish brown color, faint smell, much suspended matter.</td>
<td>4.15</td>
<td>307.70</td>
<td>Do.</td>
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<tr>
<td></td>
<td>19, 169, Machooa Bazar Street.</td>
<td>E</td>
<td>Do.</td>
<td>Yellowish color, faint unpleasant smell, little suspended matter.</td>
<td>2.40</td>
<td>390.50</td>
<td>Do.</td>
</tr>
<tr>
<td>Aug 10</td>
<td>145, Burra Bazar.</td>
<td>G</td>
<td>Filthy state.</td>
<td>Almost colorless, faint unpleasant smell, suspended matter.</td>
<td>3.68</td>
<td>791.65</td>
<td>Do.</td>
</tr>
</tbody>
</table>
### Well Waters, 1877—Continued.

<table>
<thead>
<tr>
<th>Date</th>
<th>Locality</th>
<th>Section</th>
<th>Reason why water was submitted to analysis</th>
<th>Description</th>
<th>Total Ammonia parts per million</th>
<th>Amm. of Chlorine parts per million</th>
<th>Whether condemned for domestic purposes or not</th>
<th>What was done to the well</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aug. 10</td>
<td>24, Jorabagan Street</td>
<td>E</td>
<td>Cholera death in neighbourhood</td>
<td>Yellowish green color, faint unpleasant smell, suspended matter, animal life distinct.</td>
<td>2-84</td>
<td>265-25</td>
<td>Condemned.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>11, 3, Hanspookur Lane</td>
<td>E</td>
<td></td>
<td>Almost colorless, faint smell, small quantity suspended matter.</td>
<td>1-42</td>
<td>390-50</td>
<td>Do.</td>
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<tr>
<td></td>
<td>12, 6, Jorabagan Street</td>
<td>E</td>
<td>Cholera death</td>
<td>Yellowish color, faint unpleasant smell, small quantity suspended matter, distinct animal life.</td>
<td>3-76</td>
<td>159-75</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>13, 30, Burtolah Street</td>
<td>E</td>
<td></td>
<td>Colorless, faint unpleasant smell, large quantity of suspended matter, distinct animal life.</td>
<td>2-73</td>
<td>319-50</td>
<td>Do.</td>
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<tr>
<td></td>
<td>14, 9, Shama Bay's Lane</td>
<td>E</td>
<td></td>
<td>Almost colorless, faint unpleasant smell, small quantity suspended matter.</td>
<td>2-64</td>
<td>408-50</td>
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<tr>
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<td>15, 24, Bustee Joraban Street</td>
<td>E</td>
<td></td>
<td>Brown color, stinks badly, very opalescent, much suspended matter, distinct animal life.</td>
<td>17-40</td>
<td>159-75</td>
<td>Do.</td>
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<tr>
<td></td>
<td>16, 1, Horo Lall Doss's Lane</td>
<td>E</td>
<td></td>
<td>Almost colorless, faint smell, small quantity of suspended matter.</td>
<td>3-95</td>
<td>177-50</td>
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<tr>
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<td>17, 16, Burra Bazar Moydappathy</td>
<td>G</td>
<td></td>
<td>Colorless, faint unpleasant smell, little suspended matter.</td>
<td>2-88</td>
<td>177-50</td>
<td>Do.</td>
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<tr>
<td></td>
<td>18, 5, Jorabagan Street</td>
<td>E</td>
<td>Cholera death</td>
<td>Whitish yellow color, smells unpleasantly, opalescent, suspended matter, and traces of animal life.</td>
<td>15-80</td>
<td>88-75</td>
<td>Do.</td>
<td></td>
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<tr>
<td></td>
<td>19, 9, Burra bazar Baneaputty</td>
<td>G</td>
<td></td>
<td>Almost colorless, faint unpleasant smell, suspended matter, animal life.</td>
<td>3-28</td>
<td>195-25</td>
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<tr>
<td></td>
<td>20, Bustee Horo Lall Doss's Lane</td>
<td>E</td>
<td></td>
<td>Yellow color, decided unpleasant smell, suspended matter.</td>
<td>4-32</td>
<td>248-50</td>
<td>Do.</td>
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<tr>
<td></td>
<td>22, 136, Serpentine Lane</td>
<td>K</td>
<td></td>
<td>Yellow color, unpleasant smell, little suspended matter, much animal life.</td>
<td>6-40</td>
<td>621-25</td>
<td>Do.</td>
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<tr>
<td>Date</td>
<td>Locality</td>
<td>Section</td>
<td>Reason why water was submitted to analysis</td>
<td>Description</td>
<td>Total Ammonia parts per million</td>
<td>Chlorine parts per million</td>
<td>Whether condemned for domestic purposes or not</td>
<td>What was done to the well</td>
</tr>
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<tr>
<td>Jan. 28</td>
<td>Doorga Churn Mittur's Street</td>
<td>C</td>
<td>Cholera death in neighbourhood</td>
<td>Almost colorless, but in long cylinder appears yellowish, faint unpleasant smell, small quantity suspended matter, no animal life perceptible.</td>
<td>1.40</td>
<td>88.75</td>
<td>Condemned.</td>
<td></td>
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<tr>
<td>Feb. 7</td>
<td>13-B, Nattur Bagan.</td>
<td>B</td>
<td>Do.</td>
<td>Almost black, unpleasant smell, excessively turbid animal life.</td>
<td>51.50</td>
<td>841.35</td>
<td>Do.</td>
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</tr>
<tr>
<td>Feb. 10</td>
<td>Ram Kanto Bose’s Lane.</td>
<td>A</td>
<td>Do.</td>
<td>Slight brownish tinge, slight smell, small quantity suspended matter, no visible animal life.</td>
<td>3.30</td>
<td>639.00</td>
<td>Do.</td>
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</tr>
<tr>
<td>Feb. 14</td>
<td>Smith’s Lane.</td>
<td>N</td>
<td>Do.</td>
<td>Yellow color, slight smell, some suspended matter, small traces of animal life.</td>
<td>3.30</td>
<td>479.25</td>
<td>Do.</td>
<td></td>
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<tr>
<td>Feb. 30</td>
<td>Noyau Chaund Dutt’s Street.</td>
<td>C</td>
<td>Do.</td>
<td>Yellow color, unpleasant smell, small quantity suspended matter, distinct animal life.</td>
<td>1.92</td>
<td>152.65</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td>Feb. 15</td>
<td>Ram Kanto Bose’s Lane.</td>
<td>A</td>
<td>Do.</td>
<td>Yellowish color, unpleasant smell, moderate amount suspended matter, no visible animal life.</td>
<td>12.80</td>
<td>582.20</td>
<td>Do.</td>
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<tr>
<td>Feb. 19</td>
<td>Railway Tank, Scaldah.</td>
<td>K</td>
<td>Do.</td>
<td>Almost colorless, slight smell, small quantity suspended matter, no visible animal life.</td>
<td>0.80</td>
<td>452.60</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td>Feb. 20</td>
<td>Bow Bazar Street.</td>
<td>K</td>
<td>Do.</td>
<td>Almost colorless, no smell, very small quantity suspended matter, no visible animal life.</td>
<td>0.60</td>
<td>450.85</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td>Feb. 22</td>
<td>Bamutollah Street.</td>
<td>B</td>
<td>Do.</td>
<td>Yellow color, unpleasant smell, much suspended matter, animal life.</td>
<td>48.00</td>
<td>816.50</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td>Feb. 25</td>
<td>Serang’s Lane.</td>
<td>N</td>
<td>Do.</td>
<td>Almost colorless, slight smell, small quantity suspended matter, no visible animal life.</td>
<td>0.94</td>
<td>608.20</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td>Feb. 28</td>
<td>Nemoo Gawsat’s Lane.</td>
<td>B</td>
<td>Do.</td>
<td>Yellow color, unpleasant smell, much suspended matter, no visible animal life.</td>
<td>17.52</td>
<td>514.75</td>
<td>Do.</td>
<td>Filled up.</td>
</tr>
</tbody>
</table>
### Well Waters, 1878—Continued.

<table>
<thead>
<tr>
<th>Date</th>
<th>Locality</th>
<th>Section</th>
<th>Reason why water was submitted to analysis</th>
<th>Description</th>
<th>Total Ammonia parts per million</th>
<th>Chlorine parts per million</th>
<th>Whether condemned for domestic purposes or not</th>
<th>What was done to the well</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feb. 28.</td>
<td>13-J, Patwai Bagan.</td>
<td>I</td>
<td>Cholera death in neighbourhood.</td>
<td>Yellowish color, slight smell, small quantity suspended matter, no visible animal life.</td>
<td>0.94</td>
<td>603.50</td>
<td>Condemned.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>21, Nathu Bagan.</td>
<td>B</td>
<td>Do.</td>
<td>Brownish color, unpleasant smell, slightly opaque, small quantity suspended matter.</td>
<td>41.06</td>
<td>532.50</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1, Nemoo Gosain’s Lane.</td>
<td>B</td>
<td>Do.</td>
<td>Brownish color, stinks, suspended matter, and much animal life.</td>
<td>6.96</td>
<td>390.50</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td>Mar. 4.</td>
<td>71, Dhurumtollah Street.</td>
<td>B</td>
<td>Do.</td>
<td>Yellow color, slight smell, small quantity suspended matter, no animal life.</td>
<td>3.36</td>
<td>319.50</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9, Boloram Mozoomdar’s Street.</td>
<td>B</td>
<td>Do.</td>
<td>Black color, horrible stench of sulphureted hydrogen, very opaque, much suspended matter.</td>
<td>11.17</td>
<td>492.00</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>168, Cotton Street.</td>
<td>E</td>
<td>Do.</td>
<td>Slight yellowish tinge, slight smell, little suspended matter.</td>
<td>0.20</td>
<td>195.25</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>113, Dhurumtollah Street.</td>
<td>E</td>
<td>Do.</td>
<td>No smell, small quantity suspended matter, no visible animal life.</td>
<td>2.50</td>
<td>53.25</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>82-5, Burtollah Street.</td>
<td>E</td>
<td>Do.</td>
<td>Full yellow color, slight smell, much suspended matter, distinct animal life visible under microscope.</td>
<td>222.00</td>
<td>781.00</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8, 27, Bonomally Sirca’s Street.</td>
<td>B</td>
<td>Do.</td>
<td>Almost colorless, very slight smell, little suspended matter, distinct animal life visible under microscope.</td>
<td>18.60</td>
<td>319.50</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5, 23-9, Durponaryan’s Lane.</td>
<td>E</td>
<td>Do.</td>
<td>Almost colorless, very slight smell, much suspended matter, no visible animal life.</td>
<td>14.80</td>
<td>514.75</td>
<td>Do.</td>
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<tr>
<td></td>
<td>17-22, Durponaryan’s Tagor’s Street.</td>
<td>E</td>
<td>Do.</td>
<td>Slight yellowish color, very slight smell, little suspended matter, no animal life.</td>
<td>2.00</td>
<td>254.00</td>
<td>Do.</td>
<td></td>
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<tr>
<td></td>
<td>5, 3, Antony Bagan Lane.</td>
<td>I</td>
<td>Do.</td>
<td>Yellowish color, no smell, little suspended matter.</td>
<td>9.48</td>
<td>230.75</td>
<td>Do.</td>
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<tr>
<td>Mar.</td>
<td>25.</td>
<td>7-a, Bysack's Lane.</td>
<td>F</td>
<td>Cholera death in neighbourhood.</td>
<td>Greyish white color, stinks badly, very opalescent, much suspended matter.</td>
<td>1.92</td>
<td>71.00</td>
<td>Condemned.</td>
</tr>
<tr>
<td>6.</td>
<td>124, Manjeetollah Street.</td>
<td>D</td>
<td>Do.</td>
<td>Deep brown color, unpleasant smell, opalescent.</td>
<td>219.00</td>
<td>1384.5</td>
<td>Do.</td>
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<tr>
<td>8.</td>
<td>21, Mahoo Pal's Street.</td>
<td>B</td>
<td>Do.</td>
<td>Yellow color, stinks badly, little suspended matter, no animal life.</td>
<td>734</td>
<td>727.75</td>
<td>Do.</td>
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<tr>
<td>11.</td>
<td>6, Ashutosh Dey's Lane.</td>
<td>F</td>
<td>Do.</td>
<td>Almost clear, transparent and colorless, no smell, no visible animal life.</td>
<td>5.24</td>
<td>213.00</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td>5, Suri's Lane.</td>
<td>K</td>
<td>Do.</td>
<td>Colorless, slight smell, little suspended matter, no visible animal life.</td>
<td>9.96</td>
<td>319.50</td>
<td>Do.</td>
<td></td>
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</tr>
<tr>
<td>12, Nilmoy Mitter's Lane.</td>
<td>C</td>
<td>Do.</td>
<td>Blackish color, stinks badly, very opalescent, full of suspended matter, animal life.</td>
<td>68.00</td>
<td>550.25</td>
<td>Do.</td>
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<tr>
<td>12, 82-17, Burtollah Street.</td>
<td>E</td>
<td>Do.</td>
<td>Almost colorless, very slight smell, little suspended matter, no animal life.</td>
<td>0.46</td>
<td>1260.25</td>
<td>Do.</td>
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<tr>
<td>14-C, Goomgur Lane.</td>
<td>G</td>
<td>Do.</td>
<td>Almost colorless, slight smell, small quantity suspended matter.</td>
<td>3.31</td>
<td>727.75</td>
<td>Do.</td>
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<tr>
<td>222, Cornwallis Street.</td>
<td>F</td>
<td>Do.</td>
<td>Yellowish color, nasty smell, little suspended matter.</td>
<td>5.68</td>
<td>177.50</td>
<td>Do.</td>
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<tr>
<td>1, Ram Chunder Bancerjee's Lane.</td>
<td>I</td>
<td>Do.</td>
<td>Yellowish color, very unpleasant smell, little suspended matter, animal life.</td>
<td>0.60</td>
<td>35.50</td>
<td>Do.</td>
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<tr>
<td>13, 22, Free School Street.</td>
<td>M</td>
<td>Do.</td>
<td>Almost colorless and transparent, very little suspended matter.</td>
<td>5.04</td>
<td>337.25</td>
<td>Do.</td>
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<tr>
<td>15, Nilmoy Mitter's Lane.</td>
<td>C</td>
<td>Do.</td>
<td>Greenish yellow color, unpleasant smell, much suspended matter.</td>
<td>5.04</td>
<td>319.50</td>
<td>Do.</td>
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<td></td>
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<tr>
<td>135, Machooa Bazar Street.</td>
<td>F</td>
<td>Do.</td>
<td>White color, slightly opalescent, little suspended matter, animal life.</td>
<td>22.40</td>
<td>1029.5</td>
<td>Do.</td>
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<tr>
<td>54, Old Boytuckhana Bazar Street.</td>
<td>I</td>
<td>Do.</td>
<td>Yellowish green color, slight smell, much suspended matter, animal life.</td>
<td>3.62</td>
<td>532.50</td>
<td>Do.</td>
<td></td>
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<tr>
<td>Date</td>
<td>Locality</td>
<td>Reason why water was submitted to analysis</td>
<td>Description</td>
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<tr>
<td></td>
<td></td>
<td>Complaint</td>
<td>Deep yellow-brown color, unpleasant smell, large quantity of suspended matter.</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Complaint</td>
<td>Yellow-brown color, unpleasant smell, no visible animal life.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Complaint</td>
<td>Yellow-brown color, unpleasant smell, no visible animal life.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Complaint</td>
<td>Almond color, no smell, small quantity of suspended matter, no visible animal life.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Complaint</td>
<td>Yellow color, slight smell, unpleasant smell on keeping.</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Complaint</td>
<td>Yellow color, slight smell, unpleasant smell on keeping.</td>
<td></td>
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</table>

**Well Watters, 1878—Concluded.**

<table>
<thead>
<tr>
<th>What was done</th>
<th>Complaint</th>
<th>Section</th>
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<tr>
<td>Condemned</td>
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<td>J</td>
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<td>Do.</td>
<td></td>
<td>F</td>
</tr>
<tr>
<td>Do.</td>
<td></td>
<td>F</td>
</tr>
<tr>
<td>Do.</td>
<td></td>
<td>F</td>
</tr>
<tr>
<td>Do.</td>
<td></td>
<td>C</td>
</tr>
<tr>
<td>Do.</td>
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</tbody>
</table>

Total Ammonia Parts per Million

- 0.10
- 0.29
- 8.59
- 7.29
- 213.90
- 11.7
- 213.90
### Water Supplies of Calcutta

<table>
<thead>
<tr>
<th>Date</th>
<th>Locality</th>
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<th>Reason why water was submitted to analysis</th>
<th>Description</th>
<th>Ammonia parts per million</th>
<th>Chlorine parts per million</th>
<th>Whether condemned for domestic purposes or not</th>
<th>What was done to the well</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan. 10</td>
<td>14-2-89, Machooa Bazar Street.</td>
<td>H</td>
<td>On the receipt of objection from the owner to dewater.</td>
<td>Almost colorless, no smell, small quantity suspended matter, animal life.</td>
<td>0.33</td>
<td>639.06</td>
<td>Condemned.</td>
<td></td>
</tr>
<tr>
<td>,, 15</td>
<td>69, Sitanarin Ghosh's Street.</td>
<td>I</td>
<td>Do.</td>
<td>Yellow color, no smell, opalescent, contains suspended matter.</td>
<td>12.60</td>
<td>372.75</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td>June 17</td>
<td>29, E. Gopce Kristo Paul's Lane.</td>
<td>B</td>
<td>Do.</td>
<td>Bright yellow color, unpleasant smell, small quantity suspended matter, no animal life.</td>
<td>7.92</td>
<td>301.75</td>
<td>Do.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1880.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jan. 23</td>
<td>6, Brindabun Mullik's Lane.</td>
<td>D</td>
<td>Complaint.</td>
<td>Black color, stinks abominably, large quantity of suspended matter, animal life.</td>
<td>64.00</td>
<td>514.75</td>
<td>Do.</td>
<td></td>
</tr>
</tbody>
</table>

---

*Well Waters, 1879.*
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 35½ 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.

<table>
<thead>
<tr>
<th>Description of Waters</th>
<th>Percentage of both tank and well water</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tank waters, ...........</td>
<td>52</td>
<td>124</td>
</tr>
<tr>
<td>Percentage, ............</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>Well waters, ...........</td>
<td>19</td>
<td>76</td>
</tr>
<tr>
<td>Percentage, ............</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Percentage of both tank well water, ............</td>
<td>35½</td>
<td>100</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Sewages containing more than 250 parts of chlorine per million</th>
<th>Dilute sewages containing from 250 to 150 parts of chlorine per million</th>
<th>Waters contaminated with considerable quantities of sewage from 150 to 100 parts of chlorine per million</th>
<th>Dirty waters containing from 100 to 60 parts of chlorine per million</th>
<th>Moderately safe waters containing from 50 to 20 parts of chlorine per million</th>
<th>Good waters containing less than 20 parts of chlorine per million</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tank waters, ...</td>
<td>56</td>
<td>38</td>
<td>14</td>
<td>6</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Percentage, ...</td>
<td>45</td>
<td>30</td>
<td>11</td>
<td>5</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Well waters, ...</td>
<td>49</td>
<td>18</td>
<td>1</td>
<td>5</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Percentage, ...</td>
<td>64</td>
<td>24</td>
<td>1</td>
<td>7</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Percentage of well and tank waters, ...</td>
<td>52 (\frac{1}{2})</td>
<td>28</td>
<td>71 (\frac{1}{2})</td>
<td>5 (\frac{1}{2})</td>
<td>4 (\frac{1}{2})</td>
<td>2</td>
</tr>
</tbody>
</table>

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.
### A. Tank Waters.

<table>
<thead>
<tr>
<th>Name of Section</th>
<th>Sectional letter</th>
<th>Population per acre by Census of 1876</th>
<th>No. of waters analysed</th>
<th>No. classed as Sewages</th>
<th>No. classed as Dilute Sewages</th>
<th>No. classed as waters containing considerable quantities of sewage</th>
<th>No. classed as Dirty waters</th>
<th>No. classed as Moderately Safe waters</th>
<th>No. classed as Good waters</th>
<th>Average ammonia parts per million</th>
<th>Chlorine parts per million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shampooker, A</td>
<td>75</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8.86</td>
<td>339.0</td>
</tr>
<tr>
<td>Koomartooey, B</td>
<td>163</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>12.60</td>
<td>377.2</td>
</tr>
<tr>
<td>Burtola, C</td>
<td>81</td>
<td>21</td>
<td>15</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>14.62</td>
<td>367.7</td>
</tr>
<tr>
<td>Sooka's Street, D</td>
<td>87</td>
<td>14</td>
<td>5</td>
<td>2</td>
<td>6</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>6.48</td>
<td>215.3</td>
</tr>
<tr>
<td>Jorabagan, E</td>
<td>152</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>17.00</td>
<td>319.5</td>
</tr>
<tr>
<td>Jorasanko, F</td>
<td>137</td>
<td>6</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>26.21</td>
<td>295.8</td>
</tr>
<tr>
<td>Burra Bazar, G</td>
<td>108</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>8.20</td>
<td>199.1</td>
</tr>
<tr>
<td>Colootollah, H</td>
<td>214</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>21.93</td>
<td>209.5</td>
</tr>
<tr>
<td>Moocheeparr, I</td>
<td>111</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>51.77</td>
<td>307.2</td>
</tr>
<tr>
<td>Bow Bazar, J</td>
<td>156</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4.96</td>
<td>161.0</td>
</tr>
<tr>
<td>Puddepooker, K</td>
<td>119</td>
<td>13</td>
<td>11</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>23.70</td>
<td>241.9</td>
</tr>
<tr>
<td>Waterloo Street, L</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5.13</td>
<td>161.0</td>
</tr>
<tr>
<td>Fenwick Bazar, M</td>
<td>135</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4.96</td>
<td>161.0</td>
</tr>
<tr>
<td>Taltollah, N</td>
<td>124</td>
<td>14</td>
<td>7</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>23.70</td>
<td>241.9</td>
</tr>
<tr>
<td>Colinga, O</td>
<td>72</td>
<td>10</td>
<td>1</td>
<td>2</td>
<td>6</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5.13</td>
<td>161.0</td>
</tr>
<tr>
<td>Park Street, P</td>
<td>23</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>7.17</td>
<td>162.1</td>
</tr>
<tr>
<td>Bamun Bustee, Q</td>
<td>30</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>Hastings, R</td>
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<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.09</td>
<td>19.1</td>
</tr>
</tbody>
</table>

### B. Well Waters.

<table>
<thead>
<tr>
<th>Name of Section</th>
<th>Sectional letter</th>
<th>Population per acre by Census of 1876</th>
<th>No. of waters analysed</th>
<th>No. classed as Sewages</th>
<th>No. classed as Dilute Sewages</th>
<th>No. classed as waters containing considerable quantities of sewage</th>
<th>No. classed as Dirty waters</th>
<th>No. classed as Moderately Safe waters</th>
<th>No. classed as Good waters</th>
<th>Average ammonia parts per million</th>
<th>Chlorine parts per million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shampooker, A</td>
<td>75</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>12.80</td>
<td>582.2</td>
</tr>
<tr>
<td>Koomartooey, B</td>
<td>163</td>
<td>12</td>
<td>8</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>17.00</td>
<td>466.1</td>
</tr>
<tr>
<td>Burtola, C</td>
<td>81</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3.29</td>
<td>240.0</td>
</tr>
<tr>
<td>Sooka's Street, D</td>
<td>87</td>
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<td>2</td>
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<td>0</td>
<td>0</td>
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<tr>
<td>Jorabagan, E</td>
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<td>5</td>
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<td>16</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>21.17</td>
<td>371.7</td>
</tr>
<tr>
<td>Jorasanko, F</td>
<td>137</td>
<td>7</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>Burra Bazar, G</td>
<td>108</td>
<td>6</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1.82</td>
<td>410.8</td>
</tr>
<tr>
<td>Colootollah, H</td>
<td>214</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.33</td>
<td>693.0</td>
</tr>
<tr>
<td>Moocheeparr, I</td>
<td>111</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
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<tr>
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<td>1</td>
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<td>0</td>
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<td>0</td>
<td>1.71</td>
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<td>119</td>
<td>4</td>
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<td>0</td>
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<td>0</td>
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<td>6.62</td>
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</tr>
<tr>
<td>Taltollah, N</td>
<td>124</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2.12</td>
<td>541.4</td>
</tr>
</tbody>
</table>
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 Pultah; 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, 7,164,159 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 8,556,023 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 ease 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.
### London Water supply, average for 7 years.

<table>
<thead>
<tr>
<th>Source</th>
<th>Total solid Impurity</th>
<th>Organic Carbon</th>
<th>Organic Nitrogen</th>
<th>Ammonia</th>
<th>Nitrogen as Nitrites and Nitre</th>
<th>Total Combined Nitrogen</th>
<th>Chlorine</th>
<th>Hardness</th>
</tr>
</thead>
<tbody>
<tr>
<td>From the Thames,</td>
<td>27.26</td>
<td>201</td>
<td>0.33</td>
<td>0.01</td>
<td>204</td>
<td>238</td>
<td>1.77</td>
<td></td>
</tr>
<tr>
<td>From the Lea,</td>
<td>27.79</td>
<td>135</td>
<td>0.24</td>
<td>0.00</td>
<td>199</td>
<td>223</td>
<td>1.79</td>
<td></td>
</tr>
<tr>
<td>From the Deep-wells in the Chalk,</td>
<td>40.26</td>
<td>0.12</td>
<td>0.00</td>
<td>0.42</td>
<td>421</td>
<td>433</td>
<td>2.43</td>
<td></td>
</tr>
<tr>
<td>Edinburgh water supply,</td>
<td>14.10</td>
<td>203</td>
<td>0.12</td>
<td>0.00</td>
<td>None</td>
<td>0.12</td>
<td>0.89</td>
<td>4.40</td>
</tr>
<tr>
<td>Glasgow water supply from Loch Katrine,</td>
<td>2.40</td>
<td>185</td>
<td>0.22</td>
<td>0.01</td>
<td>Do.</td>
<td>0.23</td>
<td>0.95</td>
<td>0.00</td>
</tr>
<tr>
<td>Liverpool water supply,</td>
<td>9.66</td>
<td>210</td>
<td>0.29</td>
<td>0.02</td>
<td>Do.</td>
<td>0.31</td>
<td>1.53</td>
<td>0.30</td>
</tr>
<tr>
<td>Manchester do.,</td>
<td>7.00</td>
<td>132</td>
<td>0.31</td>
<td>0.02</td>
<td>Do.</td>
<td>0.33</td>
<td>0.90</td>
<td>0.00</td>
</tr>
<tr>
<td>Dublin do.,</td>
<td>6.34</td>
<td>238</td>
<td>0.24</td>
<td>0.01</td>
<td>Do.</td>
<td>0.25</td>
<td>1.24</td>
<td>0.00</td>
</tr>
<tr>
<td>Switzerland the Rhine above Schaffhausen,</td>
<td>15.80</td>
<td>108</td>
<td>0.12</td>
<td>0.03</td>
<td>Do.</td>
<td>0.15</td>
<td>0.29</td>
<td>3.99</td>
</tr>
<tr>
<td>London Sewage,</td>
<td>64.50</td>
<td>4386</td>
<td>2184</td>
<td>5567</td>
<td>Do.</td>
<td>7060</td>
<td>10.37</td>
<td></td>
</tr>
</tbody>
</table>

### Average composition of unpolluted water.

<table>
<thead>
<tr>
<th>Source</th>
<th>Total solid Impurity</th>
<th>Organic Carbon</th>
<th>Organic Nitrogen</th>
<th>Ammonia</th>
<th>Nitrogen as Nitrites and Nitre</th>
<th>Total Combined Nitrogen</th>
<th>Chlorine</th>
<th>Hardness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rain water</td>
<td>2.95</td>
<td>0.76</td>
<td>0.15</td>
<td>0.04</td>
<td>0.03</td>
<td>0.42</td>
<td>0.22</td>
<td></td>
</tr>
<tr>
<td>Upland surface water</td>
<td>9.67</td>
<td>0.32</td>
<td>0.02</td>
<td>0.00</td>
<td>0.09</td>
<td>0.13</td>
<td>1.13</td>
<td>1.50</td>
</tr>
<tr>
<td>Deep well water</td>
<td>43.78</td>
<td>0.61</td>
<td>0.18</td>
<td>0.10</td>
<td>0.45</td>
<td>5.23</td>
<td>5.11</td>
<td>15.80</td>
</tr>
<tr>
<td>Spring water</td>
<td>28.20</td>
<td>0.56</td>
<td>0.13</td>
<td>0.01</td>
<td>0.38</td>
<td>3.07</td>
<td>2.49</td>
<td>11.00</td>
</tr>
<tr>
<td>Sea water</td>
<td>3808.7</td>
<td>278</td>
<td>1.65</td>
<td>0.05</td>
<td>633</td>
<td>203</td>
<td>1975.6</td>
<td>48.30</td>
</tr>
</tbody>
</table>

**Remarks.**
### CALCUTTA HYDRANT WATER.

**Average results from the Analysis of Four Years.**

*Results of Analysis expressed in parts per 100,000.*

<table>
<thead>
<tr>
<th></th>
<th>Total solid Impurity</th>
<th>Organic Carbon</th>
<th>Organic Nitrogen</th>
<th>Ammonia</th>
<th>Nitrogen as Nitrites and Nitrates</th>
<th>Total Combined Nitrogen</th>
<th>Chlorine</th>
<th>Temporary</th>
<th>Permanent</th>
<th>Total</th>
<th>Remarks</th>
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<tbody>
<tr>
<td><strong>Average for 1st of January,</strong></td>
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<td>Do. February</td>
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<td>Do. March</td>
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<td>Do. April</td>
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<td>Do. May, ...</td>
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<td>Do. June, ...</td>
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<td>Do. July, ...</td>
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<td>Do. August</td>
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<td>Do. September,</td>
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<td>Do. October</td>
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<td>Do. November,</td>
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<td>Do. December,</td>
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<td><strong>Sums, ...</strong></td>
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<tr>
<td><strong>Average for year</strong></td>
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</tbody>
</table>

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*Water supplies of Calcutta.*

1880.
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 21.63 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.

HOOGHLY WATER.

Results of Analysis expressed in parts per 100,000.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>June 1st, 1879, 19-56</td>
<td>0-130</td>
<td>0-052</td>
<td>0-000</td>
<td>Traces only.</td>
<td>0-052</td>
<td>1-32</td>
<td>4-24</td>
<td>2-45</td>
</tr>
<tr>
<td>2</td>
<td>June 23rd, 17-08</td>
<td>0-148</td>
<td>0-099</td>
<td>0-001</td>
<td>0-023</td>
<td>0-123</td>
<td>0-923</td>
<td>3-46</td>
<td>3-25</td>
</tr>
<tr>
<td>3</td>
<td>June 26th, 16-68</td>
<td>0-138</td>
<td>0-075</td>
<td>0-002</td>
<td>0-053</td>
<td>0-130</td>
<td>0-852</td>
<td>3-33</td>
<td>3-38</td>
</tr>
<tr>
<td>4</td>
<td>July 1st, 12-48</td>
<td>0-113</td>
<td>0-063</td>
<td>0-000</td>
<td>0-039</td>
<td>0-132</td>
<td>0-89</td>
<td>0-72</td>
<td>4-57</td>
</tr>
</tbody>
</table>

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 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. Macnamara'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. Macnamara 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. Macnamara 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. Macnamara 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.

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Low Water 17th December 1881</th>
<th>Low Water 15th March 1882</th>
<th>Low Water 12th June 1882</th>
<th>Low Water 8th September 1882</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total solid residue from filtered water</td>
<td>26.6</td>
<td>27.9</td>
<td></td>
<td>12.9</td>
</tr>
<tr>
<td>Organic matter</td>
<td>6.0</td>
<td>5.6</td>
<td></td>
<td>2.6</td>
</tr>
<tr>
<td>Insoluble earthy salts</td>
<td>16.9</td>
<td>19.9</td>
<td></td>
<td>8.0</td>
</tr>
<tr>
<td>Soluble salts</td>
<td>3.6</td>
<td>1.9</td>
<td></td>
<td>1.5</td>
</tr>
<tr>
<td>Sodium chloride</td>
<td></td>
<td>1.1</td>
<td></td>
<td>0.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Low Water 1st December 1878</th>
<th>Low Water 1st March 1878</th>
<th>Low Water 1st June 1878</th>
<th>Low Water 1st September 1878</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total solid residue from filtered water</td>
<td>24.6</td>
<td>34.7</td>
<td>97.1</td>
<td>13.3</td>
</tr>
<tr>
<td>Organic matter</td>
<td>5.0</td>
<td>5.6</td>
<td>11.9</td>
<td>2.4</td>
</tr>
<tr>
<td>Insoluble earthy salts</td>
<td>16.7</td>
<td>19.3</td>
<td>16.4</td>
<td>9.0</td>
</tr>
<tr>
<td>Soluble salts</td>
<td>2.6</td>
<td>8.9</td>
<td>67.6</td>
<td>1.3</td>
</tr>
<tr>
<td>Sodium chloride</td>
<td></td>
<td>7.6</td>
<td>55.7</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Low Water 1st December 1878</th>
<th>Low Water 1st March 1878</th>
<th>Low Water 1st June 1878</th>
<th>Low Water 1st September 1878</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total solid residue</td>
<td>16.80</td>
<td>24.34</td>
<td>15.16</td>
<td>11.12</td>
</tr>
<tr>
<td>Carbon and nitrogen of organic matter</td>
<td>0.158</td>
<td>0.164</td>
<td>0.111</td>
<td>0.124</td>
</tr>
<tr>
<td>Sodium chloride</td>
<td>1.01</td>
<td>1.87</td>
<td>1.70</td>
<td>0.79</td>
</tr>
</tbody>
</table>

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
Water supplies of Calcutta.

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 March 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 March, 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 Burranagur, 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 Burramagur, 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 unfit 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. naphura* 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. naphura*. 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 larnial depression, and the greater part of the outer surface of that bone is placed

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† Cat. of Mammalia in Brit. Mus. Pt. iii, p. 177, 1852.
|| 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 malar-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 malar-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 striae, 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 Roepstorftii, 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.

8 MAY 1895
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JOURNAL OF THE ASIATIC SOCIETY OF BENGAL FOR 1879.


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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.³*), 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.1) is of considerably larger size and more complex structure than the replaced milk-molar (fig. 1, m.m.1).

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 (soudaicus).

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. $\frac{(3+3)-(3+3)}{3-3}$

$\frac{m.3-3}{3-3}$; the adult molar dentition of the normal form, m.m. $\frac{1-1}{1-1}$ p.m. $\frac{3-3}{3-3}$

$\frac{m.3-3}{3-3}$; and of the abnormal form, m.m. $\frac{0-0}{1-1}$ p.m. $\frac{4-4}{5-5}$ 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 palaeontology, 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.1) and the first premolar
(p.m.1) 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 foetal 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 foetus 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 num-
ber 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.2) is developed, replacing the second milk-incisor. In the figured
specimen, the two incisors (i.1, i.2) 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.1); the
second incisor (i.2) 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.
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. 1 1 0 0 ; 2 2 0 0 , the adult dentition will be normally c. 0 0 0 0

m.i. 0 0 1 1 i. 1 1 1 1 or abnormally c. 0 0 2 2 i. 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

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* Loc. cit.
† 'Les Enchainements du Monde Animal: Mammifères Tertiaires,' p. 50, cit 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.
|| 'Osteographie,' Atlas, Rhinoceros, pl. viii.
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. decemensis, and other extinct species, no permanent incisors, in either jaw, were ever developed, and in the adult the symphysis of the mandible and the premaxillae are consequent ly 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 Cope (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 Trochalopterum 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 Trochalopterum 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, 1 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 Trochalopterum, 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 hand post oculum producto, regione postoculari grisea nec fusca, rostroque robustiore distinguendum: pileo brunneo, dorso griseo-olivaceo, postice olivaceo, coloribus transewantibus; supercilio brevi albo, loris brunneis, cum pileo concoloribus; capitis lateribus cum regione parotica pallide rufescenti-griseis, colli lateribus cinehere; rectricibus remigibusque brunneis, illis remigibusque secundarii ultimis subobsolet transfasciatis; mento, gula, atque pectore albescenti-griseis, conspiciue fusco-stratis, media gula fere alba; abdomine medio albido, lateribus cum pennis subcaudalibus teetricibusque inferioribus alarum ferrugineis, tibii olivaceis; rostro negro, pedibus fuscis, iridibus saturate rufis.

Long. tota exempli masculini 9, ache 3-5, caudae 3-6, tarsi 1-45, rostri a fronte 0-8, ejusdem a rectu 1, culminis 0-9 poll. Angl.

Hab. In summis montibus provinciæ Travancore, ad extremitatem meridionalem peninsulae Indiae.

Head above 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 stripe, 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 Timevelly boundary. Two are males; of the third, the sex has not been ascertained. The differences in measurement are trilling: 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 8½ to 9½ 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.

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XIII.—On a new Species of Papilio from South India, with Remarks on
the Species allied thereto.—By J. Wood-Mason, Officiating Superin-
tendent, 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. Bour-
dillon 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 lanceo-
late 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 Draavidarum_, 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. Cas-
tor_, 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. ii, 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 irroration 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. Custor*, 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. Dravidarum*, 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. Mahadeeca*, 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. Custor*, 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 Linnaean 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. Pollix* 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 Dalsa 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 \(d.3\), 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
(\(d^3\); 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 (\(d^3\), 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 ac-
quired 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 speci-
men 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 collec-
tion, 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 mal-
formed 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 lengthen-
ing of the lobular 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.
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 mark-
ings of the hind-wings exactly like those of the other form (\(P.\ Pollux)).
1 PAPILIO DRAVIDARUM, ♂
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. Choon*, 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 trilling 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.

\[d.3 = \text{third branch of the median vein.}\]

* 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.

(Received July 15th;—Read Nov. 3rd, 1880.)

(With Plates X and XI.)

Previous to his appointment to the Yarkand Mission, Dr. F. Stoliezka had been working for some years at the animals of the Indian land Mollusea, 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 superintendence 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 occurrence 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 Zonitidae (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 Stoliezka’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 Zonitidae variously assigned to the genera Ariophanta, Hemiplecta,† Rhysota, Xesta, and Rotula; and one plate has been required for the Helicidae 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.

† Oxytes.
Genus ARIOPHANTA, Des Moulins.


With plate giving three figures of shell and two of the animal from life; type lavipes, 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:—

\[
\begin{align*}
(\text{himalayana, Lea} = \text{interrupta, Bs.}) & \quad \text{Bengal.} \\
(\text{lavipes, Müll.}) & \quad \text{Bombay.} \\
(\text{retrorsa, Gould (Hemipleeta, Sect. E of Theobald)}) & \quad \text{Tavoy.} \\
(\text{janus, Chem.}) & \quad \text{Malacca.} \\
(\text{rumphtii, v. d. Busch.}) & \quad \text{Java.} \\
\text{Adams adds to these:—} \\
(\text{ryssolemma, Albers (? Thyreus, Bs.)}) & \quad \text{Java ?} \\
(\text{trifasciata, Chemn,} = \text{lavipes, var.}) & \quad \text{Malabar.}
\end{align*}
\]

and he figures lavipes, 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:—

\[
\begin{align*}
(\text{laidlayana, Bs.}) & \quad \text{Lower Bengal.} \\
(\text{kadapaensis, Nevill,}) & \quad \text{Madras.} \\
(\text{nicobarica, Chemn. re-named, as it is not found in the Nicobar Islands.}) & \quad \\
(\text{cysis, Bs.}) & \quad \text{Nilgiris.} \\
(\text{thyreus, Bs.}) & \quad \text{Nilgiris.} \\
(\text{intumescens, W. T. Blf.}) & \quad \text{Bombay.} \\
(\text{immerita, W. T. Blf. (in coll. Beddome}) & \quad \text{South Canara.}
\end{align*}
\]

near interrupta.

\[
\begin{align*}
(\text{cambojensis, Reeve}) & \quad \text{Siam.} \\
(\text{regalis, Bs.}) & \quad \text{Borneo.}
\end{align*}
\]

\[
\begin{align*}
(\text{vittata, Adams and Reeve,} (\text{vide Adams. Gen. Moll. pl. lxxix, fig. 5, as Nanina).}) & \quad \\
(\text{bajadera, Pfr.} = \text{ammonia, Valenciennes}) & \quad \text{Bombay.}
\end{align*}
\]

Mr. William Theobald (Cat. Land and Freshwater Shells of Brit. India) includes—

\[
\begin{align*}
(\text{auris, Pfr. (? cysis, Bs.)}) & \quad \text{Kundah Hills, Madras.} \\
(\text{cycloctrema, Bs.}) & \quad \text{Sumcysar Hills, North of Tirhoot.}
\end{align*}
\]

a true Helix belonging to the delibrata-group.
Mr. Edgar Smith agrees with me, on a comparison of the species in the British Museum, that this is rumphi, Mus. Cuming.

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. Java.
— raraeulata, Mous. (Xesta) Adenare, near Timor.
— striata, Gray (Nonina) Singapur.
— atrosuca, 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 laevides, 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.
— sanni, Pfr. Habitat ?
— ampulloriodes, Reeve (Mus. Taylor = cysis.) Nilgiris.
— linstedti, Pfr. (Mus. Cum.) Malacca.

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 PHEEPOEiE, 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 Nonina, 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) levipes, Müll., var. trifasciata, Chemn.**


*Gmelin, Syst. Nat. p. 3616, no. 13.*

*Chemmitch, Conch. 9, t. 108, fig. 915, 916.*

*sub-genus, *Heliacale*, 2me group Aplostomes, 3me Sect. rubannée.*

*Féussac, Hist. Moll. pl. xcii, fig. 3 à 6.*

*Féussac, 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. cxxxi, 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.**


= *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. levipes*, 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.


The figure is a copy of fig. 30 of MSS. drawing of a specimen from Manblum.

Helix laidlayana, Bs. Hanley, Coneh. Ind. Pl. lviii, fig. 3, 4, 5: figure 4, from Cuttack 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 Mahableshwar, 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 Mahableshwar 4,500 feet above the sea, bajadera (which is rare at Mahableshwar) 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 tranquabarica, 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*:

*bulla*, Pfr. (*Rhysota*, Albers)  
*fulvida*, Pfr.  
*biamensis*, Mouss.  
*halata*, Mouss.  
*rufa*, Less.  
*xanthotricha*, Pfr.  

*setigera*, Sow.  
*gummata*, Sow.  
*theodori*, Phil.  
*centralis*, Mouss.  
*cuvieriana*, Lea  
*nova-ibernia*, Quoy.  
*humphreysiana*, Sea  


*semigranosa*, Sow.  
*panayensis*, Brod.  
*semiglobosa*, Pfr.  

Adams gives some others, three of which are Indian:

*blainvilliana*, Lea.  
*conoidalis*, Adams and Reeve  
*denso*, Adams and Reeve  

? *ligulata*, Férus.  
*limaëensis*, Mouss.  
*lurida*, Gould  
*rubricata*, Gould  
*rufescens*, Gratel.  

? *semirugata*, Beek.  
*steursii*, Shuttl.  

? *trancSeaarica*, Fabr.  

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 (*vide* Suppl. Index, Conch. Indica).  

Nevill in his *Hand-List* makes it much more circumscribed and admits

*distineta*, Pfr.  
*neptunus*, Pfr.  

Luzon.  
Mindanao.  
Java.  
Java.  
New Ireland.  
Guimares Is. and Negros.  
Luzon.  
Luzon.  
Mergui.  
Java.  
Java.  
Luzon.  
New Ireland.  
Singapur.  
Java.  
Landour.  
Phillippines.  
Panay, do.  
Samar, do.  
Bengal.  
Feejee.  
Feejee.  
Madagascar?  
Bengal.  
Amboina.  
India.  
Philippines.  
Saigon.  
Cambodia.
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* *cymatium,* Bs.
  *sylvicola,* W. Blf. MSS.
  *basileus,* Bs.
  *beddomei,* Blf.
  *basilessa,* Bs.
  *undosa,* W. Blf.
  *chenui,* Pfr.
  *oxytes,* Bs.
  *cycloplax,* Bs.
  *castor,* Theobald
  *pollux,* Theobald
  *blanfordi,* Theobald
  *orobia,* Bs.

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* (See. D) of Theobald
(l. e. p. 22): who places therein:

  *basilessa,* Bs.  
  Travancore.  
this should not be included. I do not recognize any resemblance even in the shell.

  *blanfordi,* Theobald.  
  Darjiling.  
  *castor,* Theobald.  
  Khasi.  
  --- var. *a. ehrraensis,* W. Blf.  
  Darjiling.  
  *cycloplax,* Bs.  
  Khasi.  
  *oxytes,* Bs.  
  Khasi.  
  *pollux,* Theobald.  
  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. ii. 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.
Godwin-Austen—On Stoliczka's M.S.S. Drawings, &c. [No. 3.

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 Helix 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. 261.

Explanation of the Plates.

Plate X.

Fig. 1, 1a. Helix (Ariophanta) interrupta, Bs.
Fig. 2. ——— laiderayana, Bs.
Fig. 3. ——— lavipes, Müller, var. trifasciata.
Fig. 4. ——— intumescent, W. T. Blf.

Plate XI.

Fig. 1, 1a. Hemiplecta orobia, Benson.
Fig. 2. Helix (Oxytes) oxytes, Benson.
Fig. 8. Helix (Hemiplecta ?) ligulata, Fér.
Fig. 4. Helix (Oxytes) pollux?, Theob.
XVI.—New Species of Brackish-water Mollusks.

By GEOFFREY NEVILL, C. M. Z. S.

(Received November 1st;—Read December 1880.)

Subfamily BYTHINIINÆ, Troschel [emend.].

Gebiss der Schnecken, I, 1857, as Group “Bythinae”; emend. Stimpson, 1865, and Clessin, Malak. Blät. 1880, as subfamily of the Rissoide.

STENOThYRA WOODMASONIANA, n. sp.

*T. parva*, imperforata, ovato-acuta, solida, crassa, pallide viridula, polita, nitida, (*sub lente*) obsolete submalleata; *spira aculeiformis*, sub-concava, producta, apice peracutissimo; *anfr. 6*, haud convexi, ultimus pertumidus, medio subangulatus, basi planatus, antice ad aperturam abrupte et valde deflectus; apertura percontracta, perfecte rotundata, marginibus continuis, valde incrassatis.

Long. 3½, 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.

STENOThYRA HUNGERFORDIANA, n. sp.

*T. parva*, imperforata, ovato-elongata, solidinscula, viridula, vix nitida, (*sub lente*) lineis impressis ac dense puncticulatis confertim cingulata; *spira paululum elongata*, ovato-convexa, apice obtuso, sutura profunda ac obsoleta marginata; *anfr. 4*, convexi, ultimus compressa ovaliformis, antice sub-applanatus, valde descendenis; apertura perpusilla, suboblique rotundata-ovata, superne leviter angulata, sulco profundiori ab anfractu ventrali separata, peristomate obtuso.

Long. 2½, diam. 1½ 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 punctation; 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.

**Stenothyra blanfordiana, n. sp.**

*T. minima, superficie rimata, subventricoso-ovata, vix solidiuscula, nitida, laevis, pallide cornea, subpellucida; spira subacuta, apice minuto, subobtuso; anfr. 4½, convexi, ultimus magnus, subsolutus, tumide-ventricosus, subbiangulatus, antice subapplanatus; apertura subovalis, paululum postice retrorsa, peristomate continuo, superne angulato. Operculum ovale, superne leviter acuminatum, vix crassiusculum, spirale, apice subcentrali, interne testaceo-costatum.*

*Long. 3½, diam. 2½ 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-curvature, 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 "Hydrobiæ"; emend. Stimpson, 1865.*
HYDROBIA (BELGRANDIA) MILIAECA, n. sp.

_T. minuta, vix rivata, conico-elongatula, solida, parum nitida, albido-viridula, lavigata; spira paululum produeta, apice minuto, acutiusculo; anfr. 5, convexiusculi, ultimus duobus rapidè accrescentibus, ultimo basi subplanulato, ad apertura gibbositate erassa circumscripto; apertura ovato-rotundata, intus incrassata, peristoma continuum, valide incrassatum, margine externo arenato, basi sinuato, margine columellari subangulatim contorto, subreflexo. Operculum sat profunde immersum, tenue, pellucidum, vitreum.

Long. vix 2\(\frac{1}{3}\), diam. 1\(\frac{1}{2}\) mill.

_Hab._ Port Canning.

_Var._ minor; long. 2, diam. 1\(\frac{1}{2}\) mill.

_Hab._ Port Canning.

Found in great abundance in brackish-water ponds, associated with _Valvata (?) microscopica_, Nev., new species of _Bythinia, Martesia, Teredo (?), Ekharella, Theora, Stenothyra blanfordiana_, &c. From the last-named, the remarkable callosity behind the outer lip, besides many other characters above recorded, 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 Blanford.

Subfamily ASSIMINEINÆ, [emend.].

Group Lithoglyphi, Troschel, Gebiss der Schnecken, I, 1857 [pars].

Fam. Assiminiidae, H. and A. Adams, Genera Moll. 1858.

Fam. Assimineidae, Clessin, 1880.

Section of sub-fam. Tomatiopsinae, Stoliezka, Gast. I, 1868.

ASSIMINEA SINENSIS, n. sp.

_T. imperforata, ovato-conica, solidula, nitida, subglabra, castanoc-fusca, linea impressa infra suturam subobsoletae notata; spira producta, conica, apice subaeuto; anfr. 7\(\frac{1}{3}\), subplaniusculi, ultimus compressus, vix convexiusculus, carina nulla munitis; apertura parea, subverticalis, marginibus ecallo subobsoletae junctis, margine externo tenuis, margine columellari arenato, incrassato, satureate castanoc-fusco, 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 tenues, glabra, nitida, vivide straminea, ad suturam fascia livida (plus minusve subobsolete) margina; 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, castango vivide tintae; apertura subrotundata, marginibus callo subobsolete castaneo junctis; 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 glabriuscule, 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 subangularis; apertura ampla, subverticalis, marginibus callo pervalido fusco-limiato junctis, margine colomellaris folre recto, calide incrassato, sordide fusco, inferne subrotundato.

Long. 5\(\frac{1}{2}\), diam. 3\(\frac{1}{2}\) mil.  

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-viridesceens, anguste umbilicata, laevigata, sutura lineari, haud marginata; spira curta, apice perobtuso; anfr. 4, rotundato-convexi ac tumidi, ultimus infulatus, subtus convexus, basi propre regionem umbilicalem subexcavate depressus; apertura subverticalis, ovato-pyriformis, dimidiam totius longitudinis acuans, intus pallido
viridescens; margo columellaris superne valde intortus, reflexus, in conspicue fulvo tinctus, inferne vix rotundatus.

Long. 3, diam. 2½ 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 mintissime perforata), carina parva ac subobsoleta circumscripta, lanceolata, conica, solidinscula, nitida, subglabra, dilute castanea, prope suturam pallide rubido fasciata ac linea impressa marginata; spira conico-elongata, unfracitum ultimam, sere acquirum, apice perminuto, acutissimo; anfr. 7½, vix convexiusculi, regulariter erescuentes, ultinam subcompressus, obscure subangulatus; apertura parva, subverticalis, ovata, marginibus callo tenui junctis, margine columellari pallide castaneo, paululum incrassato, subrecto, inferne subangulato.

Long. 4, diam. 2½ 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, Fase. 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 Collonia quodammodo memorans, peculiariter obscure sed profunde umbilicata, de-
presso-conoidea, solida, crassiuscula, nitida, subglabra, ad basim (sub lente) striis incrementi subobsoletis munita, saturissime fulvo-lividia, infra suturam albo fasciata, fascia prope aperturaum plus minusve evanescente; sutura vix distincta, linea obscure impressa et subobsoleta notata; spira obtuse depresso-conoidea, apice minutissimo; anfr. 5, ultimus subtus per-globose ventricosus, ad peripheriam obsolete subsubangulatus, infra sub-planulatus, circa umbilicum callo lato pallide fusco et obscure albo-limbato munitus; apertura ampla, subrotundata, intus incrassata, marginibus callo albido prope aperturaum valido ac distincto (interdum subobsoleto) junctis; columella pernotabiliter et valde incrassata, inferne abrupte retrorsa, triangulari-linguiformis, applanata ac excavate rugosa, superne in umbilicum abrupte desinentes. Operculum tenue ac corneum; anfr. 3 (sub lente vix distingundti) in umbonem subcentralem ac prominentem desinentes.

Alt. 3, diam. 3½ mill.

Hab. Port Canning.

The most remarkable and abnormal species of the genus as yet described. The animal is that of a typical Assiminea, 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. 6½, convexi, supremi sublaciaes, caeteri infra suturam distincte angulati, superne sublaciaes, inferne spiraliter confertimque sulcata, oblique subgranulatim decussati, ultimus globose subrotundatus, in medio striis decussantibus plus minusve subobsoletis, prope umbilicum distinctioribus, notatus; apertura sat ampla, subverticalis, marginibus callo nitido junctis, marginis columellari supra leviter contorto, infra rotundato.

Long. 4½, 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, 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-cylindri, supremi laeves, 2dus spiraliter sulcatus, 3tius et 4tus insigne equaliterque decussati (quasi gemmuli), ultimus subbiangulatus, supra peripheriam angulatus, striis decussantibus paululum subobsolitibus notatus, sculptura infra ecranescente; apertura subverticalis, parva, marginibus callo indistincto junetis, margine columellari hand contorto, leviter rotundato.

Long. 2¾, diam. 1¾ 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 laece castanea, sutura subindistincta; spira brevis, apice vix acuto; anfr. 6, subumide convexiuscula, ultimus magnus, regulariter ovuliformis, infra suturam linea impressa subobsolitae notatus; apertura verticalis, marginibus callo castaneo junetis, margine externo tenui, margine columellari incrassato, recto, paululum retrorso, ad basin subabrupte angulato.

Long. 4, diam. 2¾ 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, striae 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, persolda, 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; aper-
tura sat magna, marginibus callo acute valido et albo junctis, marginine
externo regulariter convexo-rotundato, columnari subrotundato, duplex
ac valde reflexo, regionem umbilicalem tegente, supra distincte transvers-
simque unisulcato.

Long. 3¼, diam. 2¼ 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.


‡ Mr. Bradford 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:

\[
\begin{align*}
  m &= 0.652 \\
  r &= 1.517 \\
  l &= 0.026
\end{align*}
\]

\[
\{ m = 0.652 \} \text{ internal.}
\]

\[
\{ r = 1.517 \} \text{ ohms at } 85^\circ \text{ F.}
\]

\[
\{ l = 0.026 \} \text{ external.}
\]

Total, \[ 2.195 \text{ ohms.} \]

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 experimen-

* 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°; \( \frac{\text{max.}}{\text{min.}} = \frac{33.7}{27.0} \); 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:

<table>
<thead>
<tr>
<th>No. of Experiment</th>
<th>Mode of producing the current.</th>
<th>Speed of engine per minute.</th>
<th>Mean speed per minute of dynamo-electric machine.</th>
<th>Mean of main current in milli-( \text{oersteds} ).</th>
<th>Current in milli-( \text{oersteds} ).</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean.</td>
<td>Max.</td>
<td>Min.</td>
<td>Sent at Calcutta.</td>
</tr>
<tr>
<td>1</td>
<td>60 Minotti</td>
<td>...</td>
<td>...</td>
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<td>9.8</td>
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<td>2</td>
<td>Dyn. el. A.</td>
<td>60.37*</td>
<td>62.1</td>
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<td>3</td>
<td>Dyn. el. E.</td>
<td>59.9*</td>
<td>66.1</td>
<td>54.1</td>
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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.

† \( \frac{A}{E} \) main currents = 1.32.

\( \frac{A}{E} \) 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 Ω 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.

\[
\begin{align*}
\text{Internal resistance of dynamo-electric machine A} & \quad n = 0.652 \text{ internal} \\
\text{Wire coil} & \quad r = 1.517 \text{ ohms at 50°F.} \\
\text{Leading wire to tangent of external galvanometer} & \quad l = 0.026 \text{ 1.543 external}
\end{align*}
\]

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\(^{1/3}\) revolutions per minute; \( \frac{\text{max.}}{\text{min.}} = \frac{64}{56} \); while the mean deflection of the main-current was 37 87\(^{6/8}\); \( \frac{\text{max.}}{\text{min.}} = \frac{40.25}{35.01} \).

When the lamp was in circuit (from 11:5 to 11:32 hours), the mean speed of the engine was again 60\(^{1/3}\); \( \frac{\text{max.}}{\text{min.}} = \frac{61}{59} \); while the mean deflection of the main-current was 44\(^{1/7}\), \( \frac{\text{max.}}{\text{min.}} = \frac{46^2}{42^1} \).

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.

<table>
<thead>
<tr>
<th>No. of Experiment</th>
<th>Number and name of line and length in miles</th>
<th>Real conductance of line in B. a. m.</th>
<th>Resistance of battery at receiving station in B. a. m.</th>
<th>Currents in milli- oersteds.</th>
<th>Mode of producing the currents</th>
<th>Remarks</th>
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The several lines were connected to the battery wire in the order given in this table. The first line, Jubulpore No. 1, was connected at 8:45 hours; the last line No. 3, Agra, at 10:53 hours. Before the actual experiments began, i.e., before 8:45 hours, all the lines were tested for sent currents at Calcutta, and received currents at outstations, when the usual signalling battery was on. Directly after each line had been connected to the battery wire of the dynamo-electric machine, the sent currents at Calcutta and the received currents at outstations were taken.
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. \( \phi \); when the lamp was in circuit, 45,706 m. \( \phi \).* 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 1:548 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 show 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. \( \phi \), if all keys were simultaneously and permanently sending. This represents only 0:35 \% of the main current (36,801 m. \( \phi \)) with \( r \) in circuit, and 0:28 \% of the main current (45,706 m. \( \phi \)) 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. \( \phi \),

* Calcutta by the formula: \( e = \text{47330 to } (\text{m. } \phi') \).
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 \( r = 1·543 \) b. a. u. was 36801 milli-oersteds. This represents work done at a rate of 20473 \( \mathcal{J} \) 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 Aëmona, 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 *Aëmona 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 *Aëmona* 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 *Aëmona*, Hewitson.

*Head* small. *Antennae* 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 setae 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 whisp 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 obsolesly ocellated on the underside.

In the form of the hind-wings and in the position of the male scent-fans Æmona agrees with Xanthotania, and in its pointed fore-wings with Zeuxidia, Euispe, and Discophora, but it differs from these and from all the other Indian genera of Morphinae 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.

I. Æmona Amathusia. Pl. VI, Figs. 3, 4, 5.


Æmona Amathusia, Id., Exot. Butt. vol. iv, 1868, Zevn. et Æm. pl. i, fig. 3—4, 2.

2. "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.

"Underside rufus, 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 3-1\(\frac{2}{10}\) inches

"Hab. Northern India."

The female is only known to me from Hewitson's description and figures.

5. 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.


2. *Æmona Lena.*


ʃ. "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 sub-marginal 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.

"Antennae ferruginous; palpi and legs tawny yellow.

"Expance of wings 3½ inches.

"Hab. Yuen,“ 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 Thongyeen forests, British Burmah, by Captain G. E. L. Marshall, the three white spots on the anterior half of the hind-wing are larger, forming a band divided by the veins.

(3.) Fore-wing sharply angulated at the apex with its outer margin arched.

3. *Æmona Peali,* Pl. VI, Figs. 5, 6, ʃ.


ʃ. Closely allied to *Æm.* Amathusia. Upperside coloured and marked in the same manner, but with the ocelli as well as the strigae of
the underside showing through. *Anterior wing* with the apex angulated but not produced, the outer margin arched instead of coneeave-sinuous, 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 striae 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 Laestrygonum. Pl. VI. Figs. 1, 2, ♂.


♂. 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 irrated 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 luteous.

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 seta, below eretaceous-white; abdomen eretaceous-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 setae, &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 let 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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(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. Stolitck's papers in this Journal† on the anatomy of several forms of Helicidae. The untimely death of Dr. Stolitck, 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

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. distemina, B. and O. aurantica, Desh., is placed in the family Rissoideae, subfamily Pomatiopsinae. At p. 43, the same genus Omphalotropis (with but one species O. distemina, B.) is repeated as a member of the family Heliacinidae, subfamily Hydroceainae.
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. xlvi, 1877, pt. 2, p. 313), and two other species (Cremnociconchus fairbanki and Corbicula iravidica) represented in the same work require explanation. To facilitate reference, this is given below under the name of each shell.

This mistake is not corrected in the long list of 'Addenda et Corrigenda.' To show how grave the error is, it is only necessary to mention that the Rissoidae are as distinct from the Helicinidae in organization as are the Littorinidae from the Neritidae, and that Onychalotropis has been clearly proved to belong to neither, but to the Cyclosomatidae (See Ann. Mag. & Nat. Hist. May, 1865, ser. 4, vol. iii, p. 341). Moreover, the Indian locality of Onychalotropis aurantiana 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, Tricula montana.


† For instance, I cannot help doubting whether any of the numerous forms referred to Mr. Nevill to Microcyclus are really congeneric with H. ornadella 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 Heliceidae 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 then Nanina, endless difficulties are encountered. The ear-

* These appear, however, to deserve distinction from true Rotula, see after.
‡ Albers Heliccen, 2te 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 *Macrochlamys* 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 *Macrochlamys* of Benson (1832) and *Ariophanta* of Desmoulins (1833), the first founded on *H. indica* (Benson nee. Pfr.), believed by many authors to be the same as *H. vitrinoideas*, the second founded on *H. lavipes*. The name *Nanina* was given in 1834. My impression is that *Helicarion*, *Macrochlamys*, and *Ariophanta* will have to be accepted as genera, *Nanina* being merely a synonym of *Macrochlamys*.

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 *Hemi-
plecta*, *Eupleeta*, &c. shells allied to others formerly in these 'Contributions' called *Nanina*.

1. *Ariophanta imperita*. Plate III, Fig. 4, 4a.


This shell was originally described from an immature specimen, and the same was figured in the 'Conchologia Indica.' Subsequently, Col. Bed-
dome 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 Goleondah 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. lavipes* and *A. laidlayana*.

2. *Oxytes sylvicola*, sp. nov.

*Testa perforata*, depressa, carinata, solidula, olcozo-nicans, epi-
dermide crassiuscula obtecta fulva vel luteo-fusca, striis obliquis incrementi

† E. g. in *Macrochlamys*, some forms of which at least have the central tract nar-
rower 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 Sinhgar near Poona, in the Dee-
can.
atque linceis impressis minutis spiralibus subdistantibus superne decussata (nucleo sublævigato), subitus levior sed distinete decussato-striata. Spíra
parva elevata depresso-conoida, fere convexa, apicis obtuso, suturó lineari, antice vis impressa. Anfr. 5½, sensim acerescentes, primi planulati, ultimi
covexiusculi, ultimis haud descendens, subitus convexus, modice inflatus, sed infra carinam, nisi juxta aperturam, leviter compressus. Apertura
obliqua, angulata-lunaris, intus livido-albida; peristoma acutum, intus sub-
incrassato-labiatum, marginibus callo tenui junetis, columnállorí curvato,
breviter reflexo. Diam. maj. 32, min. 29, axis 17 mm. Apert. 16½ mm.
lata, 13½ oblique alta.

Háb. In montibus ‘Burail Range’ dietis, ad alt. 3000-4000 pedum, in
província ‘North Cachar’ Bengalíae orientalis (II. H. Godwin-Austen).

Shell perforate, depressed, carináte, not very thin, having a greasy
lustre, and a thick epidermis, tawny or yellowish brown, marked with ob-
líque raised strie of growth decussated by fine subdistant spiral impressed
lines above (the nucleus almost smooth), and with fainter radiating strie
and concentric impressed lines below. Spíre but little raised, almost con-
 vex, depressály conoid, apex obtusus, suture linear at first, but slightly im-
 pressed near the mouth. Whorls 5½, gradually increasing, the inner nearly
flatt 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. Apertura obliqua, angulatamente lunata, a little
broader than high, pale livid within. Peristome sharp, with a slightly
thickened lip inside, the margins joined by a thin callus, columnállar mar-
gín 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 (measur-
ed obliquely) 0·53.

There is a very remarkable resemblance between this shell and that
described by me as Nonína koondaënsis (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. koondaënsis is an ally of N. indica
(Pfr.) and N. spiplayi, shells doubtless nearly allied to Hemíplecta, 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.

3. Hemiplecta tinostoma, sp. nov., Plate III, Fig. 1.

Testa anguste umbilicata, convexo-depressa, confluentem striis spiralibus minutis lincis increscenti decussata; fulva, lineis pallidis angustis supra peripheriam, altera fuscâ infra, cincta; subitus pallidior, laevior, nitidula. Spira conveca, apice obtusa, suturâ primum lineari, antice impressâ. Anfr. 5, planiusculi, sensim accrescentes; ultimus convexior, antice latior sub-ascendens, ad peripheriam angulatus, subitus convexus, aperturâ versus planulatus. Apertura obliquâ, multo latior quam alta, lunato-oblonga, intus albescens, fuscâ peripherali albidâ conspicua; peristomatis marginibus subparallelis, callo tenui junctis, basali albo, recto, crassiusculo, longe oblique, ad umbilicam subreflexo, supero arcuato, leviter inflexo. Diam. maj. 50, min. 39, axis 21 mm.; apert. 28 mm. lata, 18 oblique alta.

HAB. In montibus 'Tinnevelly Ghats' dictis Indiæ meridionalis, ad latus orientale provinciæ Travancore (H. Beddome).

Shell narrowly umbilicate, convexly depressed, closely decussated with fine spiral striae 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 Tinnevelly Ghats, between Tinnevelly 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, subitus pallidor; fascià exigua peripherali albida circumdata, conferentim striis incrementi lineisque minutis spiralibus subgranulatim decussata, circa umbilicum levior. Spira depressa-concava, apice obtusa, suture primam linear, antice impressa. Anfr. 4½, planiunculi, sensim acercentes: ultimus superne magis convexus, ad peripheriam subangulatus, antice latior, subtos convexus, juxta aperturam paululo compressus. Apertura obliqua, latior quam alta, lunato-oblonga, supra peripheriam subangulata, latius pallide livida, fascià peripherali albescente conspicua; peristomatis marginibus subparallelis, callo tenui granulato junctis, supero externoque arcatis, hand inflexis vel incrassatis, basilii albi, recto, obtuso, longe obliquo, ad umbilicum subreflexo. Diam. maj. 42⅔, min. 36, axis 20 mm.; apertura 23 lata, 17 oblique alta.

**Hab.** In montibus 'Aghastyanallay' dictis, inter provincias Tinnevelly atque Travancore, in Indià meridionali (H. Beddome).

Shell narrowly umbilicate, depressed, subcarinate, yellowish chestnut, paler and dull yellow below around the umbilicials, 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 4½, 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 semi-oval, 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 *Hemiplecta* 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, depressoglobosa, solidiuscula, rugoso-striata, lineis impressis distantibus spiralibus superne circumdata, albida, eburnea. Spira depresso-conica, apice obtuso, suture impressa. Anfr. 5½, convexiusculi, sensim accrescentes, primi translucentes, subhastati; ultimus primum, nec antice, ad peripheriam subangulatus, aperturam versus latori, rix descendens, subtus subinflatus. Apertura obliqua, late lunaris; peristomate superne simplici, extus subtusque subreflexo, junctum umbilicum reflexo atque subincurvato, margine basali arcuato. Diam. maj. 29, min. 23½, axis 17½ mm.; apert. intus 15 lata, 14 oblique alta.*

**HAB.** Ad Papanassam, in montibus ad latum occidentale provincie Tinnevelly, India meridionalis (*H. Beddome*).
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. cxx., figs. 2, 3.


_Hab._ In montibus Garo Khasi et Naga dictis, 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 precedente.

Shell imperfect, conoidly depressed, above ornamented with oblique, close, and arcuate fine hair-like costulation, smooth and marked with radiating striae below; pale horny, paler beneath. Spire depressedly conical, the sides nearly straight, apex rather sharp, suture impressed. Whorls S, 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. ornatissima*, found on the other side of the Brahmaputra valley at the base of the Sikkim hills, except in being imperfect. *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. ornatissima*, 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 lappets (as in many Helices). Above the caudal gland there is a short horn. The shell entirely exterior, ribbed or striated above, smooth below*. On the

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† Cat. p. 20.
‡ Hand-list, p. 34.
§ See, for description of the animal and odontophore of *Situla* (or *Conolida*, 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.

† I. 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 vitrinosides type, but the projecting lobe (i. e., that above the caudal gland) is small.*
Nanina sirkigallensis, Nevill; Bengal, Behar (Hand-list, p. 28).
Helix climacterica, Benson; Assam hills, Burma.
Eulecta 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. aniceps 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. acuducta, I cannot now obtain 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. ingririine and H. camura from Sikkim are still more like H. subrugata from Australia, the type of Thalassia.

7. SESARA INGREGI

Helix ingririine, Blanford, Hanley, Conchologia Indica, pl. lx. figs. 9, 10.
Rotula diplodon, Bs., partim, Theobald, Cat. Land & Fresh-water Shells Brit. Ind. p. 21.
Nanina (Sesara?) diplodon, Bs., partim, Nevill, Handlist Moll. Ind. Mus. pt. i. p. 53.


Hab. In montibus 'Yoma' dictis, Pegu ab Arakan secerentibus, 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 angulately 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 "*laxigata, parum striatula*", whereas fresh specimens exhibit nearly the same fine subgranulate decussating striation as *S. ? ingrani,* 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. ? ingrani* 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. ? ingrani* 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 subangularly concave, without the curv-
ing 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, pertennis, nitida, laevigata, subtente obsolete striatula, fulvo-cornea. Spira param elevata, apice obtuso, sutoria levii aliquando marginatâ. Anfr. 5, viri convexinseuli, regulariter acress-
centes; ultimus non descendens, peripheriâ rotundatus, subtus convexus. Apertura obliqua, lunaris, lator quam alta. Peristoma tenue, simplex, leviter sinuatun, marginibus remotis, callo tenuissimo junctis, columnellâ brevissime verticali, peranguste reflexo. Diam. maj. 11, min. 9\(\frac{1}{2}\), axis 5\(\frac{1}{2}\).

Animal pallio maximo indutum, duos lobos latos linguiformes emittent-
te, qui spiram testæ omnino circumfectae. 

Hab. Ad Bombay.

Shell perforate, conoidly depressed, very thin, smooth, and polished, obsoletely striated beneath the lens, fulvous horny in colour. Spire sub-
conical, 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, slight-
ly curved when viewed from the side; margins distant and united by a thin callus; the columellar border vertical for a very short distance, slight-
ly reflexed. Major diameter 0·44, minor 0·33, 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. indicius, 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 peculiar-
ly 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 Macro-
chlamys and rounded, not horn-shaped.

This shell is common in the island of Bombay and neighbouring low-
lands on the west coast of India, and I have seen a form from the hills of
the Wynnaad in Southern India that appears undistinguishable. I have also several specimens of a Macrochlamys from the ancient town of Champanir, 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 effulgens, W. Bl., MSS.—Theobald, Cat. Land and Freshwater Shells of British India, p. 18.
Nanina (Microcystis?) Tenuicula, Nevill, ib. p. 36.

Testa aperte perforata, turbinata, tenuis, flavo-vel fulvo-cornea, levigate, utida, diaphana, oblique striatula, sub lente lineis impressis confertis minutis in anfractibus superioribus subtilissime decussata. Spira subconica, lateribus convexiusculis, apice obtuso, suturâ leviter impressâ. Anfr. 5½-6, convexiusculi, regulariter crescentes, ultimus non descendens, ad peripheriam obsolete subangulatus, angulo omnino antice evanescente, sed in testis junioribus validiore, subitus convexus, radiatim striatulus. Apertura obliqua, ovato-lunaris, latior quam alta. Peristoma tenue, rectum, marginibus subconucentibus, columellari subverticali, breviter reflexo. Diam. maj. 9, min. 8½, axis 6 mm.

Hab. Ad Bombay et in terris vicinis, neeon 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 whors with minute, close, impressed spiral lines. Spire subconical, the sides a little convex, apex obtuse, suture slightly impressed. Whors 5½-6, rather convex, regularly increasing, the last not descending, obsolete 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 tenunicula* 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.**


*Helix plicatula*, Hanley, Conch. Ind., p. 14, pl. xxviii, fig. 1.


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? wyniei**, sp. nov., Plate III, Fig. 5, 5a.

*Testa perforata*, subturbinato-depressa, striatula, nitida, albido-cornica, diaphana, fascià rufà supra peripheriam circumdata. Spira depresso-conica, apice obtusâ, sutorâ leviter impressâ, fascià rufà intus marginatâ. Anfr. 5\textfrac{1}{2}, lenta aceressentis, ultimus peripheriâ rotundus, subtus modice convexus, apertura versus vix descendens. Apertura late lunaris, obliqua, diagonalis; peristoma tenue, intus hand incrassatum, margine basali subrecto obtuso, columellari reflexo. Diam. maj. 19, min. 17\textfrac{1}{2}, axis 9\textfrac{1}{2} mm. (ex icone). In eumculo minore diam. maj. 13\textfrac{1}{2}, min. 12\textfrac{1}{4}, axis 7\textfrac{1}{2} mm. apert. 7 lata, 6 oblique alta.

Hab. Ad Mari (Murree) in montibus Himalayanioccidentalisibus inferioribus haud procul a flumine Jhelum (*A. B. Wynne*).
Shell perforate, subturbanately 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 5½, increasing slowly and regularly, the last rounded at the periphery, moderately convex beneath, scarcely descending towards the mouth. Aperture broadly lunate, oblique, diagonal; peristone 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. 0·34, 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 subgeneric group, or even to Zonites. However, it is associated at Mari with a true Macruchlamys (M. pronat) 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 mollusca consist of Bulinina of the Petræus section.

The specimen of M. wynnei 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. Wyne of the Geological Survey of India, to whom I am indebted for several mollusca 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. Couch. iv. p. 48, pl. exviii, figs. 6-8); but, in the first place, it can scarcely, I think, be the species figured by Jacquémont (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 Macruchlamys? wynnei. Now, I have another species from Mari, which agrees admirably with Marten’s description in these re-

* Novill, ‘Scientific Results of the Second Yarkand Mission,’ Mollusca, p. 17.
spect, and which resembles Jacquemont'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. jacquemonti* is probably a *Bensonia*.

12. **Pupa (Pupisoma) evezardii.**


**Testa imperforata, vix subrimata, conoidico-ovata, tenuis, cornea, lineis elevatis irregularibus filiformibus obliquis ornata. Spira subitus subcylin-
dracea, superne conoidica, lateribus convexis, apice obtuso, suturā impressa.** Anfr. 4½, convexi, regulariter crescentes, ultimus parum major, peripheria atque basi rotundata, haut antice desecundens. **Apertura diagonalis, truncato-rotunda, edentula; peristome tenue, rectum, expansiusculum, marginibus conicis et umbilicis, columnellari verticali, ad basin subtorto, adnato-reflexo, regionem umbilicalem tegente. Long. 2½, 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, conoidoi 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 4½, 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; columnellar 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, "Synglar," presumably Sihlgarh, 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 Syladri range and the Nilgiris, forms that do not appear hitherto to have been described.

The subgenus *Pupisoma* was proposed by Stoliczka* for the Moulmeln

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.c., has referred the Helix orea of Benson to the same section of Pupa as P. lignicola; and in this he is, I think, unquestionably right.


Testa conico-ovata, tenuissimula, parum nitida, distincte atque flexuose striata, viridescenti-cornua. Spira scalaris, apice acutissimula, suture velde impressa. Anfr. vix 3, pereconexi, ultimus 1⁄3 longitudinis subaequans. Apertura ovata, obliqua; peristoma tenuem, margine dextro medio ineriter arenato; columella arenata, reecedens, callosa. Long. 17, diam. 10, alt. (v. diam. min.) 6 mm., apertura 13 mm. longa, vix 9 lata.

Hab. Saxis ripibusque adhaerentibus prope Mahabaleshwar ad summos montes 'Syladri' 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 1⁄3 of the length. Aperture oval, oblique; peristome thin, the right margin moderately curved forwards; the columella arenate, 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.

† 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 *Litliotis*, which has a similar habitat.

The figures in the 'Conchologia Indica' 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.


Hab. In montibus 'Sivagiri' dictis (Tinnevelly) Indiae meridionalis (H. Beddome).

*Varietas anfractibus quinque, superne et in umbilico confertim filiformi-striata, laminā parietali duplici, in montibus habitat prope urbem Cumbun. Exempli majoris diam. maj. 6½, min. 3⅓, alt. vix 3; ap. long. 2½, lat. 2 mm.*

Shell rather openly but not perviously umbilicated, depressed, oval, yellowish white, translucent, glossy, scarcely striated. Spire almost flat, suture but little impressed. Whorls 4½, 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, semi oval, 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.


**Testa umbilicata, depressa, sphæroidico-ovata, lœvigata, 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, antorsum devians, subitus convexus, circums umbilicum compressus, post aperturam fossiculis impressis constriectus. Apertura obliqua, fere semi-ovalis, laminâ unâ validâ flexuosa intrante parietali, dentibusque 5, tribus in margine columellari, duobus in dextro, horum uno inferiore majore laminae parietali opposito, alio minore superiore, convexitata. Peristoma incrassatum continuum, fere solutum, album, unilique late expansum, postice juxta angulum subprofundè retrosinuatum, margine parietali valido, concavo. **Diam. maj. 5, min. 3½, alt. 2½.**

**Hab.** In montibus hang procul ab urbe Cumbum (Madura) Indiæ meridionalis (II. Beddome).

**N. B.** In nonnullis exemplis peristoma quadri-vel tridentatum nec quinquedentatum est, dente uno columellari et aliquando uno palatali carunc.

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 semi-oval, 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-
1880.] W. T. Blanford—Contributions to Indian Malacology. 203

icient. 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, circro-albida. Spira depresso-conica, param exserta, apice obtusiuscolo, suturâ impressâ. Anfr. 5, convexi, penultimate postiee rotundatus, haud ultra ultimum (a basi spectatus) prajieicus; ultimus inflatus, multo major, eccentricus, antorsum devians, subius convexus, levigatus, politus, circum umbilicum praesertim antice compressus, post aperturam fossiculis impres- sis constrictus. Apertura obliqua, fere semiivalis, lamellis duobus intran- "tibus parietalibus, sinistrâ longiore, intus tortâ, dentibusque 5, duobus columnellaribus, superiore minore juxta umbilicum, inferiore magno dupliciti, uno basali lamelliformi transverso, duobusque in margine dextro, inferiore subbifido, superiore minore, coaretata. Peristoma album expansum, ad angulum postiee vis simatum, marginibus callo duobus lamellâs seriente juncti- tis. Diam. maj. 5 3/4, min. 4, alt. 3 1/4 mm.

Hab. In montibus 'Balarangam' dictis (Mysore) Indiae meridionalis (H. Beddome).

Shell umbilicated, depressed, globosely ovate, rather indistinctly striat- ed, 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 semiival, and furnish- ed 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 confertam atque arcuatum costulato-striata, nitidula, diaphana, cerco-allida. Spira depresso-conica, parum exserta, apice obtuse, suturâ parum impressâ. Anfr. 5½, superiores convexitus sensu, penultimus postice rotundatus, longæ ultra ultimum (a basi spectatus) proiectiæ; ultimus valde eccentricus, antërum devians, subtus subplanulatus, levigatus, in umbilico striis filiformibus flexuosus ornatus, circum peristomâ compressus atque aperturam versus angularis, juxta peristoma scrobiculis constrictus. Apertura obliqua, truncato-ovalis, lamellarë validæ parietalis intrante flexueæ, antice subhifidæ, dentibusque quattuor, uno columnellari, alio basali, duobus in margine dextro, convexta. Peristoma increasatum, subcontinuum, album, expansum, marginibus collo crasso lamellifero junctis, dextro prope angulum sinuatum. **Diam. maj. 6½, min. 4, alt. 3 mm.**

**Hab.** In montibus haud procul ab urbe Tinnevelly Indianë meridianaë (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 5½, 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 subhifid in front, and with four teeth—one columnellar, 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 lamellae are peculiarly
inconstant. Thus, the original type of *Streptaxis perrotetii*, the common
species on the top of the Nilgiri hills, has two lamellae*; 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
Sylvâetri, or Western-Ghat range. The most northern locality from which
I possess a specimen is the hill-fort of Torna, near Sinhgârâ, 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 11½ mm.
by Sï, and it is nearly allied to the Nilgiri *S. perrotetii*, and perhaps still
more nearly to the Ceylon *S. eingalensis*.

18. ENNEA MACRODON, sp. nov., Plate II, Fig. 15.

*Testa flexuose rimata, subeylindrico-turrita, diaphana, nitidula, con-
fertim capillaceo-costulata, cereo-albida. Spira elongata, sursum parum
attenuata, lateribus subrectis, apice obtuso, saturâ impressâ. Anfr. 7,
convexi, duo superiores levigati; ultimus aperturae versus subascendens.
Apertura verticalis, oblique semioculis, lamellà validà bicrûir intrœte
parietalì, alâi columnarii profundà, dentibusque tribus, uno tuberculiformi
columnarii, alio magnî lamelliformi transverso basali latus dextrum versus,
tertio minore in margine dextrò, coactata. Peristoma album, expansum,
juxta anfractum penultimum sinuatûm, marginibus callo lamellifero junctis.
Long. 5, diam. vix 2, ap. long. 1½ mm.*

Hab. Apud Pykara in summos montes 'Nilgiri' dictos Indiae meri-
dionalis.

Shell flexuously rimate, subeylindrically 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, 
semi-oval, obliquely truncated above, and very much contracted by teeth, 
consisting of a strong re-entering bifid parietal* plica on the callus con-
necting 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 plica, and with it nearly 
cutting off the posterior corner of the aperture, and a third, broad, lamell-
iform, 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 mar-
gins 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. 
pirriici of Pfeiffer,† but I noticed it as a distinct form when describing 
E. sculpa (J. A. S. B., 1869, xxxviii, pt. 2, p. 141), and mentioned some 
of its peculiarities. E. macrodon is distinguished not only from E. pirriici, 
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. sculpa, E. pirriici, 
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. pirriici, 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-
albidating confermit subobsoletae costulata. Spira parum attenuata, lateribus 
convexiusculis, apicis obtuso, suturâ impressâ. Anfr. 7½, convexiusculi, 
ultimo antice breviter ascendens. Apertura verticalis, oblique semi-ovalis, 
lamellâ validâ intrante bieruri, flexuosa, parietali juxta angulum, aliâ pro-
fundâ columellari, et quatuor dentibus, uno columellari, duo basalibus, 
guarto dextrai plia parietali opposito, coarctata. Peristoma expansum, 
albidum, juxta anfractum penultimum sinuatum, marginibus callo lamelli-
fero junctis. Long. diam. 2, ap. long. 1½ 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 (H. 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, semi-oval, 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) 0·05 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).


HAB. In montibus ‘Balaramgan’ dictis provincia Mysore in India meridionali (H. 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 6½-7, slightly convex, the last whorl ascending very little near the mouth. Aperture nearly vertical, semi-oval, 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 0.01 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.


*Hab.* In montibus 'Golconda' dictis, haud procul ab urbe Vizagapatam (H. Beddome).

*Var. minor, anfractibus 5½; long. 3, diam. 1½, ap. long. 1¾ mm. (Pl. II, Fig. 16.)*

*Hab.* In montibus haud procul ab urbe Karnul (Kurnool) Indiae 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 columnar tuberules (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 Goleoroda 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 *Eunca* 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.


Hab. In montibus 'Sivagiri' dictis (Tinnevelley) Indiæ meridionalis (II. Beddome).

Shell rimate, subcylindrically turretted, 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 lamellae—one of them in front to the right near the angle of the mouth, slightly twisted inside, the other to the left near the colomellar 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 profundiuscula. Anfr. 5½, convexi, infra saturam inflati, gradatim crescentes, ultimus antice vix ascendens. Apertura subrotunda, superne truncata, lamellá validá parietali intrante subtortá, partem posterioriorem aperturae fere discernente, alitáque
columnellari profundā, vix in fiance conspicā, coarctata; dentibus palatalibus in peristomatē nullis. Peristoma continuum, longe adnatum, album, incrassato-patens, undique expansum, intus granulatum, margine columnellari angulatiam incisum, basali lato, dextrali intus juxta lamellam parietalem breviter projiciente, angulum versus leviter retro-sinuatum. Long. 3\textsuperscript{3/4}, diam. 2, ap. intus 3/8 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\textfrac{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 columnellar 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 columnellar 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 vari 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**.


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 Nonina calpis from the Nágá and Khásí hills are included. Streptaulus blanfordi has been found in Sikkim, and in the Dalla 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. Spiractulum travancoricum, Beddome, MS., Plate III, Fig. 6.


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, euneave 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 proeured at a considerable elevation, 4000 or 5000 feet, in the hills between Travancore and Tinnevelly, not far from Cape Comorin.

26. Cataulus costulatus, sp. nov., Plate III, Fig. 7.

Testa subperforata, subovato-turrita, solida, subsinuata costulata, pallide straminea. Spira convexo-turrita, apice obtusiuseulo, sutoru valde impressa. Anfr. 7½, convexi, ultimus arctius convolutus, antice porrectus fere solutus, carinâ basali valdidâ, compressâ, costulâtâ, antice dilatâtâ munitus; periomphalo mediocri, costulato. Apertura subcircularis, fere verticallis, canali ad latus sinistrum marginis basalis patente, ore suboblique, subtus spectante. Peristoma album, incrassato-expansum, revolutum, postice dextrorum atque antice sinistrorum ad canalem basisalem producunt, margine columellari angustiore, cum anfractu penultimo breviter juncto. Long. 16, diam. (perist. incl.) 5, diam. min. 5½, aperti. intus 3 mm.


Shell subperforate, subovately turreted, solid, rather coarsely and subsinuately costulated, of a pale straw-colour. Spire turreted, with convex sides, apex rather obtuse, sutures well impressed. Whorls 7½, 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 columnellar 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 Catalalus, 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 Calad 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. Catalulus albescens, sp. nov.

Testa subperforata, subovato-turrita, teniuscula, albido-cornea, subsinuate costulato-striata. Spira turrita, latribus convexis, apice obtusiusculo, suturâ valde impressâ. Anfr. 7, convexi, ultimus arctius convolutus, antice postice, fere solutus, vix descendens, carinâ basali transversim striatâ, postice obsoletâ, antice validâ, juxta aperturam dilatatâ munitâ; peristomphalo mediocri, plicato-striato. Apertura subcirculares, fere verticalis, canali ad latus sinistram marginis basalis patente, orc antice spectante. Peristoma album, incrassato-reflexum, postice et ad canalem basalem productum, margine columellaris angustiore, cum anfractu penultimo breviter junctum. Long. 13, diam. maj. 5 1/2, min. 4 1/2, apert. diam. intus vix 3 mm.

Hab. In montibus Travanoeois inaud procel 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. evrytrema, 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 *Cataulus*. 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 Travandrum. 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 *O. 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 Indica,' 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 *travankoricus*. 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 *Catulus* 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.


**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, columnellar expanded below, but emarginate and cut away into a re-entering 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, levigata, nitidula, vix verticaliter striatula. Spira conica, apice acuto, suturâ impressâ. Anfr. 6, convexiusculi; ultimus ad peripheriam atque subitus rotundatus, circa perforationem radiatum striatus. Apertura fere verticalis, ovata, spiram altitudine hand aequans. Peristoma tenue, marginibus subconniventes, callo tenui junctis, externo recto, columellari expansiusculo. Opere? Long. 4\(\frac{1}{2}\) \text{mm.}, diam. 3; ap. long. vix 2, lat. 1\(\frac{1}{2}\) \text{mm.}

Hab. In insulis Andamanicis cum precedente (*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.) disterna* (Benson, Ann. & Mag. N. H. Dec. 1863; Pfeiff., 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, tenuinscala, striis obliquis incrementi, alisque spiralisbus, minutis, subolute subtilissimae decussata, in anfractibus superioribus, nisi duobus supremis, undique, atque in inferioribus et supra et infra suturam costulato-striata, pallide rufescenti-fulva, anfractus ultimo cingulo pallido circunvallato. Spira conica, apice acuto, sutura impressa. Anfr. 6, convexi; ultimus ad peripheriam rotundatus, subtus convexus, radiatum striatum, in umbilico costulato-striatum, lineâ impressâ basali in loco carinae circumpum umbilicum instructus. Apertura obliqua, rotundato-ovata, 3⁄4 longitudinis subaequans. Peristoma tenue, marginibus subconcentibus, callo tenui junctis, externo basilique rectis, columellari subtus expansisseulo, juxta perforationem retrosinuato. Operc. ? Long. 3 3⁄4, diam. 2 3⁄4; ap. long. 1 3⁄4, lat. 1 3⁄4 mm.

Hab. Cum precedentibus in insulis Andamanicis (J. Anderson).

Shell perforate, ovately conical, rather thin, finely marked with oblique striae of growth and minute decussating spiral lines (only visible beneath the lens), costately 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 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. distemina 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 Assimineae. 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.


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 striae 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. Sept. 1851, Ser. II, Vol. 8. p. 194.—Nevill, Handlist Moll. I. M. p. i, p. 320. Hanley; Coach. 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 from of *Paludomus* was procured by Colonel Beddome in streams traversing the plains between Trevandrum and the foot of the Aghastyamalai 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 spiraler circumdata, albido-cornea, epidermide crassâ olivaceâ objectâ. Spira conica, apice erosa, suturâ valde impressâ. Anfr. superst. 3 (in testâ integrâ 4-5), concrevi, ultimus dimidiam longitudinis subaequans, modice ventricosus, subitus circa umbilicum angulatum compressus, umbilico conico, intus lavigato. 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 serf 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, angularly 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 0.05 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 shown, 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 equilateralis, rhomboideo-ovata, ventricosa, solidiuscula, concentrico striata atque costulis subrenotis, interdum plus minusve obsoleta, ornata, epidermide olivaceâ induta, intus violacea: latera antico ante unbones prominentes subhorizontali, tunc fere regulariter convexo, postico declivi, oblique subtruncatulo, demum subangulato, margine ventrali modice arcuato; ligamento postico subito contracto. Lat. 10½ mm., long. 9, crass. 7.

In alio exemplo long. 11½, lat. 8½, crass. 7.

Hab. Ad Mandelay, urbem capitalem regni Avaë.

Shell nearly equivalve, 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 arcuate. 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 0·12 inch, breadth from umbones to ventral margin 0·36, thickness 0·28; of another much longer shell, the same measurements are 0·16, 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 Corbicula. 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.


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.


11. *Streptaxis concinnum*, 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 teeth should be lower down.

15. (Lower figure) *Ennea exilis*, enlarged four diameters. All the teeth are wrongly represented; see description.

16. *Ennea macrodon*, enlarged four diameters. The teeth in the peristome are not distinct in the figure, and the large tooth inside the base is omitted altogether.

17. *Ennea stenostoma*, var., enlarged four diameters. Teeth not correct, they should be precisely the same as in fig. 17.

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. *Paxidomus travancoricus*, 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 alabata.*

4. *Ariphanta immerita.*

5. *Macrochlamys wynnei.*


7. *Catanius 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 Niceville.

(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 rhopalocerous 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 mimick 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
polyles 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 mimick 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.


2. Danais melanoleuca.


Numerous specimens of both sexes (A. de Roepstorff and Moti Ram).
3. EUPLECA CORE.


One female (*Moti Ram*) agreeing with Bengal specimens.

4. EUPLECA ANDAMANENSIS.

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 Satyrinae.

5. LETHE EUROPA.

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.
" BLASIUS, Fabr.

Males and females (*A. de R. and Moti Ram*).

8. MYCALESIS OTREA.

— *francisca*, Id., *ibid.*, pl. 326, figs. E, F.
A female of one of the numerous varieties of this species.

8. MYCALESIS RADZA.

One male and two females.

9. ELYMINIA'S COTTONIS.

Numerous males (*A. de R. and Moti Ram*); one female (*A. de R.*).

Subfamily Morphinae.

10. DISCOPHORA CELINDE.

*Pap. celinde*, Stoll, *Pap. Exot. Suppl.* 1790, pl. 37, figs. 1, 1 A.
One female.
Subfamily Nymphalinae.

11. Cethosia nicobarica.


Two pairs (Moti Ram) and one male (A. de R.) agreeing perfectly with specimens from the Nicobars.


Numerous specimens, male and female (A. de R. and Moti Ram).

13. Cirrhochroa anjira.

Males and females.


_Pap. erotica_, Fabr., Entom. Syst. 1793, vol. iii, p. 76.
Numerous males and females.

15. Messaras erymanthis, var. nicobarica.

Males and a female.


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.


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.


Male and female.


___ stephensii__, Id., ibid. p. 55, ♀.

A single male.

22. Cyrestis cocles.


A single male of this delicately tinted butterfly.

23. Cyrestis thyodamas.


_Amalthia ganescha_, Koll. in Hügel's Kaschmir, 1848, vol. iv, p. 430, pl. 7, figs. 3, 4.

One male.

24. Hypolimnas bolina.

_Hypolimnas 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.


Two males and a female.


_Pap. gambrisius_, Fabr.

Numerous specimens of each sex (A. de R. and Moti Ram).

27. Neptis mananda.


Two pairs (A. de R. and Moti Ram).

Seems very near to _N. khasiana_.


Five males and a female (A. de R. and Moti Ram).
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29. **Athyma selenophora.**

*Limenitis selenophora*, Koll. in Hübci's Kaschmir, 1848, 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. **Symphedra teuta, var. teutooides.**


Males and females (*A. de R.* and Moti Ram).

31. **Tanaecia cibaritis.**


Numerous males and females (*A. de R.* and Moti Ram).

32. **Tanaecia acontius.**


One female.

33. **Limenitis procris, var. anarta.**


One female.

34. **Nymphalis athamas.**


One female.

Family **ERYCINIDÆ.**

35. **Abisara bifasciata.**


Three females.

Family **LYCÆNIDÆ.**

36. **Lampides ardates.**


One female.

37. **Lampides aelianus.**


One male.

30
38. Lampides elpis.


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 fasciae; all the fasciae 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 $\varphi$ 0.72, $\delta$ 0.58—0.68; whence expanse = $\varphi$ 1.5, $\delta$ 1.2—1.4 inches.

41. **Lampides plumbeomicans**, n. sp.

Closely allied to the preceding, but much smaller; with three instead of two fasciae on the underside of the anterior wings, with all the fasciae relatively broader, and with those of the posterior wings much less complexly faulted and contorted.

$\delta$. 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 fasciae as also the fasciole commencing at the costal vein where they are all broken.

Posterior wings with corresponding fasciole and fasciae, which latter are more or less faulted at every vein though much less contorted and consequently more easily traced than in the preceding; fasciae and fascioles of both wings margined on both sides with fuscous of a rather deeper shade than the ground and with whitish.

$\varphi$. 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 fasciae, especially conspicuous and coarse.

Length of anterior wing $\delta$ 0.56, $\varphi$ 0.58, whence expanse = $\delta$ 1.12, $\varphi$ 1.16 inches.

Two males and a female.
42. Polyommatus sangra.


Innumerable males and females. The commonest ‘blue’ in Calcutta, being obtainable in any number wherever there is a patch of grass.

43. Aphnæus lohita, var. zoilus.


♀. Larger than the male. _Upperside_ smoky brown, marked obscurely with darker bands corresponding to those of the underside. _Underside_ with the intervals between the hands wider owing to the greater breadth of the wings. In all other respects as in the male.

Length of fore-wing 7; whence expanse = 1.46 inches.

Males and one female.

44. Hypolycæa erylius.

_H. erylius_ (Godart), Hewitson, Ill. D. Lep. Lyc. p. 49, pl. xxii, fig. 1 ♂, 2, 4 ♀.


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, ♂.


♀. Smaller than the male. _Upperside_ sepia-brown with a bronzy gloss, the spots and fasciae 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 fasciae 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 ‘66; whence expanse = 1.38 inches.

It differs from _S. phocides_ ♀ (= _S. jolcus_ (Felder), Hew., Ill. D. Lep. Lyc. 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 fasciae, 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 conspicuous 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 westermannii*, 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. westermannii*, 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*.


♂. 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 coerulescent 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 = 84; whence expanse = 1.78 inches.

48. *Deudorix epijarbas*.


*Deudorix epijarbas*, Hew., Ill. D. Lep. Lyc. pl. vii, figs. 16, 18, ♂, 17, ♀.

Very numerous specimens of both sexes.

49. *Deudorix diencees*.


Males and females.

The Museum possesses males from Silhet and Calcutta also.

50. *Deudorix orseis*.


♀. 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 = 6S; whence expanse = 1.42 inches.

Two males and two females.

51. *Deudorix varuna*.


A single male.

52. *Myrina atymnus*, var. *prabha*.


Males and female.


Two females.


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*.


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. *Teias hecabe*.

*Males and a female.*

57. *Teias harina*.


*Males and females.*

58. *Hebomoia roepstorffii*.


♂. 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
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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.


Numerous males and females (A. de R. and Moti Ram).

60. Catopsilia crocale.

Callidryas crocale, Butler. Lep. Exot. 1869-74, p. 22, pl. ix, figs. 1, 2, 3, 6, ♂ ♀.

Two males.

61. Pieris nadina, var. nama.


Hewitson, Ex. Butt. Pieridæ, 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.

Two pairs.
Lepidoptera from the Andaman Islands, &c. 237

63. ERONIA VALERIA, var. NARAKA.


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.


Two males and two (white) females differing in no respect from those of continental India (Naga Hills, Cachar, Bhutan, and Madras).

Tachyris galatea, Felder, is a perfectly distinct race peculiar to the Nicobars, whence we have specimens.

Subfamily Papilioninae.

65. ORNITHOPTERA HELICONOIDES.


A male and a female.

66. PAPILIO CHARICLES.


One female of the 3rd form (Moti Ram).

This is the Andaman representative of the continental P. androgens; 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.


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.


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 euryplus.**

One pair.

71. **Papilio clytia, var. flavolimbatus.**


This variety agrees in the size and distinctness of the cretaceous white markings of the upperside best with specimens from Silhct, 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, suffused 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. epaminonidas*, 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 irroration 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 setae, below cretaceous-white; abdomen cretaceous-white with a tapering dorsal black band and two lateral fusaceous 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 underside 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 setae, &c."

73. **Papilio 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.
Male and female.

76. Ismene lebadea.
One male.

77. Ismene druna.
Two males.

78. Tagiades ravi.
One male and two females.

79. Tagiades alica.
♀. 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 alyson.
Many specimens.

81. Hesperia ocella.
Males.

82. Hesperia colaca.
Two specimens.
83. Hesperia cahira.


Males and females.

84. Hesperia beturia.

_Hesperia beturia_, Hewitson, Desc. Hesp. 1868, p. 36.

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.


Male.

86. Telegonus thyrsis.

_Telegonus thyrsis_ (Fabr.), Butler, Fabr. Lep. p. 262.

Three males.

87. Pamphila mesoides.


Many specimens.

88. Pamphila gola.


Numerous specimens (A. de. R. and Moti Ram).

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-
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 hadenii*, 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-fascus, aliquando griseo-lovatus, subitus pallidior, caudâ pedibusque cum dorso concoloribus, caudâ fere \( \frac{3}{4} \) corporis cum capite aequante; auriculis brevibus, vellere contectis, pilis longiusculis extus munitis; ungibus longis, albidis compris, pilis haud obtectis; pollice brevi, unguifero; dente molario inferiori antico angulis 4 externis, 5 internis, spatii in coronâ 7 minutus, secondo tertiio singulis angulis utrinque tribus, totidem spatii; dente superiore primo spatii 5, angulis utrinque tribus, secundo spatii 4, angulis tribus externis, duobus internis, terto denique angulis tribus, quorum ultimus rotundatus, externis, duobus internis, in lorum elongato-ovatum postice productum desinente notando. Long. corporis cum capite 0'12 met., caudâ 0'32, auris 0'07, pedis posterioris a calcaneo 0'18, cranii 0'028.

Hab. Ad Mari (Murree) in montibus Himalayais occidentalis, 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 \( \frac{3}{4} \) 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 \( \frac{3}{4} \) and \( \frac{4}{4} \) 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 it 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:

<table>
<thead>
<tr>
<th>Description</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of head and body from nose to anus</td>
<td>4'75</td>
<td>3'65</td>
</tr>
<tr>
<td>Ditto tail from anus (hairs at end not included)</td>
<td>1'35</td>
<td>1'2</td>
</tr>
<tr>
<td>Height of ear from orifice</td>
<td>0'25</td>
<td>0'26</td>
</tr>
<tr>
<td>Breadth of ditto</td>
<td>0'25</td>
<td>0'26</td>
</tr>
<tr>
<td>Length of fore-foot without claws</td>
<td>0'4</td>
<td>0'4</td>
</tr>
<tr>
<td>Ditto of hind-foot and tarsus without claws</td>
<td>0'7</td>
<td>0'7</td>
</tr>
<tr>
<td>Ditto of claw of middle toe</td>
<td>0'11</td>
<td>0'13</td>
</tr>
</tbody>
</table>
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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 Rhopalocerous Lepidoptera from the Indian Region.—By Captain G. F. L. Marshall, R. E., and Lionel de Niceville.

(Received December 27th, 1880.)

1. Euplœa (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. Zopheressa jalaurida, 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 upperside 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.


♂. 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 sub-marginal 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. latarius* ♀ 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 sub-marginal 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)*.


♂. 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 ochre-ous 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.


♂. ♀. 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 yellower 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.


♂. ♀. 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 Ashamboo hills by Mr. Harold S. Fergusson.

♀. **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 *Euploea 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 SATYRINE.**

*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 *Clerome* and *Æmona*, genera of *Morphte*; 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 *παροδίον*, 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 Papilioninae 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 underside by a curvilinear groove.

Posterior wings tailed, subquadratique, 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.

Antenne fine and distinctly clubbed.

Female unknown.

No Asiatic genus of Satyrinae presents us with any approach to the remarkable arrangement of the two hindmost 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. archaen and its congener 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 subcrescentic 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 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.
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