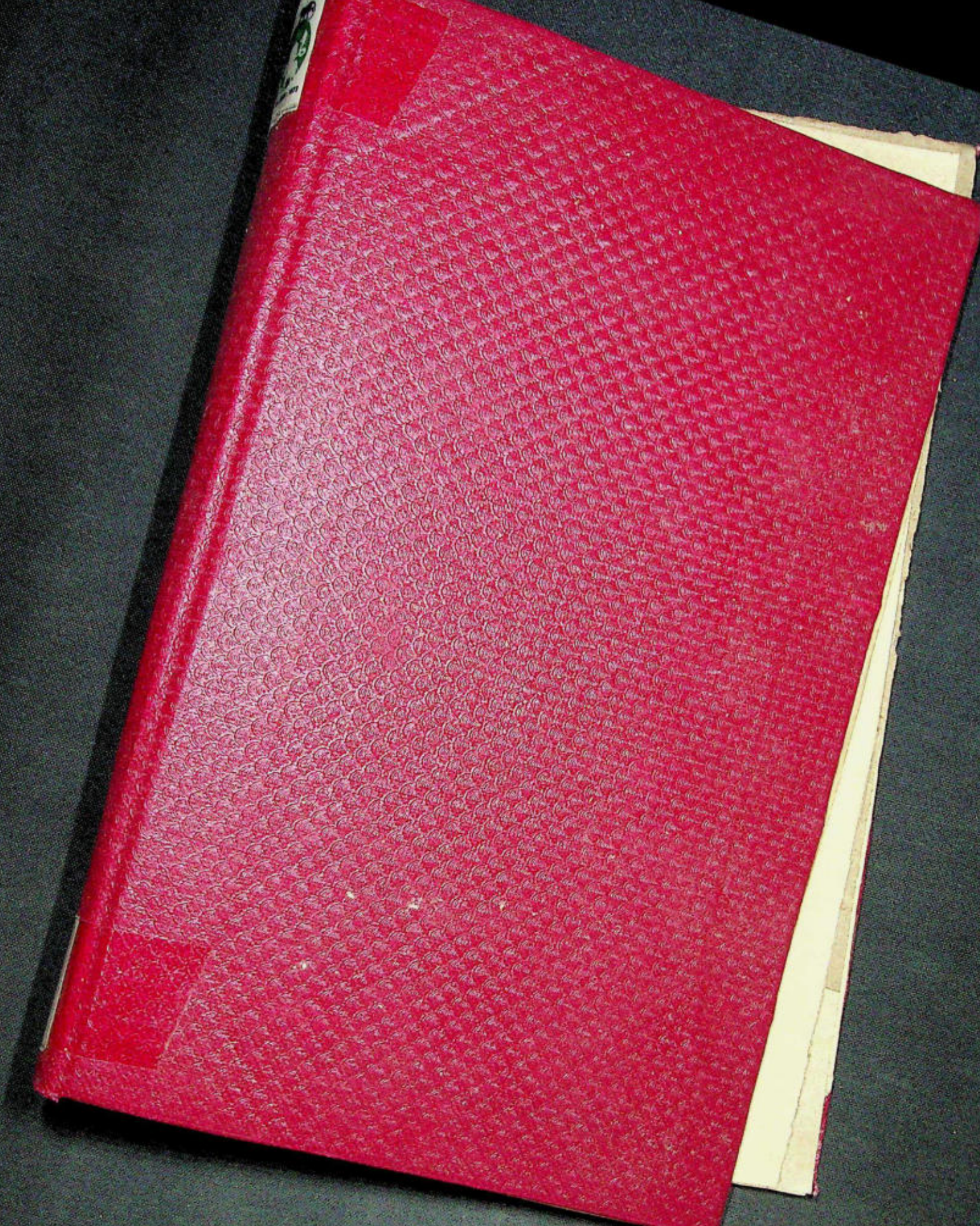




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"It will flourish, if naturalists, chemists, antiquaries, philologers, and men of science in different parts of *Asia*, will commit their observations to writing, and send them to the Asiatic Society at Calcutta. It will languish, if such communications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

SIR WM. JONES.

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ZOOLOGICAL GARDEN
CALCUTTA

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ASIATIC SOCIETY.

PART II.—PHYSICAL SCIENCE.

No. I.—1866.

Physical Character of the Karens.—By the Rev. F. MASON, D. D.

[Received 7th January, 1865.]

KARENS.*

The name Karen has been adopted from the Burmans, who apply to various uncultivated tribes, that inhabit Burmah and Pegu; but as used, in these notices, as designating a people that speak a language of common origin, which is conveniently called Karen; embracing many dialects, and numerous tribes. These tribes, though speaking a common language, have no common name with which to distinguish themselves; but in this respect, they do not differ from our own ancestors. Cæsar found some twenty or thirty different tribes in Britain, but it does not appear that they had any common name by which they designated themselves.

* The following pages are offered as answers to "Queries respecting the human race addressed to travellers, by a Committee of the British Association for the Advancement of Science," at the request of Col. Phayre; and embrace all the writer has to say on the general division of the Queries, entitled "Physical Characteristics;" from Query 1 to Query 49.

No answers are given to Queries 5, 6, 7, 8, 9, 10, and 30, relating mainly to Anatomy, because satisfactory ones have not been obtained. Nor are answers given to Queries 13, 14, 15, 16, because the writer has already published on the subject of Language in the Journal of the Asiatic Society of Bengal, and in his work on "Burmah." To write again on the subject, would necessarily compel the writer to repeat considerable of what is already in print, which seemed unnecessary.

The word Karen has been supposed to signify *aboriginal*, from *y* "first," and *ka*† a formative particle; but the derivation is Europe not Burmese. The Burmans have never been so recondite in nam wild tribes. When the Buddhist missionaries landed at Martaban, t denominated the aboriginal inhabitants *Beloos*, or "Monsters," the Burmese still retain the name for a tribe of Karens on the bor of Karenee. The subdued Bghais they dispose of as *Loo-Yain* "wild men; while the more civilized Mopghas that bring honey bees' wax for sale, they call *Taubya*,§ "wild bees;" and they fin the dress of another a distinctive name, and call them "Red Karen

The word *Karen* is probably a Karen word. One of the northe Karen tribes, with which the Burmans must have held most inte course before they conquered Pegu, call themselves *Ka-yong*, which sufficiently near the Burmese to be the same word. Then we hav precisely parallel case in the name they give this tribe, which *Gai-kho*,‖ a Karen word that is manifestly identical with *Kai-k* the name the other Karen tribes give them.

Eight distinct Karen tribes are known, who speak dialects so dive that they cannot understand each other; and yet, on examination, larger proportion of the roots of each dialect are of common origin.

These tribes have often several names, and not only are travell misled by them; but residents often take up wrong impressions a give, for distinct nations, names that refer to the same tribe.

A few of the tribes only have distinctive names for themselves, a all, when speaking to each other, use the word for man to design themselves; precisely as the Hebrews use the word for man as proper name of the first man, Adam. Were these terms for n adopted in English, the tribes would be much more accurately dis guished than they are at present. Thus we should have

Pgha-knyan	for	Sgau.
Pie-yà	„	Bghai.
Prà-kă-yà, or Kă yà	„	Red Karen.
Heu-phlong	„	Pwo.
Peu	„	Taru.
Plau	„	Mopgha.

* ရင် † တ ‡ လူရိုင်း § တောဝ ဗျား ‖ ဂဲ

Pray-kā-yong	for	Kay or Gaikho.
Lau	,,	Toungthu.

Sgau, or *Pgha-knyau*.

his tribe is known by a diversity of names.

gau, the name the tribe give themselves.

urmese Karens, thus designated by some English writers.

White Karens, the name given them by English travellers to distin-h them from the Red Karens.

Iyeet-tho, so designated by the Burmese.

Shan, the name the Pwas give them.

Pa-ku, the name by which they are known in Toungoo, and to the l Karens; but it more properly denotes a sub-tribe of Sgaus.

Shan-ne-pgha, a name given to another sub-tribe of Sgaus.

We-wa, a small sub-tribe of doubtful origin, but probably originally us.

BGHAI, or PIE-YA.

The Bghais have no distinctive name for themselves, besides Pie-ya. Bghai is the name the Sgaus give them, and they recognise the ne so far as to apply it with an adjective to sub-tribes among mselves.

Bghai-kā-ten, "Bghais at the end," is the name of the Tunic hais, as used by the Pant Bghais; because they live at the extre-y of the tribe nearest Toungoo.

Tunic Bghai is the name given to the above sub-tribe, by English ters, because they wear tunics or frocks.

Bghai-kā-hta, "Upper-Bghai." The Pant Bghais are thus de-inated by the Tunic Bghais, because they live on the streams ve them.

Pant Bghai is the denomination by which all the Bghais that wear ts are known to English writers.

-yaing, or Ka-yen Ayaing, "Wild Karens," is the name the mese give to nearly all the Pant Bghai.

eik-bya-gyie, "Great Butterflies" is the Burmese name of a por-of the Tunic-Bghai.

eik-bya-guay, "Little Butterflies" are other villages of Pant hai.

Pra-pa-ku, is the name given by the Red Karens to the Bg
that live near the Pa-kus.

Manu-manau is a Burmese name given to a mixed sub-trib
Bghais.

Pray is the Red Karen name applied to the Manu-manau an
some other clans related to the Bghais.

Lay-may is Burman for a sub-tribe of Bghais, called Pray by
Red Karens.

Shan-kho is a name given to a Bghai clan in the north-eastern
of Toungoo.

Red Karen, or Ka-ya.

The Red Karens have no name for themselves, except Ka-ya,
Prâ-kâ-ya.

Ka-yeu-nie, "Red Karen" is the name given them by the Burm
on account of the red-striped pants they wear.

Bghai-mu-hta, Bghai-mu-htay, names given them by the Bgh
signifying "Eastern Bghai."

Yang-laing, "Red Karens" is their name among the Shan tribe

The-pya the name by which the Kay people designate them.

Ta-lya a small sub-tribe of Red Karens, are thus denominated
the Red Karens themselves.

Yen-ka-la, the Burmese name of the above clan.

Tha-vie, or Tha-vie-la-kha is a Red Karen name for a people
their own tribe living ten days' journey above them, on the Salwe
and who were separated from them when driven from Ava, sixt
generations ago.

In 1861, our Assistant in Karenee reported a singular letter t
was sent by them to Karenee; the object of which was not stated
tinctly, but it was understood as a challenge to fight. The follow
is a translation:—

"Now, the words of God and his commands have come to us.
all men give up the customs of their ancestors, and offerings to spi
and live in peace. As for us in the land of Tha-vie, we will d
in peace and obey the commands.

"Nevertheless, at the proper time we will make a feast; and
feast is not a woman's feast, but a man's feast; and when the t
arrives to dance, we will dance. And the shades of the dead, and

spirits will look on. We say to you, if you wish to look on, come and look, and bring sword and spear. We have appointed the month of March for the time of holding the feast."

Pwo, or Heu-phlong.

The Pwos call themselves Sho.

Pwo is the name given them by the Sgau.

Meet-khyen is a name given them by the Burmese, signifying "liver-khyens."

Talaing-Karens is a designation they have in some published papers, and they are sometimes thus designated by the Burmese, because they are principally found among the Talaings.

Shoung is a name given to a small sub-tribe of Pwos in the north of Toungoo.

Taru, or Plu.

Taru is the name given to a tribe nearly related to the Pwos by the Red Karens.

Khu-hta is the name they give themselves.

Be-lu or monsters is the name by which they are characterized by the Burmese. A part of the tribe shave the whole head excepting two tufts of hair, one on each temple, which gives them a sufficiently frightful appearance to account for the name the Burmese have given them.

Be-lu-ba-doung is the name given them by the Kay tribes.

Mo-pgha, or Plau.

Mo-pgha is the name of one of the villages, from which the missionaries have named the whole tribe; but it is a name they do not recognize themselves. Neither do all call man Plau. Small as is the tribe, there are two or three different dialects among the people, and we have Pie-zau, and Pie-do for man, as well as Plau.

Plau-bya, "Wild Bees" is a name the Burmese give them in some documents.

Pgha-Pwo is a designation sometimes given them.

Kai, Gaikho, or Prai-ka-young.

The Kai, or Kay, or Gaikho have no distinctive name for themselves, beyond Prà-kă-young, or Kă-young, their word for man.

Kà appears occasionally as designating the people, but it signifies land in their dialect, and properly denotes the country.

Kai, or Kay is the name given them by the Bghais, but they never use it alone. They make three divisions of the tribe.

Kai-kheu "Upper-Kai," often applied to the whole tribe.

Kai-la "Lower-Kai."

Kai-pie-ya "Kai's people."

Gai-kho is the name which the Burmese give them in imitation the Bghai Kai-kho.

Pa-htoung is the name the Red Karens give them.

Hashwie is a small tribe related to the Kay, and thus denominat by the Bghais.

Hashu is the name they give themselves.

Toungthu, or Lau.

The Toungthus are related to the Pwos by their language.

Toung-thu is the name given them by the Burmese.

Pa-au is the name by which they designate themselves.

There is nothing to associate this tribe with the Karens but t language, excepting that the people have the appearance of bein Shan trib.

Shan Karens.

The generic name that the Shans give the Karens in their o country is Yang, which is softened in Burmese into Yen, or Ye Hence we have of the following Karen tribes is the Shan country which we know little more than the names.

Yang-lang, "Black Karens."

Ying-ban.

Yen-seik.

Yein.

Sok, or Tsok is the name the Shans give all the Karens that re in the Burmese territories, without distinction of tribe.

Physical Characteristics.

Though the preceding tribes are one in language, they are scar one in anything else. They differ materially in their physical racteristics.

The Pwos and Toungthus, that usually inhabit the lowlands, re ble the Burmese, who inhabit similar localities, in their phy traits more than they resemble the Karens that dwell on the m tains. They are a short muscular people with large limbs, larger

the Burmese; while the mountaineers are usually of little muscle and small limbs. It is a popular idea that mountaineers are stronger, and hardier than lowlanders, but, however, it may be in other lands, it is certain that in Burmah the mountain tribes are weaker people than those who live on the plains. The cause, however, may possibly be other than the locality.

In stature, all the Karens, excepting perhaps the northern tribes, are shorter on an average than Europeans. In a promiscuous assembly of one hundred men, embracing several tribes, two were *five feet seven* inches high, eight were *five feet six* and a half inches, and all the rest were shorter. An intelligent man that measured *five feet five* inches and a *half*, was confident that he was taller than the average of Karens. I should fix the average at from *five feet four* and a *half* to *five feet five*. The shortest man I have measured, is a Bghai chief, who was only *four feet eight* inches high; and the tallest Karen I have seen, was not quite six feet.

A company of one hundred Karen women had only two that were *five feet* one inch high, eight were about *four feet ten;* and the rest shorter. The average cannot be more than *four feet nine*. The shortest woman I have noted, was *four feet five*.

In different villages, the average would vary considerably from the above. A village of Mopghas, on the hills, that can be seen with a glass from the city of Toungoo, is remarkable for its short men, especially the younger ones. I doubt there being one over five feet high. On the contrary, the northern Bghais and Gaikhos are comparatively tall, perhaps as tall, usually, as Europeans; but they are a small minority; and I attribute their superiority, in part, to the higher and cooler region that they inhabit.

Though small in stature, the Karens appear to be tolerably well proportioned. No prevailing disproportion between different parts of the body has been noted.

In those parts of the body which are not exposed, the northern tribes, at least, are as fair as the Chinese. The young people, both male and female, among the Gai-khos and northern Bghais, often have red and white in strong contrast on their countenances; altogether unlike the uniform clay colour of their more southern relatives. I have met with individuals, who, if seen alone, would be pronounced

part European. Indeed, if not exposed to the sun, some of them would be as fair, I think, as many of the inhabitants of Northern Europe.

The yellow tinge of the Chinese is very distinctly seen on many of the Karens, particularly the females; and yellow, as well as white, considered handsome, by Karen connoisseurs of beauty.

The hair is straight and coarse, usually jet black; but a few h brownish hair.

The eyes are commonly black, but as we proceed north, many h eyes are met.

The head is pyramidal, the breadth of the face across the chee bones wider than across the temples, and the bridge of the nose rise only slightly above the face. Occasionally a decided Roman nose seen, but there is still a depression between the eyes not possessed the Romans. The face is lozenge-shaped, and the whole countenan in typical specimens, is Mongolian. There is a great diversity in i viduals, and these traits are less developed in the more civilized Sg and Pwos than in the wilder Pakus and Bghais.

It is not easy to describe the characteristic countenances of different tribes, yet there are characteristic differences, which the perienced eye detects. There is considerable too in locality, wh affects the countenance, apart from the difference of race. Thus t Sgaus of Tavoy and Mergui can usually be distinguished from t Sgaus or Pakus of Toungoo. Education also affects the countenan The Karens that have been educated in our Mission schools look l quite a different tribe from their wild countrymen on the hills.

The Karens rarely marry with other races; but among those who settled near the Burmese, a Burman is sometimes found with a K wife, and in every instance that has come under my personal obs tion, the children have had a strong Burmese cast of countena There in a village near Toungoo where there are several of these ed families; Europeans do not distinguish them from Burmans. persons acquainted with the Karens readily recognise them as a m race. There is a village, however, on the mountains called "Vil of Talaingings," that tradition says was settled by a compan Talaing men who fled into the jungles during some of the war Pegu two or three centuries ago; but there is very little in the c

tenances of their descendants to distinguish them from other Karens. Their faces are a little longer, their cheek bones not quite so widely expanded, and their faces have a little less of the lozenge shape.

Births.

When a child is born, in some clans the mother, in others the mid-, cuts the umbilical cord, and puts the placenta into a joint of a bamboo, and wraps it in a rag. The father then takes it and s it up on a tree. An abortion is treated in a like manner, but ree selected is a species of Ficus, and the abortion is supposed to me one of the Cicadæ that are so often heard singing at evening.

On returning to the house, if the child be a girl, the father goes rough the pantomime of performing a woman's labours, beating ldy in a mortar, and the like. If a boy, he spears a hog, and, seizing first man he meets, wrestles with him, to indicate what his son do when he comes to manhood.

he knife with which the navel string is cut, is carefully preserved the child. The life of the child is supposed to be in some way nected with it, for, if lost or destroyed, it is said the child will not ong lived.

About the third day, when the navel string sloughs and comes y, the father takes his net, and, with a few friends, goes out fish- and hunting. The success of the party is deemed prophetic of the racter of the child. If much fish or game is obtained, he will be perous; if little, he will be unfortunate.

n the return of the party, a feast is made, the friends are invited, the child is purified and named. Children are supposed to come the world defiled, and unless that defilement is removed, they will nfortunate, and unsuccessful in their undertakings.

n Elder takes a thin splint of bamboo, and, tying a noose at one he fans it down the child's arm; saying:

"Fan away ill luck, fan away ill success;
Fan away inability, fan away unskilfulness:
Fan away slow growth, fan away difficulty of growth:
Fan away stuntedness, fan away puniness:
Fan away drowsiness, fan away stupidity:
Fan away debasedness, fan away wretchedness:
Fan away the whole completely."

The Elder now changes his motion and fans up the child's arm; saying:

"Fan on power, fan on influence:
Fan on the paddy bin, fan on the paddy barn:
Fan on followers, fan on dependants:
Fan on good things, fan on appropriate things."

He next takes a bit of thread that has been prepared for the p pose, and tying it round the child's wrist, says: "I name thee A. using the name that the parents had previously determined upon.

Sometimes a name is selected from among their ancestors, or ot relatives; but in such cases they are always careful to select one who bearer was rich, or valiant, and prosperous; ever avoiding the po and unfortunate, as they suppose the name influences the character the man.

Often a name is selected indicative of the state of the parent's m at the time the child is born. A man rejoices at the birth of a and he names it "Joy." A mother is suffering, and she calls daughter, "grief." Another has a son born when he is hoping for liverance from Burmese oppression, and the advent of White Forei ers, so he names him "Hope."

Frequently a child is named from some circumstance connected w its birth. One is called: "Father-returned," because the father turned from a journey just as the child was born; and another is na ed "Harvest," because born at harvest time. For like reasons have, "New-house," "Sun-rise," "Evening," "Moon-rising," "F moon," and "February."

Sometimes the child is named from its appearance, and hence meet with the names "White," "Black," and "Yellow." "Wh is about as common a name in Karen, as Smith or Jones in Engli

The animal, vegetable and mineral kingdoms all occasionally fur names. There are "Tiger," "Yellow-tiger," "Fierce-tiger," "Ga and "Goat-antelope;" "Hornbill," "Heron," "Prince-bird," "Mango-fish;" "Eugenia," "Job's-tears," "Cotton," "Gold," " ver," and "Tin;" with many others of a like character.

When the child grows up, and developes any particular tra character, the friends give it another name, with "father" or "mot attached to it. Thus, a boy is very quick to work, and he is na

"Father of swiftness." If he is a good shot with a bow and arrow, he is called "Father of shooting." When a girl is clever to contrive, she is named "Mother of contrivance." If she be ready to talk, she becomes "Mother of talk."

Sometimes the name is given from the personal appearance. Thus, every white girl is called "Mother of white cotton;" and another, in elegant form, is named "Mother of the pheasant."

Occasionally, the name refers to locality. Thus, one living near the Sitang, is "Father of the Sitang;" and another, on the borders of Thoukyekhat, is "Father of the Thoukyekhat."

Frequently a second name is given without "father" or "mother" being attached to it. Thus, a handsome young person is denominated "Yellow-rising sun;" and one with remarkably long hair, "Horse-tail."

When a man is married, and has a child born to him, his name is changed again to the father of that child. The mother's name is changed in like manner. Thus, I have a Bghai writer called Shie-mo, and his father is known as the "Father of Shie-mo; and his mother, as the "Mother of Shie-mo."

Where there are two persons of the same name, they are distinguished by appending to their names the names of the villages where they reside; analagous to the Norman *de* followed by the name of a place.

The Red Karen ceremonies, at the birth of a child, differ considerably from those noted above. With them, after the child is three days old, the time at which the mother is deemed convalescent and able to walk out, a feast is made by the parents, and the house is open for all to come and eat and drink who choose. All who come are treated as children. After the feast, the mother takes the child in a wrapper, on her back, and goes down out of the house. She is then supposed, in a legal figment, to proceed to the paddy field, but in fact she goes but a few yards, digs the ground a little with a hoe, or spade, pulls up a few weeds, and returns to the house. These are symbolical acts, by which the mother pledges herself to labour for the support of the child. The mother next carries her babe to the houses of her near relatives, where the people visited present the child, if a boy, with silver or iron; if a girl, with beads, or a chicken, or a pig.

After these preliminaries, the child is named; often after some person that has been visited who made handsome presents; and always

after some relative, that the memory of their ancestors may be preserved.

Infanticide is rare. Occasionally, when the mother dies, the infant child is killed and buried with her; and I have known a woman confess that she killed her little sister, soon after her birth, because it ugly; but such things are not common. Children are not exposed.

No measures are taken to alter or modify the form of a child any of its limbs. It is carried about in a wrapper, naked, till it walk, when it is sometimes clothed in a loose tunic; but more of it is allowed to run about naked. No modification of the limbs practised.

Among no people are children taught so little as among the Karen and nothing is taught them to modify the character. They grow like weeds, and are remarkable for nothing so much as for their wilfulness and disobedience. Yet the Sgaus have a very stringent injunction to obedience to parents. The Elders say:

"O children and grandchildren! respect and reverence your mother and father; for, when you were little, they did not suffer so much as musquito to bite you. To sin against your parents, is a heinous crime.

"If your father or mother instruct or beat you, fear. If you not fear, the tigers will not fear you."

They are also taught to obey kings; another of the commands of the Elders being: "O children and grandchildren! obey the orders of kings, for kings in former times obeyed the commands of God. If we do not obey them, they will kill us."

There is nothing remarkable in the sports of the child.

The age of puberty may be set down at from twelve to fifteen years. The people not having had the means of keeping their ages, nothing precise can be affirmed that depends on a knowledge of the age. The Karens consider fifteen as the marriagable age.

While writing, six Karens came in, and on inquiry, one says his mother had five children, two say their mothers had eight, two belonged to families of twelve children, and one man of about fifty years of age is the last surviving child of thirteen by one mother. Women that live to forty-five years of age probably bear on an average eight to nine to ten children. The Karens consider ten as the proper complement.

A verse from an old song intended to teach the duty of children taking due care of their aged mothers, says:

"A mother can bear ten children,
A child cannot bear ten mothers:
A mother bears ten children
And her strength is exhausted."

vins are very uncommon; much more so than among European ns; and I never heard of more than two at a birth.

A large family is deemed a great blessing. When seated around the at night, they sometimes sing:

"People's Kyee-zees many, I covet not,
People's money much, I covet not,
I covet young paddy ten cubits high,
Good children and good grandchildren."

The proportion of sexes among adults is remarkably equal, for it is rare to find either man or woman over twenty-five years of age is not married or has been married. The proportion in infancy not be very diverse.

Children are reared with difficulty. Large numbers die in infancy n want of care, and from ignorance of the proper way to manage diseases of children.

Nothing remarkable in their senses has been observed, excepting their eyes are uncommonly good in seeing objects at a distance; which may be the result of habit. When I have shown them the ges on the distant hills through my glass, and asked if they did see them plainly; the reply has often been: "Yes, but I can see about as well without the glass."

ie women bear children to quite as late an age as Europeans. nen, that I should judge to be between forty and forty-five, may ten seen with children at the breast.

ree years is the period for which a child is deemed entitled to nother's milk; but they are oftened suckled longer. It is not mmon to see a woman suckling her babe at one breast, and its brother or sister at the other.

Betrothal.

The Karens go on the principle that marriages are made in [illegible]. They believe that parties who marry do so in accordance with an engagement into which their sentient spirits entered in the presence of [illegible] before they were born.

It is a very common practice among all the tribes, except the [illegible] Karens, for parents to betroth their children while young, if not in fancy. They have an idea that children are benefitted by it. If child is sickly, the parents say, "We had better seek a wife for boy. A wife may invigorate him and make him stronger."

Some one then who has a daughter is selected, and if the pare[illegible] are agreed, and the fowl bones give a favorable response, a feast made, and the children are betrothed. The feast is provided by parents of the boy, and one of the Elders offers the prayer of betrot[illegible] saying: "Lord of the land and water, Mokhie of the land and w[illegible] these two are engaged to be united in marriage. May they have life, may they produce seed, may their shoots sprout forth, may t[illegible] grow old together!

After a boy and girl have been betrothed, should they, on comin[illegible] marriageable age, be unconquerably averse to the union, the par[illegible] say: "Ah! their spirits did not consent, their guardian angels did make the agreement."

The young people sing:

"God and the spirit;
Without their consent,
No marriage is made.
God and the spirit,
And with their consent
No marriage is staid."

Should there be a mutual desire to sever the engagement, the[illegible] rents of the youth go to the friends of the girl; and after the intro[illegible] tory remark that the union does not appear to have been agreed [illegible] heaven, they say: "They were not planted together, they wer[illegible] sown together, and they do not love each other. Water spilt, [illegible] the vessel empty; flour thrown out, leaves the basket empty. [illegible] must be the loss of half, and the paying of half." Then the pa[illegible] of the girl pay half the expenses of the feast at the betrothal.

ENGAGEMENT.

When a young man wishes to take a girl for a wife, the first persons to be consulted are her parents. If they make no objections, he employs a go-between to transact the business for him.

The go-between takes a fowl and gives it to an Elder who consults the bones, and if the response is unfavorable, the match is broken off and no further proceedings taken.

When the fowl's bones are read as approving the marriage, the go-between goes to the parents of the girl, when, in some sections, the following form of dialogue takes place:

Go-between.—"Now I will creep up thy stairs, I will tread on the steps of thy ladder. Thou plantest up large house posts, thou flattenest wide bamboo planks. Thou callest thyself the master of the house, a good man. When the sun rises, it shines upon thee; when the moon rises, it shines upon thee. Thy head is as large as a still pot, thy face as long as the gigantic bean pod. How wilt thou reply? The children lift their eyes on each other. They lift their hearts on each other's heart. Wilt thou approve?"

Girl's Guardian.—"Man is the horse's tooth; the elephant's tusk. Man is a tree, a bamboo. We are the woman, the female. We cannot reach distant waters, nor arrive at far off lands. We dare not strike those who seize us, we dare not strike back again. The man can reach waters, and arrive at distant lands. Can he take upon himself the charge of a house and a field?"

Go-between.—"Fear not, be not anxious, for the house and the field. Mother dying, occupy mother's chamber; father dying, occupy father's chamber. By day, there is one sun; by night, there is one torch. Fear not, be anxious for nothing."

Girl's Guardian.—"If thy word is true to thyself; if thy language is true to thyself; if thy word is one, thy foot-print one—Let not the foot depart from its shadow, let not man leave his place—very good. Thou art a hunting dog, thou scentest the covert; thou trackest the game. Art thou satisfied?"

Go-between.—"I am a hunting dog, and in scenting the hiding place and tracking the game, I have got to thee."

Girl's Guardian.—"Thou art a hunting dog. What ornaments hast thou brought? Let me take a look at them."

When the work of the go-between is done, the friends of the young man take a hog, an ox, or a buffalo, according to their circumstances, and, leading it to the dwelling of the parents of the girl, they kil' it and examine its gall bladder. If the bladder is full, they say e omen is favourable to the union; but if flaccid, containing little li it is deemed unfavourable. Still, a feast is made, but it is eate sadness, and the people murmur, "If they are married, they will no children; they will be unsuccessful in their undertakings, and will die young." Sometimes the marriage is broken off, and somet it proceeds.

If the gall bladder be plump, there is great rejoicing, and all s the couple will live to old age, and have a numerous posterity. fore partaking of the feast, an Elder takes a bit of the liver and vise of the animal together with boiled rice on a plate, and, pouring t out on to the earth, prays; "Lord of the heavens and earth, L the lofty mountains and high hills, we give thee food and May these two persons prosper and be successful, may they ha posterity, may they live to old age, that they may bring up sons daughters." After the prayer, the elders eat, and then all the pe eat after them. After eating, they drink spirits, beat kyee- dance, and sing songs.

After this engagement feast, sometimes the marriage takes place a few days, but frequently, for various reasons, it is delayed for a siderable period, sometimes for years; and when the delay is prot ed, it is not uncommon for the engagement to be broken off.

Should the girl refuse to fulfil her contract, she must pay all expenses of the engagement feast with interest. "If a hog was k she must repay a buffalo. If a horse was offered, she must repa elephant; and there is the shame besides."

These exaggerated demands are never exacted to the letter general terms it is said: "If a man breaks his engagement, he his outlay; if a girl breaks her engagement, she must pay a fine.

If a young man wishes to break the engagement, he public clares that he will sacrifice all the affair has cost him, and a return: "Let the fowl be," he says, "as if the hawk had tak Let the food I furnished the parents be as if the tiger or leopard devoured it. Let the presents I made her relatives be as if su

the water, or destroyed by fire." After this public declaration, the girl is considered at liberty to receive proposals from others; which, without it, she is not.

Marriage.

there are no obstacles to an immediate union, after an interval of or three days, the relatives of the bride conduct her to the house bridegroom's parents, with a procession of her friends blowing ets. When the bride ascends the ladder into the house, water ured on her abundantly from the verandah, till her clothes are through. She then eats with the bridegroom's relatives, and, at- led by her female friends, she goes into the chamber. The young 's friends make presents to all the party, giving the most valuable he relatives of the bride.

hen the time for the company to separate approaches, two of the rs take a cup of spirits, which is called "the covenant drink," one speaks for the bride, and the other for the bridegroom.

ne says; "Now the woman is thy wife, thy daughter-in-law, own daughter, thy own wife who will live with thee. Should e drowned, should she die by a fall, should she be bitten by isonous snake, we can say nothing. But should she be killed foray, should she be carried into captivity, should she be put nds, thou must purchase her freedom, or obtain the price of her d."

e other Elder then says: "What thou sayest is true. She is not hild of another, she is my child, my wife, my daughter-in-law. ld she die by accident, I can do nothing. I will lay her out, put n her mouth, drink by her side, make a funeral feast, and bury But should she be carried into slavery in a foray, I will carry -zee for her redemption, and thou must demand a fine. I will spirits to drink, thou must spread out food to eat. We together urchase the woman. But if we cannot obtain her if she has illed or is lost, we will demand her price. If I ask her price in ees, thou must demand it in slaves. We together will make it n for making reprisals; and if I am the father of the foray, thou e the mother of it. If I am the head of the foray, thou shalt e army; and if I call the army, thou shalt be the head of the

foray; and we will work together. If I go first, thou shalt come last; and if I come last, thou shalt go first."

Each one then gives to the other to drink, and each says to the other: "Be faithful to thy covenant."

This is the proper marriage ceremony, and the parties are married.

Now, the people say, they are man and wife and may live where they choose, with the parents of the man, or with the parents of the woman, or may live independent of both. "They may have food or no food; clothes or no clothes; may live in peace, or fight and quarrel. No one will interfere. It is nobody's business but their own. No one has any right to control them." As a matter of fact, however, the young man usually goes to live with the parents of his wife, and remains with them for two or three years.

Marriage ceremonies among the Red Karens differ materially from those described above. They never betroth their children in infancy, but leave the young people to make their own engagements.

When the parties have agreed to marry, the man kills one or more hogs or fowls in his own house, and makes a feast. To this the friends of the bride, male and female, conduct her; and she eats, drinks, and spends the night in the house with her companions.

In the midst of the feasting, and in the presence of the whole company, the bridegroom offers a cup of spirits to his bride, who drinks it up; and then he asks her: "Is it agreeable?" To which she replies, "Very agreeable."

The next day the bride returns home and makes a similar feast, to which the bridegroom and his friends go. It is now her turn to offer the cup to him, and when he replies to her question: "Is it agreeable?" that it is "very agreeable," the two are regarded as married.

Often, however, the reply is playfully given: "Not agreeable," and then the feasts have to be repeated till the favourable response is obtained.

Marriages, according to the Bghais, ought to be always contracted among relatives. First cousins marry, but that relation is considered undesirably near. Second cousins are deemed most suitable for marriage. Third cousins may marry without impropriety, though

relation is considered as undesirably remote. Beyond third cousins marriages are prohibited.

Chastity.

ong the Red Karens, chastity, both with married and unmarried orted as remarkably loose. The commerce of the sexes among people is defended as nothing wrong, because "it is our custom." au-bwakepho has a regular rule to give six rupees damages in f rape; but these are the only cases of *crim. con.* that he enter- in his courts.

hastity is cultivated, however, by the other Karen tribes; and one ans by which it is preserved, is early marriages. The great majo- are married soon after the age of puberty. Still, while the young le are as chaste as most people in Christian nations, lapses among married are not uncommon; but illegitimate children are very

e Sgaus at least are not wanting in good precepts, notwithstand- or a contrary course. The Elders say:

) children and grandchildren! do not commit adultery, or forni- , with the child or wife of another; for the Righteous One looks from above, and these things are exposed to him. Those that us, will go to hell.

f you meet the wife of another, avoid her, and pass on the lower f the road."

ough the Bghais do not appear to have precisely the same form mmand, yet they regard adultery as particularly offensive to God, being the cause sometimes of bad crops.

man nature is the same everywhere, and the betrothal of child- infancy often results in unhappy marriages, and unfaithfulness marriage tie.

etimes the parties, on becoming of marriageable age, so dislike her, that they rebel against the authority of the Elders, and nnections for themselves more congenial to their tastes.

Polygamy.

gamy is neither permitted nor practiced by any of the Karen but Karens who live in the neighbourhood of the Burmese

sometimes adopt the Burmese custom of taking an additional wife, as they do that of worshipping idols. The Sgau Elders charge their children:

"O children and grandchildren! If you have one husband or wife, lust not after another, male or female; for God at the beginning created only two, one male and one female."

Divorce.

Divorces are not unfrequent, arising often from marriages made by the parents of the betrothed in infancy, and the children grow up without any love for each other.

If a man leaves his wife, the rule is that the house and all the property belongs to her. He is allowed no claim on his money or valuables that may be in the wife's possessions, after he has left her. Nothing is his but what he takes with him.

If a woman forsakes her husband, it is usual to allow a share of property, but no more than the husband consents to allow.

Widows.

Widows retain their husbands' fireplace, and endeavour to support themselves. When young they usually marry again; but if old and unable to support themselves, they look for help to their own relations, and often suffer from neglect. The obligation to treat widows kindly is recognised in theory, but often neglected in practice. The following story from the Bghai gives a too true picture of the matter.

"Formerly, there was a woman whose husband died, and left her to get a support as best she could. All her children were small. Their father had forsaken them, and the mother took care of them in every corner or interstice she could find.

"She had no relations of her own in that country. She had only her husband's relations, and her husband was dead, and his relations would not help her. She could not therefore get curry for them, and she fed her children on the sheaths of the blossoms of the plantain flowers: these she called to the children "brains," as she knew not, but that was the proper name.

"When the neighbours heard the children say they lived on brains, they said: 'The woman is a witch! Morning after morning

brains; evening after evening it is brains. It must be she goes and gets human brains to eat. We cannot get so many brains: and they have no father. Where can so many brains come from?'

"After awhile they concluded they would kill her for being a witch, and they made known their intentions to an uncle of hers. He said: 'Wait till I can go and see her.' When at leisure, he went to see the family. He killed a deer, took the head to the children, and showed the brains to the children, asking: 'Does your mother feed with brains like these?' They all replied: 'No, uncle, mother us with brains that are bright red.' There are no fibres in them these.'

"The uncle then repeated his enquiries successively with the heads a horse, an elephant, a bear, a goat-antelope, a bison, a barking deer, orcupine, a bamboo-rat, a squirrel, a tupai, a rat, a bird, a fowl, a ke, a frog, a fish, and every kind of animal known in the country; the children said to all, 'Uncle, our mother feeds us with no such ns as these.'

He thought to himself; 'It is not this, and it is not that. Surely woman is a witch, for there is no other kind of brains it can be, human brains.' So he concluded it was best to kill her.

However he went out hunting one day more, and all day he met nothing; so on his return home he plucked two sheathes of wild tain blossoms, and bringing them into the house, he laid them n by the wash stand. One of the children saw the bright red thes; 'My uncle has brought me some brains, I will eat them al elf, I will not give a taste to any one else.' All the children ced greatly, and said 'These are the brains on which mother fed

When the uncle knew that his niece was not a witch, he t fainted at the thought of having so nearly consented to her ."

Food.

Karen is a most omnivorous animal. Always excepting the race, he eats every quadruped from a rat to an elephant; and is scarcely a reptile unacceptable to his palate, from a sand lizard rocodile, and from a toad to a serpent. Flying ants and crawl- rubs are in his bill of fare; and there is no bird too tough, no fish

too bony for his table. Dogs are not eaten by the Southern Karens, but they are as great delicacies in the Bghai country as they are in China.

To this great mass of animated nature, the whole vegetable kingdom is made to serve as greens. Nearly every weed is a vegetable, and the young shoots of the largest trees serve as spinage. They are so careless about what they gather for greens, that one of our young teachers poisoned himself, not long ago, by the vegetable curry he made by the way, while travelling.

Besides game, the Karens raise hogs and fowls for home consumption as well as for sale, and on festive occasions, those who are able purchase and kill a buffalo or ox; so they do not seem to lack animal food. Still, they may be often seen sitting down to rice and vegetable curry, with perhaps a taste of dried fish, and they certainly do not eat as much animal food as Europeans. They live much like the wild beasts of the forest. When chance, or something very like it, sends them a whole beast, they eat meat to surfeit; and then they live on vegetables and rice, till the wheel of fortune turns round again.

The meat is often cut into small pieces and boiled in curry; but it is also frequently roasted or grilled. Fish is often dried, as is also the flesh of game sometimes; but dried so imperfectly, that it usually has a very bad odour.

The Karens distil from rice or millet a kind of whiskey, of which men, women, and children often drink to intoxication. But, like the meat, this too they have not on hand constantly; and they are sober a great part of the year, because they cannot get anything to drink to be intoxicated.

In the matter of quantity, they take more food at a meal than Europeans; and yet, if labouring hard, require to eat more frequently. I have often walked with them, up hill and down; and though they could walk all day, from sunrise to sunset, after an early breakfast with a couple of crackers, and water from the brook by the way, the Karens were always knocked up by noon; and had to stop and take a hearty meal, before they were able to proceed. This is true of all the natives in the country; but is not quite understood by some of the medical men. Natives are sometimes taken into the hospitals

actually starved to death by not having food enough allowed them to keep up their strength.

Dress.

The dress of Karen men, south of Toungoo, is a tunic, or frock, and a wrapper; the latter serving for a sheet to sleep in at night. Each one, too, usually carries a bag slung over his shoulder.

The tunics of different tribes and clans are distinguished by the peculiar embroidery of each.* The Sgau tunic has red horizontal lines on a white ground. The Bghai tunic, on the contrary, the red lines perpendicular. The Pgho tunic has a broad belt of broidery at its base, and the Pahu tunic has a narrow band, and the tres varied for every village, originally distinct families, so the kings are equivalent to coats of arms.

e clan of the Bghais wear tunics, but by far the larger portion of ibe wear pants, and no tunic; and all the tribes beyond them, as aikho, Tarus, and Red Karens wear pants; but each tribe or has some variation in the stripes of figures worked on them, so like those who wear tunics, they can be distinguished at a .†

epting the Red Karens, all the women wear a short gown, petti- and large turban, all variously ornamented. The Red Karen have corresponding articles of dress, but each one is merely a gular piece of cloth.

dresses are made of cotton, which the women usually plant, clean, spin into thread, and weave into cloth. The Northern s and Gaikhos, who raise the silkworm, adorn their dresses with usion of silk embroidery.

ome of their clans, the Elder who officiates as high priest in fferings, or sacrifices, has a longer and more ornamented tunic ed to him than ordinary, but nothing in their traditions has und to explain the reason.

lescribe the different modes of ornamenting their dresses, would a long article by itself, and a series of drawings.

re is one exception. The Mopghas wear the same tunic as the Tunic- but why, no reason is known. They speak widely different dialects.
re is one exception. The Northern Bghais, and the Gaikhos wear the nts.

Tattooing is a practice quite foreign to all the Karen tribes, excepting the Red Karens, who are all tattooed across the back with a figure resembling the rays of the rising sun. They can give no account of the origin of the custom. Karens who are brought in contact with the Burmese and Talaings, often adopt their customs, so that Karens are often found, especially among the Pghos, tattooed and dressed like Burmans.

No characteristic mode of amusement has been observed. The Karens dance, wrestle, and show their agility much like the nations around them.

Games of chance are not unknown to the people, but they are addicted to them, and never bet on them, unless they have been rupted by the Burmese or Shans.

Every village has a good complement of old people in it, and I met with two men, who considered themselves a hundred years o Every village has persons over sixty, seventy is not uncommon, e is rare, but ninety is met occasionally.

No marked difference has been noticed between the sexes in r to longevity.

Sickness.

Where diseases are not deemed contagious, ordinary attenti bestowed upon the sick by their friends and relatives; but when c gious diseases appear, like the small-pox, the whole population s struck by a panic, and they abandon their houses and scatter in jungles, where they build booths, and remain till they consid disease to have passed away. They deem the cholera as conta as small-pox, and though husbands and wives, parents and ch will unite and watch each other to the end; yet all often run aw soon as a person is dead, and leave him unburied. It is ext difficult to get people buried in times of cholera.

The Karens attribute diseases to the influence of unseen spiri hence, to cure them, they resort to making offerings to appe spirits that are supposed to be offended. They have twenty o distinct names for different offerings that are made for the sick. do not, however, exclude the use of medicine altogether; a Karen Elders have a large Materia Medica, consisting of roo

herbs, leaves and bark, to fall back upon when the offerings do not prove efficacious.

From satisfactory statistics the annual death rate of the Mountain Karens has been ascertained as a little over two and a half per cent., or about the same as in London. The same years that these statistics were collected, the death rate among the acclimatized European soldiers in Toungoo, was only one per cent. The difference should be attributed, it is believed, to difference in constitution, difference in habits, and difference in treatment of the sick; and not to locality. The Karen Mountains appear as healthy as the Scotch Mountains, or Mountains of Pennsylvania. That something does affect the death besides the locality, is manifest from the deaths in the Toungoo The very years that one man only in a hundred was dying in onments, from eight to seventeen in a hundred were dying in the

rens lack vigour of constitution, and therefore present a weak ing power to disease. They are subject to intermittent fevers ghout life. I have prescribed to shivering infants at the breast shaking old men of threescore and ten. An European does not them, but he has a strong constitution, which struggles hard, it comes off victor, it is a victor for life. For the first four of my jungle travels, I had fever every year, but for thirty since, with one slight exception, I have been entirely exempt. from land leeches often result in bad sores on Karens; while ropean will sit down and pick off a dozen from his legs after k, without the slightest subsequent inconvenience. In some ies, there is a species of gad fly that bites severely, and its often followed by an ulcer on a Karen; while I have had ks of both my hands dotted all over with blood spots from tes, without suffering anything beyond the temporary incon-

Karens are a dirty people. They never use soap, and their enamelled with dirt. When water is thrown on to them, it their backs, like globules of quicksilver on a marble slab. bathing has a cooling, but no cleansing effect. Dirt is half brother, and is the father of a host of skin diseases to he Karens are subject. About half of them have the itch, and

many in the form of dreadful sores. Shingles, and fish-skin, and ring-worm are nearly as common as *psora*.

Many diseases, common to all nations, are much more fatal to Karens than to Europeans. The measles are as fatal as the small-pox in Europe, and the hooping cough often makes sad havoc among children. I have known more than twenty die of this disease in a small village of some two hundred inhabitants.

Consumption kills a few, dropsy more, dysentery many, and occasionally considerable numbers are reported to me as dying of fevers; and yet I have never met with a single case of fever among the Karens, that did not yield to medicine. Enlarged spleen is very common, and is sometimes fatal. Ulcers do not kill, but they are as common as skin diseases, and are in great variety.

There is a disease very prevalent among the Sgau tribes, in which large ulcers appear on the limbs. I have had patients brought to towns, where they have been sent to the hospitals; and some they have been slightly benefited; but in no case has a cure effected by European treatment; and I have never found a Su who understood the nature of the disease. One said: "It leprosy;" but I think it is a kind of leprosy. Another remarked cases submitted to his treatment: "I cannot help thinking there is thing venereal in it." This the Karens uniformly deny, but I certainly seen cases in which both legs were masses of what app to be incurable sores completely cured, by severe salivation admini by a Burmese doctor; which favours the idea of the venereal cha of the disease; but I have seen others die under the same treat The disease is hereditary in most instances, but whenever an appears, the Karens consider it infectious, and will not ha patient in the same house with them. They insist on his livin separate house, as much as they would a leper. The Burmes ever, do not consider the disease infectious, in which they are correct. The Bghais say it is a foreign disease, and some call Paku disease," and others the "Burmese disease;" while the I in some sections call it "the Martaban disease," and in oth Toungoo disease."

Goitre is common on the hills in special localities. It abo one village on the granite mountains, while villages three hou

distant are nearly exempt, though located on the same hills, with the same geological formation. Three or four days' journey beyond this, in an extensive region, where the rocks are exclusively secondary limestone, goitre is again found in excess, while other villages, on the same limestone range, are quite free from the disease. In neither of these districts has any metallic mineral been found. Still, there must be something special in the localities where it abounds to produce it; but what that is, remains to be discovered. All that can be said of it with certainty is, that it is a disease of the hills, for it is not found on the plains; nor did I ever meet with it on the hills in the Tenasserim provinces. The Karens attribute it to the soil, and say that the disease is caught by eating beans, pumpkins, and other vegetables raised the infected locality, and by drinking the water that runs through Their theory has probably some foundation in fact.

owls and hogs that the Karens raise, are occasionally attacked by lent disease by which they die off as if they had the cholera; and loes on the plains are subject to a like complaint.

Worms.

ozoa are very abundant. The round worm, *ascaris lumbricoides*, en vomited up by Karens, both children and adults. The comape worm, *tænia solum*, is a common inhabitant of the bowels, as lso thread worms, *ascaris vermicularis*.

Death.

nen an elder among the Bghais, with a large number of descendlies, the people build a place in the hall for the deposit of the , and they hew a coffin out of the body of a tree, and hew a for it, like the Chinese coffins.

body lies in state three or four days, and during the time men ipes, and the young men and maidens march round the corpse music. At night, the piping is discontinued, and singing is uted.

n the piping and marching is not going forward, the exercises ersified by weeping and mourning; or by the men knocking together, and others showing their dexterity by putting their or heads in between, and withdrawing them quickly before the s come together again.

Before the burial, an elder opens the hand of the dead man and puts into a bangle or some other bit of metal, and then cuts off a few particles with a sword, saying: "May we live to be as old as thou art." Each one in the company goes through the same ceremonial, and the fragments gathered are looked upon as charms to prolong life.

When about to bury the corpse, two candles made of bees-wax are lighted, and two swords are brought. A sword and a candle is taken by the eldest son, and a sword and a candle by the youngest; and they march round the bier in opposite directions three times, each time they meet exchanging swords and candles. After completing the circuits, one candle is placed at the foot of the coffin, and the other the head.

A fowl or a hog is led three times round the building in which body is placed, and on completing the first round, it is struck with strip of bamboo once; on completing the second round twice; and the third round it is killed. If a fowl, it is killed by twisting head off. The meat is set before the body as food.

Young people are buried in a similar manner, but with abridgement of the forms.

When the day of burial arrives, and the body is carried to grave, four bamboo splints are taken, and one is thrown toward west, saying: "That is the east." Another is thrown to the saying: "That is the west." A third is thrown upwards toward top of the tree, saying: "That is the foot of the tree;" and a f is thrown downwards, saying: "That is the top of the tree." sources of the stream are then pointed to, saying: "That is the r of the stream;" and the mouth of the stream is pointed to, sa "That is the head of the stream." This is done, because in everything is upside down in relation to the things of this world.

The body is then buried, and the grave filled in without ceremony, and when the top of the grave has been neatly sm off, a little fence of trellis work is built around it. Within this boiled rice and other food is placed for the dead.

On returning from the grave, each person provides hims three little hooks made of branches of trees, and calling his sp follow him, at short intervals, as he returns, he makes a moti hooking it, and then thrusts the hook into the ground. This i

vent the spirit of the living from staying behind with the spirit
he dead.

After the funeral, the grave-digger washes his clothes, or the neg-
t to do so renders him unfortunate. Married children may dig the
ave for a parent, but young ones are prohibited. They must hire
one to do the work, and give him five rupees.

Feast for the Dead.

e the Chinese, the Bghais make annual feasts for the dead, for
years after a person's death. The feast is made at the new
near the close of August, or the beginning of September; and
he villagers that have lost relatives, partake in it.

Before the new moon, they prepare food, plantains, sugar-cane,
acco, betel nuts, betel leaves, and other articles of consumption. A
mboo is laid across one angle of the roof of the room, and on it are
g up new tunics, new turbans, new petticoats, beads and bangles;
at the appropriate time, when the spirits of the dead are supposed
e present, having returned to visit them, they say: "You have
to me, you have returned to me. It has been raining hard, and
must be wet. Dress yourselves, clothe yourselves with these new
ents and all the companions that are with you. Eat betel
her with all that accompany you, all your friends and associates,
the long dead. Call them all to eat and drink."

fter dark, all the people eat bread made of boiled rice beaten in a
ar. The bread is spread down, and the people are invited: "All
are hungry, eat bread here."

ext morning, the first day of the moon, which is deemed the
er feast day, the previous last day of the month being regarded as
lay of preparation, all who have Kyee-zees hang them up, and
them. Then they kill a hog, and make thirty bottles of bamboos.
one bottle, they put honey, into another water, in a third whis-
in a fourth salt, in a fifth oil, in a sixth chillies, and into the
th tumeric. The other twenty-three are laid aside. Loopholes
ade to each bottle through which a string dyed yellow is tied.
er setting apart the seven bottles that have been filled, the re-
ng twenty-three are filled with food indiscriminatively. Some
pork, some with boiled rice, some with bread, some with whis-
and some with betel. When these are filled, rice bread is rolled

up in leaves, and the rolls piled up together; and then a large ... of open work is woven, into which all these bamboo bottles and ... rolls of bread are put.

When the rice and meat is cooked for the feast, after the abo... arrangements have been made, the food is placed on kyee-zees, ... little bamboo stools, if they have no kyee-zees; and they have ... very particular to spread out all the food at the same instan... some of the spirits of the dead, being delayed in eating, should l... behind by their companions.

So soon as the food is arranged on the tables, the people beat ... kyee-zees and begin to cry, which they say is calling the spiri... come to eat. Each one calls on the particular relative, for whom ... has prepared the feast, as father, mother, sister or brother. ... mother, he says; weeping: "O prince-bird mother, it is the close ... August, Oh! It is the new moon in September, Oh! You ... come to visit me, Oh! You have returned to see me, Oh! I ... you eatables, Oh! I give you drinkables, Oh! Eat with a ... heart, Oh! Eat with a happy mind, Oh! Don't be afraid, mo... Oh! Do not be apprehensive, Oh!"

After the weeping exercises are over, the spirits are suppos... have finished their repast, and then the people sit down to eat wh... left.

More food is then prepared and put into the basket with the b... boo bottles, that the spirits may have food to carry away with th... and at cock-crowing next morning all the contents of the ba... including the bamboo bottles, are thrown out of the house or ... ground; when the same scene of crying and calling on the spirit... the dead is repeated, as detailed above.

They do not weep long, because it is related that in ancient ... a woman had a daughter, whom she loved much, and after her ... she made this annual festival for her and wept long; when a pr... reproved her, saying: "That is enough. Your daughter says: ... companions have left me. They have all gone on before.'" ... the mother said: "Seize her for me," and the prophet attemp... grasp her, but he got only a single hem from her garment. ... the people never weep long, that the departed spirits of their fr... may not be left behind by their companions.

utions to Indian Malacology, No. VI. Descriptions of new nd shells from the Nilgiri and Anamullay Hills, and other places n the Peninsula of India.—*By* W. T. Blanford, *A. R. S. M., F. G S.*

[Received 3rd February, 1866.]

Of the shells described in the following pages, the greater portion were collected by Captain Beddome, Deputy Conservator of Forests, n the Madras Presidency. This is the case with all the shells from he Anamullay hills, and also the remarkable species of Spiraculum om the neighbourhood of Vizagapatam. The Nilgiri Hill shells e found by myself in a recent visit, and *H. intumescens* was given me some years since by Mr. Theobald as *H. Bajadera*, Pfr. ve since collected the shell myself living at Mahableshwar.

1. Spiraculum Beddomei, n. s.

hell very broadly umbilicated, depressed, sub-discoidal, smooth, (?) white with transverse chesnut zigzag stripes. Spire flat or sub-x, suture deep. Whorls 5, rounded, the last cylindrical, de-ing gradually towards the aperture, and furnished, 7-10 milleme-behind the peristome, with a short open sutural tube, projecting *rds* and upwards, not touching the penultimate whorl. Aperture onal, circular, peristome double, both lips continuous, the inner tly expanded, curved back into a shallow angular sinus at the e, the outer expanded, and inverted upon the upper and dextral ins, rising near the suture into a compressed wing, which is at-d throughout on the left side to the penultimate whorl. Opercu-horny, concave within, convex without, flattened near the centre, 3 outer whorls furnished with a free spiral testaceous lamelliform .

	Millem.	Inches.
Major diameter, ...	27	1.12
Minor ditto,.....	23	.92
Height, ...	10	.4
Interior diameter of aperture, ..	8	.32

tat. Kimery Hills near Waltair (Vizagapatam), northern divi-the Madras Presidency.

This species is of about the same size as *Sp. hispidum*, which it closely resembles in many particulars, though differ several essential characters. Of these perhaps the most remarkabl the forward direction of the sutural tube, which, in all the previou described species of *Spiraculum* (even if the Moulmein *Opisthoporu Fordoni*, Bens. be included), is retroverted. In several forms of *Opis thoporus*, however, the spiracle projects forward, as in the present species. The wing of *Sp. Beddomei* is much more distinct, higher and more pterocycloid than that of *Sp. hispidum;* the inner peristome (which is deficient in the last named species), is angularly sinuat beneath the wing, but there is no approach to the deep sub-circul opening of the Indian species of *Pterocyclos*. All the specimens cured by Captain Beddome were dead and weathered, and had their epidermis, but the traces which remained, shewed no appr to the hispidity from which the Khasi hill shell derives its n The operculum has even more resemblance to that of *Pteroc tenuilabiatus*, Metcalfe, than has that of *Sp. hispidum*.

This is the first discovery in the peninsula of India of a speci *Spiraculum*, that genus having hitherto only been met with east of the Bay of Bengal, in Assam and Burmah, while the generic form *Opisthoporus* occurs in the Malay countries and B. In a country like India, which intervenes between two great zo cal provinces, the Malayan, and the Africano-Asiatic, such excep al occurrences are natural, and instances are known not merely of lying species, but of genera, such as *Cataulus* and *Cyclotopsis*, pe to the Indian peninsula or to Ceylon, though belonging to Malay. African families. The presence of a *Spiraculum* on the eastern of India, is a parallel case to the existence of *Otopoma Hindu* W. Blanf. in Hattiwar. It should also be noted that the discov specimens of the two Burmese helices, *H. Castra*, Bens. and *H. cula*, Bens., on the hills of Orissa, shews that some few Bu species even have extended their range down the western side Bay of Bengal.

2. Nanina (Ariophanta) intumescens, n. s.

Shell sinistrorse, narrowly and sub-obtectly umbilicated, thin, finely, subplicately, transversely striated with obsolete decu

sculpture, dull fulvous brown, horny, rather lighter in colour just above the periphery and around the umbilicus. Spire convexly conoid, apex very obtuse, suture scarcely impressed. Whorls 4½, slightly convex; the last bluntly carinate, descending very little near the aperture, tumid beneath, compressed around the umbilicus. Aperture large, diagonal, truncately sub-circular; peristome white, subexpanded, margins approaching each other, columellar margin nearly vertical, rather broadly reflexed, partly covering the umbilicus.

	Millem.	Inches.
Major diameter, ...	32	1.3
Minor ditto,.....	26	1.05
Axis, ...	22	0.9

itat. Mahableshwar. Western Ghats of Hindustan.

his fine species of *Ariophanta* has long been confounded with *na Bajadera*, Pfr. which is, however, although a variable easily distinguished. *N. Bajadera* is more globose and thicker, at the same time more transparent, it has much stronger sculp- (and deeper sutures) and is always rounded at the periphery near mouth, and frequently throughout, while in *N. intumescens*, the angulation is persistent. *N. Bajadera* too has a fine vitreous e, while *intumescens* is dull, and the former shell is usually of a ish olive colour, though varying in this character and sometimes ibling the latter. The animals also shew a difference in colour, of *N. intumescens* is uniformly, so far as I have seen, dark cine- while that of *Bajadera* is much lighter, but very variable. The shell is found mostly on shrubs, the former on the ground, and *intumescens* has as yet only been found at Mahableshwur, 4,500 bove the sea, *Bajadera* (which is rare at Mahableshwur) abounds equally or nearly equally high hills of Singhur and Poorundhur, ong the summit of the Western Ghats at about 2,000 feet. It ls at Khandalla at the top of the Bhore Ghat.

ve already mentioned, in a previous paper, (An. Mag. Nat. Hist. ruary, 1863) that an examination of the type specimens of *adera*, Pfr. and *N. ammonia*, Valenciennes, has shewed these posed species to be identical. I long doubted the distinct- the species now described from *N. Bajadera*, but although

I have specimens of the latter from many different places, they are all easily distinguished from *N. intumescens*.

3. N. (*Hemiplecta?*) Sisparica, n. s.

Shell openly perforated, subumbilicated, depressed, rather thin, striated, white with a yellowish brown epidermis, having a rather dull oily lustre. Spire convex, apex obtuse, suture flat, linear, submarginate. Whorls 4, very flatly convex above, apical whorl marked with very fine decussated plicate striation, the last not descending distinctly but bluntly angulate above the periphery, convex beneath. Aperture oblique, semiovally lunate, white and pearly within, the breadth exceeding the height, peristome thin, margins distant, united by a callus, columellar margin very oblique, and triangularly reflexed to the perforation.

	Millem.	Inches.
Major diameter, ...	37	1.5
Minor ditto, ...	31	1.3
Axis, ...	18	.75

Habitat. Sispara ghat, Nilgiri hills, S. India, rare.

I know of no near Indian ally of this species. *N. Orobia*, B from Darjeeling, which approaches it in some respects, is more g and more solid, and has impressed sutures. The Ceylonese *N. Cl* however, closely resembles the species above described in form, th it is easily distinguished by its peculiar impressed sculpture. tained but two specimens, one of which was living, near the t Sispara ghat. It is remarkable that so fine a shell should have e ed detection before.

The animal differs in no essential character from those of the trorse *Ariophanta* section. It has a large mucus pore at the the foot without any lobe above, the mantle is of moderate siz head and neck granulated, the caudal portion of the body mar oblique parallel, impressed wrinkles, and broadly margined n sole with a double, impressed line.

4. N. (*Macrochlamys?*) Hebescens, n. s.

Shell scarcely perforate, inwardly depressed, yellowish or thin, horny, dull, marked with very close microscopic in

oblique lines above, more polished and radiately striated below. Spire low, apex rather acute, prominent, sub-acuminate, suture deep. Whorls 5½, rounded, the first narrow, the last much broader, very bluntly sub-angulate at the periphery, and tumid beneath. Mouth large, nearly vertical, lunately sub-ovate, breadth exceeding the height; peristome thin, straight, margins sub-distant, united by a very thin callus, columellar margin nearly vertical above, very briefly and broadly reflexed, nearly covering the perforation.

	Millem.	Inches.
Major diameter, ...	15	0.6
Minor, ...	12½	0.5
Axis, ...	8½	0.33

tat. Anamullay hills. S. India.

's species resembles the Bengal *N. subgesta*, Bs., and the Cey- *N. carneola*, Pfr. (as figured by Reeve) in form, but has r lustre and deeper sutures, resembling in the latter character of the Ceylon *Naninæ* of the same section. The microscopic ure is peculiar, the impressed lines being very close, but some- irregular and wavy. They cause the dull appearance of the . An ordinary lens is insufficient to shew them: under a cope with a 1½ in. objective they are very distinct.

5. N. *(Macrochlamys?)* Lixa, n. s.

ll obtectly perforate, rather depressly turbinate, very thin, ful- horny, dull, obliquely striated and marked with very fine and mpressed lines, also oblique, only visible under the microscope, ed beneath. Spire conical, apex acute, suture impressed. s 5½, convex, gradually increasing, the last much broader, obso- sub-angulate at the periphery, tumid beneath. Aperture nearly , roundly lunate, breadth very little exceeding the height. me thin, straight, margins sub-distant, columella nearly vertical y briefly reflexed above, almost concealing the perforation.

	Millem.	Inches.
Major diameter, ...	13½	0.54
Minor ditto, ...	12	0.48
Axis, ...	9½	0.38

Anamullay hills. E. side.

This is a shell with a similar dull greasy lustre to the last and owing it to the same cause, viz, microscopic sculpture. It is a well marked species. Very possibly, however, intermediate varieties may be found connecting it with *N. hebescens*.

6. N. *(Macrochlamys)* INFAUSTA, n. s.

Shell openly perforated, convexly depressed, very thin, fulvous horny, obliquely finely striated, spire convex, apex distinct, sutur scarcely impressed. Whorls 6, flattish above, gradually and regular increasing, the last not descending, depressed, swollen beneath, obs letely sub-angulate above the periphery. Aperture oblique, lun breadth exceeding the height; peristome thin, margins distant, u by a very thin callus, columellar margin vertical above, briefl triangularly reflexed.

	Millem.	Inches.
Major diameter, ...	23	0.92
Minor ditto, ...	20	0.8
Axis, ...	12½	0.5

Habitat. Anamullay hills, S. India.

Three specimens of this species occur amongst Captain Be Anamullay collections. The above dimensions are those of the and most perfect specimen. In both of the smaller specimens measure respectively in their major and minor diameters and ax 18, 10, and 17, 15, 9 millemetres, there is more or less descent last whorl at the aperture, but both specimens have a stunted ance, and irregular descent of the last whorl is very common in mal individuals of all forms of *Helix*.

This species has no very marked character. It is very nea *trinoides*, Desh., but may be recognised by its smaller and mouth, narrower last whorl and more convex form. In sha sembles *H. monticola*, Hutton.

7. VITRINA AURIFORMIS, n. s.

Shell very depressed, irregularly ovate, ear-shaped, very th ed, polished, with a membranaceous epidermis, greenish or yellow in colour, paler at the nucleus. Spire flat, suture impressed. Whorls 1½. Aperture oval, occupying the wh

part of the shell, and exposing the interior to the apex; peristome membranaceous.

	Millem.	Inches.
Length, ...	13	0.52
Breadth, ...	8	0.32
Height, ...	2½	0.1

Habitat. Sispara ghat, Nilgiri hills, Southern India.

This species is very near *V. gigas*, Bens. and still more closely allied *V. Peguensis*, Theobald, being, however, a more depressed species an either, and more open. It is also less solid than the last named cies. I have not met with the animal, which may possibly differ those of other Vitrinæ.

the animal resemble those of *V. gigas* and *V. Peguensis*, the occence of this mollusk on the western flank of the Nilgiri Hills be one of the most anomalous with which I am acquainted gst the land-shells of India, since I know of no other instance of layan type, unrepresented on the Himalayas, of which species on the hills of Southern India. A small auriform shell such as nay, however, have been easily overlooked, and the Himalayan an fauna is, probably, far from thoroughly known.*

animal of *V. Peguensis* has been partly described by Mr. Theo- who, however, has unfortunately not mentioned the form of the , the presence or absence of lobes covering the shell, nor the ce of a caudal gland, unless by the expression "caudali papilla is intended to imply its absence; more probably Mr. Theobald's g is that the overhanging lobe, so conspicuous in some forms of is absent, the gland existing, as in *Ariophanta* &c.

Vitrina is not the only south Nilgiri species. A larger membus form also occurs, which requires comparison with Mr. s *V. membranacea* from Ceylon.

8. Achatina Anamullica, n. s.

turrito-ovate, thin, finely striated, horny with high vitreous Spire turrited, sides convex, apex obtuse, suture impressed.

* Theobald (J. A. S. B. XXXIII. p. 244,) includes *V. gigas* in his list of n shells, but the species is found on the Khasi hills, the fauna of which ely from that of the Himalayas.

Whorls 8, scarcely convex, the last rounded beneath. Aperture oblique, peristome thin, columella moderately arcuate, obliquely truncated below.

	Millem.	Inches.
Length, ...	27	1.1
Diameter,.....	12	0.48

Aperture 10 millemetres high, 6½ broad. Habitat. Anamullay Hills.

Intermediate in its characters between *A. Nilagarica*, Bens., and the oblong ovate, Achatina of Ceylon.

Captain Beddome's Anamullay collections comprise the followin species in addition to those above described :—

Nanina vitrinoides, Desh. var.

N. Shiplayi, Pfr.

N. Indica, Pfr. var.

N. Travancorica ? Bens.

N. Basilens, Bens.

N. ampulla, Bens.

N. auris ? Pfr.

Bulimus Nilagaricus, Pfr var.

B. physalis, Bens.

B. sp. near B. trifasciatus, Rv., one imperfect specimen.

Cyclophorus Jerdoni, Bens.

C. deplanatus, Pfr.

C. sp. near C. ravidus, Bens. (or possibly an immature *Aulo*

C. sp. (apparently near C. Shiplayi, Pfr., but finely cost possibly the young of an *Alycæus.)*

Pterocyclos nanus, Bens.

Pt. rupestris, ?! Bens.

Paludomus, sp.

Neritina Perrotettiana, Recleiz.

To which there only remains to be added *Cataulus recurvat* to complete the list of known shells from the Anamullays. few remarks upon the species above quoted.

But one specimen occurs of the shell which I am disposed sider a variety of *Nanina vitrinoides*. It is small, measuring millemetres by 16 in its two diameters, and 8½ in height: I pressed in form, and of a greenish tinge, but appears to di

essential particular from the Bengal variety. The species has not before, so far as I am aware, been found in Southern India. *N. Shiplayi*, Pfr. inhabits the eastern base of both the Anamullays and the Nilgiris; on the latter hills I have found it at the foot of the Coonoor ghat. The animal is a *Nanina*, closely resembling *N. indica*, Pfr. and *N. aeducta*, Bens., having a large mucus pore at the caudal extremity of the foot without an overhanging lobe, or with but a very rudimentary one. The mantle lobes are small, and the animal in all respects closely resembles that of the sub-genus *Ariophanta*. A solitary specimen of *N. indica* from the Anamullays is very solid and rather strongly marked, the sculpture being less regular than in the common form, and scarcely granulate, the last peculiarity being perhaps due to weathering, as the specimen is decorticate and somewhat bleached. It is a dwarf form, less depressed than the type, and measures 17 and 15 millem. in its two diameters, and 10 in height. The shells found on the Nilgiris vary considerably.

Nanina Basilens, Bens. (*H. Titanica*, Pfr.), I learn from Captain Beddome, is far from scarce in the teak forests of the Anamullays, a tract of 2,000 to 3,000 ft. above the sea, where *N. ampulla*, Bens. also occurs. The range of the latter shell extends a considerable distance to the north, in the Wynaad district, where it was found by Dr. Jerdon, if I recollect, at the base of the Coorg hills, while *N. Basilens* does not appear to be found north of the remarkable gap in the Western Ghats at the Palghat cherry, which, traversing the very highest portion of the mountain chain, divides the Nilgiris from the Anamullies, and through which the railway from Madras to Beypoor passes. Both *N. ampulla* and *N. Basilens* have only been found west of the Hills.

I have not had an opportunity of comparing the shell referred provisionally to Mr. Benson's recently published *N. Travancorica* with Mr. Benson's description, and the identification is therefore unsatisfactory. The shell referred to *N. auris*, Pfr. is identical with a species found at Ootacamund on the Nilgiris, and corresponding closely with Reeve's figure of that *N. auris* in Conchologica Iconica.

The little shell which I have called *Bulimus Nilagaricus*, I was at first disposed to consider a distinct species. It is only 14 millem. in length and base by 6 in diameter. But some specimens from the Nilgiris are no larger, and there are graduations in size from these to

the typical shells. The solitary specimen of *B. physalis* has only traces of spiral sculpture, but it appears to agree in every other respect with Mr. Benson's description.

A dwarf form of *Cyclophorus Jerdoni*, only 29 millem. in diameter and 19 high, and 2 species of *Pterocyclos*, one of them unquestionably identical with *Pt. nanus*, Bens., are also comprised in Captain Beddome's collections. The second species of *Pterocyclos* of which a single weathered specimen was found, shews no essential distinction from the Bengal *Pt. rupestris*, Bens., but it appears improbable that that form should really exist so far to the south.

Cyclophorus deplanatus, Pfr. some decorticated specimens of which were amongst the Anamullay shells, occurs abundantly on S[illegible] ghat, at the western extremity of the Nilgiri plateau. A small s[illegible] in Captain Beddome's collections, with more colouring than *C.* [illegible] *dus*, Bens., and ornamented with zigzag transverse stripes, may p[illegible] bly be a young specimen of that species, but its thin and contin[illegible] peristome recalls that of some forms of *Aulopoma*, and the possi[illegible] of its belonging to that genus is strengthened by the deficiency [illegible] epidermis close to the peristome. As the Anamullays have [illegible] furnished a *Cataulus*, the occurrence of a species of *Aulopoma* [illegible] means improbable.

The *Paludomus* is perhaps a variety of the species comm[illegible] Bombay. The little *Neritina Perrotettiana* was previously un[illegible] except in the Pykara river on the Nilgiris.

We have evidently, as yet, only an instalment of the mo[illegible] fauna of the Anamullays. None of the shells above specified a[illegible] the higher ranges. So far as they have been collected, the[illegible] might have been anticipated, a general identity with Nilgiri[illegible] but at the same time a somewhat closer approximation to th[illegible] lese fauna.

P. S.—The above paper was written six months ago, an[illegible] have been sent for publication in the Society's Journal at [illegible] that I hoped to be able to procure drawings of the shells for [illegible] pose of illustrating it. In this, I have again been disappoint[illegible] am compelled to forward the descriptions of the shells by the[illegible]

In the meantime, however, I have received from Captain [illegible] several additional shells from the Anamullay hills collecte[illegible]

during the past year. Besides several new species, the collection comprises *Helix Anax*, Bens., and a fine large *Nanina* resembling *N. Cysis*, Bens. but dextrorse, and which is very possibly a large variety of Mr. Benson's *H. Basilessa*. It occurred at a height of 7,000 feet above the sea. I append descriptions of 3 of the new species sent.

9. Achatina Beddomei, n. s.

Shell turrito-ovate, solid, finely and closely sub-costulately striated, dark purplish brown, epidermis in parts having a tendency to assume a dirty cream colour, especially in dead specimens. Spire convex below, slighly acuminate above, apex obtuse, rather inclined to the right, suture impressed. Whorls 7½-8 convex, the last ⅔ of the entire length, rounded at the base. Aperture nearly vertical, sub-pyriform, milky within; peristome thickened, white, outer margin rather straight, not arcuate, columella deeply curved, lined with callus, subobliquely and rather broadly truncated at the base.

	Millem.	Inches.
Length, ...	30	1.2
Diameter, ...	11½	.45

Aperture 10 millem. long, 6 broad.

Habitat. Anamullay Hills, 5,000 to 7,000 feet (Beddome.)

This is a more solid form than any of the Nilgiri species, and it differs from all of them, and also from the solid Ceylonese forms, in its acuminate apex. It is a well marked species.

10. Achatina textilis, n. s.

Shell ovate-oblong, rather solid, translucent, striated near the base, smooth, polished, dark chesnut with close vertical and horizontal lines of a greyish yellow colour, varying in breadth and resembling threads of an irregularly woven cloth. Spire elongated, conoidal with convex sides, apex obtuse, sutures impressed. Whorls 7, convex, the last about ⅔ of the entire length, rounded beneath. Aperture vertical, truncately semioval, milky within; peristome slightly thickened, white, right margin slightly sinuate toward the base, columella deeply curved, obliquely truncated beneath, margins united by a thin callus.

	Millem.	Inches.
Length, ...	26	1.05
Diameter, ...	13	0.52

Aperture 10½ millem. long, 7 broad.

Habitat. Anamullay Hills, 6,000 feet, (Beddome.)

This is the only indigenous Indian *Achatina* with which I am acquainted, possessing coloured markings. In form it approaches some of the Ceylon *Achatinæ*, and also an undescribed Deccan species.

11. Bulimus trutta, n. s.

Shell perforated, conically ovate, thin, finely striated, light yellow with two spiral rows of sub-distant chesnut spots, sub-quadrate form, on all the whorls, and two spiral chesnut stripes, the low sometimes very faint, upon the last whorl below the periphery. Spi conical, apex acute, sutures impressed. Whorls 5½, convex. Ap ture nearly oval, slightly oblique. Peristome thin, margins united a thin callus, columellar margin vertical, narrowly reflexed, the refle portion meeting the penultimate whorl at an angle.

	Millem.	Inches.
Length, ...	14	.55
Diameter,.....	9	.35

Aperture 7 millem. long, 4½ broad.

Habitat. Anamullay Hills, (Beddome.)

There is some doubt whether the shells above described be a They have a somewhat immature appearance, but all the speci sent, four in number, are of precisely the same size, and the peristome is characteristic of the group of *Bulimus Bengalen* which the present species belongs. From that species and its all s easily distinguished by its short conical form.

Number.	Date of fall. Year.	Date of fall. Month and day.	Name of locality and geographical situation.	Weight.* Of the largest specimens.	Weight.* Of the specimens in the Museum.
			1.—METEORIC STONES.		
1	1492	7th Nov.	Ensisheim, Elsass, France, ...	1 oz. 44 grs.	1 oz. 44 grs.
2	1798	13th Dec.	Benares (near Krakhut) East Indies, ...	1 oz. 347 grs.	1 oz. 347 grs.
3	1803	8th April,	L' Aigle (Dept. de l' Orne) France, ...	1 oz. 434 grs.	1 oz. 434 grs.
4	1807	14th Dec.	Weston, Connecticut, U. S. A. (2 specimens,)	65 grs	111 grs.
5	1808	22nd May,	Stannern (near Iglau) Moravia, ...	5 oz. 228 grs.	5 oz. 228 grs.
6	1808	?	Moradabad, East Indies,§	287 grs.	287 grs.
7	1812	5th August,	Chantonnay, Vendée, France,...	2 oz. 319 grs.	2 oz. 319 grs.
8	1814	15th Feb.	Bachmut, Yekaterinoslaw, Russia, ...	4 oz. 13 grs.	4 oz. 13 grs.
9	1815	18th Feb.	Duralla, territory of Patyala, East Indies,†		
10	1821	15th June,	Juvenas near Libonnez, Ardéche, France, ...	3 oz. 407 grs.	3 oz. 407 grs.
11	1822	30th Nov.	Bittoura 75 miles N. W. of Allahabad, East Indies,‡	11b15 oz. 410 grs.	3 lb. 13 oz. 42 grs.
12	1822or23	...	Umbalah, East Indies, ...	1 oz. 108 grs.	1 oz. 108 grs.
13	1827	16th Feb.	Mhow, Ghazeepore, East Indies,‡	4 oz 234 grs.	4 oz. 234 grs.
14	1838	18th Feb.	Akburpore, Sarahanpore, Eas Indies,†		
15	1838	6th June,	Chandakapoor, Berar, East Indies, ...	304 grs.	304 grs.
16	1838	13th October,	Cold Bokkeveldt, Cape of Good Hope, ...	67 grs.	67 grs.

* Weights are given in pounds, ounces and grains.

Note 1.—Specimens with a mark ‡ are besides represented by a cast of the entire stone in addition to the specimens of the original.

Note 2.—Specimens with a mark † are represented by a cast only.

§ According Mr. Piddington the Society possessed in 1845 3 pieces of this interesting meteorite.

Number.	Date of fall. Year.	Date of fall. Month and day.	Names of locality and geographical situation.	Weight. Of the largest specimens.	Weight. Of the specimens in the Museum.
17	1841	12th June,	Château Renard, Loiret, France, ...	5 oz. 328 grs.	5 oz. 328 oz.
18	1843	25th March,	Bishopsville, S. Carolina, U. S. A. (2 specimens,)	160 grs.	223 grs.
19	1843	6th July,	Manegaon, Kandeish, East Indies, (2 specimens,)	268 grs.	1 oz. 67 grs.
20	1846	Found in the Society's collection.	Assam, East Indies, ...	10 oz. 96 grs.	10 oz. 96 grs.
21	1847	27th Feb.	Iowa, Linn County, U. S. A., ...	6 oz. 426 grs.	6 oz. 426 grs.
22	1850	30th Nov.	Shalka, 10 miles S. of Bancoorah, East Indies, (several specimen,) ...	2lbs 15oz. 100grs.	5lbs. 7oz. 140 grs.
23	1852	23rd Jan.	Nellore near Madras, East Indies,†		
24	1852	4th Sept.	Mezö, Madaras, Marasch, Transylvania, ...	15 oz. 348 grs.	15 oz. 348 grs.
25	1852	2nd Dec.	Bustee, (between Goruckpore and Fyzabad,) East Indies,†		
26	1853	6th March,	Segowlee, Sarun, East Indies, (3 specimens,)‡	8lbs 11 oz. 266grs.	19lbs. 1 oz. 611 grs.
27	1855	5th August,	Petersburgh, Lincoln country, Tennessee, U. S. A., ...	42 grs.	42 grs.
28	1857	28th Feb.	Parnallee, S. of Madura, East Indies,†...		
29	1860	28th March,	Kheragur, N. of Bhurtpoor, Agra, East Indies, ...	4 oz. 412 grs.	4 oz. 412 grs.
30	1860	14th July,	Dhurmsala, Punjab, East Indies, (2 specimens,)	15 oz. 306 grs.	1 lb. 7 oz. 66 grs.
31	1861	12th May,	Goruckpore (Pijsnaisi), East Indies, (3 specimens),‡	10 lbs. 12 oz.	
32	1863	11th August,	Dacca (Shytal 40 m. N. of) East Indies, (several specimens,)‡ ...	10lbs. 6oz. 12lgrs.	11lbs 2oz. 380grs.
33	...	...	Shergotty, ... ¶	3lbs. 9 oz. 259grs.	3lbs. 9 oz. 259grs.
34	...	...	Jessore,‡		

... was somewhat exceeding 5 lbs. 1 oz. 313 grs.
... not ... distributed.

Num	Year.	Month and day.	Names of locality and geographical situation.	Weight. Of the largest specimens.	Weight. Of the specimens in the Museum.
			2.—METEORIC IRONS.		
1	1776		Knasnojarsk, Teniseisk, Siberia (Pallas-iron,) (2 specimens,) ...	324 grs.	1 oz. 95 grs.
2	1784		Toluca, Xiquipilco, Mexico, (2 specimens,)	11 oz. 71 grs.	17 oz. 139 grs.
3	1792	Found,	Zacateras, Mexico, ...	1 oz. 87 grs.	1 oz. 87 grs.
4	1811		Ellbogen, Bohemia, (2 specimens,)	310 grs.	1 oz. 66 grs.
5	1814	Disc.	Texas, Red river, U. S. A., ...	18 oz. 180 grs.	18 oz. 180 grs.
6	1815	Found.	Lénarts, Scharosch, Hungary, ...	2 oz. 342 grs.	2 oz. 342 grs.
7	1827	Found,	Atacama, Belivia, S. A., ...	3 oz. 276 grs.	3 oz. 276 grs.
8	1840		Coke Country (sevier-iron), Tennessee, U. S. A., ...	188 grs.	188 grs.
9	1840		Smith Country, (Carthago) Tennessee, U. S. A.,...	239 grs.	239 grs.
10	1841	Found.	Kuffs Mountain, Lemington Country, U. S. A., ...	244 grs.	244 grs.
11	1843		Arva, Hungary (2 specimens,)	1 oz. 207 grs.	1 oz. 207 grs.
12	1847	14th July,	Braunau, Bohemia, ...	7 oz. 29 grs.	7 oz. 29 grs.
13	1847	Disc.	Seelaesgen, Neumark, Brandenburg, Prussia, ...	5 oz. 284 grs.	5 oz. 284 grs.
14	1850		Tuczon, Onora N. Mexico, ...	385 grs.	385 grs.
15	1856		Tewall Hill, Madison Country, N. Carolina, U. S. A., ...	2 oz. 31 grs.	2 oz. 31 grs.
16	1857		Tula, Netschaêvo, Russia, ...	4 oz. 420 grs.	4 oz. 420 grs.
17	1861		Robertson Country, Tennessee, U. S. A., ...	1 oz. 249 grs.	1 oz. 249 grs.
18	1861	Disc.	Bittersgrün, Saxony, ...	10 oz. 232 grs.	10 oz. 232 grs.

Observations on the Astronomical points determined by the brothers Schlagintweit in Central Asia.—By Captain* GOLUBIEF.

From the Journal of the Imperial Russian Geographical Society. Part 4th, 1861.

[Received 11th January, 1866.]

During the current year, the first volume of the Narrative of the Scientific Expedition of the brothers Schlagintweit to India and High Asia, extending over a period of four years, from 1854 to 185[illegible] made its appearance. This remarkable production is all the valuable, inasmuch as it will not only embrace the results of t plorations of the brothers Schlagintweit, but likewise those o learned travellers who were their predecessors in this field of The first volume contains a collected series of astronomical and netic determinations. The number of the points for which geogr cal co-ordinates are given is 112, but the degree of their exa differs considerably. Many of the points for which co-ordinat given were obtained from Indian triangulations; but many othe determined from march-routes alone. The determinations wh less exact, belong naturally to the northern portion of the jour Tibet and Turkestan. The corrections which it would be ne to make in the existing maps, in consequence of the Schlagi determinations, would be very considerable, particularly in lon Thus, for instance, Lé, in Ladak, is alleged to lie 44′ more to t than was originally supposed, and altogether the whole of Tibet would have to be removed about 20′ to the westwar changes in the latitudes are less extensive, the highest do no 10′, as in the case of Balti. The Karakoram pass, the high attained by Europeans who had preceded the Schlagintweits, northwards by 11′, and the same distance farther to the W marked on any previous map.

* This paper was read at a general meeting of both sections of t Geographical Society. The president of the section of physical geo Semënof, who had only just returned from abroad, took occasion to own doubts as to the correctness of some of the determinations and of the brothers Schlagintweit. He communicated to the members p these results, which bear evident traces of haste, are regarded with by the learned in Germany. The extensive range of the labours, th city of the collections and observations which devolved on the cel vellers, produced the confusion and irregularity apparent in their and collections.

The weight which is to be attached to these corrections, must depend on the degree of exactness which regulates the scientific labours of the brothers Schlagintweit; but unfortunately, in the volume that has been issued, this consideration is not dwelt on, that is to say, the probability of errors in the determinations is nowhere alluded to. The determinations themselves are not particularised minutely enough, to enable us to estimate their value.

In order to judge of the correctness of these labours, we bring forsome examples. Thus, in the determinations of Lé in Ladak, ror which should be expected in the latitude would amount to The longitude of Lé was determined by the transfer of one neter which was rated at Simla on the 15th May, at Lé on the September, at Srinagar the 24th October; the longitudes of a and Srinagar are known. The rate of the chronometer should been deduced from the longest transfer occupying 162 days, from , in the main result, a considerable error was to be expected† ting to no less than 7′.5. Further an error has crept into the tions of the brothers Schlagintweit which, when corrected, will heir result by 8′ (instead of 77° 14′ 6″ it should be 77° 22′ 5″ Greenwich). The correction of the chronometer was determined Karakoram pass on the 9th of August; by its action from (15th May) to Srinagar (24th October) the longitude of the s determined at 77° 30′ 4″. But corrections of the chrono- t Lé were also obtained on the 11th July and 17th Septem- rding to which the determinations of the Karakoram pass is be 77° 39′ 5″ or, otherwise, differing by 9′.

atitude of Lé was determined twice by polar heights.

11th July, ...	34°	7′5
16th September, ...	34°	9′2
Mean, ...	34°	8′3
According to Cunningham, ...	34°	9′1
„ Moorcroft, ...	34°	9′3

ronometer was rated in the Observatory of Calcutta in March, April, 1857 (pp. 98 and 102). From this it must appear, that the 4 hourly disturbance of the chronometer on the spot would not be ±s. In the longitude of Lé, also, one can suspect an error of at $\frac{125.37}{2} = \pm 29$s. From Simla to Lé is a journey of 125 days, from gar 37 days; whole duration of the journey 162 days.

But the Schlagintweits express their doubts as to the correctness of the determination of time at Lé on the 11th July, and, therefore, do not take it into account. Nevertheless, an error of no less than 10′ must, in all probability, be suspected in the longitude of the Karakoram pass as well as in the longitude of Lé. It remains, consequently, open to doubt, which longitude is to be accepted, that given by the Schlagintweits, or that previously adopted by Humboldt, which Thompson, who visited this pass in 1848, found to be quite accurat Up to this point, the corrections are less than ½°, and applied map attached to the description of their journey, they excite c ty, but not surprise; but the upper portion of the map repres Central Asia puzzles every one, by its marked difference f thing that has hitherto been known of these countries. It is s to say that the position of the three bases of the cartography of part of Asia, namely the towns of Khotan, Yarkand and Ka disagrees with those hitherto generally accepted, by nearly 180 for all the three points nearly equally lie 10′ in latitude, and 1 longitude, more southward and westward, according to the dic the Schlagintweits.

At the same time, the determinations of little Bokhara, belong to the Jesuits, cannot call forth strong doubts; on the co there is strong reason for believing, that if these determinat not altogether correct, they are but very slightly incorrect. I garia, there are several points determined by the Jesuits, and so sequently by me in 1859. From a comparison of these det tions, it becomes evident that the latitudes given by the Je correct to a minute. But the astronomical observations in D were, in all probability, not made by the Jesuits themselves Chinese whom they had instructed. It must therefore be that the points in little Bokhara, where the Jesuit fathe themselves, are equally correct. As regards the longitudes, known that the existing itineraries coincide perfectly wel determinations of the Jesuits, though it must be acknowle the marche-routes having almost a meridional direction, can out any appreciable error in the longitudes. Generally spea better acquainted we become with Chinese Turkestan, the vinced we are of the accuracy of the determinations of t

In support of this, we shall here bring forward the following example. There are two routes, besides others, across the Tian Shan leading to little Bokhara; one from Kuldja to Aksu, the other from the southern shore of Lake Issyk-kul by way of the Faûkû pass, to Ush. Until the astronomical labours of 1859, both these routes presented on the map considerable angles with the axis of the mountain range; the first one of nearly 45°, and the other that of 30°, but according to the astronomical results obtained in 1859, it was found that the inclination of routes from Kuldja to Aksu, to the axis of the range, did not exceed 30°, while the route to Ush intersects the ridge in a direct line, and runs north and south. It appears strange then after this discovering the great inclination of the transverse routes to the axis of the mountains, that Issyk-kul, with the neighbouring countries on the northern side of the Tian Shan, had not been before removed to the west, as was done subsequently in consequence of the astronomical determinations; or that all the series of points in Little Bokhara were not removed to the east, and in every case not to the west. Facts like these, speak in favour of the positions of Ush and Aksu, and other towns of Little Bokhara determined by the Jesuits; and it must be observed, that up to the present time no one has had the same means, as possessed by them, of determining the relative positions of these towns. The last point that the Schlagintweits determined instrumentally, is Suget, a halting place for caravans, proceeding from Badakhshan to Yarkand. This route is marked on a very rare map, which is a direct copy of an original one compiled by the Jesuits and translated by Klaproth; a point on this road under the same latitude with Suget, as determined by the Schlagintweits, has nearly one and the same longitude. Beyond Suget, all the other points on the Kuen-lun and in Turkestan, are determined by the marche-routes; the most northern of these and nearest to Khotan, which the two brothers Herman and Robert succeeded in reaching, is the village of Bashia. This point is also given on the map of the Jesuits, its position being fixed by marche-routes, not by direct determination. The difference in the positions of Bashia, as given by the Jesuits and the brothers Schlagintweit, amounts to 6′ in latitude, and 47′ in longitude. How is it then possible, after this, to accept the position of Khotan, and with it of the other towns of Turkestan, as given by the Schlagintweits,

differing as it does by 130′ in longitude from the astronomical determinations of the Jesuits, when neither Herman nor Robert visited Khotan, while the papers of Adolph perished with him in Kash[illegible]r?

But how are we to regard the more recent labours in the country adjoining Little Bokhara, which cannot be reconciled to the points of the Schlagintweits?

Thus Sarry-Kul, the source of the Amu, which was determined by Wood, the Schlagintweits could not place on their map, according to the determination of Wood, but were obliged to remove it nearly 2° to the westward.

Issyk-kul is also marked on the map 2° more to the west than it should be, according to the last Russian astronomical determinations in 1859. And if this Lake be marked in its true position on the map of the Schlagintweits, Sarry-kul would then fall back on Yarkand, and the western extremity of Issyk-kul will appear above Aksu, which, of course, would be impossible.

Petermann, in his notice of the labours and researches of the Schlagintweits, is of opinion that a review of their determinations in Little Bokhara is premature, more especially as the marche-routes by which they were guided, are not yet published. But the astronomical results of 1859, which so distinctly contradict the determinations of the Schlagintweits, belong to the Russian Geographical Society, and this is our excuse for expressing our doubts of the correctness of a certain portion of the results of the brothers Schlagintweit, before reviewing the data on which they are based.

Comparative, hypsometrical and physical Tableau of High Asia, the Andes, and the Alps.—By ROBERT DE SCHLAGINTWEIT, *Professor at the University of Giessen.*

Contents.—I. *Geographical configurations.* 1. Plateaux. 2. Passes 3. Peaks.

II. *Hydrography.* 1. Lakes. 2. Springs.

III. *Physical phenomena.* 1. Snow-fall. 2. Snow-line. 3. Glaciers.

IV. *The varieties of habitation.* 1 Towns and villages. 2. Pasture grounds.

V. *Extreme heights visited by man.* 1. Mountain-ascents. 2. Balloon-ascents. 3. Effect of height.

VI. *Limits of vegetation and animal life.*

Illustrations.—1. Drawings of many of the objects (plateaus, peaks, towns, &c.) mentioned in this Tableau, as well as panoramic profiles and maps, are contained in the Atlas to the "Results of a scientific mission to India and High Asia," by Hermann, Adolphe, and Robert de Schlagintweit.

2. The heights, given in English feet, are absolute, referring to the sea-level.

Transcription.—Vowels and diphthongs sound as in Italian and German: â = a in "but;" â = an in the French "gant;" ü = ü in German.—Consonants as in English. The sign ' marks the syllable to be accentuated.

The materials, upon which this comparative tableau is based, are:

For *High Asia*, viz.—The Himálaya, Western Tibet, the Karakorúm and Künlün, our own travels and observations, combined with the valuable data of the Great Trigonometrical Survey of India, and with those of our predecessors.

For the *Andes*.—The celebrated "Voyages aux régions équinoctiales," by Alexander de Humboldt, which possess to this day the highest value and importance; in his recent publications,* the newest contributions of science have been added with a master's hand.

* Kosmos.—Ansichten der Natur, 3rd edition.—Kleinere Schriften.—I always quote the original, German edition.

For the *Alps*.—The two volumes "Untersuchungen über die physicalische Geographie und die Geologie der Alpen," published by my brothers Adolphe and Hermann.

I. Geographical Configurations.

1. *Plateaux.*

Plateaus, in consequence of their being more or less intersected by deep and broad valleys, or from being covered with ridges, are so variable in their form, that the use of the name, in many instances, appears to be somewhat arbitrary. I prefer not to extend the meaning of the name too far, and in so doing diverge from the practice of earlier travellers, who commonly applied the term to every mountainous region of great *general* elevations—as the natives of the Himálaya have a tendency to do—irrespective of its form.

In the *Himálaya*, which is composed in almost every direction of lofty and irregular ridges, and intersected by numerous valleys of inconsiderable width, no plateau of any extent has been discovered as yet, nor is it at all probable that one exists.

Western Tibet was for a long time supposed to be little else than a country of plateaux—an erroneous impression emanating from the first observers, though Humboldt had early pointed out the error of this belief,* as well as later travellers (the Stracheys, Cunningham, and Thomson). Plateaux certainly do occur in Tibet; they are, however, much less numerous and considerably smaller than I had been led to expect. In Bálti, the plateau Deosái is 14,200 ft. high.

Between the *Karakorúm* and *Künlün*, especially near the western crest of the former, several well-defined plateaux of extraordinary height occur. Some of the highest are called: Dápsang (17,500 ft.), Búllu (16,883 ft.), Aksáe Chin (16,620 ft.), and Voháb (16,419 ft.) In summer, no snow covers these plateaux, but also no vegetation: in the far distance there are some isolated, lofty, snowy peaks, besides which the eye discerns nothing but barren rocks, and extensive sterile plains, all well watered by streams, to which the glaciers covering the flanks of the peaks afford an ample and lasting supply. If water was wanting to these plateaux, they would be a complete desert, as uninhabitable to man as to any animal.

* Ansichten der Natur. Vol. I., p. 104.

In the *Andes* are to be found, if not the highest, at least the most extensive plateaux of our globe, which generally lie along the very ridge of the mountains, and on which large towns are situated, as Cerro de Pasco (14,098 ft.), Potosi (13,665 ft.), and Cuzco (11,380 ft.). There is also a large plateau surrounding the elevated lake Titicaca (12,843 ft.).

In the *Alps*, plateaux occur only at their base; the Swiss plateau having a mean height of 1,460 ft., the Suevo-Bavarian plateau of 1,420 ft.

2. *Passes.*

The mean of a sufficient number of such passes, which lead over the *principal crests*, is particularly to be taken into consideration, it being approximatively proportional, or, to express it more clearly, equal to the general mean height of these crests. The passes situate in the lateral ramifications of the principal crests—though they are numerous—cannot be included in these general means, being geographically of [illegible] importance.

The mean height of passes in the three principal mountain-chains of *High Asia* is as follows:

A. *For the Himálaya* (mean of 19 passes,)..... 17,800 ft.

From Sikkim to Kishtvar: Bhután and Kashmír being excluded: the former [illegible] want of materials, and Kashmir on account of the Himalaya there [illegible] losing the character of one well-defined and predominant chain.

B. *For the Karakorúm* (mean of 3 passes,)...18,700 ft.

From long. E. Gr. 76° to 79½°, the heights in the eastern continuation being quite unknown.

C. *For the Künlün* (mean of 2 passes,)..... 17,000 ft.

As the two passes are situated in parts not differing in any particular from the general mean of this chain, they may be looked upon as representatives of the other.

From these numbers it appears, that the Karakorúm has by far the greatest mean height of passes; but the one pass which we must still consider the highest, is situated in the Himálaya. This is the *Ibi Gâmin pass* (20,459 ft.) leading from Gărhvál to Gnárí Khŏrsum, which my brother Adolphe and I myself crossed as the first, and as yet as the only Europeans, Aug. 22, 1855. The pass next in height

is the Mustágh pass in the Karakorúm chain (19,019 ft.), the third the Changchénmo, or Yéngi Daván (about 18,800 ft.), in the same chain. None of these passes are generally used as commercial roads. The highest pass as yet known to be regularly crossed with horses and sheep, for the purposes of commerce, is the Párang pass (18,500 ft.; Mr. Theobald, Jr. makes it 19,132 ft., which seems too high—); and between this height and 18,000 ft. are situated several of the most important and frequented passes, as the Mána (18,406 ft.) the Karakorúm (18,345 ft.) and the Kióbrang (18,313 ft.). The lowest passes in the Himálaya chain are the Shínku La (16,684 ft.) and the Bára Lácha (16,186 ft.); the well known Níti pass reaches 16,814 ft.

In the *Andes*, the general mean elevation of the passes is, according to Berghaus:

For the Western Andes, ... 14,500 ft.
For the Eastern Andes,..... 13,500 ft.

The highest passes are: Alto de Toledo (15,590 ft.), Lagunillas (15,590 ft.), and Assuay 15,526 ft.). The latter pass attains, according to Schmarda, only 14,517 ft.

In the *Alps*, the mean of the passes is ..... 7,550 ft.

The highest pass, at least in former times not frequently used for commercial purposes, is the St. Théodule (11,001 ft.), upon which the brothers Platter have now erected a meteorological observatory.

3. *Peaks.*

In the beginning of this century, the Andes were supposed to contain the highest peaks on our globe, and Chimborazo to rise supreme above the rest. Though as early as 1816 this was proved by Captain Webb's measurements to be incorrect, yet some time elapsed, before the superiority of the *Himálaya* above the Andes was generally admitted. Now we know, from the valuable and accurate observations of the G. T. Survey of India, that Gaurisánkar, or Mount Everest (29,002 ft.) is the highest peak of the world. The memoir of Major J. T. Walker in the Journal of the Asiatic Society of Bengal, 1862, No. I., pp. 32—48, gives a detailed enumeration of the peaks hitherto measured in the Himálaya; this memoir, as well as the publications of Captain Montgomerie and private communications kindly received from the Surveyor General's Office, enable me to state, that 216 peaks are now accurately measured in the chain of the Himálaya. Among

peaks, 17 exceed the height of 25,000 ft., 40 the height of ft., and 120 the height of 20,000 ft.

the *Karakorúm*, peaks have lately been discovered, which are ly inferior in height to the loftiest in the Himálaya, though nly its western part has as yet been explored. With regard to the eights of its eastern continuation, there is not enough known to llow even of an estimate being made.

The highest peaks of the Karakorúm are the Dápsang (Ko of the . T.-S. 28,278 ft.), the Diámar (26,629 ft.), and the Masheribrúm 25,625 ft.)

With reference to the *Künlün*, we can only mention the peaks that e saw and measured between the Yurungkásh pass and the western ination of this chain; our idea about the general height is the limited, as we have not even itinerary reports of former travel- o assist us. None of the peaks seen there by ourselves exceeds 00 ft.

the *Andes*, important alterations have very recently been made reference to the succession of the peaks, when arranged according ght, and, even now, the same amount of accuracy cannot be d to the hypsometrical determination of its principal peaks as trigonometrical operations in the Himálaya. The highest peak Andes is the Aconcagua (23,004 ft.) in Chili (Pissis gives 2,451 ft.): and there are as many as five peaks higher than mbarozo (21,422 ft.). In High Asia, forty-five peaks are which exceed in height the dominating peak of the Andes, ncagua.

Alps, Mont Blanc (15,784 ft.) and Monte Rosa (15,223 ft.) known to be the highest peaks. Other high peaks are; n, or Lagerhorn (14,954 ft.), Weisshorn (14,813 ft.), Mont 4,787 ft.), and Dent Blanche (14,305 ft.).

II. Hydrography.

1. *Lakes.*

Himálaya, there are but very few lakes. That of Nainitál , in Kámáon, the Vúllar lake (5,126 ft.), and the Chinár Srinágar in Kashmír, suffice to exhaust the category of those mention.

Glacier lakes.—Accumulations of water formed by one gl
structing the outlet of a higher one—are of much more frequent
rence. At times, the wall of ice breaks away before the press
the swollen waters, when the lower lands become suddenly inund
and the torrent rushes on with uninterrupted violence for miles, exer
cising a marked influence even down to the lower parts of the river.
Similar inundations, some of them of a most destructive character
have several times occurred. Two of the most elevated glacier-lake
are the Destál (17,745 ft.), in Gărhvál, and the Námtso, or Yúnán
(15,570 ft.) in Lahōl.

Western Tibet and Turkistán possess many lakes, all of which ar
situated in great heights; they are, however, gradually drying up, a
becomes apparent by the unmistakeable marks of larger surface
maining from former times. They contain a greater quantity
than lakes in general, and most of them to an amount which r
them more or less brackish.

The following are the names and the heights of the principal

Lakes of Western Tibet and Turkistán.

Aksâe Chin, ...	16,620	Níma Kar, ...	...
Tso Gyagár, ...	15,693	Háule, ...	...
Tso Kar, or Khauri Talán,	15,684	Tso Gam, ...	...
Múre Tso, ...	15,517	Tso Bul. ...	...
Kiúk-Kiöl, ...	15,460	Tso Mitbál, ...	...
Mansaráur, or Tso Mápan,	15,250	Upper Tsomognalarí,	...
Rákus Tal, or Tso Lánag,	15,250	Lower Tsomognalarí,...	...
Tsomoríri,...	*15,130		

In the *Andes*, the most remarkable lake is that of
(12,843 ft.)

The foot of the *Alps* is adorned with a great many lakes, al
elevations of from 600 to 1,600 ft.

2. *Springs.*

Springs of an ordinary, mean temperature, commonly c
springs, are of frequent occurrence in High Asia; the finest
copious springs are to be found in *Kashmír*, as the sprin
Vétur Vúllar, Kókar Nag, Achibál, A'nat Nag and otl
spring Sónda Bréri, also in Kashmír, situate about five m
east of Shahabád, is the only intermittent spring as yet
High Asia.

* According to Mr. Theobald, Jr. (see Journ. As. Soc., Beng, 186
p. 513) only 14,272.

...stern Tibet, where rains in the higher parts are rare, and ... the dryness in summer is so excessive that even the formation ...dew is scarcely perceptible, cold springs are comparatively rare. ... Turkistán, in Bálti, and Hasóra, we find a greater number of springs, a fact intimately connected with the general meteorological conditions of these provinces.

With reference to the limit, at which springs are to be found still in High Asia, I give the following data, derived from our own observations. The greatest height, at which we found a spring in the Himálaya, was 15,920 ft.; this spring was situated on the slopes of the Kyúngar pass. In Tibet, we discovered a real spring on the slopes of the Ibi Gámin peak still at a height of 17,650 ft.; this ...g is probably the highest spring hitherto found.

... the highest spring in the Andes, Humboldt names the one ...ed "Ladera de Cadlud," at a height of 15,526 ft. above the level ...he sea; in the Alps, Adolphe and Hermann have found the high... ...old spring at 10,440 ft.

...t springs occur in High Asia in a surprisingly great number,* ...he sea-level up to heights of more than 16,000 ft. The highest ...rings of High Asia are at Murgái, (16,382 ft.), in Núbia, at ...i (about 16,000 ft.), in Sikkim, at Púga (15,264 ft.), in Ladák, ...e lake Aiúkkió (15,010 ft.), in Turkistán, and at Chagrár ... 15,000 ft.), in Pangkóng. As a curious and remarkable fact I ...d, that the highest hot spring in India, at Hazaribágh, in ... is only 1,750 ft. above the level of the sea.

...ottest spring of High Asia is at Manikárn (temp. 202° Faht.) ... (this is the hottest spring as yet found all over Asia), at ...i (temp. 193° Faht.) in Gárhwál, and at Chorkónda (temp. ...ht.) in Bálti. The hottest springs of the world (if we ... those, which rise in the immediate neighbourhood of volca... ...to be found in the Andes. There "Aguas de Comangillas," ...hemequillo and Quanaxuato, at a height of about 6,200 ft., ... north 21°, show a temperature of 205°.3 Faht.;† and the "Las Trincheras" between Porto Cabello and Valencias, in

...he "Enumeration of the hot springs of India and High Asia, given ...s. Soc. Journal, 1864, No. I., p. 49.

...ldt's "Essai pratique sur la Nouvelle Espagne." 2nd Ed., Vol. III. ...190.

Mexico, have increased, between the years 1806 and 1823, fro
Faht. to 206°.6 Faht.,* thus exceeding at present the temperat
the "Aguas de Comangillas" by 1°.3 Faht.

The hottest known spring of Europe, unconnected with prese
volcanoes, is that of Chaudes Aigues in Auvergne (temp. 176°
Faht.).†

III. Physical Phenomena.

1. *Snow-fall.*

The lowest height at which snow has fallen in the *Himálay*
during the winter, is about 2,500 ft., but such cases are extremel
rare, having occurred in Kámdon and Gárhwál only twice (in 181
and 1847), since the British took possession of the country.‡ S
has fallen in the memory of man only once in Nahán§ (3,207 ft
the province of Simla. The snow, which falls once within sev
years in the Kángra valley, down to heights of 3,000 and 2,700
disappears almost immediately. At Haribágh the snow melts
on the day it falls, or at least within thirty-six hours. Durin
travels in Kúlu, I was informed by the natives, as well as by s
gentlemen who knew this part of the country thoroughly, tha
village of Mándi (2,480 ft.), is below the limit of snow-fall.

At an elevation of 5,000 ft. scarcely one year passes by
snow-fall; but, even at this height, the snow disappears aft
days, and sometimes even hours. "It snows, but one does
it," the natives of Kathmándu (4,354 ft.) very significantl
say, meaning, that the rare nightly snow-falls are melted away
earliest rays of the sun. 6,000 ft. may be assigned as the
the Himálaya, where snow regularly falls in winter, with th
bility of remaining some time upon the ground.

In *Western Tibet* and in the *Karakorám*, the general el
the country is so great, even in its lowest regions, that no
below the limit of hibernal snow-fall. But the quanti
actually falling is inconsiderable, and this circumstance it
forms one of the chief causes that the passes of the Karako

* Humboldt's "Kosmos," Vol. IV., p. 246.
† Newbold, in "Philos. Transactions," 1845, p. 127.
‡ Colonel R. Strachey, in this Journal, Vol. XVIII., Part I., p. 30
§ This Journal, Vol. III., p. 367.

the highest, remain open throughout the year. In some parts of Tibet the winter is the only season, when atmospheric precipitation at all takes place.

In the *Kúnlún*, even on its southern slopes, a greater amount of snow is precipitated than on the northern side of the Karakorúm, whilst its Turkistani (northern) slopes differ still more from the Karakorúm in this respect, they being visited by very heavy rains and great snow-falls. Even at Káshgar (about 3,500 ft.), in Turkistán, there are said to be several snowy days every winter.

My data, which I was able to collect on snow-fall in the *Andes*, are very few and vague, that I could not draw any conclusion from them. Also for the *Alps*, I could not bring forward any new facts with reference to the snow-fall.

2. *Snow-line.*

The snow-line, or the average height where snow remains perpetually throughout the year, has offered unexpected difficulties in its determination for the *Himálaya*. When Webb and Moorcroft first fixed out the general heights reached by the snow-line, when they from discovered the remarkable fact, that, in spite of the influence not sig from exposition, the snow-line of the Himálaya descends lower Moorcr *southern* (Indian) than on its *northern* (Tibetan) slopes, the near the ents of these travellers, now proved to be correct in all material (about discredited by men of science both in Europe and in may add Humboldt, however, was among the first who endeavoured Bengal ove the distrust with which these discoveries were received;

The gave an explanation* of the causes which were possibly suffiin Kúlu originate so remarkable a phenomenon as this of the unlooked-Jámnótr erences existing between the snow-lines of the Tibetan and 190° Fa lopes. He considers it "the results conjointly of the radiation exclude rom the neighbouring elevated plains, the serenity of the sky, noes) are nfrequent formation of snow in very cold and dry air." Of near Chi causes, however, the last is the most important. The direct in latitude being less interrupted on the Tibetan side, has also its springs nfluence; but the effect is comparatively small. As the best cion of the quantity of snow-fall being the principal cause of ver the pression on the southern (Indian) slope of the Himálaya, may

* See t

* "Asie Centrale," pp. 284, 327; "Kosmos;" Vol. I. p. 358.

be adduced the fact, that we found the isothermal lines for the year and the summer, which coincided with the snow-line on the Indian side, decidedly warmer than those on a level with the Tibetan snow-line. The fact, moreover, of the *Karakorúm*—though on an average three degrees farther north—having the snow-line so excessively high on both its slopes, offers another instance of the influence of limited precipitation.

In the *Künlün*, the meteorological conditions also become apparent in the different limits of the snow-line on either side; but here the effect is the reverse of that perceived in the Himálaya, the greater precipitation on the "northern" slopes (towards the plains of Turkistán) lowering the snow-line on that side to a considerable extent.

Although, in the Himálaya at large, the snow-limit of the Tibetan side does not descend so low as that of the Indian, yet the influence of exposition at once becomes apparent in the ordinary sense, corresponding to these latitudes, if we examine the slopes of a crest or mountain, of which, by the nature of its position, both slopes belong either to the Indian side of the ridge in general, or to the Tibetan side. The many and vehement disputes upon the much-discussed subject of snow-limits have chiefly arisen from the entire neglect of this modification.*

The values we obtain for the height of the snow-line on the three mountain chains of *High Asia* are:

			Feet.
A.	*Himálaya.*	Southern (Indian slopes), ...	16,200
		Northern (Tibetan) slopes, ...	17,400
B.	*Karakorúm.*	Southern (Tibetan) slopes, ...	19,400
		Northern (along the Turkistani plateaux),	18,600
C.	*Künlün.*	Southern (facing mountainous ramifications),	15,800
		Northern (facing the Turkistáni plain),† ...	15,100

For the *Andes*, the snow-limits are, according to Humboldt and Pentland:

* See Batten, in the "Calcutta Jour. of Nat. Hist.," Vol. IV. p. 537; Vol. V. p. 383. Capt. T. Hutton, "in the same Journ." Vol. IV. p. 275; Vol. V. p. 379; Vol. VI. p. 56; and Capt. A. Jack, "in the same Journ." Vol. IV. p. 455.

† "Asie Centrale," 1847, Vol. II. pp. 165 and 177.

	Feet.
Eastern Andes of Bolivia, ...	15,900
Western Andes of Bolivia, ...	18,500
Andes of Quito, ...	15,700

For the *Alps*, my brothers obtained:

Southern slopes, ...	9,200
Northern slopes, ...	8,900
Extremes (near the Mont Blanc and Monte Rosa group), ...	9,800

3. *Glaciers.*

The existence of the glaciers of High Asia was first made known for *Western Tibet*, by Vigne, who alludes to them repeatedly in his "Travels in Kashmír," London, 1842. Colonel Richard Strachey the first* who (in 1847) proved their existence in the *Himálaya*. recent date of this discovery will appear the more surprising, the immense number of glaciers now positively ascertained to be is region is taken into consideration. The great amount of ice met with, even in lower elevations of the Himálaya, could not rse escape the observation of previous travellers; these masses, er, they used to designate as "hard, frozen snow-beds," and to er them as local phenomena, analogous to remains of avalanches. both sides of the Karakorúm and the Kúnlún, we also found , having forms identical with those of the Alps, and following e laws of motion. Some of them are considerably larger than ciers in Europe. The Aletsch glacier in the Alps extends a er fifteen miles in length, whilst some of the glaciers, surveyed ain Montgomerie and his party in Bálti (on the southern side Karakorúm)" boast of no less than thirty-six miles in length, readth of from one to two and a half miles. The Biáfo rms, with the glacier on the opposite slope towards Miggáir, us river of ice of sixty-four miles running in an almost ine, and without any break in its continuity beyond those nary crevasses of glaciers. The Biáfo glacier is supplied in easure from a vast dome of ice and snow, about one hundred hty square miles in area, in the whole of which only a few projecting points of wall are visible. The Bálsoro main glacier, thirty-

* See this Journal, Vol. XVI., part II. p. 794; Vol. XVII. part II. p. 203.

six miles in length, and with fourteen large tributary glaciers of from three to ten miles in length, would form a study in itself, and give employment for several summers, before it could be properly examined."*

In the *Himálaya*, the lowest glaciers go down to 11,000 ft. and even 10,500 ft.; the Píndari ending at 11,492 ft., the Timtimna at 11,430 ft., the Tsóji at 10,967 ft., and the Chàia at 10,520 ft.

In *Western Tibet*, they descend to about the same elevation; thus, the Mustágh 11,576 ft., the Tapto 11,508 ft., the Támi Chúet to 10,460 ft., the Bépho (Biáfo of Capt. Montgomerie?), near Askoli, even to 9,876 ft. The latter is worthy of notice as a remarkable case of low termination.

In the *Künlün*, the glaciers end probably at heights not much [illegible] ing from those in Western Tibet; at least so we infer from the g[illegible] ral appearance of the upper part of the glaciers we saw during travels in these regions. The glaciers on both flanks of the pass presented, however, no instances of particularly deep descen

In the *Andes*, no glaciers are as yet known to exist,† and th[illegible] not occur in tropical America, from the equator to 19° latitude

In the *Alps*, the lowest glacier is that of Lower Grindelwald[illegible] ing at 3,290 ft, but in general 5,000 ft. must be consider[illegible] rather low end of a glacier.

IV. The Varieties of Habitation.

1. *Towns and Villages.*

The *Himálaya* rises, in general, so abruptly above the [illegible] India, and the latter, particularly in the western regions, are [illegible] selves of such an elevation, that even in the lower parts of th[illegible] there are but few, if any points of less height than 1,000 ft. level of the sea. Two causes more especially have tended t[illegible] the order of population in these districts, the lower parts be[illegible] deserted in favour of the lands lying immediately above. [illegible] instance, the prevailing steepness of the country hereabou[illegible] still considerably increased by the erosion of the rivers, pr[illegible] successful cultivation of the soil; and, again, the fertile, wel[illegible]

* Montgomerie, in "Journ. As. Soc. Beng. 1862, No. II. p. 210.
† Humboldt, "Asie Centrale," Vol. II. p. 167.

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* See this Journal, Vol. XVI., part II. p. 794; Vol. XVII. part II. p. 203.

ted plains of India are converted, wherever they touch the southern foot of the Himálaya, into swampy and marshy lands, called the Tarái, which in some parts form but a narrow strip or belt, whilst in others, as in Nepál, they attain a breadth of thirty to forty miles. The Tarái abounds with large and lofty forest trees. Owing to the swampy and malarious character of the Tarái, which skirts the extremities of the valleys, the neighbourhood is rendered as uninhabitable to the tribes of the Central Himálaya as to the highly susceptible and less seasoned visitor from European climes. Consequently (from all these reasons stated), in the inferior stratum of heights, ranging between 2,000 and 3,000 ft., the number of places inhabited by the natives is comparatively insignificant; while population reaches its maximum in the [illegible]elt of life rising from 5,000 to 8,000 ft., the traces of man and [illegible]welling-place begin rapidly to disappear at 11,000 ft., and [illegible] before.

[illegible]e *highest limits of habitation*, however, very often present them- [illegible] under a form which almost excludes the possibility of strictly [illegible]aring them as dependent upon climate. It is a remarkable fact, [illegible]n some provinces of the Himálaya, especially in Nepál, Kămáon, [illegible]Gărhwál, many villages are deserted in winter, though as far as [illegible] their elevation and the solid construction of the houses, they [illegible]very well be inhabited throughout the year. The natives, how- [illegible]efer removing to villages less elevated, where they spend the [illegible]onths. In the Himálaya west of Gărhwál, such modifications [illegible]ccur; at least we are not aware of the existence of villages in [illegible] Kúlu, Kishtvár &c., where the inhabitants follow regularly [illegible]dic example furnished in other parts of the hill country.

[illegible]lps of Europe also present instances of this kind in Findelen [illegible]), Bresily (6,594 ft.), and many other summer villages of [illegible] less elevation on the French side of the Alps.

[illegible] *Tibet* is a country of such general elevation, that only in [illegible]ce of Bálti villages are to be found below a height of 6,000 [illegible] of the chief towns are built at considerable elevations; [illegible]pital of Ladák, lies 11,527 ft. above the level of the sea. [illegible]*st permanently* inhabited places are, however, Buddhist [illegible]ries, the most elevated being probably that of Hánle, (15,117 [illegible]ft.), in Ladák. I state it positively as my conviction, that nowhere in

the world there exists a permanently inhabited place at a height exceeding 15,600 ft. Paul de Carmoy's "Pueblo de Ocoruro," in the Sierra Nevada, 18,454 ft. high, will prove, on a closer examination, to be a temporarily inhabited place, similar to the *summer villages* of Tibet, of which I name Gártok (15,090 ft.), Nórbu (15,946 ft.), and Púga (15,264 ft.)

In the *Kúnlún*, even the foot of its southern (Tibetan) slopes is so elevated, that no villages exist at all. By combining with our own observations a variety of reports received, I obtain for its northern slopes 9,400 ft. as the limit of permanently inhabited villages; summer villages reach about 10,200 ft.

In the *Andes*, large and important permanently inhabited places have been built at great heights (Cerro de Pasco, 14,098 ft., [illegible] 13,665 ft.); they are generally situated on plateaux. Santa B[illegible] a mine with solid houses, about three miles south of Huancaveli[illegible] situated at a height of 14,508 ft.

For the *Alps*, I have already had occasion to mention their su[illegible] villages. The highest permanently inhabited villages are i[illegible] valley of Avers in Graubündten, where Juf lies at an eleva[illegible] 7,172 ft., and that of Cresta exceeds 6,700 ft. But the roads l[illegible] across the passes have rendered it necessary to construct hous[illegible] the top which are permanently inhabited; the highest of t[illegible] present being the well known monastery of St. Bernard (8[illegible] As long as the road over the Stelvio or Stilfser Joch was [illegible] Santa Maria (8,146 ft.) was also inhabited throughout the ye[illegible]

2. *Pasture-grounds.*

In the *Himálaya*, pasture-grounds "Kărik," for sheep an[illegible] cattle, are for the most part in low elevations, and at no [illegible] tance from the villages. The Kărik Bitergnár, in Kămáon [illegible] mentioned as an exception to this general rule, it being [illegible] an elevation of 14,594 ft. Nowhere are there built on the[illegible] grounds châlets (Alpenhütten), which are as little used in [illegible] laya as tents in the Alps.

Dairies, which are dispersed all over the Alps, and which [illegible] source of a profitable income under an able management, [illegible] unknown in the Himálaya, even in those parts, as Kashmír and Nepál,

where ample tracts exist extremely favourable for erecting such establishments even on a large scale.

The pasture-grounds of *Tibet*, to which the numerous herds of sheep are driven in summer, reach an elevation from 15,000 to 16,349 ft., beyond which the Tibetan shepherds, who sometimes remain upon the mountains from June to September, cannot be supposed to make any permanent residence. The most elevated pasture-grounds of Tibet are, Lársa (16,349 ft.), Zinchín (16,222 ft.), Kyángchu (15,781 ft.), Riákchin (15,064 ft.), Amlung (15,300 ft.), and Júgta (15,058 ft.)

Though many cloudless days succeed each other in these lofty regions, thus leaving the power of direct insolation unimpaired, the climate always remains bleak; while the prevailing winds not only [illegible] effects of a low temperature, but also that of a low barometrical pressure, thus presenting a remarkable modification of climate, of which I shall hereafter give some detail in the considerations upon the influence of height in general. The shepherds with difficulty provide themselves with a sufficient supply of fuel for cooking purposes; sometimes they contrive with much labour and pains to erect rude stone walls, behind which they may take shelter during the night. These walls are usually circular in form, from four to five feet high, and without a roof.

In the *Kuenlün*, the slopes on its southern side are so elevated, that there exist no pasture-grounds at all; on its northern slopes, they do not occur above 13,000 ft.

For the *Andes* no data with reference to pasture-grounds are at my disposal.

The pasture-grounds in the *Alps*, which are generally in the neighbourhood of Châlets, may be met with at heights of 8,000 ft. and upwards: the Fluhalpe (8,468 ft) on the Findelen glacier near the Monte Rosa, and the Torrenthütle, in the Anniviers valley, being instances of the greatest elevations.

V. Extreme heights visited by man.

1. *Mountain-ascents.*

Temporary habitations, frequented for some months, as we have seen from the discussion of the highest pasture-grounds, sometimes reach a height of nearly 16,300 ft. As far as my experience goes, I

may state, that for short periods of ten or twelve days, man may considerably exceed this height, not without suffering, but at least without positive injury to himself. During our explorations of the Ibi Gámin glaciers, August 13th to 23rd, 1855, we encamped and slept during these ten days in company with eight men at very unusual heights. During this period, our lowest camp was pitched at 19,326 ft.—the greatest height at which we ever passed a night — another was at 19,094 ft.; two camps exceeded 18,300 ft., and the remainder ranged between 18,000 and 17,000 ft. Apart from the extreme elevation and consequent cold, the bodily exertions imposed upon us during our stay, proved a great tax upon our powers. On [illegible] we crossed a pass of 20,439 ft., and three days earlier, August 19th, [illegible], we had ascended the flanks of Ibi Gámin to a height of 22,239 ft. This, as far as we know, is the greatest height yet reached on any mountain, though considerably below that to which man has arisen in balloons.

On the Sássar peak we attained (August 3rd, 1856) an elevation of 20,120 ft. As early as 1818, however, the brothers Alexander and James G. Gerard ascended (October 18th) a peak in Spiti 19,411 ft. high, not far from the Porgyál, or Tazhigáng. Subsequently, August 31st, 1828, Dr. James G. Gerard reached 20,400 ft.

From Captain T. G. Montgomerie we learn, that a station of 19,979 ft. has been reached twice by Mr. W. H. Johnson, and another of 19,958 ft.* in height by Mr. W. G. Beverley. Mr. Johnson took, besides, observations in Ladák at one station more than 20,600 ft. high, the greatest altitude yet attained as a station of the Trigonometrical Survey of India.† A trigonometrical mark has even been erected on a point 21,480 ft. above the level of the sea, "but unfortunately there was not sufficient space to put a theodolite on it."

In the *Andes*, Humboldt ascended the flanks of Chimborazo (June 23rd, 1802) to a height of 19,286 ft.; this being the extreme elevation attained at that period. Some years afterwards (December 16th, 1831), Boussingault reached, on the same peak, a height of 19,695 ft.‡

In the *Alps*, my brothers Adolphe and Hermann once remained in the Vincenthütte, on the slopes of Monte Rosa, fourteen days at a

* See this Journal, 1861, No. II., pp. 99, 110.
† See this Journal, 1863, No. II., p. iii.
‡ Humboldt's "Kleinere Schriften," p. 157.

height of 10,374 ft. The well known English Professors Tyndall and Frankland even passed the night of August 21st, 1859, on the top of the Mont Blanc (15,784 ft.)

2. *Balloon-ascents.*

In the free atmosphere the greatest height was reached by Mr. Glaisher in a balloon, which was directed by Mr. Coswell; he ascended, September 5th, 1862, the extraordinary height of at least 30,000 ft., but, as he was unable to make any observations above that height, being suddenly overtaken by sickness, it is supposed that the balloon rose as high as seven miles = 36,960 ft.

Not less remarkable than this ascent was the one performed by Gay-Lussac as early as the beginning of this century (September 16th, 1804), when he rose to 23,020 ft. Between Gay-Lussac's and Mr. Glaisher's ascent, several attempts have been made to reach great heights in balloons, especially in England, during one of which the late Mr. Welsh reached (November 10th, 1852) 22,930 ft.* The balloon-ascents made in England were all combined with experiments of a highly interesting nature, and instituted by a scientific committee, among whose members it is sufficient only to name Sabine and Sykes.

Previous to Mr. Welsh, Messrs. Bixio and Barral rose (July 27th, 1850) to a height of 23,009 ft.

As a balloon-ascent, remarkable not only on account of the height reached, but on account of the horizontal distance performed, I must mention the one made by Mr. Nadar, in company with eight persons, October 18th, 1863. Mr. Nadar rose from Paris and let himself down —or he rather fell down—near Rethem, a small town on the river Aller, in Hanover. The direct distance between these two towns is about 395 miles, and as it took 15 hours, 47 minutes to travel through this distance, the balloon flew 2,227 ft per minute, or 37 ft. per second. But, as the balloon was far from going in a straight line, it has been computed, that the greatest velocity attained by it amounted to 50 ft. per second.

3. *Effect of height.*

The effect of height is chiefly perceptible in the decrease of temperature and barometrical pressure. According to our observations,

* "Philosophical Transactions," 1853, Part III., p. 320.

the atmospheric pressure is, at a height of about 18,600 or 18,800 ft., one-half of that at the level of the sea. At an elevation of 22,200 ft. (so trivial a height when compared with the extreme upper limit of the atmosphere), we observed a barometrical pressure of 13.364 inches, so that nearly three-fifths of the weight of the atmosphere lay below the point reached by us at the time.

It is evident that there must be a limit beyond which the degree of rarefaction is incompatible with the conditions of human existence; but it will ever remain extremely difficult to determine the line of demarcation, with any approach to scientific precision.

The influence* which height exercises upon man, varies with the individual; a man in good health having the chance of less suffering. The difference of race has apparently no appreciable influence. Our Hindu servants suffered far more from the cold than our Tibetan companions, though not more from the diminished pressure. For the generality of people the influence of height begins at 16,000 ft., a height nearly coinciding with that of the highest pasture grounds visited by shepherds.

The complaints produced by diminished pressure are headache, difficulty of respiration, and affection of the lungs, the latter even proceeding so far as to occasion blood-spitting, want of appetite and even sickness, muscular weakness, and a general depression and lowness of spirits. Bleeding of the nose we experienced ourselves, though very rarely, the loss of blood on such occasions being insignificant; but bleeding of the ears and lips we neither experienced personally, nor observed in others during our travels in *High Asia*. Humboldt,† however, states, that on the Antisana, at a height of 18,141 ft., his companion, Don Carlos Montufar, bleeded heavily from the lips, and that during the ascent of the Chimborazo, every one suffered from bleeding of the lips and even the gums.

The effects here mentioned, which disappear in a healthy man almost simultaneously with his return to lower regions, are not sensibly increased by cold, but the wind has a most decided influence for

* Notices and remarks on this subject are to be found in "Gleanings in Science," Vol. I., p. 330; Gerard's "Koonawur;" Hooker's "Himalayan Journals," Vol. II., p. 413; Thomson's "Western Himálaya and Tíbet," p. 135 and p. 133.

† "Kleinere Schriften," Vol. I., p. 148.

the worse upon the feelings. As this was a phenomenon we had not hitherto found mentioned by former observers, we directed our particular attention to it, and remarked instances where fatigue had absolutely nothing to do with it. In the plateaux of the Karakorúm, it was a common occurrence, even for the sleepers in the tents, where they might be considered as somewhat protected, to be waked up in the night with a heavy feeling of oppression, the entire disturbance being traceable to a breeze, which had sprung up during the hours of rest.

The effects of diminished atmospheric pressure are considerably aggravated by fatigue. It is surprising to what a degree it is possible for exhaustion to supervene; even the act of speaking is felt to be a labour, and one gets as careless of comfort as of danger.

VI. Limits of vegetation and animal life.

1. *Vegetation.*

In *India*, the vegetation is not limited by climate in the elevations existing; the highest peaks, as the Dodabétta (8,640 ft.), in the Nilgiris, the most elevated plateaux are covered with trees, shrubs, and in fact a luxurious vegetation, not only along their slopes, but even on their top.

In the *Himálaya*, trees grow very generally up to heights of 11,800 ft., and in those parts there are extensive forests covering the sides of the mountains at but a little distance below this limit. Those forests are especially beautiful in the higher valleys of Kâmáon and Gârhwál, in the Bhagiráthi valley.

In *Western Tibet*, though we did traverse it in various directions, none of us found anything at all corresponding to a forest. Apricot trees, willows, and poplars are frequently cultivated on a large scale; poplars, indeed, are found at Mángnang, in Gnári Khórsum, still at a height of 13,457 ft.; but they are the objects of the greatest care and attention to the Lamas.

In the *Künlün*, we found the trees on its northern side not to grow above 9,100 ft. On the northern side, we saw no trees at all; here the considerable height of the valleys we passed excluded them.

In the *Andes*, trees end at about 12,130 ft.; in the *Alps* on an average at 6,400 ft., isolated specimens occurring, however, above 7,000 ft.

The cultivation of grain coincides, in most cases, with the highest permanently inhabited villages: but the extremes of cultivated grain remain below the limit of permanent habitation. In the *Himálaya*, cultivation of grain does not exceed 11,800 ft., in *Tibet* 14,700 ft., and in the *Künlün* 9,700 ft. For the *Andes*, the limit is 11,800 ft.; in the *Alps*, some of the extremes are found near Tindelen, at a height of 6,630 ft., but the mean is about 5,000 ft.

The upper mean limit of grass-vegetation is, in the *Himálaya*, at 15,400 ft., in *Western Tibet* at 16,500 ft.; in the *Künlün*, grass is not found above 14,800 ft.

Shrubs grow, in the *Himálaya*, up to 15,200 ft., in *Western Tibet*, as high as 17,000 ft. On the plateaux to the north of the *Karakorúm*, shrubs are found at 16,900 ft., and, which is more remarkable, they occasionally grow there in considerable quantities on spots entirely destitute of grass. As an example, I mention the Voháb Chílgâne plateau (16,419 ft.) and Bashmalgún (14,207 ft.)

In the *Künlün*, the upper limit of shrubs does not exceed 12,700 ft.; above this height grass is still plentiful; and shrubs being here, as generally everywhere else, confined to a limit below the vegetation of grass, the range presents an essential contrast in this respect to the characteristic aspect of the Karakorúm.

In the *Andes*, shrubs grow up to 13,420 ft., in the *Alps*, their upper limit is at 8,000 ft.

The very extreme limit of phanerogamic plants appeared in *Tibet* at the north-eastern slopes of the Ibi Gămin pass, at a height of 19,809 ft.; next in order came those of the Gunshankăr peak, in Gnári Khórsum, at 19,237 ft. In the *Himálaya*, the highest plants were found by us at 17,500 ft., on the slopes of the Jánte pass, in Kămáon.

In the *Andes*, Colonel Hall found the highest phanerogamic plants on the slopes of Chimborazo, at 15,769 ft., consequently 4,040 ft. lower than the Ibi Gămin plants in Tibet.

In the *Alps*, my brothers found an analogous extreme on the southern slopes of the Vincent pyramide at 12,540 ft.

2. *Animal life.*

Monkeys appear to frequent, in the Himálaya, regions exceeding 11,000 ft. in height; the *Semnopithecus schistaceus*, Hodgs. ascending

higher than others. These monkeys, called "Langúrs" by the natives, have been frequently seen at 11,000 ft., while the fir-trees among which they sported were loaded with snow-wreaths. This species is not known in India, whilst the Macacus Rhesus is met with in India, as well as in the Himálaya.

In *Western Tibet*, and farther to the north, no monkeys have yet been found. *Tigers* ascend to 11,000 ft. in the Himálaya; they are not, however, seen in Western Tibet or the Künlün.

Leopards may be met with, in the Himálaya and in Tibet, even at 13,000 and 14,000 ft. The *lion*, though intimately connected with the mythology of High Asia, has been forthcoming, in historical times, only in Kashmír. In India, the lion occurs at the present day only in Guzrát, and there only in very small numbers.

Jackals were found by us in the Karakorúm between 16,000 and 17,000 ft. *Wolves* are not known to frequent the Himálaya Proper, but they are found in Tibet, where we saw of traces of them in sand close to the Karakorúm pass (18,345 ft.)

Various species of beautiful *wild sheep* and *ibex*, together with the *Kyáng* and the *wild yak*, are met with in large herds on the highest plateaux between the Karakorúm and the Künlün.

The *cat* is common in Tibet; *dogs* are the companions of the Tibetan shepherds, whom they follow over passes exceeding 18,000 ft.

Some species of *bats* are seen in the Himálaya up to 9,000 ft.; and the Tibetan *hare* occurs even in heights exceeding 18,000 ft.

Migratory birds are not known to cross the Himálaya, as many birds of Europe cross the Alps. *Doves* were seen by us at very great heights in the Karakorúm and Künlün; this was the most surprising, as other birds were very rare.

The domestic *fowl* has recently been introduced with great success by Gulab Singh into Bálti, Ladák, and Núbra.

Fishes were found by us in some rivulets of Tibet exceeding 15,000 ft. In the *Alps* they cannot live beyond 7,000 ft.

Of *reptiles* we found snakes and saurians as high as 15,200 ft. In the *Alps* they go up to 6,000 ft., in the *Pyrenees* to 7,000 ft. In the *Andes*, snakes were found by Schmarda at about 11,500 ft.

For *butterflies* we found in the Himálaya 13,000 ft., in Tibet and Turkistán even 16,000 ft. as localities of permanent habitation. *Bee-*

tles probably follow the highest formation of grassy turf in the Himálaya, as well as in the Andes and the Alps. *Mosquitoes* go up to 8,500 ft.; and *peepsies* make themselves very troublesome during the rainy season as high as 13,000 ft.

The existence of *infusoria* seems as little subject to limitation by height in High Asia, as in the Andes and Alps. In a few fragments which we chipped off from the rocks of the Ibi Gamin pass (20,459 ft.) Prof. Ehrenberg of Berlin detected their presence, and found them not insignificant in quantity; he discovered twelve species new to science.

(*Notes and Queries.*)

[Received 20th December, 1865.]

Camp, near Myanoung, November 22nd, 1865.

During a visit to Calcutta a few months ago, Mr. Grote drew my attention to a sort of controversy which had been started at home, touching the habit, which fireflies were stated to exhibit occasionally, of a concurrent exhibition of their light, by vast multitudes acting in unison; a statement which appeared to have been somewhat sceptically received. Mr. Grote does not appear to have ever witnessed this phenomenon in Bengal, and questioned me if I had ever observed any confirmatory instance. Fireflies are tolerably well known, of course, to the resident in Bengal, but I had never there observed any such habit among the countless fireflies, which form such fiery-like ornaments to the shrubberies about Calcutta. In Pegu, however, I have witnessed the exhibition in question; myriads of fireflies emitting their light, and again relapsing into darkness, in the most perfect rythmic unison. I much regret, that I did not secure specimens, but the circumstances were as follows. I had halted my boat for the night, alongside a small clearing in the low lying tract of country, forming part of the Irawadi estuary (Delta), east of the Bassein river. There the water was salt, and the entire country not more than a foot, [illegible] above the flood level. Night had closed in, and my servant, who brought in the tea, asked me to step out of my tent and see the fireflies which, he said, he had never seen the like of before. On stepping out of the tent, a truly beautiful sight presented itself. In front was the broad and deep river sweeping on, νυκτὶ ἐοικὼς, with its indistinctly seen background of primæval forest on its opposite bank. Around me was the recently-formed clearing, with its two or three huts and my own camp, as the sole proof of man's occupancy, for miles and miles, but, for all the wildness and almost desolation of the scene, the bank on which I stood was a glorious spectacle, and those acquainted with the class of native servants will well understand that it must have been at once unusual and beautiful indeed to rivet the attention of a listless khitmutgar!

The bushes overhanging the water were one mass of fireflies, though, from the confined space available for them on low shrubs, the

numbers may not have been actually more than are often congregated in Bengal. The light of this great body of insects was given out as I have said, in rythmic flashes, and, for a second or two, lighted up the bushes in a beautiful manner; heightened, no doubt, by the sudden relapse into darkness which followed each flash. These are the facts of the case (and I may add, it was towards the end of the year), and the only suggestion I would throw out, to account for the unusual method of luminous emanation, is, that the close congregation of large numbers of insects, from the small space afforded them by the bushes in question, may have given rise to the synchronous emission of the flash, by the force of imitation or *sympathy*.

Mr. Montgomery, of the Survey Department here, also fully corroborates the habit of our Pegu fireflies simultaneously emitting their light, but adds, he has only remarked it under conditions similar to those described above, in low swampy ground. It still remains, therefore, to be decided if the insect is different from the ordinary one, or if, as I am inclined to think, the simultaneity is produced by sympathy and great crowding of individuals.

Whilst my pen is in my hand, I would add a few words on the address of Dr. J. E. Gray to the Zoological Section of the British Association, printed at page 75 of the Notices and Abstracts appended to the Report of the Association for 1864.

The excellent remarks on the aim and arrangement of Public Museums will, it is to be hoped, not escape the attention of those interested in our own Calcutta Museum, and the especial stress he lays on the exclusion of light from collections on spirits, is what I urgently brought to the notice of the Society but a short time since. It is not, however, to this portion of Dr. Gray's address that I would now refer, but to the statement at page 82 that, "*the natives of India and of the islands of the Malayan Archipelago have brought into a semi-domesticated state various species of wild cattle, such as the Gyal, the Gour, and the Banteng.*"

Of the first of these, the Gyal, we know that such is the case, but I should much like to know in what part of India or Malaynesia the *Gour* or the *Banteng* are "semi-domesticated," certainly, the feat has never been performed by any "*native of India*," of whose geography and powers incurably lax notions appear to be stereotyped in England,

from the ablest downwards. I would enquire, therefore, through the pages of this Journal, to what instances Dr. Gray can allude, as the fact is certainly novel to those in India. The Governor of Rangoon, at the time of the last war, I am told, had a pair of Gour sufficiently tame to be yoked in a cart, but this is quite insufficient to establish their claim to be viewed as semi-domesticated. In India, the difficulty of rearing the calves is notorious.

Again, immediately before the passage I have quoted above, Dr. Gray remarks, "In the lower and warmer region of Central and Southern Asia, *the Zebra* has been completely domesticated."

In the passage, Dr. Gray is alluding to wild species brought by man into a state of domestication, and I confess to some curiosity as to the wild stock of the domesticated Zebra. There is, I fancy, some little confusion, however, in Dr. Gray's ideas here, as, on the previous page, he tells us, "the oxen" "are never found *truly wild*."

The distinction, too, which Dr. Gray draws (loc. cit.) between the "*truly domesticated*" animals, the ox, the sheep, the horse, the camel, the dog and the cat, and the "*semi-domesticated*," as the buffalo, the goat, the pig, the rabbit, the reindeer, the yak &c., appears forced and to a great extent imaginary.

The distinction between these two classes of animals is more due to the efforts of the *Breeder* than to *mere domestication*, and I should have thought, that the highest triumphs of some of our rabbit fancies and of our breeds of pigs merited quite as much as our "sheep" to be considered as "truly domesticated," if thereby is intended an unnatural deviation from the wild stock, solely produced by the art of the Breeder.

I cannot enter at greater length on this most interesting question, but I hope that some of the readers of this Journal who have perused Dr. Gray's report, will be able to furnish some explanation of the points indicated above.

Another query I would ask is, to what *race* of *Calotes mystaceus* can Gunther refer to, when he states that "an old male measures nearly 24 inches, the tail taking 19 inches?" Now *Calotes mystaceus* is *common in Birma*, and more than a score have passed through my hands, but no specimen that I ever saw attained to even 12 inches of total length!

Are not two races or species here united, a smaller one from Birma, and a larger one from Camboja or elsewhere south?

The type in the Paris Museum, Gunther says, is "not full grown," but it was from Birma, and is probably the size of ordinary Birmese specimens.

W. Theobald, Jr.

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PART II.—PHYSICAL SCIENCE.

No. II.—1866.

Russian Geographical Operations in Asia.—Communicated by Lieut.-Col. J. T. WALKER, *R. E.**

[Received 8th March, 1866.]

TRANSLATION OF A PORTION OF THE "COMPTE RENDU DE LA SOCIÉTÉ IMPÉRIALE GÉOGRAPHIQUE DE RUSSIE" FOR 1864.

The Society has never failed to profit by every opportunity that has presented itself, for extending our geographical knowledge of the countries bordering on Central Asia; consequently, in the month of February last year, M. Severstow, a distinguished Naturalist, who was accompanying an expedition into the countries beyond the Ili and the Tchou, was charged to collect information, with a view to preparing a physico-geographical description of all the countries through which the expedition would pass.

* Of the two accompanying papers, one is a translation of a portion of the "Compte Rendu de la Société Impériale Géographique de Russie," for the year 1864, while the other is a translation from the 4th volume of the Journal of the Russian Geographical Society for 1864.

In the first the names are spelt as in the original French memoir.

The Society has just been enriched by highly interesting geographical materials, thanks to the cordial co-operation of its honorable members M. Milioutine, the Minister of War; M. Duhamal, the Governor-General of Eastern Siberia, and Admiral Boutakow.

We have been furnished with a very interesting manuscript chart prepared by the Staff Major. It represents, on a scale of 40 verstes (27 miles) to the inch, the southern portion of the Kirghiz Steppe, or, approximately speaking, the region between the Eastern shore of the sea of Aral, and the Chinese frontier, extending from 76° to 102° of longitude, and from 40° to 50° of latitude, and comprising the northern half of the district called Touran. On this map we have the result of all the geographical operations of the past few years represented for the first time. Until now they had remained isolated, and almost unknown to the scientific world. They greatly modify the general geographical aspect of this region. There are now determined a sufficient number of astronomical points to serve as a basis for an exact cartographic representation of the region above mentioned. We must observe, however, that the fixed astronomical points are as yet very irregularly distributed. They are comparatively numerous in the western part of the map, along the road from Orenburgh to the Syr-Daria, and along the lower course of that river, also along the Chinese frontier in the Eastern part of the map, but, about the middle, they are very sparsely scattered.

We now possess many orographic and hydrographic data, thanks to the military expeditions, and reconnoissances of 1864, and to the operations carried on for several years in the basin of the Syr-Daria by Admiral Boutakow. These data serve to correct the hitherto confused notions of the countries situated within and around this region. We have also received more accurate information regarding the races that people these countries, their mode of life, their migrations, the remains and traces of their ancient condition, and the possibility of their future civilization. We can here only point out the most salient geographical features of the mass of materials we have received, and of which the Society will avail itself for its future publications. The geographical position of all the region above mentioned will have to be considerably altered, more especially as to western Turkestan, and the Khanat of Khokan. For instance, Aoulièta, a town

of Khokan, ought to be shifted, on the map, half a degree towards the south, and one degree towards the east; the town of Turkestan at least a degree and a half towards the south, &c. Similar changes are equally necessary for many other points. The eastern part of this region is essentially mountainous. The principal chain of mountains is found to be a western branch of the Tian Chan; its direction is from east to west from the lake Issik Koul, down to the lower course of the Syr-Daria; these mountains were vaguely known under the general name of Karataou. They may be divided into three groups, the chain of the Kentchi-Alataou, the chain called Alexandrowskaïa, and that of Kazikourt.

The Kentchi-Alataou consists of two parallel chains, which follow the northern bank of the Issik Koul; they are separated (on the east of the Issik Koul) from the Tian Ghan by the Pass of San Tasch; their greatest height is 14,000 feet. From this range, a lower range trends in a north-western direction, separating the waters of the Ili from those of the Tchou.

The second group, the Alexandrowskaïa, or the Alataou-Kirghisnyn chain, whose summits are covered with perpetual snow, joins the first at the defile of Baoum, on the western extremity of the Issik-Koul; thence it stretches due west towards Aoulièta, separating the river Tchou from the river Talas; its greatest height is 15,000 feet. To the north of this chain, other hills, rising not higher than 5000 or 6000 feet, stretch as far as the Syr-Daria, following the direction of that river down to Djoulek, and forming, so to say, a prolongation of the Alexandrowskaïa chain. It is to these hills that the name of mount Karataou, which has been wrongly given to the whole system of mountains in this country, properly belongs.

Lastly, the third group forms the Kazikourt chain and lies to the south of the Alexandrowskaïa, from which it is separated by the basin of Talas. The Kazikourt mountains appear to be a continuation of the principal branch of the Tian Chan; winding along the southern bank of the Issik-Koul, they fill the territory of Khokan with their southern ramifications. The disposition of these chains of mountains fixes the watersheds of the basins of the Tchou and the Syr-Daria, the two principal valleys of this country, lying almost parallel to each other. The valley of the Syr-Daria trends, with many

windings, from the south-east to the north-west. The Tchou flows in the same direction. Conformably with the general disposition of the whole mountain system of this region, these great basins are much narrowed towards the east, near Issik Koul, where all the above mentioned ramifications of the Tian Chan are concentrated. It must be observed, that the predominant direction of these chains of mountains, not only in this country, but in all mountainous parts of Central Asia, is always to the north-east. We now have more accurate data concerning the course of the Tchou, especially about its various sources, also its relation to the Issik Koul, from which it does not take its source, but with which it is connected by its affluent, the little river of Koutemalda.

The central portion of the basin of the Syr-Daria has been explored in detail, and with much success, thanks to the expeditions made during many years by Admiral Boutakow, who has quite recently communicated to us the general results of his enquiries, but especially of his late explorations between Fort Perowsky, and the locality called Baildir Tougai.

It is impossible to set forth here all the accumulated data of these countries of Central Asia, but seeing the interest that they excite, we must add a few more words about their population. It consists chiefly of nomadic Kirghises, and a rather restricted number of Khokans. Their mode of life and degree of civilization correspond with those of the Kirghises who inhabit the country north of the Syr-Daria and the river Tchou.

Their chief wealth consists in cattle, horses and camels. They also cultivate their land and sow wheat, barley and tobacco.

After the military expedition of 1862, a great part of these Kirghise wanderers, from beyond the Tchou, passed into our territory.

To retain these tribes in subjection, the Khokans constructed forts, called Kourgans, in great numbers. The four chief ones were Pichpek, Merké, Aoulićta, and Souzak. Aoulićta on the Talas (between the valley of the Tchou, and the chain of mountains which trend from Issik Koul towards the west) has an important position, for it is situated on the grand commercial road from Tachkend and Turkestan, towards the fortifications of Vernoï, Kouldja and Sémipalatinsk. It is by this road that the caravans come from the southern

regions of Central Asia to go to China, as well as to Russia. On a branch of this road, which stretches towards the north-west, at a junction of the roads of Orenbourgh, Troïtsk and Ouïa, is situated the town of Turkestan which encloses within its walls a sacred edifice, the mosque built over the tomb of Azret Sultan.

Passing now to the topographical operations executed in these Kirghise steppes of Siberia, we will mention the surveys that were effected on the western borders of China, under the direction of Colonel Babkow. These operations embrace two distinct circles,—the northern parts of the Tarbagataï mountains, and the valley of the river Borokhoudzir. In the [illegible] of these circles, Captain Nifantiew of the Topographical Corps surveyed the region that is bounded on the *west* by the road which [illegible] the Khabar Assou Pass, and by the course of the river Tamyrysk; on the *south*, by the chain of the Tarbagataï; on the *east*, by the line of the Chinese posts, and on the *north*, by the Kitchkiné Tau mountains, branches of the Manak, and of the Tarbagataï. This region includes an area of 5,270 square verstes.

In the country beyond the river Tchou, the topographers who formed part of the detachment with the expedition, surveyed the following localities. 1st, From the post of Kastek, by the pass of the same name, to the mouths of the little Kebin, and thence re-ascending the river Tchou, to the mouths of the great Kebin, then 40 verstes of the lower course of this last river. Then again, from the mouths of the little Kebin, along the river Tchou, to the ford of Tchoumitch. All these surveys have been mapped on a scale of 250 sagènes (or 1750 feet) to the inch. 2nd, From the river Talas, crossing mount Kara Boura, to the river Tchotkala (Tchirtchik). 3rd, The marching roads along the valley of the Arys, and those from Tchemkent to Aoulièta, also from Tcholak Kourgen to Aoulièta, have been drawn on the scale of 5 verstes to the inch. 4thly, Plans of the forts of Tokmak, Merke and Aoulièta have been drawn out, on a scale of 250 sagènes to the inch.

We have received from M. Bésac, the Aide-de-camp General, a map of the topographical operations, executed and projected in the country of Orenbourg, from the year 1861 to 1865, with a Memoir.

The total survey is 17,687 square verstes done in detail, and 3,928 in half detail; 168,178 reconnoitered, and 2[illegible],100 triangulated. During

a period of four years, the total amount of survey operations is 212,019 square verstes.

These surveys embrace the following localities; 1st, the two banks of the river Yany Daria; 2ndly, the left bank of the Syr-Daria, from the fort Perowsky to Yany Kourgan, a destroyed fortress belonging to the Khokans, and thence to the place called Baildyr Tougai; 4thly, the northern and southern slopes of the Karataou chain; 5thly, the mouths of the river Emba, and the Bay of the Caspian Sea at the mouth of this river. Among the newly made maps, the principal are, the map of the country of Orenbourg, on a scale of 50 verstes to the inch; a new map of Central Asia and the country of Orenbourg, 200 verstes to the inch; and 24 sheets of a special map of this country, on a scale of 10 verstes.

The Society is continuing the publication and translation of the 7th Vol. of Ritter's Geography of eastern Touran. M. Grigoriew is compiling and making the necessary additions for completing this work, and is carrying on his labours with such activity, that we may look for the first part of his work during 1865.

However short our account may seem of all the important geographical operations in Asia, it is nevertheless sufficient to show that they embrace a large extent of this part of the world, and give rise to questions of both local and general interest. The several expeditions and explorations, in which our Society has taken part, form an uninterrupted chain which extends along our Asiatic frontier, from the Pacific Ocean to the Caspian Sea; from the valley of the Onssouri and the peninsula of Corea to the Oust Ourt, Turkestan and Khorassan. With the exception of some conflicts with the Khokans, our enterprises along the frontier have been of a strictly peaceful, scientific or commercial character, and our commerce has been considerably developed. These friendly relations are strengthened by an event of great importance which marks the past year, viz., the final pacification of the Caucasus, the point of our Asiatic frontier that is nearest to Europe.

We must now pass on to the hydrographic operations executed in the Caspian Sea, which have always greatly interested our Society.

Last year, our honorable member, M. Ivachinzew, who is the chief of these operations, read out to the Society, at a public meeting,

a remarkable Memoir on the question of the variations of the level of the Caspian Sea. The same persons who carried on these hydrographic operations in 1863, continued them in 1864. At the beginning of the year, the Surveyors were concentrated in the southern parts of the sea, between Bakow and Lenkoran, a region bristling with rocks and volcanic islands. From January up to May, they explored and fixed the positions of several isolated volcanic reefs, which, as they undergo frequent change from the action of subterranean fires, often become very dangerous to navigators, and consequently require frequent soundings and examinations. The materials thus collected, regarding this volcanic region, may some day serve as valuable contributions towards the composition of a complete monograph of this extremity of the Caucasus.

In the month of May, the hydrographic expedition crossed over to the eastern shore, between Tub-Karagane and the gulf of Karabougaz. During the subsequent five months, an extent of more than 200 versts was surveyed and sounded, chiefly between the isthmus of Mangushlak and the gulf of Krasnovodsk, under the command of Lieut. Phillippow and Lieut. Dournew of the Pilot Corps. Soundings were also taken by Lieut. Onlsky, in the middle of the Caspian Sea, with an apparatus specially constructed for bringing up specimens of the different strata and the fossil and animal life they contain.

In June and July Captain Phillipow's party explored the entrance to the gulf of Karabougaz. At the same time, Lieut. Staritzki made some interesting observations on the speed of an uninterrupted current of water directing its course through the Gulf towards the Sea.

The object of these observations was to determine the quantity of water which enters the gulf of Karabougaz, and the quantity of saline particles which is brought there. The exploration of the mouth of the Karabougaz will serve as a basis for a complete study of this interesting gulf. It is the opinion of M. Baer, the Academician, that this study will lead to a solution of the question regarding the variations of saltness in the Caspian Sea. No one will doubt the economical importance of this question, which is intimately connected with the future fisheries of the Caspian. The results of the hydrographic operations are developing gradually, and are partly published. In addition to the maps and plans of different parts of this sea

that have already appeared, a report of the astronomical and magnetic operations is being actually printed.

In speaking of the favourable results that have been obtained by the activity of our Society, we have not had the least intention to attribute it to one more than to another of its functionaries. Among us individuals change and succeed each other so rapidly, that we cannot say the progress and strength of our institutions rest with them. It is the general conditions of our activity, and the liberal spirit by which they are pervaded, that unite and attract a constant succession of individual labourers. Besides the actual operations of the Society during the past 20 years, a vast amount of labour has been undertaken voluntarily, and without remuneration, by members of the Society, as well as by strangers, in private and in official capacities. Such are the public lectures, which many of our colleagues have delivered without any remuneration, and which have attracted large audiences to our reception Halls. We need not mention, in this place, the number of persons who, during the past and many preceding years, have disinterestedly brought accounts of their labours to the Society. It is doubtless through the liberal spirit which unites and animates all our members and constitutes our strength, that this great amount of work has been accomplished. Religiously to preserve this spirit should be our first duty, and our most sacred obligation.

TRANSLATION OF A PORTION OF THE JOURNAL OF THE RUSSIAN GEOGRAPHICAL SOCIETY, VOL. IV. 1864.

At a meeting of the Society on the 2nd and 14th December, 1864, Rear Admiral Boutakof read a paper on the subject of his last exploration on the Syr-Daria, between Fort Perovski and Baildyr-Tugai (a locality in the Tashkened territory). In 1863 Rear Admiral Boutakof steamed 538 miles up the Syr-Daria, from Fort Perovski. This officer has now explored, determined astronomically, and mapped 1003 miles of that river's course, beginning from its mouth. He expresses his conviction that the river is navigable still higher up, although, for want of fuel, he could not this time proceed further. The general ascending direction of the river from Fort Perovski is towards the south-east as far as the parallel of 43° of latitude; thence it is directly to the south. Throughout the whole distance of 538 miles,

from Baildyr-Tugai to fort Perovski, the river flows in a magnificent mass of water between depressed banks of an argilo-salinous and sandy character, for the most part inundated at high water; there was nowhere either a *break* in the banks, or a stone, for the observation of the geologist. The swamps, after the subsiding of the waters, afford excellent pasturage whereon numerous Aouls of Kirghizes settle for the winter. In the midst of these meadow patches there occur here and there like *islands*, sand hillocks differing in height, from 30 to 40 feet, and overgrown with tamarisk, &c. The dry argilo-salinous banks rise from 7 to 10 feet above the level of high water, and are covered with tamarisk bushes with thorn (growing high and thick), and in some places with the "Turanga" and "Djida." Nearer to our own possessions, large tracts are covered with the "Saxaul." Vegetation is most abundant on the islands, many of which are two miles long. Upon these the "Djida" grows 4 fathoms high, and the thickness of the "Turanga" reaches 10 inches in diameter. Almost all the islands are covered with a dense, almost impassable brushwood, where the Kirghizes declare there are tigers, drawn thither in pursuit of wild boars. The breadth of the river is from 150 to 400 fathoms; the depth from 3 to 5 and 6 fathoms; the current ran at a speed of 7 verstes ($4\frac{3}{8}$ miles) an hour, the average being from $4\frac{1}{2}$ to 6 verstes (3 or 4 miles); the water was of a dirty yellow colour, but when allowed to settle, was very soft and agreeable to the taste. Admiral Boutakof found no evidences of a settled life throughout the whole of the river's course. Patches of soil, cultivated by the poorest of the Kirghizes, occurred at extremely rare intervals; and these were irrigated by water from canals replenished by hand from the river. The Kirghizes generally sow millet, sometimes barley, water-melons, and musk melons in their fields. There are two principal reasons for the absence of population along the banks of this river: firstly, the absolute want of any guarantee for personal security and for the protection of property and labour in the face of perpetual disturbances in Turkestan, Tashkend and Khokan; and secondly, the greater advantage of settling along the rivulets running from the Kara-tau mountains; these afford better facilities for irrigation than the Syr-Daria, which inundates and washes away its banks, and consequently demands an enormous amount of labour for the construction and maintenance of the necessary

embankments. This splendid water-course, navigable to Fort Djulek (the extreme eastern fort on the Syr-Daria line of frontier) which would be a picturesque feature in any other place, is surrounded by a bleak desert, and is now only occasionally enlivened by migrating hordes of Kirghizes, whereas the remains of the ancient towns of Otrar (where Tamerlane died) and of Tunent (destroyed by Tamerlane) which were seen by Admiral Boutakof, and the traces of a once extensive system of irrigation surrounding the ruins of these places, and occurring also in many other parts, are evidences of a once numerous, industrious, and settled population. The shores of the Syr-Daria, above and below Fort Djulek, present a striking contrast. Above Djulek is a howling desert; below, and particularly commencing from Fort Perovski, all is life and activity along the banks. Corn fields and melon fields occur continually, with populous Aouls of well-appointed tents, animated by the presence of herds of cattle. The Kirghizes assemble by hundreds to dig fresh canals for irrigation. Vast tracts of swamp and reeds, which were impassable in 1848, have been protected by embankments against the overflowing of the river and converted into corn fields which now engage the labour of thousands: and all this is exclusive of the localities within 50 or 100 miles of our Forts, especially the neighbourhood of Fort No. 1, where, in the excellent gardens surrounding the Cossack settlements, grapes are grown, and cotton has been sown not without success. Kirghizes and sometimes Karakalpaks constantly migrate from the Khivan territories to the lands under Russian protection, so that they at length find themselves cramped for space. The Khivan and Khokandian forts which stood on the grounds now occupied by the Russians, were the centres of the most merciless and barbarous persecution. The Russian forts, on the other hand, are now guarantees for security, and serve to promote traffic and the general well-being of the natives.

The advent of the Russians did certainly produce a most beneficial crisis in the condition of the Kirghizes of the Syr-Daria.

Within 8 miles of Baildyr-Tugai, Admiral Boutakof's highest limit of ascent, there are the ruins of a small Khokandian fort, Bair-Kurgan, demolished, according to Kirghiz tradition, about 100 years ago. At a distance of 40 miles higher up, on the left bank, are the remains of the town of Tunkat (rased by Tamerlane). This place is

now called Tskilleh, after a saint of that name whose tomb is close by.

There are more Kirghizes grouped about Tunkat than over the entire extent of country traversed by Admiral Boutakof; and to all appearances these were opulent, being possessed of immense studs of horses and camels, and of droves of horned cattle and sheep. Above that place, *i. e.* nearer to Tashkend, he fell in with two rich migrating Aouls, one encamped by the side of the river.

[illegible] the Syr towards the river Arys, an open space becomes [illegible] the zone of reeds, at 4 or 5 miles from the river, [illegible] with clayey sand mounds that are covered with a scanty [illegible] brushwood. Some of these mounds are evidently artificial. On a sort of [illegible]eland, within 7 miles in a direct line, and almost due north from the mouth of the Arys, are seen the remains of what may have been the citadel of the ancient town of Otrar.

From the mouth of the Arys to the little fort of Utch-Kayuk, abandoned two or three years ago by the Khokandians, and built on a marshy soil, the distance is $84\frac{2}{3}$ miles. The character of the river here is still the same, the same bends and islands, the same depressed banks, mostly flooded, the same vegetation along the shores and on the islands. The forts Utch-Kayuk, Din-Kurgaon, Yang-Kurgaon, Djulek and Ak[illegible]ichet, (now fort Perovski), Kumysh-Kurgaon, Chin-Kurgaon, and Kush-Kurgaon (the three latter below fort Perovski,) were the rallying points of the Khokandians, for the subjugation of the Kirghizes, and the centres for the collection of tribute and the general merciless oppression of that people. Yang-Kurgaon, raised by the Khokandians in 1857, and Din-Kurgaon, erected in 1860, were the last points of Khokandian resistance against the spread of Russian influence; here also the last attempts were made by the Khokandians to retain under their yoke the Kirghizes who passed over in masses to place themselves under our protection. Yang-Kurgaon fell in 1860 to the Russian arms; Din-Kurgaon in 1861. Utch-Kayuk is the nearest place to the town of Turkestan; it was visible from the river, being situated in a hollow of the foreland of the Kara-tau mountains.

The only affluents of the Syr seen by Admiral Boutakof are the rivers Arys and Sauran-Su, falling into the Syr on its right bank

opposite the An-djar settlement, $8\frac{3}{4}$ miles below Utch-Kayuk; other rivers emerge from the Kara-tau mountains, namely the Tuitchke whereon Turkestan is situated, the Karaichik, 6 miles lower down, and the Sart-Su; these do not reach the Syr-Daria, but lose themselves in the marshes formed by its inundations.

Below Utch-Kayuk the country at first is inundated, and large wet meadows, or more correctly morasses, extend along both banks of the river, but further on, especially on the right bank, land is firmer.

Nearer Djulek the trees on the banks are higher and thicker than along the whole remaining portion of the river's course. In the immediate vicinity of this Fort, there is a very pretty avenue of tall and thick willows, looked upon by the Kirghizes as a sanctuary (Aulie).

Between Djulek and fort Perovski the banks are generally firm and salinous, but not elevated. The "Saxaul" is very abundant at the Kasakty-Syra, Chagouen and Kushsant settlements, and opposite Burinbai. The islands and the continuing banks are covered with the "djida," "turanga," and occasionally with willows, and the margins are usually clothed with high dense thorn and reeds. Sandy hillocks occur beyond the saline plains, and in many places Kirghiz tombs and the remains of long neglected irrigating canals are met with.

From the 14th July, when the expedition was proceeding upwards and was within 67 miles of Utch-Kayuk, the waters were visibly subsiding, and daily decreased, though the heat continued to be great, up to 30° R. in the shade. This was doubtless owing to the exhaustion of the supply of snow which accumulates on the mountains, where the river takes its rise. At fort Perovski the water began to fall only from the 30th of July, and at Fort No. 2 from the 5th of of August (N. S).

Notwithstanding that Admiral Boutakof's expedition had to halt at night close to marshy lands, there were no cases of ague, and so far as he was able to judge, the climate on the Syr-Daria, in its upper as in its lower course, was healthy. His astronomical observations disclose great inaccuracies in this portion of the map of Central Asia which is founded on the determinations by the Persian Missionaries of the 18th century.

The communication made by Admiral Boutakof, who has long distinguished himself by many years of labour in this region, was listened to with great attention, and received with great enthusiasm. We could not give here more than the mere outlines of the paper, which he is now preparing for the press, and which will appear with a map of the Syr-Daria. There is no doubt that Admiral Boutakof's work will be an agreeable acquisition for modern geographers.

Kashmir, the Western Himalaya and the Afghan Mountains, a geological paper by Albert M. Verchère, *Esq., Bengal Medical Service; with a note on the fossils by* M. Edouard de Vernueil, *Membre de l'Académie des Sciences, Paris.*

[Received 11th March, 1865.]

Introduction.

Of all the great chains of mountains on our Planet, the most stupendous is, singularly enough, the least known to the geologist. Many fossils have indeed been collected by travellers in the Himalaya, and a few have been determined; but satisfactory sections and careful descriptions are very scarce, and it has not yet been found practicable to attempt any general grouping and arrangement of the rocks and beds of these mountains. Jacquemont's researches in Kashmir have not, I believe, much advanced our knowledge of the geology of the country.[1] Mr. Vigne was no geologist, and his observations were not sufficiently accurate for scientific purposes; the same remarks apply, more or less, to most visitors who have published what they saw amongst the higher ranges. Captain R. Strachey, R. E. in his papers on the geology of the Himalaya, between the Sutlej and the Kali rivers, gives a map and two sections which are of great interest; they do not, however, refer to the portion of the Himalaya which I have studied, and they leave yet a vast field for more precise investigations. I regret not having been able to consult Capt. H. Strachey's paper

on the physical geography of Little Thibet, and Dr. Thompson's work on the same country; neither have I had the benefit of Mr. Medlicott's Memoir on the southern ranges of the Himalaya, between the rivers Ganges and Ravee, nor any of the other papers which have been written on the Sub-Himalayan ranges.

Of the geology of Kashmir especially, I believe that very little indeed has ever been published, and that not even a geological horizon has been discovered. Mr. Vigne and Dr. A. Fleming reported having found in Kashmir "Nummulitic limestone disturbed and calcined by greenstone;" this was an error of some importance, as it gave a false datum from which to fix the age and relations of the Asiatic rocks. Dr. A. Fleming, in his report on the Geological Structure of the Salt Range, published in Selections from Public Correspondence of the Punjab Administration, Vol. II., 1855, has the following passage:—

"From Kashmir, too, Mr. Vigne obtained limestone *containing* "*nummulites*. This we have seen in situ on the side of a mountain "at the upper end of the Manus Bal lake, where it is much disturbed "and calcined by greenstone. It probably forms the summit of "many of the higher hills on the northern side of the Kashmir valley, "a district fraught with interest to the geologist and hitherto quite "unexplored."

When I arrived at Srinuggur, Mr. Drew, who had visited Manus Bal, showed me some specimens of the limestone of that locality, and expressed a doubt about the markings seen on the rock being nummulites; he considered their markings to be the result of crystallisation and weathering; but I could not accept this view, and regarded the little marks as indications of organisms. I was unwilling to believe that Dr. A. Fleming could possibly have made a mistake about nummulites, after the experience he had had of their appearances in the Salt Range and the Bunnoo district; and, as Mr. Drew acknowledged that he was not familiar with the nummulitic formation, and the specimens shown me were very bad and ill-preserved, indeed merely faint marks in a coarse limestone, I temporarily admitted Dr. Fleming's view. I was, at the time, unable to visit Manus Bal, or to absent myself a single day from Srinuggur, owing to great sickness amongst the visitors; but I had the good luck to discover a bed of fossiliferous limestone and shales within a few miles of

ggur. These beds were near enough to enable me to ride to n a few hours, and I soon found that they contained the same s as were known to occur in the dressed blocks of limestone tained from Buddhist ruins) of which the river-walls and river-tairs of Srinuggur are built, and I also found the remains of one of the antique quarries near my favourite locality. Ultimately, the rocks reported to be nummulitic were found to be carboniferous, and the so-called nummulites, rings of Encrinite-stems; the volcanic rocks were also ascertained to be palæozoic in age and not intrusive. (See para. 53, where the Manus Bal limestone is described in detail.)

To my friend, Captain Godwin-Austen of the great Trigonometrical Surv[illegible], I owe my best thanks. I had wished that this paper might have been written in conjunction with that gentleman, and it would have been well for the reader, if it had been so; but as Capt. Austen went to Bhotan and I to Bunnoo, such a hope had to be abandoned.

In drawing up the map, I have used for its topography whatever materials I could procure, but I have not had the benefit of many recent discoveries and surveys. The compilation was made from works of very different values. Kashmir, Hazara and the British Trans-Indus districts are, I believe, tolerably accurate; the Salt Range is less so; whilst the Korakoram Chain, the Hindoo Koosh, Kaffiristan, Chitral, Kabul, etc. only lay claim to give a general outline and direction of the ranges, valleys and rivers. About the Hindoo Koosh, I much regret not having been able to avail myself of the maps of Kaffirstan lately published in the office of the Surveyor General of India.

It may appear, on seeing how little of the Afghan mountains is geologically coloured, that there was no necessity of extending the map as far as the Hindoo Koosh, but I hope that the advisability of having sketched in this chain will be acknowledged, after reading the fourth chapter of this memoir.

The geology of the map is partly from my own observations and partly from information obtained from friends and travellers; I have endeavoured to enter nothing which did not appear pretty certain. I have been able to sift satisfactorily a good deal of the information obtained, by means of specimens which were either shown or given to me.

I have added a few sketches of fossils which, I hope, will be sufficiently well done to enable the organisms to be easily recog The forms sketched are those which have appeared to me characteristic of the beds met with.

The two parts of which this paper consists are nearly separate memoirs. In the first, chapters 1 and 2, a description of the mountains of Kashmir is given in some detail. In the second theoretical views are discussed; but as Kashmir is merely a small portion of the Himalaya, it was found impossible to understand many fossils without taking such general views as referred to the whole mass of the chain; and, further, as the Himalayan chain is supposed by me to be intimately connected with the Afghan mountains, these mountains had also to be considered. In order to be intelligible, it became therefore necessary to write a cursory survey of the Afghan-Himalayan regions; this is done in the 3rd chapter. It is of course very superficial and incomplete; yet I hope that it may not be without some interest. On the data furnished by the first three chapters, the hypotheses advanced in the fourth are based.

I have not entered into many details on the eocene and miocene formations (except incidentally), as it would have lengthened to undue proportion this already too long paper; these formations deserve to be studied by themselves. The same remarks apply to the Jurassic and Saliferian rocks. In chapter 3, however, a few words will be found on the nature and relations of these beds. The principal object of this paper, in its descriptive portion at least, has been a study of the older rocks, viz. Silurian and carboniferous, together with the volcanic and metamorphic rocks.

I trust that the many imperfections and errors which cannot fail to occur in a memoir of this nature, will not be too severely criticised. My excuse is that this paper was prepared at one of the out-posts of the Punjab Frontier, where I had not the usual assistance of a Museum and a Library. Such as it is, I hope that it may not be without interest to some of the members of the Society who are fond of geological researches.

Chapter I.—*Felstone and Porphyry.*

The mountains South-West, South and West of Cashmir.

Baramoola is a small city, well known to the tourist in Cashmir and to the pedestrian coming from Murree; it is a haven of rest, for here boats may be hired to take him to Srinagar, the very heart of the valley. From the heights above the town the traveller gets his first view of the celebrated vale, and in the spring of the year it is difficult to imagine any more beautiful landscape than it affords. It [illegible] disappointment or enthusiasm commences, according to the traveller's disposition: for to many Cashmir is an overrated land, whilst to the scientific man, to the artist or the antiquarian it is a mine of [illegible] wealth.

The town is [illegible] at the foot of a hill which has a direction west to east, and [illegible] two to give a passage to the river Jheelum. It is approximatively in N. Latitude 31° 13′ and E. Longitude 74° 23′. Its southern view is limited by a small hill, the Atala, and on the west a mountain of 8,467 feet, the Shumalarum, also confines the horizon. Thus, placed in a cradle of hills, on the banks of the Vedusta, it has a picturesque aspect, a damp cold climate, a celebrity for rain and storms, and a great name for earthquakes.

The hills at the foot of which Baramoola is built are the extreme [illegible] of the great Kaj Nag Range, which, proceeding from E. to W. for 20 miles, bifurcates into a huge north-westerly branch (which I shall leave alone for the present, as I know nothing about it), and a southern branch which, proceeding S. S. W., divides again, one arm going west towards Mozofferabad, whilst the other, the Kiren or Kirna range, crosses the river at Ori (or rather the river crosses it) to be continued with the Kandi range in the direction of the Pir Punjal chain.

2. The whole range of hills near Baramoola dips S. by a few degrees E., and in describing the rocks from S. E. to N. W., we shall therefore proceed from the more superficial to the deepest.

On the left bank of the river, we find a clinkstone or felstone of a dark grey colour and slaty texture, and an appearance as if it had been drawn while in a viscid state. It has a sandy feel to the hand; it breaks into long narrow flags having a close resemblance to pieces of

pine wood which have been cut and prepared for burning, and have weathered grey by exposure. It has a well marked stratification, which is cut obliquely to its plane by a slaty cleavage which forms with it an angle of about 113°. It has also a series of parallel joints, about 2 or 3 feet apart, and which cut the stratification at right angles but form with the cleavage an angle of 67°. The joints are usually lined by a coating of quartzite, and both quartzite and felstone are occasionally stained by iron.

The felstone appears to be entirely composed of elongated and flattened granules of felspar or albite, which has a sub-vitreous lus when closely examined; it has a dark bluish-grey colour, but weath ash-grey and even dirty white and some pieces which are very assume somewhat the silky appearance of amiánthus. The colo the paste appears to be due to augite; this, by decomposition, lets fr a certain quantity of iron which causes the surfaces of cleavage and stratification to be covered by a powdery, rusty incrustation. Sparingly disseminated in the mass are seen minute fusiform nodules of dark shining augite; these nodules are never crystalline. Some strata are extremely thin-bedded, like sheets of paper, and fall to pieces very easily, ultimately decomposing into a brownish earth. Other strata present an alternation of very thin laminæ of nearly white and dull albite, and a dark grey shining mixture of felspar and augite, so t when the rock is broken vertically, it appears striped white and g

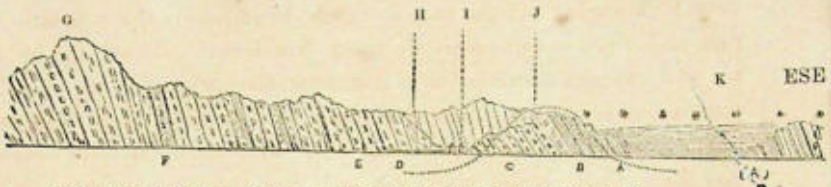
3. The above beds dip S. and a few degrees E., with an angle of 60° near the Atala hill, but the angle diminishes as we go towards the N. W., being no more than 45°, near the river at Baramoola. For two miles along the left bank of the Jheelum, this felstone was observed with, here and there, a band of amygdaloid interbedded. But I made too superficial an examination of the Atala to enter here into detail. Crossing the river to the right bank, we find that felstone also forms the hills which overhang Baramoola. Just over the city, it is similar to that of Atala, but as we proceed towards the N. W. and therefore see deeper beds, the character of the beds changes considerably. There is a beginning of separation of the minerals of the felstone, the dull white albite forming by itself innumerable penicilli having the shape of extremely elongated spindles which are imbedded in the grey felspathic paste. The rock has still

however, a well marked stratification which is rendered very conspicuous by the white penicilli being parallel to it. There are also cleavage and joints as before, but a great deal more quartz in the latter.

The next beds, lower down, are much lighter in colour and more compact in structure. The paste is ash-grey, felspathic and dull looking, but instead of the penicilli noted before, we have here regular almond-shaped masses of white saccharine albite, usually about one inch long and two-tenths of an inch across, but often made larger and with [illegible] albite in the state of a fine incoherent sand. These rocks, like the one with penicilli, but bluer in tint and interbedded with amygdaloidal greenstone and felspathic ash, containing oval nodules of albite extend to the west, as far as the Shumalarum which they appear to entirely compose.

The angle of dip, on the right bank of the river, is again very great, being about 60°, and the beds are a good deal faulted. One fault has a direction N. E.—S. W. and the river runs in it at Baramoola. It is continued in a ravine on the right bank of the river, about a mile below the town. The angle of dip is not the same on both sides of the fault, and there has been a slight down-throw on the south. The Jheelum, while in the fault, is narrow but navigable; at the ravine, it turns suddenly to the south, quitting the fault and passing over a band of rock which stretches from W. to E., thus forming a small rapid. From this place to Ori, where the Jheelum enters the Sub-Himalayan tertiary sandstones, the Vedusta follows its course across the much up-tilted beds of felstone, changing its character of a winding, placid, broad and shallow river into that of a boiling, rapid, deep and narrow torrent, and forming, as it were, a succession of small falls and cascades all the way down. The thickness of the felstone near Baramoola is enormous. I can form but a mere appreciation, not having followed the beds sufficiently far to the west; but I am certain that it is much above 5,000 feet.

4. The following section (marked I. on the map) is merely a diagram to enable the reader to understand the position of the beds. It is oblique and not at right angle to the dip.



A. Dark grey felstone, slaty, stratified and with a cleavage and joints. Fusiform, elongated, minute granules of augite. Many thin-bedded strata, ... about 400 feet.

B. Felstone like A, interbedded with strata of felspathic ash containing nodules of augite, ... 30 „

C. Rough trachytic clinkstone or felstone, breaking in elongated slabs terminated by oblique, clean joints generally lined with quartzite, ... 500 „

D. Bluish grey felspathic paste with innumerable penicilli of white powdery albite, ... 500 „

E. Pale grey felspathic paste with almond-shaped masses of albite, either powdery or compact and saccharine. Beds of ash interstratified, ... 400 „

F. A succession of beds similar to D. and E. interstratified with bands of amygdaloid and of felspathose ash containing oval nodules of augite. This rock appears to form the whole of the Shumalarum, and was seen, as far as I could see, towards the west.

G. Shumalurum, 8467 ft.

H. River Jheelum or Vedusta.

I. Baramoola.

J. The dotted line is the Atala.

K. Lacustrine Clay and Boulders.

5. The rocks, which I have endeavoured to describe, are continued along both banks of the Jheelum as far as the fort of Ori, about twenty-five miles south of Baramoola. Following them on the left bank, (Murree Road) we first cross the Atala, and can observe, near the village of Mihrur, very fine narrow slabs of felstone, twelve feet long, used as rafters to support a roof over a holy well or spring. Proceeding S. W. we cross a small marshy valley, and near the village of Ghaut Mullah we meet a succession of spurs directed towards the N. W., and which are the extreme north-western extension of the Pir Punjal Chain. These spurs are also made up completely of felspathic flagstone, identical to that which I have described above, but the dip and strike of the beds are different from that of the beds near Baramoola: the dip is W. with a

very high angle; but the rock is much decomposed, the vegetation rich, and little is seen until we reach Nausherra. Thence, the beds are well exposed, forming lofty cliffs over the path, of a grand and picturesque aspect; they are often quite vertical and seldom form an angle with the horizon of less than 85°. But the same force which has made those strata stand on end, has also broken them and wheeled round enormous sections of the beds. Even a superficial examination shows that portions of the hills, some thousands of yards long, caught as it were between two faults and thus set free in their movements, have been made to rotate on themselves, the strike changing its direction from a few to ninety degrees. Thus, near Buniar, the strike is N.—S.; a little further south it is W.—E.; four miles before we get to Ori it is W. 15° N.—E. 15° S. and the dip is southern and only 45°. At Ori the strike is again about N. W.—S. E. and the dip northern and 80°. But it is often difficult to see the stratification in these laminated rocks, as cleavages and joints are generally better marked than the stratification. The general strike, however, is from N. a few degrees W., to S. a few degrees E., and the dip is northern.

Between Nausherra and Ori, the felstone presents several appearances. The bulk of the hills is made up of a pale grey and extremely laminated felstone, having much the appearance of slate, being crossed by numerous veins of opaque quartz. These veins are sometimes so thick that they form bands of quartzite. Near Ori, some beds are seen having the appearance of metamorphic chloritic slates. Others are made up of very thin-bedded felstone of an earthy appearance, and are wonderfully wavy and crimpled, whilst the beds above and below them are but gently undulated. It appears probable that these thin-bedded layers were deposited by water during periods of volcanic inaction, and that when the covering felstone contracted in cooling, the aqueous deposit was gathered in zigzag folds. They ought, therefore, to be considered either as an ash arranged by water, or as a laterite derived from the surface of decomposing felstone, and having the same composition as its parent rock.

6. About half way between Buniar and Ori, is a small Buddhist ruin concealed by brambles and wild roses, and built of a dark grey rough trachy-dolerite. This rock was obtained from a thick band

which is well seen close to the ruin. It is divided into somewhat prismatic blocks by joints; it is generally compact, but sometimes scoriaceous, and it appears to have had some influence on the cooling of the felstone above and below it, this being much more compact near the trachy-dolerite, and becoming gradually more laminated and slaty as we get further off. I cannot say whether the trachy-dolerite is intrusive, or interbedded; but it is perfectly conformable to the felstone.

7. At Ori, we find a small valley sunk between high mountains and crossed by a tolerably big ravine and by a torrent flowing from the S. E. to N. W. This torrent divides the hills on the S. W. which are miocene sandstones and shales, from the mountains on the E. and N. E. which are volcanic. The Jheelum describes a semicircle round the extremity of the Kiren range, the beds of which cross the river to be continued with those of the Kandi or Kanda Range, which are the link between the Kirna Range and the Pir Punjal Chain. The river runs for a little while between the volcanic rocks of the Kirna and the miocene sandstones, but it very soon leaves this bed, and cutting a canal through the tertiary sandstones and clays, bids farewell for ever to rocks of a volcanic origin.

8. I will not enter into a description of the tertiaries in this paper, though we shall have to see much of them incidentally, but as it has been said and written by many persons that the miocene sandstones and clays dip under the volcanic felstone (generally described as metamorphic schists or quartzose mica-slate), I must correct the error, while we are at Ori. Both the volcanic and miocene beds are nearly vertical, but not quite, and dip northernly, and there is therefore an appearance of the miocene dipping under the felstone. On examining the high bank of the Jheelum, however, not far from the fort, I could see the miocene beds bend backwards, thus showing that they

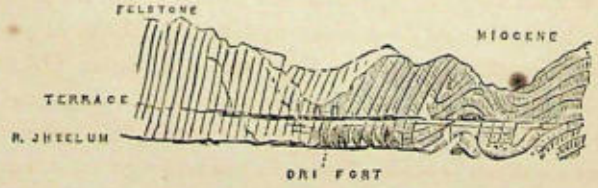


fig. 1.

are superior to the volcanic rocks, but have been dressed up against them by a lateral pressure. The diagram (fig. 1.) shows well the folded

disposition of the miocene and the bending backwards of the beds in contact with the felstone. These beds are partially concealed by a very high river-terrace of conglomerate, but this has been washed off in many places and the rocks are left uncovered.

There is, in the Sub-Himalaya, sufficient evidence of miocene sandstone having been mostly raised by a lateral movement; there appears to have been a reflection, a *refoulement* of the miocene beds towards the S. and the W., as if the enormous masses of the central chains had surged up through a chasm of the earth's crust and forced the sandstone aside, instead of lifting it up. And thus the volcanic rock of my diagram would have pressed against the miocene, and curled up and bent back the yielding plastic beds of sandstone and clay.

9. Returning now to Buniar, half way between Ori and Baramoola, we cannot fail to admire the remains of a Buddhist temple of considerable size and great beauty. It is built of a white porphyry, and of this porphyry we must now speak in detail.

The stones of the temple were obtained from huge blocks which are strewed on the river terraces on both sides of the Jheelum, in the neighbourhood of Buniar. Some of these blocks are of enormous size: one I noticed is about 20 feet above ground and nearly as thick and broad as it is high. No water-power could have moved such enormous masses, and they have evidently been brought down by glaciers. I have been told that Mr. Vigne supposed them to have been brought by icebergs floating on a huge Kashmir lake, but we need not go so far for their origin, as the Kaj Nag peaks, seven miles to the north, and the Sank or Sallar, eight miles to the south, are mostly composed of this porphyry. A glance at the map will easily demonstrate how glaciers, filling up the narrow valleys of the Harpeykai and the Khar Khol, brought down to the river-terraces blocks of porphyry detached from the summits of Kaj Nag and Sallar (13,446 ft. and 12,517 ft.). I had not time to visit these valleys and look for ancient moraines, but some blocks show striæ and scratches such as glaciers alone can produce. These glaciers no longer exist, but their disappearance is only the result of a change of climate of the Himalaya, which is abundantly proved to have taken place at a very late

geological epoch by the river-terraces, raised lacustrine deposits and other indications of diminished rain-fall.*

10. Examining the porphyry of the Kaj Nag mountains in hand specimens, we find it composed of the following minerals:—

a.—Paste of granular, white, opaque albite, fusing before the blowpipe without much difficulty or = 4½ of Von Kobell's scale of fusibility.

b.—Small transparent crystals of quartz-like rock-crystals.

c.—Large crystals of glassy shining albite, with a vitreous lustre and a lamellar cleavage. Sections of the crystals are sometimes as much as five inches long.

d.—Plates of white mica; sometimes grey.

e.—Dark augite (or Hornblende?) with an Iodine lustre and a dark greenish grey colour. It fuses = 4, without swelling or boiling.

f.—Garnets; red, brittle and cracked.

g.—Grains of magnetic iron ore; metallic lustre; black.

h.—Gold; in invisible scales.

The paste of granular albite is hardly to be seen in the most crystalline specimens of the porphyry; but it increases very much as the several crystals are less abundant and less well defined, forming rocks in which we see, beside it, only a few specks of dark augite and spangles of white mica; even these occasionally disappear, and we have a rock having a saccharine appearance, and entirely composed of minute shining grains of albite. Specimens are found in all the stages of transition, from the highly crystallized porphyry to the saccharine rock.

The quartz is not very abundant in the most perfect porphyry, but it increases in some specimens, rows of small rock crystals appear-

* The diminished rain-fall is the result of the filling up with diluvial deposits of the great troughs situated between the Himalaya, the Afghan mountains and the mountains of Central India once covered by the sea, and now represented by the valleys of the Ganges and Indus. This filling up of the sea-communication once existing between the Bay of Bengal and the Arabian Sea, converted the Himalaya's climate, then insular, or at least littoral, to an eminently continental one. The tremendous rain-fall at Cherra-Poonjee (50½ feet during S. W. Monsoons) enables us to form an idea of what the snow-fall must have been on the high summits of the Himalaya in the days when the Bay of Bengal extended to the foot of the Siwalik hills, and the Arabian Sea bathed the Salt Range.

ing in the map. It becomes also amorphous and forms bands of considerable thickness of opaque quartzite, crossing the rocks in the same manner as similar bands often cross beds of shales or other stratified rocks.

The mica is also scarce in some specimens, small spangles being occasionally imbedded in the substance of the large crystals of albite (c) or sparingly disseminated in the paste. But in other portions of the porphyry it becomes very abundant, forming tufts of plates which resist decomposition better than the other minerals, and stick out of the rock where this has been worn and rounded by exposure. These tufts of mica often form irregular bands.

The augite varies from a few specks to laminar masses of considerable size. It is often found associated with felspar alone, the other minerals having disappeared, and it thus forms a rock composed of amorphous grains of albite and lamellar masses of augite. Before the blowpipe it fuses only in places, small globules of a shining black glass appearing on the assay.

The garnets are sometimes wholly wanting and sometimes very abundant. It is very difficult to extract them from the mass, owing to their brittleness. They are mostly found where the porphyry is well crystallized and the mica abundant.

The large crystals of albite vary in size from half an inch to five inches. They have two cleavages, one nearly at a right angle to the surface of the plate, or forming with it an angle of about 95°. The other cuts the first cleavage obliquely with an angle of about 115°.* The form of the crystals is, I fancy, uncommon, and I will describe one of them with its dimensions, in order to give an idea of the proportions of the crystals.

The crystal is always twin or composed of two hexagonal plates (fig. 2) two and half inches in diameter between opposite angles, and 0.4 inch thick. Either four or the six edges of the plate are bevelled by oblique facettes, which form with the plane of the surface an angle of about 138°, so that one surface is considerably smaller

* The angles of these crystals were measured with strips of paper and a graduated half circle; the crystals were also much weathered; the results are therefore mere approximations. If I had had the means of measuring the angles with precision, I would have figured the crystals.

than the other. Two such plates are applied one against the other by their greatest surface, but one of the plates has (apparently) rotated half a turn, so that A of one plate is opposite B of the other.

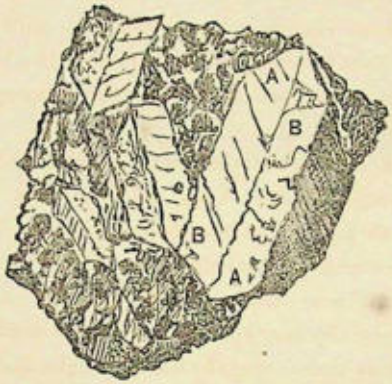


Fig. 2.

This rotation is of course only apparent, but it appears to have taken place from the cleavage of the two plates being opposite, so that when we look at a section of the double crystal (fig. 2), one side presents the shining striped surface of a lamellar cleavage, whilst the other shows the dull rough surface of a fracture across the grain. This opposition of cleavage is probably due to a play of opposite electricity generated during crystallization, but it gives the idea of one of the plates having made half a turn before applying itself against its fellow.

The perfect crystal is rarely seen; it is generally broken across, and the section (fig. 2) is conspicuous on the surface of the rock, so that, at first sight, one may fancy the crystals to be prisms, and a little trouble is necessary to understand the arrangement of the twin plates. This macle is therefore, to all appearance, a twin crystal of one of the numerous modifications of triclinic albite.

By exposure to the atmosphere, the porphyry crumbles easily and falls to a coarse gravel which is soon converted into a very white sand. While the rock is still hard and sound, the large crystals

of albite sometimes become loosened in their matrices, and, falling out, leave angular cavities on the face of the rock. The rock, when fresh and well crystallized, is however very hard: some varieties appear to crumble much more quickly and completely than others.

II.—The grains of magnetic iron ore and the gold I have not seen in the porphyry,* but they are found in the sands which, I will now endeavour to prove, have been formed by the decomposition of these volcanic rocks.

Gold is washed in most of the rivers which traverse the miocene sandstones and conglomerates of the sub-Himalaya, and is always found associated with grains of magnetic iron ore. Let us examine one of the districts where the washings are, I believe, most abundant, the banks of the Soane river, in the districts of Jheelum and Rawul Pindee, especially near the villages of Pindeh Geb, Kothair and Mukud. Let us therefore go to Rawul Pindee and travel towards the S. W. along the road to Kalabagh. We find that this dreary road, about 120 miles long, crosses obliquely from the N. N. E. to the S. S. W. the great plateau of miocene sandstone, conglomerate and clay (Sect. G.).

There is a thick bed of miocene sandstone and conglomerate, above 2,000 feet thick, which might be called the upper miocene formation of the Sub-Himalaya (contemporary of the Sewalik hills and containing the same Mammalian fossils), whilst the sandstone and shales of Murree and adjacent hills, about 5,000 feet thick and without fossils, might be regarded as the inferior miocene. These two divisions of the miocene are not exactly one on the top of the other, but rather the upper bed thinning towards the north, covers in the southern edge of the lower bed in an intricated

* A similar granitoid porphyry exists in Portugal, in the hills near Cintra about five leagues from Lisbon. It is there very variable in appearance and consistency, and is generally made up of large grains of felspar and of quartz, and of large plates of mica. It contains grains of magnetic iron ore, but I am not aware whether it contains the large twin crystals of felspars seen in the Kaj Nag porphyry. The Portugal rock is generally described by travellers as granite, but is considered by geologists as decidedly volcanic. It presents the character of crumbling easily after a certain amount of exposure.

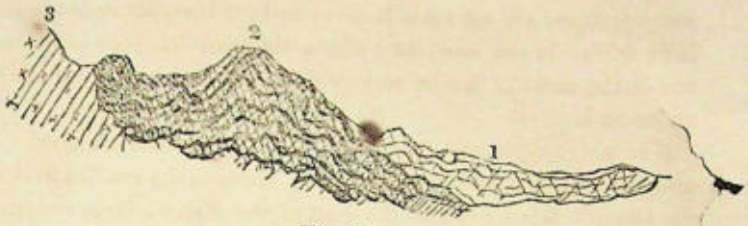


Fig. 3.

manner, as represented in the accompanying diagram (fig. 3): 1, Upper Miocene with Mammalian Bones; 2, Lower Miocene without fossils (excepting a few roots and stems and imprints of leaves); 3, Porphyry and Felstone, &c.

The upper bed is therefore not seen near Murree, whilst the lower bed is equally absent from the great plateau of Rawul Pindee, where the fossiliferous sandstone is always seen to rest directly on the Nummulitic formation, wherever this breaks through the miocene. The bed we have to deal with here is, therefore, the upper miocene only. It is much folded and faulted, forming stray folds and many faults at both extremities of the bed, and rolling in broad undulations in the centre of the plateau. Now, if we examine the much up-tilted beds near Futteh Jung, Nusrulla, or else close to the Salt Range near Kalabagh, we find them composed of a grey or greenish calcareous sandstone, of conglomerate and of sandy indurated clays containing nodules of kunkur. These beds look like inclined and parallel walls sticking out of the alluvium, and separated one from the other by open spaces or intervals; and one may at first sight fancy that the several strata have been wrenched apart at the time they were upheaved. But if we examine the beds where they are nearly horizontal, as in the neighbourhood of the Soane river near Kothair or Jubbie, we find that they consist of a hardly cohesive sand, very white and composed of minute grains of albite and quartz, with black grains of augite and spangles of mica. I have been in the habit, in taking notes, to call this sand, Pepper and Salt sand, and I shall here make use of this term, as it is a convenient one. Interstratified with this sand we find the beds of grey or greenish sandstone, of conglomerate and of sandy clay noted at Futteh Jung; and it becomes evident that at the places where we first observed the beds, and where they are much tilted up,

the pepper and salt sand has been washed out from between the harder beds, whilst in the horizontal strata, the sand has been protected by one of the strata of harder rock which acted as a roof over the sand underneath.

Now this pepper and salt sand is the one washed for gold. The washings are done during and after the rains, as the swollen waters of the torrents bring down to the beds of the rivers a large quantity of fresh sand. It is washed in the usual manner, and gives a residue of a black sand which is composed of shining grains of magnetic iron ore and grains of augite. A little more washing in a smaller vessel removes the augite and a great part of the iron; and the gold, which is rarely visible with the naked eye, is picked up by mercury.

If we examine the pepper and salt sand in situ, we shall very soon become convinced that it is nothing but the porphyry of the Himalaya ground down to powder, for we find in it numerous pieces of the porphyry not quite crushed to sand. I have found some of these pieces half an inch long and composed of a hard fragment of albite supporting specks of augite. Pieces of the large felspathic crystals I have seen also, and the smaller crystals of quartz are frequent and hardly altered and rubbed. The sandstone consists mostly of undecomposed albite and augite. It is not easy to describe in words the great similarity between the porphyry and the white sand, but their complete identity strikes one at once when we study the beds. Dr. Fleming made therefore a good guess when he wrote the following passage: "We have been quite unable to trace the source whence the gold has been derived, and are not aware that amongst the quartzites and quartzose mica slates (felstone is meant,) which are much developed in the Punjal Range, near the Baramoola Pass into Kashmir, and stretch west into the northern Hazara mountains, the metal has ever been detected in situ. From similar rocks there can be little doubt that the auriferous sands have been derived."*

And again he writes: "In the neighbourhood of the Salt Range the scales of gold are small and almost invisible, but we have heard from natives, that, in Hazara, grains of gold are sometimes found of a size such as to admit of their being picked out of the sand. If

* Report on Geological Structure of Salt Range; Selections, P. Govt. Vol. II. 1855, page 342.

this be true, we may infer that the auriferous source is somewhere to the north, and that by tracing the gold stream, so to speak, we might arrive at a point where the drifted materials become coarser, and where the gold, from its high specific gravity, has been deposited in larger quantity."*

That the miocene deposit of the Sub-Himalaya has been derived from the mountains situated N. or N. E. of it, is evident from the boulders contained in the conglomerates of the formation, these boulders being mostly volcanic rocks, such as we have seen in the mountains near the Baramoola, and such as we shall see in other parts of Kashmir. We will see, by and bye, that these volcanic rocks extend to the west, along the northern boundary of the Peshawur valley, as far at least as Jelalabad, and to the east as far, at any rate, as 80° east long., and probably much farther, though it appears from Captain R. Strachey's memoir on the geology of part of the Himalaya mountains,† that the volcanic rocks in the eastern portion of the Himalaya are more intrusive than they are in the western extremity of the chain.

If it is indeed true that grains of gold of some size are picked out of the sand in Hazara, some valuable diggings might yet be found in the valleys situated between the spurs of the Kaj Nag range or its extension to the west. But I cannot help thinking that, with a population everywhere anxious to wash gold even in very poor washings, auriferous sands of any economical value would have been worked long since, especially as the sands formed by the decomposition of a porphyry, similar to that of the Kaj Nag chain, and situated on the eastern frontier of Kashmir are searched for garnets only.

The magnetic iron ore is tolerably abundant in the pepper and salt sand, and is at present wasted by the gold-washers of Kothair and Mukud: but it has not been always so. In traversing the great miocene plateau of Rawul Pindee, I noticed for many miles along the road, between Pindeh Geb and Jubbie, small pieces of black slag, often in some quantity and evidently very old, as many pieces were seen where ravines had cut the ground, buried a foot

* Ditto ditto, page 344.

† On the Geology of part of the Himalaya Mountains and Tibet, by Captain R. Strachey, Bengal Engineers, F. G. S. Proceedings of the Geological Society of London, 1851.

and half below the surface. Knowing nothing then of the magnetic iron sand, I could not conceive whence the slags came, but on seeing the large quantity of iron ore which is washed out of the sand by the gold-diggers, I was forced to conclude that a time had been when the iron powder was saved and smelted. It is not such a poor undertaking as it might appear to wash iron from sand, especially as the gold alone would pay the men 3 or 4 annas a day, and a very little arrangement would save the iron. It contains about 70 per cent. of metal of the very finest quality and the very best to make steel. It resembles Swedish iron, and it is the same as the Kangra iron which has been proved to be of excellent quality by experiments in England. It is very dear, selling at £14 a ton. It is probable that the smelting of this iron sand was discontinued from the want of fuel, which is now very scarce on the plateau. That fuel was once more abundant, is sufficiently proved by the amount of travertin seen in many places where no springs exist now-a-days; and these fossil springs, if I may call the travertin by that name, tell us of a time when a higher jungle on the plateau and forests on the hills arrested a good deal of moisture, and wrung from the humid monsoons a portion of the rains which are now poured on the Himalaya. It would be, I imagine, easy for the local government to find out whether the magnetic iron ore is still smelted in some localities in the district, or when the smelting was discontinued, and to resuscitate the trade, the iron ore being brought to Mukud from the neighbouring villages, and there smelted with charcoal brought down in boats from the Akora Kuttuck hills or from Hazara. Excellent limestone is abundant near the banks of the Indus ten or twelve miles above Mukud. It is also abundant in the conglomerate on which Mukud is built.

The smelting of this iron sand would not, of course, give profits or yield a quantity of metal worth mentioning in comparison to the results of European industry, but it might be a valuable enterprise for natives possessing some little capital, and might much ameliorate the miserable condition of the gold-washers.

12.—Returning now to Buniar and the Kag Naj range, I must insist on the very changeable appearance of the porphyry. We have seen that it consists of a granular mass, with large crystals of albite, small crystals of quartz, crystals of garnet, plates of mica and lamellæ

of augite, and that any of these crystalline minerals or all of them may disappear, leaving a rock entirely composed of a saccharoid paste of albite. At other times the quartz becomes very abundant, and thick bands of white quartzite traverse the mass. Again, the augite, which is sometimes wholly wanting and at others in very minute specks only, may increase and at last predominate and form dark rocks with a semi-metallic lustre, the augite being generally collected in masses of aggregate plates having the lustre of iodine. It very often happens that the minerals are arranged in bands or layers as in gneiss, and this apparent foliation also varies much, and often it does not exist at all, whilst in other instances it is extremely well marked, thus gradually forming a passage to the clinkstone, described in the beginning of this paper.

13.—I have not visited the high summits of the Kaj Nag: indeed, I have only seen a few spurs of this enormous centre of mountains; but, from the road between Nausherra and Ori, one can see on the other side of the river, towards the tops of the hills, immense masses of the white porphyry glaring in the sun through the underwood which covers these mountains; and Captain H. Godwin-Austen, G. T. S., who assisted in the survey of this district, informed me that the white porphyry of the Buddist ruin at Buniar forms the summits and all the central system of the Kaj Nag range. From a coloured sketch kindly made for me by this officer we are enabled to see that the porphyry forms the whole of the main chain of the Kaj Nag, a portion of the huge North-Western branch, and extends along the western or Mozufferabad branch towards Hazara. The rock passes gradually from the granitoid porphyry I have described to less and less crystallized rocks, until it becomes the pencillated white and blue felstone which we have seen at Baramoola, and finally the earthy, slate-like felstone of the Atala mount.*

The summit of the Sank or Sallar, on the left bank of the Jheelum, I have also painted as volcanic porphyry, from my observing that the valley of the Apaikey is strewed with blocks of porphyry to a

* Captain Austen described the felstone as a hard slate, but as he said that this slate was identical with the "hard slate of the lofty cliffs over the road near Nausherra," it is evident that what was taken for slate, was an earthy slate-like felstone. At the time Captain G. Austen observed these rocks, he had not yet begun to study geology.

considerable height, and disposed in such a manner that they cannot have been brought from any other locality but the summits above. When I visited the Apaikey valley, the summits on both sides were covered with a thick mantle of snow, but the very shape of the peak, a smoothly rounded boss, was suggestive of a hill composed of materials which wear quickly and round easily under the influence of atmospheric vicissitudes.

14.—We must now endeavour to ascertain the extent of country covered by volcanic rocks similar to those I have described, and I am again indebted to Captain H. G. Austen for the following information: "The so-called granite, or, as you say more properly, volcanic porphyry, of the Kaj Nag is quite unlike the granite of the Deosais or Ladak, which is pure granite or syenite. This Kaj Nag rock is seen again in the mountains bounding the south-east end of the valley (of Kashmir) and in Kistwar; and the whole length of the Chota Dhar range, bounding Badrawar to the south, is of it; I have seen it nowhere else. It is so strikingly peculiar that I should certainly have noticed it, had I come across it in other parts of Kashmir."

How far the porphyry of Kistwar and Badrawar extends to the east, I have no means of judging;* but we have seen that the Kaj Nag extends towards the west into the upper part of Hazara; and I have had described to me some "granite" seen a few miles north of Mauserah, near the entrance into the Kaghan valley, which appears to be a volcanic porphyry similar to that which we have seen at Buniar.† But it extends still further west: Dr. Costello informs me that a great deal of "*granite*" and quartz occurs in and near the Umbeyla pass, lately occupied by the troops under General Sir Neville

* The "granitic" belt between the Sutlej and the Kali rivers, long. 77° to 80° 15′, appears to be a continuation of the porphyry of Kaj Nag, Kistwar and Badrawar. In Sirmoor, Garhwal and Kumaon it forms the centres of mountainous systems such as Chor, Dudatoli, Binsar, &c. Capt. R. Strachey describes it as "often porphyritic and much subject to decay." It passes into "*mica-shist* showing a distinctly laminated structure," (felstone ?) and also into greenstone.

† Also "a place on the road (to Mausera) as it passes along the eastern edge of the Pukti valley gets its name of *Chitti kat* (white stone) from several large blocks and hillocks of white felspathic rock containing large crystals, the same as that of the blocks on the ridge of Buri a few miles to the S. W., and like them visible "from a great distance."—*Journal of the Agricultural and Horticultural Society of India, Vol. XIV. Part 1.*

Chamberlain. The General himself, in one of his dispatches, describes some of the hills as "granite," putting a note of interrogation after the word, and thus showing that the granitoid rock he noticed was sufficiently peculiar in its appearance to make it doubtful whether it was really a granite. From specimens of the mountains near the Pass, kindly given to me by Dr. Costello, I have no doubt that the so-called granite is one of the varieties of porphyry described in paragraph 12. It passes into a felstone composed of very elongated and large spindles of opaque, dirty white, and somewhat granular felspar and bluish semi-translucent glassy felspar, and in the spare felspathic paste which cements the spindles together, a few irregular grains are seen of a mineral having a metallic golden lustre, and which is probably Diallage or Bronzite. The rock has a great resemblance to, and is indeed identical with, the most compact sort of felstone seen at Baramoola. Bands of quartzite, of which I have seen very beautiful specimens as clear as Wenham lake ice, are also extensively developed, as well as enormous masses of compact gypsum and tabular selenite.

Dr. Bellew, in his "Report on the Yusufzaies," describes a variety of volcanic rocks occurring in the ranges which separate British Yusufzaie from Chumla, Buneyr and Swat: "Feldspar grit" and "various combinations of mica and felspar," "porphyry in a variety of forms," "trap-rock in great variety," quartz, mica and clay-slate, hornblende-rock, felspar-rock and amygdaloid; "hard trap" (greenstone?) "loose, friable and crumbling" ditto. (ash?) He also describes granite and gneiss; but he adds that the gneiss is quarried for mill-stones, and, if these mill-stones, (which is very likely) are similar to the mill-stones of Jellalabad, they are a coarse gneissoid felstone, and not a gneiss. The granite again is a whitish rock, and we find it connected with and surrounded by, rocks undoubtedly volcanic. I have no hesitation therefore in regarding it as a granitoid porphyry, similar to that of the Kaj Nag. A great deal of slate and "*primitive limestone*" is also mentioned in these mountains.

Dr. Bellew concludes that these hills are "all of primitive and metamorphic rocks;" but the list of rocks he gives, proves conclusively that they are of volcanic origin.

These volcanic beds in Yusufzaie are capped, in some places, by beds of

limestone, and these again by sandstone. No fossils have yet been discovered in either the limestone or the sandstone, and the age of these strata must therefore remain unknown for the present. Near Jellalabad beds of gneissoid felstone appear. This rock is quarried to make hand-mills which are brought down by the Povindahs and sold in Peshawur and the Derajat. These hand-mills are made of a coarse trachyte which has begun to effect a partial separation of minerals, and these minerals are arranged in streaks of white, granular felspar, greyish-blue felspar, with here and there a grain of augite. It is, therefore, again one of the varieties of felstone seen at Baramoola, and probably the same gneissoid variety quarried in Yusufzaie.

15.—By reference to the map we observe that the Pir Punjal chain is the first great parallel of the Himalaya, between the long. 73° 30′ and 76° E. It is a great chain, forming a belt of high mountains between the miocene districts of Jummoo, Rajaori, Poonch and Ori and the Kashmir valley, and at both ends of this great chain an immense accumulation of porphyries and other volcanic rocks, rising to tremendous heights, and covering some thousand square miles of country, are placed like two bastions at the extremities of a centric wall. What rocks then compose the connecting chain, the Pir Punjal? The reader will easily conceive how vexed I am that I was prevented visiting this range, more especially as the information obtained from travellers is most conflicting and unsatisfactory. Mr. L. Drew, who has traversed the chain three or four times, was especially struck with the enormous development of a great slate bar of unknown age. We shall see in the next chapter, how very thick and extensive courses of slate are interstratified with beds of trachyte, ash and agglomerate, in the mountains bounding the Kashmir valley to the North. These slates are completely devoid of fossils, but as I hope to be able to fix the age of the volcanic rocks with which they are interbedded and contemporaneous, we had better reserve the discussion of their age until after the examination of the fossiliferous strata of Kashmir.

But the slates form only a band or bar in the Pir Punjal chain, and not the whole of it. I believe, that the remainder of the rocks of this range are mostly volcanic ash, felstone and agglomerates. A friend of mine and a very trustworthy observer, in the following passage

from a letter to me, is describing, I think, volcanic rocks, especially agglomerates and ash full of lapilli and volcanic conglomerates. "It (the lacustrine deposit of the valley of Kashmir) rests unconformably on trapean rocks, quartzite, quartz conglomerate, very hard and forming a compact mass." And again, further to the S. W. on the road through the Pir Punjal Pass, he says: "The rocks are principally mica-slate, with *thick beds of a hard conglomerate having a very fine dark blue matrix; this, in some places, was a mass of water-worn pebbles; but in most of it these are scattered through the mass, and are often in that case angular and small.* Up to the Pir Punjal Pass the dip is N. with a high angle; having crossed the ridge N. E. this continues all the way to Barangulla, giving these altered sandstones, slates and conglomerates an enormous thickness."* The excellent observer who wrote the above remarks did not think, it appears, that the rocks were mostly volcanic in origin, but I cannot help imagining that his description applies, in great part, to stratified ejecta of volcanic eruptions, and the passage I have put in Italics is, I think, a very fair description of ash with lapilli. Again, I must also remark that the felstone of Baramoola has always been described by travellers, and by geologists also, as mica-slate, though it contains no mica and is nearly wholly made of felspar; what has been taken for mica, being minute spindles of glassy albite. It certainly has a slaty cleavage, and the most earthy varieties have a close resemblance to metamorphic slate, and it is probably this fact which has misled most people as to the nature of the rock. It is not therefore impossible that some of the "mica-slate," mentioned above, is in reality earthy felstone.

16. The position of the Pir Punjal chain is rather peculiar, abutting as it does at both ends against enormous centres of volcanic rocks, and being separated by a great fault (the valley of Kashmir) from mountains also composed of the same rocks. In the enormous accumulation of amygdaloidal ash, agglomerate and conglomerate which we shall see, by and bye, on the other side of the valley, there is abundant proof of the existence of open volcanoes in this part of the Himalaya, at the time the porphyry was in a fluid or viscid state. The extreme

* I do not give the name of the person who kindly gave me the information quoted, as I do not agree with him on the origin of these rocks, and believe that he missed appreciating their true value, though his description is accurate.

regularity and evenness of the stratification of these cinder beds renders it highly probable that the showers of ejecta fell in a shallow sea in which the volcanoes formed islands. It appears to me, that we cannot refuse to admit that the porphyry was the base of the volcanoes, and indeed the matter which failed to escape through the vent in the earth's crust, whilst the felstone or clinkstone and varieties of trachytic rocks into which the porphyry always passes, are lavas which have flowed under the pressure of the sea. If these views are admitted, we have a series of volcanoes beginning at the Kaj Nag, and forming an arc along the north-east boundary of the valley of Kashmir, down again to the mountains of Badrawar: of this arc of volcanoes the Pir Punjal chain is the chord. Can we wonder, huge though the chain is, at its being in a great measure formed by ejecta of volcanoes received in a sea gulf and there arranged in conformable layers? The slate, as we shall see in the next chapter, was formed during the intervals of volcanic activity, and it is not improbable that the continual shower of ashes and hot stones into a shallow bay kept the water at a temperature too high for the development of animal or vegetable life.

Since writing the above paragraph, Capt. G. Austen has informed me that beds of unmistakably volcanic rocks, such as amygdaloid and coarse greenstone, are interbedded with the slate and other rocks of the Pir Punjal. This is precisely what occurs in the hills north of the valley of Kashmir, we may therefore regard the Pir Punjal as a mass of volcanic ejecta interbedded with slate which was deposited during the periods of volcanic tranquillity.

Chapter II.—*The Mountains North and North-East of Kashmir.*

17. By referring to the map, we observe that the Kashmir valley is an elongated trough with its longer axis directed S. E.—N. W. The Jheelum has a similar general direction, as far as the Woolar Lake, and the smaller stream which drains the north-western end of the valley flows from the N. W. to the S. E. To the north-east of this axis, we notice long spurs of hills which descend to the water-

edge of the Woolar Lake, the Manus Bal and the Dál and to the lacustrine plains of Pampur, Avantipoor, Bij-Behara and Islamabad. These spurs are the extreme south-western ends of a labyrinth of mountains which forms a barrier, nearly forty miles across as the crow flies, between the flat plain of the Kashmir valley and the chain of mountains which separates Kashmir proper from Drass, Sooroo and Ladak. If we consider the Himalaya as a series of parallel chains and valleys, we should have the Pir Punjal chain as one of the parallels; traversing the valley of Kashmir and the labyrinth of mountains to the north-east of it, we meet another great parallel chain, which has unfortunately no general name. It has been called by Col. Cunningham the Western Himalaya, but the name is evidently objectionable, as we want the term "Western," to designate the whole of the Himalaya between the longitudes east 73° and 79°, or between the Indus and the Sutlej. It has also been called the Central chain of the Himalaya by several authors, but the great quantity of snow which covers its peaks is merely the result of its being so placed, that it collects and condenses nearly all the remaining moisture contained in the south-western winds, and sends these winds perfectly dry to the Kailas and Karakoram ranges. The beautiful series of snowy summits presented by this chain is therefore no claim to its being the central chain of the Himalaya. I am afraid no other rule, but that of the division of drainage, can be considered safe in estimating which of the many parallel chains of a same system of mountains is the central one; and if we conform to this rule, the Karakoram range is to be regarded as the central chain of the Himalaya. It is therefore preferable to name the chain under consideration by the name of one of its great peaks, and as the Kun Nun or Ser and Mer Peaks (23,407 feet) are well known and very conspicuous in the western portion of the Himalaya, I shall make use of the term "Ser and Mer chain" to designate the great parallel range which separates the basin of the River Jheelum from that of the Indus.

Between the Pir Punjal and the Ser and Mer chains, we have not only the valley of Kashmir, but a number of independent and, as it were, isolated centres of mountains which, as I have said before, form a complicated labyrinth of hills and valleys to the north and north-

east of the Jheelum. If we travel, on the map, from the N. W. to the S. E. of the valley of Kashmir, following the banks of the Jheelum, we shall notice a series of mountains of moderate height, encroaching into the valley, and separated one from the other by broad lateral valleys more or less filled with lacustrine deposits. The first mountain we meet is on the eastern side of the Woolar lake, and is called the Safapoor (10,309). Its foot is bathed by a small but exquisitely picturesque lake, (Pl. 6) the Manus Bal. The next is close to Srinagar and is the Zebanwan (8813). Ten miles to the south-east, the Wastarwan, near Avantipoor, is the next summit; then, after crossing the valley of Trahal, we meet the hill of Kamlawan (8601), over the village of Murhama, and the Sheri Bal close to the Kamlawan. Crossing the broad valley of the Lidar River, we find the Hapatikri, a mountain which sends a spur to the S. W. to form the small hill of Islamabad at the foot of which the town of that name is built. Crossing the valley of the Arpat river, we meet with the Dhar (8146) and the Nawkan (9207). We have therefore, from the eastern shore of the Woolar lake to the extreme south-east of the Kashmir valley, a catenated chain of mountains composed of isolated summits, whilst their relations are covered by the diluvial and lacustrine deposits which fill the Kashmir valley, and the lateral valleys which open into it. This chain is therefore presented to us as a series of summits and not as a regular chain.* Its direction is that of the general parallelism of the Himalaya, viz. from N. W. to S. E. Ten miles, as the crow flies, to the northeast of this chain there is another similar one, that is to say a series of summits, apparently somewhat detached one from the other, but being in a line with the parallelism of the Himalaya. These mountains are from the S. E. to the N. W.—the Liwapatoor, the Wokalbul (14,310) the Girdwali (14,060), Batgool (14,423), Boorwaz (13,087), Handil (13,273) Saij Aha (11,334). West of the Saij Aha, this catenated

* I need hardly say that the catenated appearance of the chains described in the text is in great part due to erosion, and that this great erosion is only what was to be expected, if we remember that the whole rain-fall of the southern slope of the Ser and Mer chain has to find its way to the valley of Kashmir across these catenated chains, and that the Ser and Mer chains receive a tremendous snow-fall. I use the word "catenated," in the same sense as it is used in Anatomy, to designate the arrangement of the lymphatic glands of the neck, viz. like the beads of a necklace or rosary.

chain becomes blended with the first one I have indicated. Ten miles again to the north-east of the series of peaks just enumerated, is another chain of detached peaks or centres of mountains, arranged along a line parallel to the two others and to the general direction of the Himalaya. From the S. E. to the N. W. we have the following summits or centres of mountains: the Rajdain (15,389), the Gwasbrari (17,839) the Harbagwan (16,055), the Basmai (15,652), the Kotwul (14,271), the Haramook (16,903) and the numerous peaks which, with their complicated spurs, separate the valley of Kashmir from Gurais and Tillail.

Between all these catenated chains, connecting spurs or branches are to be seen spreading in all directions, and it is extremely difficult to give the direction of the resulting masses of mountains. But the geology of these mountains will help us a good deal to understand their topographical grouping. As we see these mountains on the map, we should be disposed to consider them as long spurs of the Mer and Ser chain descending towards the S. W.; but we shall see that all, or at least most of these summits, are composed in their centre of rocks which have once been in a fluid or viscid condition, that is of porphyry, greenstone, basalt and amygdaloid; that these melted rocks are covered by enormously thick layers of ash, agglomerate and slate interbedded, and that on the top of these beds of ejecta fossiliferous strata rest quite conformably. It becomes therefore evident, that the summits represent separate and isolated centres of volcanic action, no doubt much displaced by the last upheaval of the Himalaya, but yet preserving their relations to the beds of ejecta which were collected around their feet and on their slopes. We have therefore a linear arrangement of volcanoes, or at any rate of volcanic fused matter, (for some of the collections of melted minerals may not have reached the surface and never had a vent), this linear arrangement forming three parallel lines, and these lines being parallel to the general N. W.—S. E. direction of the Himalaya. I believe that similar lines of volcanoes or collections of volcanic matter are to be found between several of the great parallel chains of the Himalaya, but whether they are thus general or not, the ones in Kashmir are sufficient to prove that during the Palæozoic epoch, the volcanoes of the Himalaya had an arrangement more or less linear, and that the

great lines of fracture on which these volcanoes were situated, had the same direction as that of the Himalaya of our time.

18. Beginning with the southernmost line of summits, I will now describe in some detail the hills which compose it. I shall begin with that nearest to Srinagar, viz. the Zebanwan.

The Zebanwan is a mountain of 8813 feet at its highest point, with a general direction from E. to W. (Map B). Its eastern portion is nearly due E.—W., and is 2¼ miles in length. It then turns to the S. W., at the same time throwing out long spurs to the N. W. to embrace the eastern shore of the Dal. The Zebanwan keeps its N. E.—S. W. direction for 3¼ miles, when it bifurcates into two branches, a southern one, small and short, and a W. N. W. one, 2½ miles long. It is at the end of this W. N. W. branch that the Tukt-i-Suliman rises, a very conspicuous little hill, seen from nearly every part of the valley. Still further to the W. N. W., 2½ miles from the Tukt, the hillock of Hurri Parbut rises out of the lacustrine alluvial. It is evident that the Tukt-i-Suliman and the Hurri Parbut are only continuations of the W. N. W. spur of the Zebanwan, and appear as detached hillocks on account of the thickness of the lacustrine deposit. (Sect. A).

The following detailed section of Hurri Parbut, the Tukt-i-Suliman and the W. N. W. spur of the Zebanwan is at a right angle to the axis of these hills. It will give, I hope, a good idea of rocks which we shall meet again and again, and which I will, therefore, endeavour to describe now with some precision, as they are nowhere better seen or more conveniently studied.

Section of Hurri Parbut, Tukt-i-Suliman and W. N. W. spur of the Zebanwan. (Sections A, B, &c.).

Direction of chain: S. 65° E.—N. 65° W. General strike of beds S. E.—N. W. General dip of beds, north-easterly. The Section follows the direction of the range and consequently cuts the dip at an angle of about 65° instead of 90°. (See Sect: A). (Section II. of General Map). See also Map B.

Hurri Parbut. This hill is a succession of hard layers of trachy-dolerite and soft layers of other rocks. The trachy-dolerite is rough, compact, very hard and dark. I have never seen it scoriaceous. It is sparingly amygdaloidal, containing sometimes a few large geodes filled with white quartz. These beds are nearly vertical, with a dip east-north-easterly, forming with the horizon an angle seldom under 75°. The most westerly beds are nearly vertical, whilst the most easterly layers are more sloping. There are seven or

eight thick beds of this trachy-dolerite separated one from the other by the following rocks: (*a*) A slaty basalt, hard when fresh, but very soon falling into foliated debris. It reminds one somewhat of the earthy variety of the felstone of Baramoola. It is grey in colour. (*b*) an ash of a dirty-looking felspathic paste, full of rounded or oval nodules of dull augite or hornblende. These nodules are probably amygdaloidal in origin, being due to a bubbling of a hot paste of ash and water. It desintegrates very quickly into a yellow earth or a grey gritty soil on which grass grows well, soon concealing the rock below.

These beds of slaty basalt and ash are well stratified, and fill up all the spaces left between the layers of trachy-dolerite; this last rock forms prominent ridges or saddles on which the several works of the fort are built.

A marshy alluvial plain intervenes between the Hurri Parbut and the Tukt-i-Suliman.

Tukt-i-Suliman. The western extremity of this hill (as it appears above the lacustrine deposit) is a little knoll which has received the name of Rustun Ghurree.

1. Rustun Gurree: Compact greenstone either greenish or bluish; hard; fracture conchoidal. Either no amygdala or a few large ones, about the size of a pigeon's egg, often irregularly shaped, composed of white opaque quartz arranged in concentric layers and never crystallized.* Strike S. E.—N. W.; Dip N. E. = 50°. This is a hard rock and forms a prominent boss of a barren character. It is quarried for building purposes, but is too hard to be dressed, and as it breaks in angular pieces, it is altogether a very unsatisfactory building material. This bed has a thickness of about ..... 60 ft.

2. A dirty yellowish-grey felspathic ash, full of geodes of dark augite. It decays fast, the nodules of augite, after partially decomposing and colouring the whole mass ochre-yellow, drop out of their nidusses and leave a spongy mass of yellow earth somewhat resembling pumice, but not in its hardness. It is used as a good clay for pottery. It is much better developed on the northern than on the south-eastern side of the hill. In one section it is no more than ..... 10 ft.

3. Resembling greenstone but much more amygdaloid. It is hardly seen on the southern aspect of the hill, where it is covered by vegetable earth and a cemetery; but it is well seen on the lake side near the water gate,... 20 ft.

4. Tukt-i-Suliman: A mass of amygdaloidal greenstone, sometimes compact, as at the base of the Rustun Gurree, but more generally showing dark specks of augite or hornblende in the mass. The amygdala of white quartz invade it, either as large and scarce geodes disposed here and there

* These amygdala of white quartz occasionally fall out of their matrices and are to be seen in numbers, half-buried in the soft silty mud of the lake near the village of Drogehand. Should this mud one day dry up into a rock, a false amygdaloid will be produced, all the more difficult to distinguish from fused amygdaloid, as the mud of the lake is entirely formed of the debris of volcanic rocks.

irregularly in the rock, or as smaller geodes mixed among long cylindrical and twisted branches of quartz running through the mass. (See figs. 1, 1a. plat. X.) I must confess, I had some difficulty in understanding these branches; they look precisely like the arms of a canal or like small rhizomes, and they sometimes have the form of worm-burrows; they begin with thick branches or trunks about the size of the finger and throw out smaller twigs; they are often 6 or 8 inches long, and are cut obliquely by both stratification and cleavage. I have come to the conclusion, after examining a great many of these cylinders, that they are gas-vents, similar to the amygdala in origin, the imprisoned gas, in its efforts to reach the surface, having had sufficient strength to force a long passage though the viscid paste.* Dip 55° to 60° ..... about 600 ft.

5. Amygdaloidal greenstone, graduating to trachyte; with innumerable small geodes, rounded and pressed together. The greenstone becomes rough and gritty and passes into a trachyte, it is much less amygdaloidal; and on the other hand, where the rock is excessively amygdaloidal, the paste is a dark brownish black rock, which is cleaved into well defined slabs, and breaks easily into prismatic fragments. This bed forms a depression between harder layers. The stratification is easily seen by the several courses of the rock superposed one on the other; but of course it is not seen in the thickness of each course. ..... about 200 ft.

6. Pale bluish greenstone, hard, compact, with conchoidal fracture; it is closely spotted with irregular dots of hornblende. At the base of each compact layer, there is a margin 1 or 1½ foot thick and very amygdaloidal, the geodes being filled with quartz. It is a very hard stratum ... about 150 ft.

7. Closely set amygdaloid. The paste is a greenish felspar, sometimes very compact and then dark, and cleaved into slabs half an inch thick; sometimes light in shade and with the amygdala rather irregular and nearly touching one another. In many specimens, the felspathic paste shows a division of the felspar into a bluish or greenish mass and patches of white felspar; but there is no crystallization. Dip 70° nearly due E. The felspathic paste decays pretty quickly and thus this bed forms a depression on the hill side. ..... 50 ft.

8. This is the stratum on which the celebrated Buddhist ruin is built; it is the highest summit of the Tukt-i-Suliman (6263 ft.) It is composed of very hard, dark greenstone, with amygdala of white quartz, occurring sparingly. Beds of lighter coloured greenstone, with specks and nodules of augite are interstratified. A great many well defined long cylinders of quartz, either white or black or smoky, such as I have described as gas vents, are seen here. This stratum is a hard saddle or ridge; nearly vertical, and dipping easterly. ..... 60 ft.

* I have since read that Dr. MacCulloch observed in Little Cambay, one of the Western Islands of Scotland, amygdaloid containing elongated cavities similar, I believe, to those which are here described.

So far, the rocks have been purely igneous. We now meet an alternate succession of igneous rocks produced by the decomposition and arrangement under water of volcanic minerals. Ash, agglomerate and other strata of volcanic ejecta become also much more abundant.

9. A dark blue slate, in places clayey, in others calcareous, and effervescing slowly and feebly with acids. It decays soon and forms a depression. It contains no trace of organisms..... 15 ft.

10. A lumpy brown rock composed of a coarse felspathic paste which weathers chocolate-brown and contains a great number of lapilli, mostly black and basaltic-looking. It shows thin, lenticular beds of pale grey felspathic ash containing innumerable geodes, filled, some with quartz, some with dark augite (?) This stratum is not very hard, and rounds by weathering, so that it forms a smooth round boss and not a sharp saddle. It is about ... 30 ft.

11. This bed is interesting and presents a very peculiar appearance.

The rock is a pale grey trachyte in which crystals of dull white albite have imperfectly formed and arranged themselves in tufts of imperfect crystals forming more or less a star or section, (see fig. plate X.) When the rock is polished, (such as is seen in the pavement of Srinagar where it is polished by people walking over it*) the starry disposition of the crystals is evident enough, though in the fresh broken specimen it is rather confused. The rock is a passage between a trachyte and a felspathic porphyry. I have never seen or read a description of this variety of volcanic rock, and I therefore propose to call it "Soolimanite." On the north-western flank of the hill, this bed of Soolimanite is better seen than on the other side, and there presents some layers which show well the nature of the rock. Some of these layers, rather darker than those we have seen on the other side of the hill, contain the starry crystals well developed in the centre of the beds only, whilst above and below, that is near the lowest and uppermost parts of the beds, the

* The stone is not abundant, and very few pieces of it are seen in the pavement of Srinagar. I have seen two however, one in the vegetable market near the great Musjid, and the other between the first bridge and the gate of the Shere Ganie on the left bank of the Jheelum.

Fig. 4.





Fig. 5.

crystals disappear and are replaced by amygdala filled with quartz (fig. 4.) Other beds again of compact trachyte show neither starry crystals nor amygdala in their centres, but have their deepest layers invaded by large amygdala, and their upper-most portion full of small geodes, having besides a scoriaceous aspect (fig. 5).

In the middle of this bed of Soolimanite, some of the cylindrical tubes of quartz described before as gas-vents are well developed, branching in all directions through the rock.—Dip E. 70° ..... about 30 feet.

12. Slate of various colours, laminated and very false-bedded, often squeezed and twisted. It has been folded, the lower part being nearly vertical with a dip westerly, whilst the upper part dips east 65°. The centre of the fold is much contorted and gathered in zig-zags, and in these contorted parts a great many gas-vents (branching cylinders of quartz) are well seen; some as large as the finger, others of the usual size, viz. a crow's quill. ..... 200 ft.

13. A band of Soolimanite like 11. The slate of No. 12, has evidently been metamorphosed by the action of heat emitted by the band of Soolimanite which covers it. There must have been a considerable period of inaction between the two out-pours of Soolimanite to enable the slate to become collected, and it is evident that the slate was yet in the state of a silty mud at the time of the second eruption and was set bubbling by the heat of the Soolimanite.

I may here remark that I am satisfied that many of the layers of laterite, cellular slate and ash, which we shall see in this section, are nothing but true sedimentary deposits metamorphosed and rendered amygdaloidal by the bubbling or boiling of the waters which covered them. I had thought at one time, to try and distinguish the beds of ash and volcanic mud which were probably formed as I have just explained; but I found the work too uncertain and requiring too much time to be worth prosecuting. But no doubt can be entertained that, besides the slate and laterite, many of the beds of the mountains of Kashmir which appear to be volcanic ash or dust, are in reality metamorphosed sedimentary layers.

The Soolimanite has a thickness of ..... 15 ft.

14. The band of Soolimanite gradually passes into a felspathic ash, often friable, but often also hard and compact and full of oval nodules of dark augite, varying in magnitude from the size of a pea to that of a pin's head. Occasionally the ash passes, along the strike, into a hard compact quartzite. The whole bed appears irregular and lenticular, and has been probably formed by ejecta falling into shallow pools of water ..... 15 ft.

15. A calcareous rock which is not seen on the hill side, but gives out, on the brow of the hill, a good deal of nodular muddy carbonate of lime (kunkur). Here and there a brown ferruginous rotten ash (or metamorphosed calcareous shale?) crops through the grass on the top of the hill. It effervesces feebly with acid, and is probably the rock which gives out the kunkur. This layer, which is probably squeezed out of its place near the foot of the hill by the gradual curving of the strike of the harder rocks, is, at the top of the mount, at least ..... 20 ft.

16. A thin band of amygdaloidal greenstone ..... 12 ft.

17. Slate, grey. On the western side of the bed it dips W. N. W. 65°. In the centre it is much folded; on the eastern side it dips E. S. E. 75°. This angle, however, diminishing quickly to 65° ..... 20 ft.

18. Greenstone alternately coarse and fine ..... 20 ft.

19. Slaty basalt, dark bluish black, fracture conchoidal. It dips E. a few degrees S. 70° ..... 30 ft.

20. A crumbling, brown, lumpy metamorphic mud, slightly amygdaloidal. It decays rapidly into a dirty yellow coarse gravel. It is interbedded with bands of agglomerate, the lapilli being mostly basalt ..... 50 ft.

21. Sandstone, hard, rough, quartzose and micaceous; apparently much altered by heat. No organisms ..... 3 ft.

22. Coarse quartzose grit, very hard and rough. It appears to be composed up of angular grains of quartz, variously coloured, cemented together by a siliceous paste. It may be a siliceous deposit in which crystallization of the purer quartz has begun to take place ..... 15 ft.

23. Sandstone like 21. Dip. S. E. ..... 10 ft.

24. Blue compact slate, becoming gradually first coarser and more like a shale, and then more silty or like yellow and grey clay-slate. The stratification is best seen by the coloured markings which indicate it to be only 25° and E. The bed has probably been squeezed out of its place ..... 150 ft.

25. Coarse yellow sandstone with a calcareous cement. Cleavage well marked. No organisms ..... 20 ft.

26. Slate, thin bedded and falling into angular fragments. It is mostly deep blue with bands or ribbands of yellow and grey. The dip is more regular than that of the slates seen before. It is nearly due E. with an angle of 40° ..... 200 ft.

27. Slate, fissile. It differs from the preceding by decaying much more quickly by exposure, the whole bed being covered by small débris. It dips W. on its western side, and E. on the eastern, whilst the centre of the fold is zigzagged ..... 30 ft.

28. Slate, compact and dark blue ..... 8 ft

29. Slaty shale, grey and dark, dipping W. a few degrees N. at an angle of 55°. It is continued (underneath) by coarser shales which form an anticlinal (not easily seen on account of débris and of the decayed state of the shale). On the other side of the anticlinal the dip is nearly due E. 60°. The extent of outcrops of this layer (not its thickness) is about ..... 5 to 600 ft.

30. Metamorphosed slate, fissile and greyish blue; much jointed; the joints are yawning, sometimes a foot apart; they strike W. E. vertically. The stratification dips E. S. E. with an angle of 50°, but that is much falsified by the stratum inwrapping the end of the spur. This bed presents in its middle, thin layers as follows:

a. Soft, yellow quartzose sandstone, nearly friable, 8 inches. *b*. Dirty quartzite, 8 inches. *bb*. Do. with veins of pure white opaque quartz, 1 foot. *c*. A hard, brown, baked quartzose with spreading veins of quartz, 6 inches. Total 3 feet. The whole outcrop of the bed (not its thickness) is about 130 ft.

Here ends the Takt-i-Suliman, and between this hill and the foot of the W. N. W. spur of the Zebanwan passes the road from Srinagar to the Nishat Bagh. (Sect. A).

The W. N. W. Spur of the Zebanwan. Ascending this spur in the continuation of the section, we have the following beds:—

1. Slate more or less laminated, with large yawning joints striking W—E. The stratification is well shown by the colouring of the slate; it dips W. 45°; inwrapping the end of the spur.

It may be here remarked, that the beds of slate, ash and fossiliferous rocks nearly always present this inwrapping arrangement at the end of spurs and when they cross a spur; it appears that these beds had plasticity enough to bend all round when upheaved by inferior rocks. A fine example of this inwrapping arrangement is seen in the limestone which terminates the spur of the Zebanwan over the village of Zeeawan: the limestone, in endeavouring to arrange itself around the band of volcanic rock which upheaved it, has split into slices from 5 to 15 feet thick, diverging like an open fan. (Sect. C).

To come back to our section, the slate has a tendency to break into prismatic pieces, and the joint-surfaces are coated with a yellowish or

dirty white quartz. This bed is evidently a continuation of the last bed of the Tukt-i-Suliman (30 of section A), and the road passes over a synclinal, which would be very evident, were it not for the inwrapping arrangement of the slate at both extremities of the bed. As we go up the hill, we observe that the bed forms a small eminence of its own, being separated by a fault from the western beds which have a general south-easterly dip. It extends for about a thousand yards along the southern aspect of the hill, wheeling round and, as it were, lining the foot of the spur, its dip becoming gradually more southerly until it is S. W.

2. Following our section, we find, after the fault, the same alternate disposition of felspathic ash with nodules of augite, of dark slate more or less laminated, baked and metamorphosed, and of volcanic agglomerate full of dark coloured lapilli. It would be tedious and unprofitable to give a minute description of each bed, especially as the enumeration would be a long one, each bed being seldom more than 10 feet in thickness. No greenstone was seen for more than half a mile; the ashes are always tolerably compact when not in a decomposed state, and always invaded by innumerable nodules of augite. They are always well stratified, and it appears therefore evident that the whole of the ejecta fell into water, by which they were arranged in well defined strata. The amygdaloidal condition of nearly all the rocks, whether ash or slate, seems to indicate that the water was raised to a high temperature during the volcanic eruptions; and the want of animal remains in the slate beds and amongst the agglomerates is in accordance with this hypothesis.

It goes on, as I said before, for above half a mile, alternating ash and slate, with occasionally a dirty-brownish bed of rotten and calcareous ash decomposing very fast and throwing out, on its surface and also between its joints, a large quantity of kunkur. The strike of the beds turns gradually to true N. S. and the dip is E., the angle with the horizon being between 60° and 70°. Beds of laterite now begin to appear, of a yellowish grey colour and resembling indurated clay. They are a little harder than slate, sparingly amygdaloidal, and the geodes are very small and filled with quartz. They break into small cuboid fragments. These laterites are interstratified with beds of dark slate, and lying over them we get the following strata:—

x. A band of greenish-grey trachyte with small rounded geodes of chalk-white albite. It weathers somewhat reddish on its outside and wears in rounded masses. It reminds one very much of some of the felstone of Baramoola. Strike N. 15° W.—S. 15° E. Dip Easterly 40°. But this stratum varies very much along its strike, becoming in places a ferruginous, rotten, augitic amygdaloid; in others a sandstone made of big rounded grains of quartz, of hornblende and of other volcanic minerals, with a calcareous cement which effervesces powerfully with acids. This sandstone forms slabs 1 to 1½ inch thick, and superposed one over the other like bricks in a wall. Again a little further on, it is a fine, very compact, smooth laterite, passing gradually into a more sandy variety containing very minute spangles of white mica hardly visible in the day time, but which shine well by candle light, and also a few small rounded nodules of a pale green semi-lucent mineral. The variations of this bed along the strike seem to indicate a very shallow shelving shore or a pool of water, the bottom of which had been frequently disturbed by the appearance of lavas or other heated matter. The bed is about 15 feet thick at the outcrop.

xi. Then the slate, blue and compact, comes again, with occasional thin beds of sandstone or dark-stone: a coarse grained highly ferruginous amygdaloid, a sort of peperino, forms a bed 15 feet thick, and on the top of this, here and there, are patches of grey laterite. The slate and the sandstone alternate repeatedly in beds of more than five feet each, and this goes on for a thickness of about 160 feet.

xii. A ridge of coarse, brown, slightly micaceous sandstone, in superposed slabs like a built wall, now makes its appearance. It strikes S. W.—N. E. and dips easterly 45°. This strike S. W.—N. E., meeting the strike of the preceding layers *x* and *xi* which is N. 15° W.—S. 15° E., leaves an open angle or yawning on the northern flank of the hill, and this is filled up by laminated slate, much broken and of various colours, a good deal of it being yellow. It is the yielding of this soft slate which has allowed the hard and unyielding sandstone to take a direction to the S. W. instead of to the S.

The thickness of this sandstone ridge is about 45 feet, and that of the slate, which fills up the gap or yawning on the flank of the hill, about 40 feet.

xiii. Slate, hard but much cleaved; about 80 feet.

xiv. A ridge of very compact and massive baked clay, having a conchoidal fracture and large distant joints. It is yellowish grey in colour, with bands of [illegible]hter yellow: one would take it for a light-coloured basalt, if it were not for [illegible]trifling hardness, which is about that of slate. It appears to be a clay made up of silty mud, derived from basaltic and other volcanic rocks and baked after formation. Perhaps it would be best named "Massive Laterite." The joints and the surface are covered with a rich brown iridescent oxide of iron or a black crust of the same material. This rock is nearly vertical, and is near a fault of considerable extent which cuts the hill right across,

and this proximity to a large fault might perhaps account for the metamorphosed appearance of the clay.

FAULT.

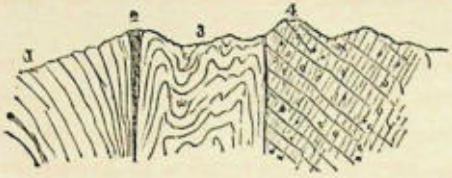


Fig. 6.

1. Slate. 2. Massive Laterite or Baked Clay.
3. Slate, Ash and Laterite in the fault.
4. Amygdaloidal Greenstone.

The fault is about 500 feet wide, and is filled with zig-zagged slate, ash and laterite. A very great deal of kunkur is found all over the ground. This fault goes right across the hill, from near the ruin of Pari Mahal to the small spur over the village of Pandrettan.

East of the fault, the rocks are very different; they are rocks similar to those we saw at the foot of the Tukt-i-Suliman; viz. greenstone and amygdaloid, and there has been therefore a downthrow on the west of the fault. The strike is very different on both sides of the fault. We have seen that on the west side it is S. W.—N. E. with an eastern dip; the greenstone and amygdaloid strike S. E.—N. W., dipping to the N. E.

There is no occasion to describe these greenstones and amygdaloids again, as I have done so before at the foot of the Tukt-i-Suliman. But we must notice here a very great quantity of what I have called gas-vents; the amygdaloidal greenstone is in some places completely perforated by these vents which are sometimes filled with quartz, sometimes with augite, and sometimes left empty. (See figs. 1. 1a, Pl. X.)

20. Crossing the broad ravine above the village of Pandrettan, a ravine in which once flourished a Buddhist city of which the ruined walls are still to be traced, we notice a spur composed of dark and brittle basalt, much jointed but not columnar. It is interstratified with a volcanic ash, similar to that seen in the Rustun Gurree. The end of the spur presents a fine example of beds of ash and laterite inwrapping or infolding subjacent beds: the spur is narrow and the layers of ash and laterite are bent down on each side of it, just as a l of paste laid across a ruler would by its weight bend on each side of the ruler. The dip of the beds is N. E., and consequently the strike is obliquely across the spur which has a W. south-western direction, and when we look up the hill, facing to the N. E., we can then see the beds of ash and laterite cropping out one above the other, like steps,

and forming arches along the strike. This curvature of course falsifies the dip on both flanks of the hill, the dip becoming northern on the south eastern flank of the spur, and south east on the other flank.

The lowest portion of the spur forms a little mound on which may be seen the remains of a gigantic Buddhist figure. The figure is that of a woman, but it is now prostrate and headless. It is a huge block of limestone. There are many other Buddhist remains at Pandréttan, all built of that rock: amongst others, a small temple in a tank is well worthy of a visit.

From Pandrettan to Panchhooka, we have a succession of thick beds of dark basalt, cleaved and jointed but never columnar, and greenstone and amygdaloid, with a few beds of compact ash containing oval nodules of augite. The basalt is the only rock which has not been described before. It is best seen in a little spur which descends to the Jheelum, hardly half a mile east of the Buddhist figure on the little knoll. It has sometimes a very black and conchoidal fracture, and at other times a pale pitch and bluish colour. It breaks into prismatic blocks which are quarried at the place where the spur hangs over the river. It does not appear to be amygdaloidal, but the greenstone into which it passes is sparingly so, the geodes being large and filled with quartz. It is difficult to ascertain the stratification or superposition, owing to the well marked cleavages and joints, but by observing the beds of compact ash occasionally met with, it is found to be easterly at a very high angle with the horizon. All the way from the stone quarry, at Alwajin, to that portion of the village of Panchhooka, designated on the map as "Large Cheenar Trees," there is a succession of these beds, but the angle of dip diminishes gradually as we travel eastwards and is only 45° at Panchhooka. There we find the following beds:—

A slaty basalt, dark and heavy, dipping to the E. a few degrees S. at an angle of 45° with the horizon. It has a cleavage dipping due W. with an angle of 45°, and vertical joints striking S. W.—N. E. It is succeeded by a coarse trap, a sort of trachyte showing a certain amount of crystallization, the rock having a granitoid or rather gneissoid appearance. The augite and the glassy felspar are the only minerals tolerably crystalline, the remainder being a paste which is sometimes nearly white, or yellow and rough; sometimes greenish-grey and conchoidal in fracture, or blue, indigo-blue and

15. Dark brown calcareo-ferruginous shales, exfoliating in thin plates and undergoing quick decay. It weathers nearly black. Extremely rich in fossils. ..... 10 ft.

16. Limestone. ..... 10 ft.

17. Dark brown calcareo-ferruginous shale..... 15 ft.

18. Limestone. ..... 10 ft.

19. Sandy shales, very dark nearly black; do not effervesce with acids; very rich in fossils. ..... 10 ft.

20. Limestone; less coarse than preceding; very fossiliferous. . 15 ft.

21. Limestone; hard and arenaceous; separated by thin layers of shale which weather dark brown and appear in relief on the section of the bed..... 5 ft.

Any further bed which may exist is concealed under Eboulis.

22. When I first met with this bed of limestone, I was particularly delighted, as I had seen no limestone in Kashmir, except the huge carved blocks of the Buddhist ruins near Srinagar and at Pandrettan. I was told that the fine bluish-grey limestone of these ruins was no longer to be found in the country, and that nobody could guess whence the stone had been obtained. Even some of the Surveyors of the Kashmir Series, G. T. S. corroborated this opinion, which appears to be the received one amongst the natives. I could see at a glance that here I had the very stone, and in examining the bed I came across the remains of an old quarry. I subsequently found some much larger Buddhist quarries of limestone, as we shall see by and bye.

Misled by Mr. Vigne and Dr. A. Fleming, who, as I have said, stated that they obtained nummulites from the Kashmir valley, I began to look diligently for these foraminifers. I found indeed a few rounded bodies which might be taken either for nummulites or rings of crinoid stems. I did not at first hit on a very good portion of the bed for fossils; those I found were extremely weathered, and I could only pay flying visits to Zeeawan. But I tried once more to discover nummulites, when lo! I came across a Productus! The following genera were found to be abundant: Productus, Athyris, Orthis, Strophomena or Leptæna, and Spirifers amongst the Brachiopods. Very few lamellibranchiates and gasteropods were seen, but an immense number of Bryozoa, especially two or three genera of *Fenestellides*—viz. *Acanthocladia* and *Fenestella* and

uals of what has been called *Vincularia multangu-*
k), but which some say is not a *Vincularia* at all.
of the fossils are familiar to every body: the *Productus*
reticulatus (Martin), *P. costatus* (Sow.), the *Athyris Roissyi*
(L'Eveillé). Other fossils are interesting on account of their rarity, and first amongst these is the claw of a crustacean, the pincers of which are two and a half inches in length. Though the pincers are neither teethed internally nor flattened into organs of natation, we may, I think, refer the fossil provisionally to the genus *Eurypterus*, if it is not even a true *Limulus*. (See Pl. V. fig. 4.)

23. We have therefore, resting on the volcanic rocks, beds of carboniferous limestone. These beds are of great thickness, and they change their characters very considerably as we follow them upwards. I have divided them into three great divisions, and I have called these by the names of the localities where they were found to be well developed. The lowest bed, which we have just seen, I have called the Zeeawan bed, from the village of Zeeawan. The next above will be called the Weean bed, from the village of Weean near which it is well developed; and the uppermost division I have named the Kothair bed,* from the name of a small district at the foot of the mountains where this upper bed is well seen. I have preferred adopting these names to the plan of using the designations of Lower, Middle and Upper, as further observations may render it desirable to sub-divide any division into two or more sections, in which case the terms lower, middle and upper would become inconvenient. In the present state of our knowledge of the geology of Kashmir and the N. W. Punjab, we may nevertheless remember with advantage, that the Zeeawan is the lowest, the Weean the middle, and the Kothair the upper bed of the mountain limestone.

24. To come back to our section near Zeeawan: we must first notice the inwrapping disposition of the beds around the end of the spur. The general strike of the volcanic rocks is N. N. E.—S. S. W.

* So few fossils were found in the Kothair bed, that it is not possible to place it, with any certainty, in the carboniferous; the same reason prevents its being placed in the Permian or Triassic. The place of this bed as the uppermost carboniferous is therefore only temporary. See the remark after the list of fossils found in the Kothair bed, Chapter II., para. 50.

and the dip E. S. E. High up the spur, this dip is ... angle with the horizon, but it diminishes gradually ... towards the plain; at the bed of quartzite it is about 45°, ... the limestone it is generally 40°. But these rocks, that is from ... quartzite upwards, appear to have been upheaved by a narrow band ... hard rock catching them in the centre and pressing them upwards in ... that central point, whilst the sides of the beds were unsupported. Instead of yielding softly and shaping themselves into a carapace-like coating, as slate and ash would have done, the limestone and the shales have separated into thick bands or slices, and these bands have spread themselves out like a fan. At the small end of the fan there has been a considerable crushing of the beds one against the other, and enormous blocks, indeed whole pieces, of the limestone courses have been squeezed out of place; whilst, at the circumference of the fan, the beds have been parted from one another, and in some places we can see the layers of limestone separated by open intervals two or three feet wide. (See horizontal section, Sec. C.)

25. I will now try to define the character of the Zeeawan bed of carboniferous limestone:—Its lithological characters are, that it is a rough, coarse and semicrystalline limestone of a dark bluish-grey colour, weathering a rich grey. If we break it, we find it made of innumerable irregular grains of a darker limestone united by a lighter cement more or less crystalline. It is full of debris of fossils; indeed I am not quite sure that the darker grains are not the debris of the organisms or excrements of animals. It is fœtid. Portions of it are arenaceous or rather shaly, and these, when exposed to the air, decompose partially, becoming soft and crumbling. The stone is soft to work and cuts with great ease, except where there are too many large fossils. It contains an immense number of minute crinoid-stems converted into spar: it breaks obliquely to the surface and gives flashes of light at certain angles. It is interstratified with courses of rich-brown calcareous shale, often of a bright rust-colour, and generally much decomposed and with bands of a black, not calcareous, sandy shale: it is also full of fossils, these being apparently converted into oxide of iron. Finally, it contains limited short lenticular layers of a much paler limestone, in thin-bedded and false-bedded patches having somewhat the appearance of a fine mortar or cement.

The characteristic fossils of the bed are the following :—

Productus Costatus (Sowerby).
„ *Semireticulatus* (Martin).
„ *Cora* (D'Orbigny).
„ *Humboldtii* (D'Orbigny).
„ { *Flemingii* (D'Orbigny). / *Longispinus* (Verneuil).

Athyris, Sp. ——— Pl. II. fig. 1 & 1*a*. *A. Subtilita* (Hall)?
„ *Roissyi?* (Verneuil) Pl. II. fig. 3 & 3*a*.
„ Sp. Nora (A. Buddista, Verchère) Pl. II. 2, 2*a* 2*b*.

Spirifer (*Sp. Verchèrii* (Verneuil) Pl. I. fig. 1, 1*a* & 1*b*.
Spiriferina octoplicata? ——— Sowerby, Pl. I. fig. 2, &c.
Orthis Crenistria, Phill. ———
Strophomena Analoga, Phill.? Pl. II. fig. 4.
Fenestella Sykesii (Koninck).
„ *Megastoma* (Koninck).
„ Sp. ——— Pl. V. fig. 1.
Vincularia Multangularis (Portl.).
Acanthocladia, Sp. ——— Pl. V. fig. 4.

We shall have therefore no difficulty in identifying this bed wherever we meet it, as the Bryozoa make a great show and immediately attract attention. The coarse granular limestone is unlike that of the other beds we shall see hereafter; the rich brown shales are also peculiar to the Zeeawan bed, and even the position close over the glaring white quartzite would assist us, if necessary.

Contributions to Indian Malacology, No. VII. List of species of Unio and Anodonta described as occurring in India, Ceylon and Burma.—*By* WILLIAM T. BLANFORD, *A. R. S. M., F. G. S.*

[Received 5th September, 1866.]

There are few genera in the whole range of natural history more puzzling than *Unio* and *Anodonta*. Every naturalist who has attended to them has been struck by the great variation of which the different species are susceptible, though it is to be regretted that this knowledge does not appear to have had much influence in restraining some naturalists from recording as distinct species isolated specimens which reached them from distant countries, and which only differed from other specimens in characters of very doubtful specific value.

Although the *Unionidæ* of the Indian waters are far behind those of some countries, and especially of America, in the amount of variation which they exhibit, amply sufficient is shewn to render them very difficult to classify. And as the question of variation is one of the most important, especially at the present day, in the whole range of zoological science, those animals which, in the wild state, exhibit the greatest amount of variation, are peculiarly worthy of study.

In endeavouring to classify the Indian shells, one great difficulty that I have found, has been the determination of described types. Descriptions of Indian *Unionidæ* are scattered through many works, not easily procurable in India. There are, probably, yet a few to which I have not had access, but as I have been able to compile a list, comprising, I believe, a very large majority of the published forms, I think that I shall be aiding any one who, in India, may be engaged in the same study, by printing the list, with references to the original descriptions and to figures, whenever such exist, and by adding such remarks as appear to be necessary.

I also hope to be able to publish figures of a considerable proportion of the species named; in some cases, copies of the original illustrations; in others, drawings of authentic specimens. I shall feel greatly indebted to any one who will aid me in this endeavour by furnishing me with typical forms, or with any specimens from distant parts of the country. In all such cases, a small series of the varieties and different ages is desirable.

The present list, therefore, is merely an instalment of what I hope may be an illustrated monograph of Indian *Unionidæ*.

It is not my intention at present to enter at all fully into the question of the limitation of specific forms. I would merely point out, that some of the described species are certainly within the ordinary limits of variation of others described as distinct. Thus out of one tank in Calcutta, I have taken specimens unquestionably belonging to *U. Corrianus*, Lea, others which were nearer to *U. lamellatus*, Lea, and young specimens representing *U. bilineatus*, Lea, whilst other forms again appeared to appertain to *U. anodontina*, Lam., (or, at least to the species figured as such in Küster's monograph) which by Lea is classed as a variety of *U. marginalis*, Lam. Yet all these forms were unquestionably identical, being united by numerous intermediate varieties, all living together in the same small pond.

Lea's figures in the Journal of the American Philosophical Society, and the Transactions of the Academy of Natural Sciences of Philadelphia, are so good and characteristic, that the difficulties which might otherwise exist in identifying forms discriminated by such minute and variable characters are obviated. Benson's species, of which only descriptions exist, are far more difficult to identify, and Gould's, which are but briefly described, still more so. Küster's monograph, in Martini and Chemnitz's Conchylien Cabinet, contains figures of but few Indian and Burmese Unios, and of those, several are incorrectly named.

For convenience sake, the species of *Unio* inhabiting India proper, Ceylon, Assam, and Burma will be separately enumerated. The species referred to *Anodonta* are so few that subdivision is unnecessary, especially as none occur in India or Ceylon. No typical form of the genus is known to exist in the Indian or Burmese area.

The following works are referred to in the ensuing pages by the abbreviations appended in each case.

Müll.—O. F. Müller, Historia Vermium, 1774 (not procurable in Calcutta).

Chemn. Conch. Cab.—Martini and Chemnitz systematisches Conchylien Cabinet. About 1780? (not procurable in Calcutta).

Gmel.—Caroli a Linne Systemata naturæ. Tom. I, Pars. VI, 1789.

Lam.—Lamarck, Histoire des Animaux sans vertebres, Vol. VI. 1819.

Gleanings in Science, Vol. I., Calcutta, 1829.

Küster, Mart. and Chem.—Systematisches Conchylien Cabinet von Martini und Chemnitz, 2nd edition, by Dr. H. C. Küster and others. Vol. IX. Part 2, commencing in 1843 : unfinished.

Ann. and Mag. Nat. Hist.—The Annals and Magazine of Natural History, London, 3rd series, Vol. X. 1862.

Trans. Am. Phil. Soc.—Transactions of the American Philosophical Society held at Philadelphia, new series, Vol. IV. 1834; Vol. V. 1837; Vol. VI. 1839; Vol. VIII. 1843.

Jour. Acad. Nat. Sci. Phil.—Journal of the Academy of Natural Sciences of Philadelphia, Vol. IV. 1858-60; Vol. V. 1862-63.

J. A. S. B.—Journal of the Asiatic Society of Bengal, Vol. III. 1834; Vol. IV. 1835; Vol. V. 1836.

Proc. Bost. Soc. Nat. Hist.—Proceedings of the Boston Society of Natural History, Vol. I. 1843-44, (not accessible in Calcutta).

Gould, Ot. Conch.—Augustus A. Gould, Otia Conchologica, descriptions of shells and mollusks from 1839 to 1862, Boston, 1862.

S. Hanley, Supp. to Wood's Ind. Test.—Supplement to Wood's Index testaceologicus, 1855 (not accessible in Calcutta).

Genus UNIO, *Retzius.*

I.—India.

No. 1.—Unio Corrugatus, Müll. sp. . Rivers of Coromandel.

Mya corrugata, Müll., p. 214, No. 398.
Unio corrugata, [a.] Lam., VI., 78, No. 34.
U. corrugatus, Küster, Mart. and Chem., p. 289, pl. 97, figs. 3, 4.

There is the greatest conceivable confusion about this species and the next one, and it is far from clear what Müller's type was. I cannot obtain access to his work in Calcutta, but Küster copies the description thus :—

Testa rhombea, viridescens, tenera, pellucida ; (umbonibus corrugatis ;) valvulæ intus striis radiantibus subtilissimis notantur.

The figures are, I suppose, those of Chemnitz's types; they are two in number, one representing the exterior of a subequilateral, nearly elliptical shell, measuring 36 mm. by 24 in its two diameters, and the other the interior of a far more inequilateral shell, also subelliptical, rather smaller than the first, and having every appearance of being a

thick form, with strong lateral teeth. The first shell is subalate posteriorly, and the posterior margin is very bluntly biangulate, the anterior margin is rounded at the end, but the slope thence to the umbo is almost a right line; the second shell is perfectly rounded both before and behind. The shell of which the interior is figured corresponds so ill with Müller's description, being neither rhombic nor thin, that it may certainly be neglected. The figure moreover is ill-executed.

Lamarck's description is a little different from Müller's: "*Unio testâ ovato-rhombeâ, tenui, viridi, umbonibus rugosis, rugis undulato-flexuosis sublongitudinalibus.* Of the variety *a* he adds *testa viridis, pubis carinâ lævigatâ.* His variety *b* is said to be the next species, *U. rugosus.*

The type shell in Mons. de la Serre's cabinet in Paris, which, by the politeness of M. Chenu, the Curator, I was enabled to examine in 1862, is a thin broadly ovate form with small teeth, and a well marked posterior wing. It measures 40 mm. from anterior to posterior margin, and 33 from the umbo to the ventral margin, the latter diameter being thus much greater in proportion to the former than in Küster's type. The valves are inequilateral and much broader behind than before, the anterior margin rounded, sloping away below to the ventral side; posterior margin bluntly biangulate, the two angles rather wide apart. The form is common in Southern India and Ceylon, and appears to have been generally accepted as the type.

Both Lamarck's and Chemnitz's types are quite distinct from Benson's *U. favidens*, which has been confounded with them.

No. 2.—Unio rugosus, Gmelin. Rivers of Coromandel.

Mya corrugata magna, Chemn. Conch. Cab. X. 346, Pl. 170, f. 1659.
M. rugosa, Gmel. p. 3222, No. 32.
Unio corrugata, [*b.*], Lam. VI., 78, No. 34.
Unio rugosus, Küster, Mart. and Chem. p. 290, Pl. 97, f. 5.

Both this and the preceding species probably inhabit the Cauvery or neighbouring streams. Küster's figure represents an elliptical subequilateral shell, with strong angulate sulcation at the umbones, extending to within no great distance of the ventral margin. Gmelin's original description is the following:—

M. testâ ovali rugosâ, extrinsecus virescente, intus margaritaceâ : cardinis dente primario crenulato, laterali longitudinali, alterius duplicato.

No. 3.—Unio marginalis, Lam. Bengal.

Lam. VI. 79, No. 41.
Küster, Mart. and Chem. p. 239, Pl. 80, f. 4.

This species is probably the most widely distributed of all the Indian forms. It is extremely variable, and I am inclined to believe that many of the species to be hereafter enumerated are merely varieties of it. I have examined the type and compared a shell from Pegu with it, which will be figured. It agrees very well. Küster's figure represents a variety with unusually prominent umbones, and rather longer from the hinge to the ventral margin than usual.

U. marginalis is by no means confined to India. It abounds, as I have already mentioned, in Pegu. One of Lamarck's forms came from Ceylon, and Küster appears much disposed to unite to it a species from the Nile in Egypt. Lamarck's type was said to inhabit rice-fields in Bengal.

No. 4.—Unio anodontinus, Lam. Bengal.

U. anodontina, Lam. VI. 80, No. 47.
U. anodontinus, Küster, Mart. and Chemn. p. 240, Pl. 80, f. 5.

Lea has classed this shell as identical with *U. marginalis*, Lam. If Küster's figures in the Conchylien Cabinet can be trusted, the two shells differ more than any one of Lea's three species, *bilineatus*, *lamellatus*, and *Bengalensis* do from each other, or from *marginalis*. Most of the Bengal specimens of *marginalis*, however, are intermediate between the two forms figured by Küster as *marginalis* and *anodontinus*.

The locality given by Lamarck for this species is Virginia. I unfortunately omitted to examine the specimen when I had the opportunity of doing so. There is, I believe, no question but that the shell was really from India.

No. 5.—Unio favidens, Bens. Ganges valley and Burhampooter valley, Assam.

Benson, Gleanings in Science, I. Pl. 8, f. 1.
" Ann. Mag. Nat. Hist. 1862, 3rd Ser. X. 188.

This species has been frequently confounded with *U. corrugatus*,

Lam. It differs totally from all the shells referred to that species, and all its numerous varieties are easily distinguished both from Lamarck's and Chemnitz's types of *corrugatus*. *U. favidens* is more inequilateral, it is a thicker shell with much stronger and broader cardinal teeth. The type, too, is more angulate, both anteriorly and posteriorly. The following varieties of *U. favidens*, with their localities, are described by Mr. Benson in the Ann. and Mag. Nat. Hist. Vol. X, pp. 188, 189.

Unio favidens, type. Bhitoura on the Ganges between Cawnpore and Allahabad.

1 *var. marcens*,.....Burhampooter river, Assam.
2 „ *trigona*, ...Nujeebabad in the north west of Rohilkund.
3 „ *Deltæ*, ... Jellinghy river, Bengal.
4 „ *Chrysis*, ...Dojora river, Kareily Ghat near Bareilly.
5 „ *viridula*, ..."Jheel" between Humeerpore and Someerpore, Bundelkund.
6 „ *densa*, ...Ganges river above Chunar.

No. 6.—Unio Cæruleus, Lea.—Hoogly river, 100 miles above Calcutta.

Lea, Trans. Am. Phil. Soc. IV, 95, Pl. 13, f. 25.
Benson, J. A. S. B. IV. 450.
Küster, Mart. and Chem. p. 228, Pl. 77, fig. 4.

The two figures agree perfectly. The type is a very thin shell, with fine lamellar teeth. Specimens exist in the Asiatic Society's Museum, brought from Bhagulpoor. The form is widely distributed in N. India; I have even a variety from Sind.

No. 7.—Unio bilineatus, Lea. Hoogly river with the last.

Symphonota bilineata, Lea, Trans. Am. Phil. Soc., IV. 98, pl. 11, f. 19.
„ Benson, J. A. S. B. IV. 452.

Benson, (Ann. Mag. Nat. Hist. Ser. 3, Vol. X., pp. 187, 195) shews that this is merely the very young form of *U. marginalis*, Lam. He is unquestionably correct. The "two delicate lines passing from the beaks to the posterior region" are, like many other umbonal markings, characteristic of young shells, and disappear gradually with age. The remains of them, much blunted, are often to be detected on adults.

No. 8.—Unio olivarius, Lea. Ganges valley.

Lea, Trans. Ann. Phil. Soc. IV, 108, pl. 16, f. 38.
Benson, J. A. S. B. IV. 453.
Küster, Mart. and Chem., p. 244, pl. 82, f. 2.

The locality given by Lea is Burrill river, India. Küster, who appears to be indebted for all his Indian species described by Lea to Dr. von dem Busch, gives Burrill river, Indiana (!), North America, as the locality. Mr. Benson says—"It is widely distributed in the Gangetic region, and is most abundant in the Rohilkund streams." The variety figured by Küster differs from Lea's type is being more inequilateral, much shorter anteriorly, and more obtuse posteriorly, and of a light green colour instead of pale olive. Indeed, it is by no means clear that the specimen figured is not a variety of *U cæruleus*. I do not know if there be such a river as the Burrill, but the locality for the original type is very probably the neighbourhood of the Buráil Range, north of Cachar, as the shell was received by Lea from a Dr. Burrough who collected extensively in Assam, and who supplied the original specimens, from which *Hylobates Hoolock* was described, to Dr. Harland.* This is not far from the localities whence the closely allied *U. Nuttallianus*, Lea, and *U. involutus*, Benson, were obtained.

No. 9.—Unio Corrianus, Lea. Calcutta.

Lea, Trans. Am. Phil. Soc. V. 65, pl. 9, fig. 25.
Küster, Mart. and Chem., p. 229, pl. 77, fig. 5.

Two completely distinct shells are figured by the two authorities above referred to. Lea's original type is a young form of one of the common varieties of *marginalis*, approaching *U. anodontina* of Lamarck; Küster's, on the contrary, is a form allied to *U. cæruleus*, but thicker, and with broader hinge teeth than that species, so that it is more diverse from *U. marginalis* than even *cæruleus* is! Küster's specimen was derived from Dr. von dem Busch, who, in this and other instances, appears to have utterly confounded different forms.

* See Transactions of the American Philosophical Society, Vol. IV. p 52. It is a disgrace to the science of England as represented in British India, and a lasting memorial of the disregard of natural history which has always been a characteristic of the British Government of India, that so remarkable an animal as the Hoolock should have been first recognised by an American naturalist at so late a date as 1834. Had India belonged to France, the United States or Russia, the study of its fauna would not have been left to the unaided efforts of private individuals.

No. 10.—Unio Bengalensis, Lea. Bengal.

Lea, Trans. Am. Phil. Soc. VI. 3, pl. 2, f. 3.
Küster, Mart. and Chem., p. 228, pl. 77, f. 2, 3.

In this case again, two totally distinct shells are figured, and again the authority for Küster's appears to be Dr. von dem Busch, whose collection furnished the specimen figured in Martini and Chemnitz. Lea's type is a very peculiar variety of *U. marginalis*, very much "longer" (that is wider when measured from the umbones to the ventral margin) in proportion to the breadth than usual. I have not met with it. It was obtained by Lea from Dr. Burrough who purchased it in Calcutta, and believed that it inhabited the Ganges. It has better claims to distinction than most of Lea's "species."*

Küster's type is a much thicker, more tumid shell, with far stronger teeth and impressed cicatrices, much more inequivalve and different in almost every character. I cannot recognise it as any form with which I am acquainted, and I much doubt its being Indian at all. At all events it is nearer to *U. corrugatus* than to *U. marginalis*.

No. 11.—Unio lamellatus, Lea. Bengal.

Lea, Trans. Am. Phil. Soc. VI. 19, pl. 6, f. 16.

This is another variety of the *U. marginalis* type, perfectly intermediate between the two last named, and approaching the type more nearly than either. Lea's shells were probably immature. In the younger shells of *marginalis*, the hinge teeth are more lamellar than in the adults, and the principal character of this "species" and of the two preceding is the lamellar teeth.

I have not met with the exact type of this shell, but it doubtless inhabits the neighbourhood of Calcutta. Specimens resembling it in every way except in being rather less long (in the dorso-ventral diameter) in proportion to their breadth are common.

No. 12.—Unio Rajahensis, Lea. Rajah's Tank, Calcutta.

Lea, Trans. Am. Phil. Soc. VIII., 239, pl. 23, fig. 53.

The above is the locality quoted. I am unable to discover what

* In a letter to my brother, Mr. Benson suggested a doubt as to whether this species were Indian. Taking into consideration the circumstance that nearly all the shells in the Calcutta bazar are foreign, this suggestion appears highly probable.

t ank is referred to. The shells inhabiting the Seven Tanks shew a considerable difference. The shell is a small, subrotundate, thick form, approaching some of the varieties of *U. favidens*, Bens., and has much the appearance of being stunted and distorted, a very common occurrence in tanks, and especially in those of Calcutta, probably in consequence of their being slightly brackish at times. Two specimens, agreeing well with Lea's figures, exist in the Asiatic Society's Museum. A very similar shell inhabits the Nerbudda.

No. 13.—Unio Shurtleffianus, Lea. Sina River, India.
Lea, Jour. Acad. Nat. Sci. Phil. III., 302, pl. 27, f. 17.

The Sina river runs past Ahmednugger in the Deccan. It is an affluent of the Bheema, one of the principal feeders of the Kistna. This shell has somewhat the form of *Unio cæruleus*, but is thicker. Unfortunately the volume containing the description of this shell does not appear to exist in Calcutta, so I cannot tell whether specimens, which I possess from the neighbourhood, belong to the type form or not. In such extremely variable shells as *Unio* this is a matter of considerable importance.

No. 14.—Unio Merodabensis *v. d. Busch, Province of Merodab in Bengal.* (!)

v. d. Busch. MS. in Küster, Mart. and Chem., p. 233, pl. 78, fig. 4.

I give the locality of this ridiculously named species as it is quoted in Küster. The locality is doubtless Moradabad in Rohilcund. Küster gives as a synonym *? U. flavus*, Benson, and adds the remark: "Whether this species be Benson's described *U. flavus*, I cannot ascertain, as I have not access to Benson's work. The name would be ill-selected, as the shell is by no means yellow."

Of course Benson's species thus referred to is *U. favidens*, of which the present appears to be a variety, very close to Mr. Benson's *var. trigona*. The name *Merodabensis* is so utter a barbarism, that it will be satisfactory to be rid of it. For the little series of blunders attending the description of this type, Dr. v. d. Busch again appears to be responsible.

No. 15.—Unio Sikkimensis, Lea. Sikkim.
Lea, Jour. Acad. Nat. Sci. Phil. 2nd Ser. IV. 251, pl. 39, f. 131.

I have some doubt about the locality assigned to this species. It

approaches the S. Indian forms of the *corrugatus* type (Lamarck's) in outline, and is barely distinguishable from two shells in the Asiatic Society's collection, which are labelled from Ceylon. It is a stouter shell than the Lamarckian *corrugatus*.*

No. 16.—Unio Nagpoorensis, Lea. Ambajiri tank, Nagpoor.

Lea, Jour. Acad. Nat. Sci. Phil. Ser. 2, IV. 270, pl. 45, f. 150.

This species is barely separable from some varieties of *Unio favidens*, Bs. It is, however, a rounder, thinner shell, forming a link, both in character and locality, between that species and *Unio corrugatus*.

No. 17.—Unio Wynegungaensis, Lea. Wynegunga river, east of Nagpoor.

Lea, Jour. Acad. Nat. Sci. Phil. 2nd Ser. IV, 271, pl. 45, f. 151.

Except in greater thickness, and stouter hinge teeth, there appears no distinction of the slightest importance between this "species" and the last. The type abounds in the Godavery and its feeders, and is, as usual, variable. The locality given by Lea is Wynegunga river, East of Nagpoor in the Deccan, Bengal, which is equivalent to talking of Philadelphia in New England, Virginia. However it is hardly fair to expect American naturalists to have accurate information on Indian geography, when an English naturalist of repute confounds the Khasi hills in N. E. India with the Nilgiris in the S. W., and when a second, in a work solely devoted to Indian zoology, perhaps the most important work on any branch of Indian Natural History, exclusive of botany, ever published in England, confounds Saharunpoor with Serampoor on the Hooghly. After this, the discovery made by the *Times* newspaper, a few years ago, that a spur of the Himalayas is visible from Calcutta is not so surprising. A distinguished French naturalist, five or six years since, placed Kattiawar in Cochin China, but it is only fair to add that this was before the French expedition to the latter country, and that French naturalists have already done not a little towards making us better acquainted with the Molluscan fauna of that little known region.

* Since writing the above, I have learned that the locality is correct. The shell was collected by Dr. Bacon.

No. 18.—Unio Theca., Bens. River Cane near Banda, Bundelcund.

Benson, Ann. and Mag. Nat. Hist. 1862, 3rd Ser. X. 186.

I have not seen this form. It belongs, according to Mr. Benson, to the *Corrianus* type of *Unio marginalis*.

No. 19.—Unio macilentus, Bens. Choia Nuddy, near Bijnore, Rohilcund.

Benson, Ann. and Mag. Nat. Hist. 1862, 3rd Ser. X. 187.

A rather thin species resembling *cæruleus*, but with stout hinge teeth, resembling those of *U. favidens*. I am unacquainted with the type, but a very similar form is common in the Damuda and its tributaries in Bengal.

No. 20.—Unio triembolus, Bens. R. Ramgunga, near Moradabad.

Benson, Ann. and Mag. Nat. Hist. 1862, 3rd Ser. X. 190.

A thick shell with large hinge teeth. A massive species which inhabits the Nerbudda, and the shells of which are found fossil associated with the bones of extinct mammalia in the gravels of the river valley, may be a variety of this species. I have never seen the type.

No. 21.—Unio plagiosoma, Bens. River Cane near Banda, Bundelcund.

Benson, Ann. and Mag. Nat. Hist. 1862, 3rd Ser. X. 191.

No. 22.—Unio lævirostris, Bens. Near Chunar, in streams and tanks.

Benson, Ann. and Mag. Nat. Hist. 1862, 3rd Ser. X. 191.

No. 23.—Unio Pinax, Bens. Gungun stream, near Moradabad, Rohilcund.

Benson, Ann. and Mag. Nat. Hist. 1862, 3rd Ser. X. 192.

The three abovenamed species appear all to be allies of *U. favidens*. They probably pass into each other.

No. 24.—Unio Leioma, Bens. Deccan? near Bombay.

Benson, Ann. and Mag. Nat. Hist. 1862, 3rd Ser. X. 192.

The locality of this shell is uncertain. I have no species from Western India which agrees with the description.

No. 25.—Unio occatus, Lea. Bengal.

Lea, Jour. Acad. Nat. Sci. Phil. 2nd Ser. V. 398, Pl. 50, fig. 304.

A compressed form, with strong teeth, fairly intermediate between *cæruleus* and *favidens*, and allied to *U. macilentus*, Bs. and *U. plagiosomâ*, Bs. but more compressed than either. It especially requires comparison with *U. macilentus*, of which it may be a compressed form.

No. 26.—Unio Gerbidoni, Eydoux. Coromandel.

Said by Lea to be the same as *Unio cæruleus*.

No. 27.—Unio Bonneaudi, Eyd. South India.

No. 28.—Unio Gaudichaudi, Eyd. Bengal.

No. 29.—Unio Keraudrenii, Eyd. Chandernagore.

I am indebted for all my information as to the above four species to Mr. Benson. I have not access at present to the work in which they are described.

In Küster's monograph of *Unio* in Martini and Chemnitz another species is described from the "East Indies," *U. Exanthematicus*, Küster, p. 243, pl. 81, fig. 2. The authority, however, for the locality is Dr. v. d. Busch, whose general accuracy, after the instances given above, may be open to doubt; the "East Indies" in a Natural History sense, not many years since, denoted any country between Africa and Kamschatka, and the peculiar pustulated surface of the shell, from which the name is derived, is unknown in any Indian species. I think it is probably not a native of the Indian Peninsula.

U. discus, *Lea*, *Trans. Am. Phil. Soc. IV*, 74, *Pl.* 18, *f.* 57, was at first stated to be from India, on, however, palpably insufficient grounds, the original specimen having been purchased from a dealer amongst a lot of shells from India. The shell is so distinct from any known Indian species, that I had concluded that the locality was assigned to it in error, before I found that in a subsequent volume of the Trans. Am. Phil. Soc., Vol. VIII., p. 234, note, Lea mentions his having ascertained that the locality was the River Moctezuma in Central America.

Mr. Benson mentions (Ann. and Mag. Nat. Hist. 1862, X., 195,) his having received from the Malabar Coast a shell which he refers to *U. consobrinus*, Lea.

Unio spuria is said by Lamarck to be from Southern Asia. Mr. Benson states (Ann. and Mag. Nat. Hist. 1862, X., 189,) that the young of *U. favidens* approaches the figure given by Wood of *Mya spuria*, which is, I suppose, the same species. It is not clear that Lamarck's type was Indian. Mr. Benson also (l. c. p. 189) refers to *Mya radiata*, Chem. as being from Malabar. *Mya radiata*, Gmelin is by Lamarck, Lea and Küster, said to be American, and even in Küster I can find no allusion to Chemnitz's species.

It is only right to add too that some of what Woodward most justly terms "the worthless fabrications of Rafinesque" (Man. Mol. p. 136, note,) came from India. No scientific purpose can be served by recalling the names from the oblivion in which they are happily buried.

II.—Assam.

No. 30.—Unio involutus, Benson. Assam.

S. Hanley, Supp. to Wood's Ind. Test.

I only know of this and the succeeding three species from reference being made to them by Mr. Benson in the Ann. and Mag. Nat. Hist. for 1862, 3rd Ser. X., 186. The work in which they were originally described is not procurable in Calcutta. *U. involutus* is said to be thin and tumid and to represent *U. olivarius*, Lea, in Assam.

No. 31.—Unio Corbis, Bens. Assam.

S. Hanley, Supp. to Wood's Ind. Test.

No. 32.—Unio Radula, Bens. Assam.

S. Hanley, Supp. to Wood's Ind. Test.

No. 33.—Unio Scobina, Bens.

S. Hanley, Supp. to Wood's Ind. Test.

U. fluctiger, Lea (teste Benson) Jour. Acad. Nat. Sci. Phil. 2nd Ser. IV. 250, pl. 39, f. 130.

" Küster, Mart. and Chem., p. 237, pl. 80, fig. 1.

Mr. Benson (in Ann. and Mag. Nat. Hist. 1862, X., 186) states that *U. fluctiger*, Lea, is a synonym of *U. Scobina*. Küster's figure of *fluctiger* differs from Lea's type, and the shell is stated to be from S. America. As, however, Küster's specimen was from Dr. v. d. Busch's cabinet, very little reliance can be placed upon the assigned locality, especially as Lea, who did not know whence the shell came, suggested that it was, possibly, South American.

Küster's type is narrower anteriorly and has rather different, coarser plication posteriorly, than Lea's. It may be a different shell.

No. 34.—Unio Nuttallianus, Lea. Assam, teste Benson.

Lea, Jour. Acad. Nat. Sci. Phil. III., 310, pl. 30, f. 25.

The locality is simply stated to be India by Lea. Benson, Ann. and Mag. Nat. Hist. 1862, X, 194, states that he has received specimens from Assam. The volume containing the description of this shell is not procurable in Calcutta.

No. 35.—Unio Jenkinsianus, Bens. Burhampooter River, Assam.

Benson, Ann. and Mag. Nat. Hist. 1862, 3rd Ser. X., 185.

An ally of *U. marginalis*, distinguished by "the very tumid form, the sloping posterior end, absence of a wing, the short ligament, and the nature and position of the teeth." (Bens. l. c.) In the Asiatic Society's collection there is a shell from Bhagulpoor perhaps referable as a variety to this species.

No. 36.—Unio pachysoma, Bens. Burhampooter River, Assam.

Benson, Ann. and Mag. Nat. Hist. 1862, 3rd Ser. X., 186.

"An inflated form of the *cæruleus* type." (Bens. l. c.) Mr. Benson also states that he has received a distorted variety from Calcutta. A peculiar tumid form which is not uncommon in Calcutta tanks is doubtless referred to. It agrees generally with the description given. This form therefore adds one more to the Bengal list.

No. 37.—Unio Smaragdites, Bens. Burhampooter River, Assam.

Benson, Ann. and Mag. Nat. Hist. 1862, 3rd Ser. X., 190.

A shell allied to *U. favidens*.

Besides these forms a variety of *U. favidens*, Bens. (*var. marcens*) has already been quoted as occurring in Assam. Mr. Benson also records the receipt of a variety of *U. cæruleus* (J. A. S. B. VI. 750) and of a small variety of *U. marginalis* (Ann. and Mag. Nat. Hist. 3rd Ser. X. 186) from that region.

III.—Ceylon.

No. 38.—Unio Layardi, Lea. Ceylon.

Lea, Jour. Acad. Nat. Sci. Phil. 2nd Ser. IV., 243, pl. 36, f. 122.

This is a shell of the *marginalis* type with a convex dorsal margin, and generally rounded outline. It appears to be a fairly distinguishable form, though very close to *Bengalensis* and *lamellatus*.

No. 39.—Unio Thwaitesii, Lea. Ceylon.

Lea, Jour. Acad. Nat. Sci. Phil. 2nd Ser. IV., 246, pl. 37, f. 125.

This shell only differs from the last in having a rather straighter hinge line, and being slightly more inequilateral. If such differences are to rank as specific, half a dozen "species" might be manufactured out of any tank in Calcutta. The separation of these two forms is perfectly unjustifiable in a genus like Unio.

The above are the only species that I can trace specially described from Ceylon. Lamarck's variety *b.* of *Unio marginalis* described as *var. testâ minore, breviore*, and 75 millimetres broad was also from Ceylon (Lam. VI. 79). Sir Emerson Tennent, in his work on Ceylon, enumerates only *U. corrugatus* besides *U. marginalis*. He, however, adds that Mr. Cuming possessed six species from the island, which had been sent to Mr. Lea. *U. Thwaitesii* and *U. Layardi* are doubtless two of these, as they were from Mr. Cuming's cabinet, but no mention is made of the others by Mr. Lea.

IV.—Burma.

No. 40.—Unio Tavoyensis, Gould. Tavoy.

Gould, Proc. Bost. Soc. Nat. Hist. I., 140.
„ Ot. Conch. p. 190.
Küster, Mart. and Chem., p. 166, pl. 48, f. 2.

"Closely allied to *U. corrugata*, Lam. which is less rounded and less corrugated" (Gould, l. c.) More nearly allied to Lamarck's than to Chemnitz's type of *U. corrugatus*. Küster's figure agrees well with Gould's description, but represents a young shell, not mature. The specimen figured was from the collection of Dr. Sturm (and not from that of Dr. v. d. Busch).

No. 41.—Unio crispatus, Gould. Tavoy.

U. crispata, Gould, Proc. Bost. Soc. Nat. Hist. I., 141.
„ „ Ot. Conch. p. 191.

No. 42.—Unio foliaceus, Gould. Tavoy.

U. foliacea, Gould, Proc. Bost. Soc. Nat. Hist. I., 141.
„ „ Ot. Conch. p. 191.

An ally (variety?) of *U. marginalis*, Lam. "Closely allied to *U. Bengalensis* and *Corrianus*, Lea." (Gould, l. c.)

No. 43.—Unio exolescens, Gould. Tavoy.

Gould, Proc. Bost. Soc. Nat. Hist. I., 141.
„ Ot. Conch. p. 191.

Apparently, from the description, another ally or variety of the *U. marginalis* type.

No. 44.—Unio generosus, Gould. Tavoy.

Gould, Proc. Bost. Soc. Nat. Hist. II., 220.
„ Ot. Conch. p. 201.

I believe I possess this species. Specimens were sent to me by Mr. Theobald from Pegu, which agree with the description fairly, except that they are smaller than the type.

No. 45.—Unio luteus, Lea. Newville, Tavoy.

Lea, Jour. Acad. Nat. Sci. Phil. III., 302, *pl.* 27, 17.

I have not access to the description or figure of this species.

No. 46.—Unio crispisulcatus, Bens. Bangong R. near Thayet Myo, Pegu.

Benson, Ann. and Mag. Nat. Hist., 1862, 3rd Ser. X., 193.

I am indebted to Mr. Theobald for specimens of this shell. It appears doubtful whether it be more than a variety of *U. crispatus*, Gould, to which Mr. Benson does not refer in his description, and with which he was possibly unacquainted. Gould's description is very brief, and gives the idea of a more coarsely sculptured shell ("*rugis angulatis radiantibus undique crispata*") besides being somewhat shorter (from the dorsal to the ventral margin) in proportion to its breadth, but these are not necessarily specific distinctions.

No. 47.—Unio Pugio, Bens. Ava and Pegu.

Benson, Ann. and Mag. Nat. Hist., 1862, 3rd Ser. X., 193.

A solitary valve was sent to Mr. Benson by Mr. Theobald, who gave the locality as Ava. I subsequently found the same form in the Myanoung district of Pegu, and Mr. Theobald has since obtained larger varieties, I believe from Prome. It is a well marked type, extremely inequilateral, and with a peculiar acuminate form posteriorly.

As already observed, the type form of *Unio marginalis*, Lam. abounds in Pegu. I found unusually fine specimens in large swamps about Henzada and Myanoung in the Irawady valley. The type gradually passes by insensible gradations into a much less transverse

form, almost subquadrate. The posterior portions of the valves were often covered by the remarkable fresh water Bryozoon *Hislopia* of Carter, apparently a new species.

I have other species from Pegu, but I am unable at present to compare them with the numerous named forms described by Lea from Siam, many of which probably extend to Burma.

Genus ANODONTA, Brugiere.

No. 1.—ANODONTA SOLENIFORMIS, Bens. Assam.

Benson. J. A. S. B. V., 750.

The type specimen is in the Asiatic Society's Museum (now the Imperial Museum). There is also an *A. soleniformis*, D'Orbigny, but Mr. Benson's name is the oldest, as it was published in 1836.

Mr. Lea has described a species from Siam, evidently very closely allied to this, as *Mycetopus emarginatus*, Lea. (Jour. Acad. Nat. Sci. Phil. 2nd Ser. V., 398, pl. 50, f. 305). As the animal has not been observed, it may be doubtful if it is really a *Mycetopus*. At the same time the character of both the Siam and Assam shells are so distinct from those of any true Anodonta, that perhaps the best provisional classification is that adopted by Mr. Lea. Specimens of *A. soleniformis* with the animal living are a peculiar desideratum.

No. 2.—ANODONTA SALWENIANA, Gould. Salween R., Burma.

Gould, Proc. Bost. Soc. Nat. Hist. I., 158.
„ Ot. Conch. p. 193.

A very peculiar broad shell, belonging to *Monocondylæa*. (See next species.) I have never seen this form.

No. 3.—ANODONTA INOSCULARIS, Gould. Salween R., Burma.

Gould, Proc. Bost. Soc. Nat. Hist. I. 158.
„ Ot. Conch. p. 193.

Subsequently in the same volume, p. 161, Dr. Gould suggested that this species might be the type of a new genus which he named *Pseudodon*. This name is by Adams quoted as a synonym of *Anodonta*, but the type species is not quoted under that genus, nor, so far as I can detect, under any other. In *Otia Conchologica*, Gould, in describing the genus, adds in brackets "perhaps equivalent to *Monocondylæa*, D'Orb." So far as the shell is concerned, this is undoubtedly the

correct position of these species, if the hinge teeth are trustworthy indicators of generic affinity. H. and A. Adams, in the Gen. Rec. Moll., include under *Monocondylæa*, *M. Vondenbuschiana*, Lea, from Java,* described by Lea as a *Margaritana* (*Baphia* of Adams) and several species of the genus have been described from Siam and Cochin China by French and American naturalists.

I have received from Mr. Theobald fine specimens obtained in Pegu which correspond admirably with *Margaritana Vondenbuschiana*, Lea, and unquestionably belong, I think, to that species; and also shells which appear to belong to a variety of *Anodonta inoscularis*, agreeing with the type in size, shape and every character of importance; and not only are the two forms unmistakeably congeneric, but I even think it probable that specimens might be met with to unite them specifically, as they differ in no essential character, except the very different degree of development of the cardinal tooth, which in *Vondenbuschiana* is scarcely raised, while in the specimens which I refer to *inoscularis* it is sometimes nearly a quarter of an inch high.

There are in the Asiatic Society's collection, also, two forms which appear to me certainly varieties of *M. Vondenbuschiana*. One of them, however, agrees more closely with the figure of *M. Cumingii*, Lea (Jour. Acad. Nat. Sci. Phil. 2nd Ser. IV, 235, pl. 33, f. 114) a Malacca shell, which only differs from *Vondenbuschiana* in unimportant minutiæ.

M. Vondenbuschiana is described and figured by Lea in Trans. Am. Phil. Soc. VIII, 222, pl. 18, f. 39, and also in Küster.

Were there nothing but the form of the hinge teeth to connect the South American species of *Monocondylæa* with the Burmese and Javanese *Pseudodon* and *Margaritana*, especially having regard to the very diverse form of the shell, I should suspect them to be in reality distinct types. But there is one little peculiarity which appears to tend to unite them. At the termination of the portion of the hinge line in which, by close inspection, flattened obsolete representations of the lateral teeth may be seen, there is a very peculiar expansion of the end of the ligament which covers a small sinus in the inner surface of both valves. This is very well shewn in Lea's figure of *Margaritana*

* Yet they state, "All the species of this genus known are from the rivers of South America."

Vondenbuschiana, and also in both Adams's figures of different species of *Monocondylæa* from S. America. The same occurs in Anodon and in the type species of *Margaritana* of Schumacher,* (*M. margaritifera*, L.). I have not had an opportunity of examining the animals of the Burmese species of *Monocondylæa*, and therefore cannot say if the gills are free or not.

Besides the above forms, a minute species of *Anodon* is stated by Mr. Benson to inhabit ponds in Bundelcund, J. A. S. B., V. 750.

P. S. No. 2*a*.—Unio spurius, Gm. Tranquebar.

Mya spuria, Gm. vol. I, Pt. VI, p. 3222, No. 16.

Unio spuria, Lam. VI, 80, No. 45.

Mya spuria, Wood, Ind. Test. p. 12, pl. 2, No. 35.

Since writing the note on this species at p. 146, I have found that it was described originally as from India. Gmelin refers to Schroeter Einl. in Conch. II, 617, No. 9, pl. 7, f. 5, so perhaps the name may have been given by Schroeter, though that by no means follows from the reference. The description is very brief: "*M. testâ rhombeâ viridi, natibus glabris*" and the shell is said to be like *corrugatus*, but nearly twice the size and perfectly smooth in front of the beaks ("*praeter vulvæ regionem tota glabra*," Gm. *l. c.*). Wood's figures are all poor. The shell can scarcely be a young form I think, if considerably larger than *corrugatus*.

Mya radiata,† I find, is attributed to Malabar by Gmelin, (p. 3220,) from whom Wood appears to have only copied his localities. The species is, I think, correctly attributed to Chemnitz by Mr. Benson, although other authors give Gmelin as their authority. Gmelin's description runs thus—"*M. testa æquivalvi pellucida tenuissime transversim striata viridi flavicante livido radiata; valvis altero latere latissimis, altero angustissimis.*" I know of no form of Indian *Unio* to which this description would be applicable, and I cannot help suspecting that the writers who have applied the name to an American species may very possibly be right. Wood's figure, also, does not recall any Indian

* It is by no means clear that *Margaritana* and *Monocondylæa* are more than subgenera, or even artificial sections of *Anodonta*. *M. Vondenbuschiana* is intermediate between the second and last in characters of the shell, and there is no known essential distinction in the animal.

† The Linnæan genus *Mya*, like most Linnæan genera, was an artificial group to some extent Besides *Mya* as now understood, it comprised *Unio* and several other genera.

species; for it is evident from the above description that the radiating lines shewn do not refer to striæ but to coloured markings. Mr. Benson's shell from Malabar was striated.

Good collections of the Unios of both Coromandel and Malabar are greatly needed to determine all these doubtful species.

MONOCONDYLÆA CREBRISTRIATA, Anthony. Pegu.
American Journal of Conchology, I., 205, pl. 18.

MONOCONDYLÆA PEGUENSIS, Anthony. Pegu.
Am. Jour. Conch. I., 205, pl. 18.

I am indebted to Mr. Theobald for the above quotations. The shells are the two *Monocondylæa* above referred to, the first being that referred by me, though with some doubt, to *Anodonta* (*Pseudodon*) *inoscularis*, Gould, the second to *Monocondylæa Vondenbuschiana*, Lea. So long as it is the practice of naturalists living in foreign countries, and, necessarily, imperfectly acquainted with the fauna of distant regions, to give a "specific" name to every animal or fragment of an animal which reaches them, lists of synonyms must multiply; and as everybody will contend for the distinctness of his "species," false notions as to the nature and value of specific distinctions must prevail. Thus, in the same paper, one of the numerous varieties of *Melania variabilis*, Benson, is called *M. gloriosa*, Anthony. Now it is worthy of remark that Mr. Benson, who has examined far more of the Mollusca of Burma than Mr. Anthony can possibly have seen, has not for years described a single Melania from that country as new, and has only described two species of Unio, although he had specimens of all Mr. Anthony's supposed new species. I can only add that it would be easy for me to describe, from the materials I possess, 20 or 30 forms of *Unio* (and nearly as many more of *Melania*) with as good claims to distinction as one-half at least of those already published from India and Burma; but were I to do so, I cannot help thinking that, while burdening science with additional names, I should have added nothing to the knowledge of the fresh water mollusca of India. Amongst fresh water shells I am convinced that forms pass into each other far more than amongst land shells, that "species," in the usual definition of the word, have no existence, that all the characters relied upon for distinguishing "species" of *Unionidæ* in especial, the form and thickness of the hinge teeth, form

of the shell, prominence of the umbones, shape of the muscular impressions, colour of the nacre, characters of the epidermis, &c. vary *ad infinitum*—in short that species must be described like genera and grouped around types, not distinguished by characters.

I see from a notice in the Paris *Journal de Conchyliologie* that, in the same volume of the American Journal of Conchology, Mr. Conrad proposed a new genus *Trigonodon* for *Monocondylæa crebristriata* of Anthony, from which, as I have stated above, *Anodonta inoscularis*, Gould, is at the best but dubiously separable specifically. But the last named shell is the type of Gould's genus *Pseudodon*, and Gould himself suggested the identity of that genus with D'Orbigny's *Monocondylæa*.* Unless Mr. Conrad has procured the animals of the Pegu forms, and shewn them to be distinct from those of South America, (and I scarcely think he can have done so,) I cannot believe that any useful object is attained by inventing these generic appellations. Even if *Trigonodon* be not *Pseudodon* over again, (Mr. Conrad appears to have already furnished one synonym before for *Pseudodon*, viz. *Monodontina*,) there has been no distinction of any generic value shewn between the shells of Burmese and Malay species of *Monocondylæa* and those of S. America; and bearing in mind that there are some genera of more restricted distribution than those belonging to the *Unionidæ*, *e. g.* the Tapir, and amongst Mollusks, *Cyclophorus* and *Megalomastoma*, common to the two regions, it would, I think, be more scientific to examine the animals of the Burmese shells allied to *Monocondylæa*, before founding new genera to comprise them.

There is of course the possibility that Mr. Theobald may have been misinformed as to the respective names of the two species, and that the type of *Trigonodon* is the form I have referred to *Monocondylæa Vondenbuschiana*. I can only add that the specimens of the same shell from the same locality sent to me by Mr. Theobald, do not differ more from Küster's figure of V. d. Busch's original specimen of *M. Vondenbuschiana* in Martini and Chemnitz, than that figure does from Lea's.

Unio Peguensis, Anthony.

American Journal of Conchology, Vol. I.

I cannot learn what species has been thus named. I hope to be able to refer to the volume before long and to return to the subject.

* Ot. Conch., p. 194.

Two Indian species of *Unio* in the Musée d' Histoire Naturelle at Paris have received MS. names from Valenciennes. I am unable to ascertain at present if these names have been published or not.

Corrigenda in Contributions to Indian Malacology, No. VI., in this volume:

P. 31,	line	2,	from bottom,	for	Kimery	read	Kimety.
32,	„	7,	„ top,	„	*Fordopi*	„	*Gordoni*.
„	„	8,	„ bottom,	„	Hattiwar	„	Kattiawar.
34,	„	2,	„ „	„	inwardly	„	conoidly.
35,	„	15,	„ top,	„	*subjesta*	„	*subjecta*.
37,	„	12,	„ bottom,		supply "it"	after	nulla.
„	„	9,	„ „		omit the word South.		
38,	„	10,	„ top,	„	oblong ovate, Achatina	read	oblong ovate Achatinæ.
„	„	17,	„ „	„	*Basilens*	„	*Basileus*.
„	„	12,	„ bottom,	„	*Alycœus*	„	*Alycæus*.
„	„	8,	„ „	„	Reeleiz	„	Reeluz.
39,	lines	21, 16 & 11,	from bottom,	for	*Basileus*	„	*Basileus*.
„	line	17,	from bottom,	for	Wynand	„	Wynaud.
„	„	14,	„ „	„	Paulghat cherry	„	Paulghatcherry
„	„	5,	„ „	„	of that *N. auris*	„	of *N. auris*.
„	„	2,	„ „	„	base by	„	barely.
41,	„	11,	„ top,	„	slighly	„	slightly.

In the previous number V. of the Contributions, an important error occurs N. CONULA, n. s. for N. CONULUS (J. A. S. B. XXXIV, 73, 1865).

In the same page, Phoung ditto, Arakan, should be Phoung Do, and three pages further, p. 76, line 12, a semicolon is omitted, altering the sense. The passage should read "a vertical lamina in front, and a second, slightly oblique, just behind; the first giving out" &c. instead of "just behind the first." The only other erratum of importance is in page 81, line 20, where "re-entering lamellar parietal" should be "re-entering parietal lamella."

Scientific Intelligence.

The following is from Mr. Blyth :—

I have already elucidated* sundry species of Ægialites (or Rin Plover) and may now further add that I have since made out the *Charadrius pusillus* of Horsfield to be the same as *Æ. ruficapillus*, Gould, figured in his Birds of Australia : Horsfield's specimen being in winter dress, and his name of course standing for the species.

The Indian Neophron (281) will have to rank as *N. gingivianus*, Latham. The *Spilornis* of Ceylon and of all S. India is the same as *S. Elgini*, Tytler, and will bear my prior name *Spilogaster* (J. A. S. XXI. 351) being distinct from the Malayan *S. bacha*, with which Professor Schlegel identifies it. *Falco babylonicus* is the *F. peregrinoides* apud G. R. Gray, as suggested in p. 282. The Cat noticed as *Felis macrocelis* in p. 283 seems, after all, to be of a different and smaller race than one received from Asám also in the Zoological Gardens. It has now been more than three years in the garden, and has only a slight fulvous tendency even yet, while the other is much more fulvescent, and is also of heavier build. I think that the larger only has the very elongated canine teeth. Neither seems to be the true *Diardii* (vel *macrocelis*) of Sumatra and Borneo; and I suspect that the larger and more fulvous animal (which the Society's Museum has from Sikhim) should rank as *F. nebulosa*, C. H. Smith, figured in Griffith's English edition of the *Règne animal*. There is also great variation in the *F. aurata*, Tem. (*murmensis*, Hodgson, and the young *F. Temminckii*, Vigors.) A rufous specimen in the India Museum has strongly developed body-markings, akin in type to those of the *macrocelis* group; others (alike from Sikhim, Malacca and Sumatra,) are deep rufous without trace of body-markings; and thirdly, there is the blackish race, which is designated *F. nigrescens*, Hodgson, in the second edition of the British Museum Catalogue of Mr. Hodgson's collections. These Cats would seem, in fact, to be in process of specialization, which is carried on a further stage in the *F. Swinhoei* of Formosa, as compared with the other races akin to *F. Diardii*. Lastly, *F. Charltoni* may be a race not strongly specialized apart from *F. marmorata*

* Asiatic Society's Journal, vol. XXXIV. p. 280.

The whole of these constitute a group of E. and S. E. Asiatic Cats *per se*, which have not the peculiar clubbed tail of *F. uncia*, with which Dr. Gray associates them. To the species of birds to be expunged from Jerdon's Indian series (p. 282), may be added *Otocoris penicillata*, for which *O. longirostris* of Kashmir, Kooloo, &c., has hitherto been mistaken. *O. penicillata* of W. Asia is smaller, with much longer ear-tufts, and the black of the cheeks is continuous with that of the breast. Have I told you that *Carpophaga cuprea*, Jerdon, is well distinguished from *C. insignis*, Hodgson, having the neck and lower parts much more ashy, while both differ from *C. badia*, (Raffles), of Sumatra? Of *C. pusilla*, nobis, I have seen more specimens from S. India, where perhaps it co-exists with the large *C. ænea;* and both *cuprea* and *pusilla* are very likely to inhabit the mountains of Ceylon. *Grauculus Layardi*, nobis, (*papuensis* apud Sykes,) of S. India and Ceylon, is very distinct from *G. macei* of Bengal, &c., much smaller, with the wings strongly banded underneath. The Malayan *G. javensis* is a miniature of *G. macei*, of the same small size as *G. Layardi*. As many as four races have been confounded under *Pycnonotus jocosus*, (L.,) a name which must be retained for that of China, which I have not seen. The Bengal bird will stand as *emeria* of Shaw (*pyrrhotis*, Hodgson). The Tenasserim and Penang race is *monticolus*, M'Clelland. That of S. India will be named by Gould, and it has no white markings on the rectrices. In the Zoological Gardens are apparently two new species of Pheasant. One is a female, of a duplicate race to *nycthemerus*, being of the true silver Pheasant type. The other is a male; very like *lineatus* of Burma; but the markings of the upper parts more resemble those of *nycthemerus;* it has no white along the ridge of the tail, and no white streaks on the flanks. Some think it a hybrid; but, if so, it can only be between *lineatus* and *nycthemerus*. The tail, however, is shaped exactly as in the former, whereas it should be considerably more lengthened, if the bird had *nycthemerus* for one parent; and its legs also should in that case be larger, and shew some trace of the crimson colour of those of *nycthemerus*. I am, therefore, disposed to consider it as a true wild race of Kallij, probably from some more eastern part of the Indo-Chinese peninsula.

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Kashmir, the Western Himalaya and the Afghan Mountains, a geological paper by ALBERT M. VERCHÈRE, *Esq., Bengal Medical Service; with a note on the fossils by* M. EDOUARD DE VERNEUIL, *Membre de l'Académie des Sciences, Paris.*

(Continued from page 133.)

Leaving with regret the Zeeawan spur, we will continue our examination of the Zebanwan mountain along its southern aspect. (See Map B.) (Section III. on General Map.)

We first cross a considerable mass of volcanic rocks, well stratified, and which we will not stop to describe, as they are similar to the felspathic ashes, black slates and the amygdaloid seen before. They present, however, a few layers of a coarsely crystalline limestone, without fossils and interbedded with layers of ash; some of this limestone is quite black and remarkably well crystallized in small crystals of jet-black spar. It would be a valuable ornamental marble, if found in some quantity. I have only seen it in thin and small patches, accompanying an amygdaloidal dust-stone of fine texture, but much decayed and nearly as black as the limestone. These patches of black rock are well seen on the slope of the long spurs which descend towards the S. E., from the highest summits of the Zebanwan. These volcanic rocks dip easterly, and their inclination is not more than 20° to 25°.

Having crossed a ravine, we arrive at the spurs over Zowoor, where we find the following beds along one section, from W. S. W. to E. N. E. We begin with No. 4 of the Section : the Nos. 1, 2 and 3 refer to the volcanic rocks and black limestone just described.

1. ..... Amygdaloidal greenstone, dips E. S. E.
2. ..... Ash interbedded with thin beds of highly crystalline azoic limestone.
3. ..... Ash interbedded with black crystalline limestone in thin patches.

4. Amygdaloid ; dip E. S. E. 20°.

5. Quartzite, white and stratified. It becomes gradually sandy and coloured blue, yellow or grey in places, ... 15 ft.

6. Crystalline limestone with the debris of fossils, undeterminable, 5 ft,

7. Lenticular beds of coarse granular limestone, full of *Athyris* sp. ? (see Pl. II. fig. 1 and 1a) and *Productus Flemingi*, ... 1 foot.

8. Limestone ; grey, weathering brown, presenting abundant sections of *Orthoceras* and a few *Fenestellides*, ... 10 ft.

9. Coarse limestone ; *Fenestellides*, *Producti*, &c. passes into.

10. Calcareo-ferruginous, brown shales with some fossils : 9 and 10, about ..... 40 ft.

These beds 6, 7, 8, 9 and 10 are therefore the same beds as there seen at Zeeawan, or they are in other words, Zeeawan limestone. They all dip E.S.E. 20°.

11. Limestone, thin bedded and shaly : no fossils, ... 5 ft.

A fault occurs here, and the following beds are seen on the eastern side of it.

12. Limestone of the Zeeawan bed brought up again. It presents the same succession as above, viz. an Orthoceras bed, a Fenestellide bed, and a brown shale bed ; the Fenestellide beds are, however, less abundant, and the lenticular Athyris ones were not seen, ... 40 ft.

27. Resting on this limestone, we find other beds of limestone having a very different aspect. In fact we have the beginning of the Weean bed of carboniferous limestone. The fauna changes considerably : no *Producti* are found, no *Fenestellides*, no great flat *Orthidæ*, but instead a very great number of small bivalves, much broken and comminuted, and here and there in lenticular beds, where fossils of one or two species have been heaped together, some small *Brachiopoda* of the genera *Spiriferina* and *Terebratula* ; some large mussel-shaped bivalves which are probably *Anthracosiæ* or some other near sub-genus of *Cardinia* ; some large and sometimes extremely gibbose *Aviculo-pectens* ; some *Pectens* four inches across ; *Goniatites* and an innumerable variety of *Encrinite* stems of all sizes. The appearance of the rock will be noticed as we get on with our section.

13. A light blue limestone, argillaceous and compact, weathering rugose like frosted glass, but without losing its fine, lustreless, clay-like, pale blue colour. It contains many remains of fossils in a bad state of preservation,... 30 ft.

A fault from N. N. W.—S. S. E.; downthrow S. W. The fault is met near the end of the spur by another running W. S. W.—E. N. E. The end of the spur, detached, as it were, by these two faults, strikes S. E.—N. W. and dips N. E. 20°. The rock of this detached bed is a shaly limestone; the fossils are small and ill-preserved; they occur in patches, one or two feet of the bed presenting a great number of remains, whilst hardly a trace of organisms is to be seen for some yards. It is about 50 feet thick,..... 50 ft.

Another fault from N. N. W.—S. S. E.; downthrow S. W. The effect of this fault has been to bring up again the bed of Zeewan limestone, and we therefore have the following bed to the N. E. of the fault.

14. A coarse micaceous marly slate, without fossils, and passing gradually upwards into sandy shales of a dark brown colour and containing *Producti*, *Orthidæ* and *Spirifers* in a very bad state of preservation. These dark shales are identical in appearance and in some of their fossils with the brown shales of the Zeewan bed, but the *Bryozoa*, so extensively developed in other localities, appear to be totally absent, and some small bivalves, which are found in the Weean bed and have not been seen in the Zeewan bed, were discovered here.* These differences however may be easily accounted for by a difference of depth of the sea at the time the Zeewan limestone and shale were deposited. The sandy and coarse micaceous slates seem to indicate a shallow sea with a drifting current on a shelving coast, a physical arrangement which may be a tolerable habitat for the large *Brachiopoda*, but unsuitable to the delicate *Bryozoa*.

This Zeewan bed is succeeded by a shaly limestone, similar to that which is seen before the fault, that is to say Weean limestone. It has a well marked cleavage, due probably to its argillaceous impurities, and this cleavage is not unfrequently more conspicuous than the stratification.

The end of the spur is, like the preceding spur, cut off by a transverse fault W. S. W.—E. N. E. and the detached end dips E. N. E. 20°, whilst the body of the spur, above the transverse fault, dips E. S. E. 20°, the cleavage noted above dips N. W. 70°.

The thickness of these two beds together is about 100 feet; they form the whole of the spur above the village of Koonmoo,..... 100 ft.

28. Above Koonmoo, in the angle formed by the divergence of the two arms of the spur, is a spring with a Zyarat called Shōkūm.

* A similar mixture of Zeewan and Weean fossils is found in some parts of the Rotta Roh in the Punjab. See Chapter III. para. 60.

The rocks which are above this spring form a little knoll very insignificant geographically, but interesting for its fossils. These are often converted into hæmatite, sometimes crystalline, sometimes powdery. The rock of the bed is mostly a hard, cherty, pinkish limestone, and in this are lenticular beds of a soft, granular, pale french-grey limestone, with innumerable minute black dots which are the crystallized stems of a very slender crinoid. These minute rings are sometimes a round plate and sometimes a five radiated star. The rock is sometimes coloured pink by iron, and then the crinoid-rings are dark red instead of black. It is fœtid and it contains the large *Anthracosiæ* (Pl VI. fig. 3,) and the Aviculo-pectens mentioned before, and also the little shell Pl. VIII. fig. 5. This spur contains also a very compact, dark, nearly black limestone, with a very fine grain, but with only a few fossils and encrinite-rings. It is a similar bed which has furnished the blocks of which the beautiful black* marble pillars of the Shalimar Bagh are made of. It takes a fine polish, and is evidently very durable. It is probable that this bed of black limestone crosses over to the valley of the Arrah river, and has been quarried there for these pillars.*

The remainder of the little spur is made up of calcareous, micaceous sandstone without fossils (?). The thickness of the beds forming this spur, is about ..... 60 ft.

Then we have again beds of limestone, shaly and sandy, much cracked and fissured, and with only the debris of fossils. The harder portion of the rock is blue, and is traversed by innumerable white lines cutting one another in all directions. It dips E. S. E. 20°.

It is succeeded by a bed of blue argillaceous limestone, weathering rugose, and traversed by thin streaks of yellow, ochrous limestone, and containing fossils in abundance, amongst others a plaited *Spiriferina* which appears common in some layers, whilst it is rare in others. Crinoid stems are also very abundant, occurring as it were in patches.

The above mentioned bed is covered in by a grey micaceous sandstone, weathering pale brown and containing the fragments of fossils, but no *Spiriferinæ*.

The total thickness of the three last beds mentioned is above ... 150 ft.

Crossing the dry bed of a torrent and a great deal of rubbish which apparently covers a fault, the sixth spur is reached, and presents the following layers :

* These pillars are generally described by travellers as black porphyry, a mistake which a very little attention would have prevented, as the sections of fossils are to be seen on the polished surface of the columns.

a. The bed with the spur brought up again after the fault, ... 20 ft.

b. The micaceous sandstone, thin and false-bedded, with well marked cleavage, ... 16 ft.

c. Fœtid pale brown, calcareous sandstone, viz. false-bedded; no fossils; dips. E. S. E. 30° ..... 1½ ft.

d. Shales; no fossils, ... 1 foot.

e. Limestone, compact and dark grey, and weathering brown. It is much shivered, and is divided by innumerable white lines crossing each other. No fossils except what appear to be worm-burrows filled with sandy ochre, 15 ft.

f. Very argillaceous limestone of a pale blue colour, with patches of a dirty yellow or pale brown colour, ... 3 ft.

29. I consider that these beds are the top of the Wecan division of the carboniferous limestone of the Himalaya, as the following beds show a very great difference in their fauna, which is nearly entirely confined to gasteropods and corals, the gasteropods presenting a great variety of shape and size. The corals of the *Cyathophyllidæ* are abundant and of considerable dimensions. The crinoid stems, some of them minute and starred, continue to be seen everywhere. The beds characterized by gasteropods and corals form the Kothair bed, which we shall see better developed elsewhere.

Continuing our section, we have therefore, resting on the argillaceous limestone, the following layers:

g. Limestone, fine grained, blue, compact and argillaceous, with patches of dirty yellow. It contains many fragments of fossils, nearly entirely gasteropods. Some of these are two inches in length. Starry rings of crinoid stems abundant. The limestone becomes gradually of a richer blue colour, some portions being indeed light blue; it weathers rugose like frosted glass. The upper part contains no gasteropods, but fossil roots and rootlets the size of the finger. It is about 25 feet thick, ... 25 ft.

This is all we see here of the Kothair bed, as a fault running N. S. brings up again the Wecan bed; but this patch of the Kothair is interesting, as showing its relation to the Wecan bed, a relation which I have not been able to trace so well anywhere else. The Wecan and Kothair beds are quite conformable.

On the other side of the fault we find:

a. A limestone, bluish-grey and compact; weathering sandy and dull grey. It is divided in layers by several sandy partings. It contains only a few encrinite stems and dotted white patches which are probably decomposed fossils. It is shivered and traversed by innumerable white lines, ... 20 ft.

b. Brown fœtid limestone, full of a transverse species of a plaited *Spirifera* and a globular *Terebratula*. It is probably a lenticular bed, and takes the place of the Spirifer bed noted above, ... 3 ft.

c. Limestone like *a*.

The end of this spur is cut by a transverse fault in the same manner as we have seen in the preceding spurs. The cut off beds are much disturbed, being vertical at the tops of the ridge, and dipping N. E. at high angles along the slope.

Beyond this is I have not examined this fine section of the limestone of Kashmir. I was never allowed to visit it again, as I was suddenly ordered away from Srinuggur, my professional services being required elsewhere. Had I had time, I intended to follow the section across the range into Nawan and down to the bottom of the Harrah Valley.

30. From the brow of the last spur which I have visited, a fine view is obtained of the next spur, which is remarkable for a great twist of the strata which compose it. The limestone is extremely white and resembles chalk-cliffs at a distance. We shall, however, see this white limestone at Manus Bal, and find that it is probably a portion of the Weean bed altered by heat. We shall find it similarly altered at Islamabad.

The whole mass of hills of Nawan appears to be limestone. The summits of Boorwaz and Batgool appear behind the range, presenting high rugged peaks of porphyry. To our right, the limestone forms a small chain which advances for some miles into the Pampur valley, and behind this chain a long line of mountains, also entirely composed of limestone, runs N.—S. to join the Wastarwan. (See maps B. and C.)

31. The little chain which descends into the Pampur valley terminates over the village of Weean. At its extremity, the Weean limestone, or middle bed of carboniferous limestone of Kashmir, is well developed, and we will now proceed to examine this locality. It is, to me, the classical ground of the Weean limestone, as the Zeeawan spur is that of the Zeeawan Bed.

Section of the hills above the village of Weean in the Pampur valley.
(See fig. 7.)

The little hillocks above the villages of Weean and Kohew, are separated from the main hill by a fault running W.—E. The beds have moreover been folded on themselves and dip due W. (at Weean), with an angle of 55°, whilst in the main hill the dip is to the N. E. with an angle between 20° and 30°. This does not, however, prevent the section of the little hill near Weean being a very good one for study. We shall proceed from E. to W.

1. Impure arenaceous limestone with fine spangles of mica. It is very shaly in the centre of the bed and there very much decayed. It changes its aspect repeatedly, adding here more sand and mica, there more clay, ... 100 ft.
2. Limestone, argillaceous; in blue and yellow patches,..... 4 ft.
3. Blue limestone, weathering brown and rough. It is arenaceous near its upper part. It contains a very few fragments of fossils, ... 20 ft.
4. Finely crystalline limestone; nearly saccharine; grey and rough..... 15 ft.
5. Like 3,..... 8 ft.
6. Limestone in blue and dirty yellow patches; fossils much broken, ... 12 ft.
7. Flesh colour limestone; hard, cherty and magnesian, ... 4 ft.
8. Sandstone, micaceous, grey, calcareous and muddy. It decays faster than the other beds and forms a depression on the hill-side, ... 2 ft.
9. Limestone, patchy blue and brown. The hardest and roughest portions are full of the debris of fossils, ... 25 ft.
10. Sandstone, soft and wearing off quickly, forming a depression 20 ft.
11. Limestone, hard and grey; it is brecciated and weathers mammilated, ... 30 ft.
12. Marly and sandy limestone, compact and hard, dark grey and weathering into a granular surface, having the appearance of a sandstone. The debris of fossils, ... 40 ft.
13. Fawn-coloured limestone, very muddy; it weathers ochrous and decays fast, forming a depression on the hill side, ... 15 ft.
14. A wall of very hard, crystalline, dark greyish-blue limestone with

patches coloured brown. It weathers a dirty dark yellow, and becomes extremely rough and pitted by exposure. The organisms it contains are quite indistinguishable, ... 3 ft.

15. Fawn-coloured limestone like 13, ... 20 ft.

16. A wall of very hard and compact limestone, grey and very arenaceous. Where it is tolerably free of sand, it is bluer and contains the debris of fossils, ... 15 ft.

17. Sandstone, pale and calcareous, with bands of crystalline carbonate of lime. It decays fast and forms a depression, ... 10 ft.

18. A well marked wall of dark greyish-blue limestone, very rough and pitted; it is arenaceous and in places cherty, ... 5 ft.

19. Sandstone, micaceous, very false-bedded and very muddy. It effervesces with acid along the scum-markings of the false bedding only, ... 15 ft.

20. A very arenaceous and argillaceous limestone, extremely variable in its appearance, but being generally of a pale clayey yellow. It is formed of extremely thin layers of two distinct rocks, one being a yellow marl, and the other a bluish grey arenaceous limestone, and these thin layers are also very false-bedded. When we make a vertical section of a hand specimen, we have a striped rock; and in a horizontal one, a succession of regularly rounded patches of bluish grey and sickly yellow. This alternation of very thin and very false-bedded layers of rocks of two different colours is the cause of the patchy appearance of many beds of the Wecan group. But it is rarely so well defined as in this present layer. In other places, the bluish limestone forms irregularly-rounded balls or nodules cemented together by the yellow marl, or the marl forms lumps imbedded in the limestone. Then again micaceous sand forms, here and there, small false-bedded layers or bands in the rock: and lenticular beds of a hard, brittle, pale yellowish, limestone, full of the fragments of bivalves and of small crinoid stems, are also found. But all these varieties of rock constitute a thick course of impure limestone, 60 ft.

Total ... 425 ft.

We have now arrived at the little ravine which indicates the centre of the fold of the beds; on its other side the same beds are repeated in an inverse manner as far as the bed 16 of the above section; the remaining beds have been denuded from the western branch of the fold. This fold deserves notice, as showing well how completely beds may be reversed in their position. It is probable that the beds nearest to the ravine are the deepest or oldest, whilst the bed which we have numbered No. 1, in the section, is the most superficial. If the hill had been denuded to half its present height above the village, the beds

would appear to succeed one another with considerable regularity from W. to E., and one bed, No. 1, would appear the deepest; but the top of the hill having been preserved, the beds can be seen plainly bending and folding themselves in two. There is a circumstance which renders it extremely easy to follow the beds along the hill-side and it is this, that the layers 16, 17 and 18 form a sort of broad ribbon at their outcrop; 16 and 18 being composed of dark grey walls of limestone which, from their hardness, are prominent 2 or 3 feet over the general surface of the slope, whilst 17, the layer between them, is a pale sandstone, decaying fast and forming a sunken furrow between the two walls. This broad ribbon, about 30 feet wide, can be followed with the eye for miles. The layers 7, 8 and 9 also form a ribbon, but less well marked than the other, being paler and not so sharp. Now, these two ribbons are of the greatest assistance in following the twists and foldings of the beds. We have seen that the ribbon 16, 17 and 18 ascends the eastern branch of the fold over Weean and curves over at the top of the hill, where its beds are perfectly horizontal, and then descends along the western branch. We see the two ribbons forming near the village of Kohew an anticlinal similar to that of Weean, but not quite so sharp, and the description of the ribbon also shows us plainly that the beds of the Weean hillocks are reversed. There is a great fault between the main hill and these two little hillocks of Weean and Kohew; on the north of the fault, the beds dip to the N. E. at a high angle, and all the soft and marly layers have decayed and tumbled down in *éboulis*,* but the hard ribbon has remained, and can be traced along the hill showing the outcrop of the beds. All the way up to Nawan we can see the beds of limestone dipping N. E. and we can infer the existence of many faults across the range from the reappearance of the ribbon on the top of each small spur which descends in the Kohew valley. We see these pieces of ribbon plunge under the soil of this small valley to emerge on the other side (fig. 7), giving us the strike of the beds of that long chain of limestone hills which connects Nawan with the Wastarwan Mountain; but although I have

* The French word is so convenient and expressive, that I do not hesitate to use it, as no English word expresses equally well the broken materials of beds which have slipped.

not visited that long chain of hills, and have not travelled up the Kohew valley, I was enabled in following these ribbons, to see that it is composed of the variety of limestone which I have called the Weean Bed.

We shall observe these ribbons wherever the Weean limestone is well developed; they are to be seen in the section I have given, between Zeeawan and Koonmoo, on the southern aspect of the Zebanwan. I did not mention them there, because they make but little show near these localities; but we shall see them well marked near Mutton, in the eastern portion of the valley of Kashmir.

32. I will now try to characterise the Weean Bed of carboniferous limestone.

It is a very arenaceous and argillaceous limestone, the sand being either in thin grey bands, or mixed with the general paste of the rock. A sandy, marly clay, yellow, dirty-yellow, pale brown or brown, forms thin and very false-bedded films in the rock, so that this is striped when bisected vertically, and patchy bluish and yellow when divided horizontally. The hardest beds are brittle, flesh-coloured and generally full of bright red minute crystals of hæmatite, and the fossils are here replaced by a powdery or semi-crystalline hæmatite which, however imperfectly, preserves their outlines. The harder rock is never blue, and the blue variety of rock is sufficiently muddy to have a soft, velvety, lustreless appearance like a fine clay, and not the clean brittle fracture of a pure and hard limestone. It has in places all the appearance of a very dirty dark-grey mud dried up, and it is then full of fossils and extremely fœtid. It contains lenticular beds of a very pale, nearly friable limestone, containing black specks which are the rings of stems of very minute crinoids, and this variety of soft limestone is the habitat of large bivalves. One single bed of limestone may be mistaken for Zeeawan limestone, bluish-grey, coarse hard and semi-crystalline, but it contains innumerable *Foraminiferæ* transformed into yellow ochre; very large *Pectens*, and an incredible quantity of fragmentary *Crinoidea*. Indeed, it is the great number of those small rings of crinoid stems, always crystallized, which causes the rock to resemble the limestone of the Zeeawan Bed.

Everything in the Weean bed tells of a shallow sea formation. The rocks in some localities, to be described hereafter, have been much altered by heat or other forces soon after their formation. We shall see them thus altered at Manus Bal and at Islamabad, and also at the Kafir Kote in the Punjab district of Bunnoo. It appears that considerable disturbances occurred while the Weean Bed was still in a soft state. But this subject will be examined more carefully in another paragraph of this paper.

The fossils differ a great deal from those of the Zeeawan Bed. In most layers they are mere debris hardly to be recognized. When they do occur, they are always crowded together in limited beds. The *Spiriferinæ* and *Terebratulæ* appear to have lived in shallow lagoons, in creeks in the sand, in pools on a flat marshy shore, and the large bivalves on sandbanks and shallows. The following fossils appear to be characteristic of the Weean Bed, as they are not found either in the Zeeawan Bed below or the Kothair bed above.

Spiriferina Stracheyii (Salter)?
„ *Stracheyii* (Salter)? var. *altior*, (Verch.).
Solenopsis imbricata? (Koninck).
Solenopsis sp. —— Pl. VI. fig. 1.
Cucullæa? sp. —— Pl. VI. fig. 4.
Anthracosia? (King)—*Cardinia*, sp. Pl. VI. fig. 3.
„ ? —— *Cardinia ovalis?* (Martin) Pl. VI. fig. 3.
Axinus, sp. n., allied to *A. obscurus*.
Aviculo-Pecten dissimilis (Fleming).
„ „ sp. n. —— (*A. circularis*, Verchère,) Plat. VII. [fig. 1, 1a, & 1b.
„ „ sp. —— ? Pl. VI. fig. 6, 6a, 6b.
„ „ sp. —— ? Pl. VI. fig. 7, 7a.
„ „ sp. —— ? Pl. VI. fig. 7, 7a, 7b.
„ „ sp. n. —— ? (*A. Testudo*, Verch.) Pl. VII. fig. 3, 3a.
„ „ sp n.? (*A. Gibbosus*, Verch.) Pl. VII. fig. 4, 4a.
Goniatites, sp. —— like *G. Henslowii* (Sowerby).
Entomostracæ – Cypridiniæ?
Foraminiferæ.
Crinoidea; Cyathocrinites and *Pentremites*.

A small bivalve, giving on section the appearance of a pair of spectacles is also found, but I never could detect the shell entire, although it is often the only fossil to be discovered.

33. But to the positive evidence afforded by these fossils, we must add the negative evidence: I mean we must remember that this is a bed of carboniferous limestone, and that notwithstanding we have no examples of the genera *Productus*, *Orthis*, *Euomphalus Bellerophon*, and *Orthoceratites*, and that there are no large *Spirifera* or *Fenestellides*. Neither have we the *Gasteropods* and *Cyathophyllides* which characterise the uppermost or Kothair bed, more by their number and variety, than by any species well defined by me. I am anxious to insist on the absence in the Weean group of these fossils, which are generally regarded as eminently carboniferous, because it has been found difficult to determine the age of rocks belonging to the Weean bed, when seen apart from the Zeeawan Bed; thus the limestone of Manus Bal, which belongs to the Weean group, has been twice reported to be nummulitic.

34. The next mountain to examine is the Wastarwan. It is a fine hill, its summits rising above Avantipoor, a small city on the Jheelum celebrated for its Buddhist ruins. An inspection of the map will be better than any description I can give of the position and relations of this mountain. It is a centre of elevation, with spurs descending in all directions, like the spokes of a wheel. I never ascended it, but I travelled along its northern and its western sides, and the following is a description of what I saw.

Section from Reechpoora towards the E. as far as longitude 73° 5′. *across the northern spurs of the Wastarwan : (See Map C.)*

The spur which descends to near Reechpoora is entirely composed of Zeeawan limestone with the characteristic fossils. The bed forms a sharp anticlinal of which the two arms slope or dip N. E. and S. W. respectively, striking N. W. to S. E. The beds of limestone inwrap the end of the spur, the layers seen above the little Buddhist ruin dipping nearly due N. The anticlinal is so sharp that the courses of rock have separated, and caves, now converted into holy quarters for a few fakirs, are to be observed on both sides of the anticlinal.

35. Proceeding eastwards, after crossing the bed of a stream, we

observe near Banda, a small Zyarut up the ravine above Ladoo, some very fine beds of limestone of which the following is the section.

Proceeding from the bottom of the ravine up the side of the spur we find.

1. Slates, so much decayed and broken that it is impossible to see their dip and strike. They are identical with those which we have seen interbedded with volcanic ash and agglomerate in the Tukt-i-Suliman and the Zebanwan, and they are very extensively developed in the Wastarwan. They are, as we have seen, more or less metamorphosed, often slightly amygdaloidal and always devoid of organisms, ... very thick.

2. Augitic ash, very amygdaloidal, the geodes being filled sometimes with dark augite, sometimes with bluish-white opalescent quartz. It strikes N. W. by W. and dips north-easterly. About ..... 25 ft.

3. Trachyte, sparingly amygdaloidal; coloured brown outside by iron, ... 10 ft.

4. Metamorphosed slate, foliated, jointed, disintegrating, ... 20 ft.

5. Compact basalt, ... 4 inches.

The debris of volcanic rocks form a breccia over the basalt; but this bed is very irregular and lenticular. The basalt is replaced in some places along the strike by a dull, light-olive-coloured laterite or baked clay, about one foot thick.

6. Quartzite, sometimes pure, opaque, white; often translucent, bluish or smoky; never crystalline. It gradually invades the laterite mentioned above, and forms ribands of dull olive and pure white quartz, ... 2 & 3 ft.

7. Zeewan limestone with usual fossils; dips N. 15°, ... 40 ft.

8. Zeewan brown shales, ... 10 ft.

9. Fine blue clay-slate; calcareous and breaking in large thin slates. It contains no fossils, ... 10 ft.

Extensive old quarries remain here, showing how fine and free a limestone the Zeewan bed can give, when quarried in portions of rock which are not weathered. The quarries are far from exhausted, or rather the amount removed is insignificant compared to what remains; blocks of any size and very sound could now be procured easily from the old quarries. It is a great pity that the Maharajah's government do not work this and other quarries for the limestone they want, instead of destroying the interesting Buddhist ruins which cover the valley, especially as the style of architecture now in favour in Kashmir is perfectly hideous.

Traversing a ravine we meet the spur which descends towards the village of Mandikpal, and the following section is met with:

1. Amygdaloidal greenstone.
2. Amygdaloid.
3. Quartzite.
4. Rotten Augitic ash.

Some of the ground is covered with ths debris of the ash, so that its relation to the next bed is not seen.

5. Limestone, argillaceous, pale bluish-grey, weathering fawn-coloured: afterwards patchy blue and brownish. It is thin-bedded and breaks in slabs about one to one and a half inch thick. It contains an abundance of *Goniatites* of 2 or 3 species. The bed is about ..... 30 ft.

The dip of these several layers of rock is N. N. E. 25°.

This is the only locality where I have seen Weean limestone resting immediately on volcanic rocks.

From Mandikpal, our section goes through a succession of limestone ridges which, from the appearance of the ribbons described at the hillocks over Weean and Kohew (para. 31), are conjectured to be Weean limestone, but I had not time to visit them. The general dip of their beds is north-easterly.

36. The western aspect of the Wastarwan I shall describe from S. to N., that is from Avantipoor to Reechpoora. It is a series of spurs with a general westwardly direction, and at the end of one of these spurs is a little knoll which I shall call for convenience sake the "Pampur knoll."

The following is the section of these spurs from S. to N. (see Map C.).

1. The whole of the spurs between Avantipoor and Tangur are composed entirely of volcanic rocks, viz., amgydaloidal greenstone, coarse basalt and ash, and black slate without fossils. The limestone is first seen about three quarters of a mile south of Barus, where two spurs approach very near the river Jheelum.

2. As we ascend the most southern of these spurs, we find, resting conformably on dark amygdaloidal greenstone, a bed of white quartzite about 2 feet thick, ... 2 ft,

3. A coarse and rough trachyte, ... 12 ft.

A fault N. N. E.—S. S. W. It opens towards the northern end, whilst the edges of it are crushed one against the other at its southern extremity. On the northern side of the fault we find:—

1. Quartzite, bluish grey, gritty and rough, ... 2 ft.

2. Trap, having a shaly appearance. A great deal of kunkur is seen along the line of fault, ... 1 ft.

3. Quartzite, excessively irregular and having a very peculiar appearance: it is divided in meshes like a very coarse travertin, or rather like lead which has been dropped in cold water while in a melted state. There is however a certain pretty well marked stratification or superposition of courses. The rock looks like a siliceous paste which had solidified suddenly when in a sate of ebullition. It first dips W. about 50°, increasing gradually to the vertical and then inclining the other way, dipping S. E. 80°. It, however, soon becomes vertical and gradually dips again W. 50°,..... 40 ft.

4. Pale trachyte. Dips W. 50°, ... 15 ft.

5. Limestone, crystalline and metamorphosed; no organisms. Weathering rough; much stained by iron-oxyde,..... 3 ft.

6. Zeeawan limestone with the usual fossils; dips W. 40°, ... 50 ft.

7. Zeeawan brown shales,..... 10 ft.

8. Slate; coarse, micaceous. Squeezed by proximity to a fault; no fossils?

A fault, from N. E.—S. W. with a downthrow or the southern side. The slates are partially in the fault.

37. If we ascend the next spur, Barus spur, from the south, pretty high up the little ravine, and make our way to the monumental "Ling" which crowns the hill,* we see nothing but trap and ashes which have been brought up again on the northern side of the fault. The top of the hill is covered with grass and debris which prevent the rocks being seen in situ, but many pieces of ash, amygdaloid and white quartzite are seen loose on the earth, showing that the usual quartzite bed exists here. On the western and north-western aspect of the hillock, the rocks are uncovered and we have the following series.

Trap and volcanic ash.....

Quartzite .....

Here two beds are covered by vegetable earth, as mentioned above.

1. Zeeawan limestone with usual fossils. Dips W. 50°,..... 40 ft.
2. Greyish-blue limestone without fossils,..... 15 ft.
3. Beds concealed by vegetable earth and by lacustrine deposits 30 ft.
4. Shaly limestone with few and broken shells..... 40 ft.

* This is, I believe, one of the largest, if not the largest "Ling" or "Emblem of Creation." It measures 14 feet in circumference and was about 20 feet high. The base is hexagonal; the preputial line is in relief, and appears to have been carved. This monster ling is now broken in two or three pieces, and the upper half is prostrate on the ground; the hexagonal base and about 6 feet of the body of the ling are still standing.

5. Limestone, very impure and containing immense numbers of a Spirifer of large size, very similar to *Spirifera Verchèri*, De Verneuil Pl. I. (fig. 1a. 1b. 4 ft.

6. Limestone with a few fossils, ... 30 ft.

7. Limestone, filled with *Productus costatus* (S. W.) often extremely depressed by pressure. Many other fossils associated with the *Productus*, such as *Athyris Spirifera*, and a species of *Chonetes*, &c. The limestone is arenaceous and micaceous, often so much so that it passes into a calcareous sandstone. This passes gradually into the next bed, the fossils becoming less frequent and the rock less sandy.

8. Shaly limestone. The beds 7 and 8 are together about, ... 60 ft.

All these beds are evidently, from their fossils, members of the Zeewan group. The series is continued by beds of the Weean limestone.

9. Sandstone, grey, then pale brown. It contains lenticular beds of limestone. The bed is much disintegrated and overgrown with grass *Goniatites*, ... ?

10. Flinty-looking, shining limestone of a bluish grey colour. Divided by pastings of shale, thin and irregular. It weathers rugose and contains no fossils, ... 15 ft.

11. Calcareous slate, thin-bedded and exfoliating, ... 1 ft.

12. Flinty limestone like 10, ... 3 ft.

A lacustrine deposit covers any further bed which may exist.

The total thickness of this section is about 260 feet. The Zeewan bed is nowhere so thick as it is here, being about 220 feet thick from stratum 1 to 8.

The remainder of the section is Weean limestone, but only partially seen here.

38. The end of the spur, immediatly north of Barus, presents also some Zeewan limestone, but it was not examined. The two following spurs are entirely composed of volcanic ash and agglomerate.

39. Then comes the long spur which ends in the somewhat detached hillock which I have called the Pampur knoll. We find in this spur the beds we have just seen above Barus, precisely in the same position and relation. The similarity is so complete that it is evident that the Barus beds once extended to the Pampur knoll without a break, but that a great portion of this limestone has been denuded.

The volcanic rocks, in the long spur, are well stratified and rather thin-bedded as they approach the limestone. They dip W. N. W. with an angle of about 45°. The Zeewan bed rests on quartzite.

and presents the same beds full of the gregarious fossil *Spirifera trigonalis (?)* and of *Productus Costatus :* the distance between these beds is the same as it is at Barus. On the top of the Zeeawan beds are seen Weean beds, but they are much more complete than at Barus, having a thickness, from the top of the Zeeawan bed to the foot of the knoll, of about 660 feet. But I believe there are probably some faults which cause beds to be repeated, and that the Weean bed is not quite so thick ; about 500 feet.

The Pampur knoll gives the following approximate section from east to west.

1. Coarse grey limestone.
2. Slaty grey limestone.
3. Patchy blue and yellow or pale brown limestone.
4. Compact blue limestone, argillaceous.
5. Patchy blue and dirty yellow.

These beds are together about 100 feet thick. They dip W. with an angle of 60°.

6. Flesh-coloured limestone.
7. Shaly coarse blue limestone.
8. Flesh-coloured limestone.

These 3 beds are together about 80 feet. Dip as above.

Other layers are buried under lacustrine deposits. This little hillock was examined very superficially, owing to want of time. No fossils were seen except the small broken bivalves mentioned above, and which are so common in all the rocks of the Weean group.

40. The spur seen half way between the Pampur knoll and Reechpoora, is tipped with Zeeawan limestone, but was not examined in detail.

41. Here ends our survey of the Wastarwan. I need not say that the central ridges and summits are entirely composed of volcanic accumulations. Black basaltic rocks are abundant, and by their disintegration, and the rearrangement by water of the black mud they gave in decaying, a great quantity of black slate was formed which is seen interbedded with beds of ash and agglomerate. These volcanic rocks do not require to be described, as they are identical with those of the Zebanwan Mountain. All the rocks of the Wastarwan present a stratification or superposition; on the northern slope it

has a general dip to the N. E., whilst on the western aspect of the hill its dip is generally westerly. There is therefore a sort of anticlinal towards the centre of the hill, following a direction from the N. W. to the S. E. We have seen how this anticlinal affects the limestone at Reechpoora, a locality which happens to be at the end of it.

42. The next mountain we meet, travelling towards the S. E. along the banks of the Jheelum, is the Kamlawan (8601) which terminates over the village of Murhamma. The mountain is composed, like the Zebanwan and the Wastarwan, of volcanic rocks. Melted rocks predominate in the centre of the system, whilst ash and laterite compose, in a great part, the most extended spurs. Slate is intermixed with the beds of volcanic cinders, and over these carboniferous limestone rests conformably. But the limestone of the Kamlawan appears to have been extensively denuded, and is only found in a small bed which makes but little show. The following is a section of the spur immediately over Murhamma. Direction of the spur N.—S. Strike E. S. E.—W. N. W.; dip S. S. W. (See Pl. 11. Section D.)

1. Trachy-dolerite, coarse and dark, here and there amygdaloidal; it has large joints regularly disposed, at right angles to the stratification and yawning, giving it a somewhat columnar aspect. This bed appears to extend from the top of the hill, to the beginning of the spur now under consideration. It is of very great thickness, and, making allowance for faults, it cannot be less than 2000 feet.
2. Baked clay-stone or compact laterite, grey, smooth, much jointed; it dips S. S. W. 70°. It has a thickness of about ..... 200 ft.
3. Limestone, crystalline, coarse and metamorphosed. It contains a few fragments of fossils, not recognizable and mostly transformed into spar, 3 ft.

A fault, ...

4. Grey laterite or baked clay, like No. 2, ... 200 ft.
5. Amygdaloid, ... 20 ft.
6. Sandstone, or perhaps volcanic dust-stone; no fossils, ... 5 ft.
7. Coarse grit of rounded grains.
8. Basalt, fine and dark brown. The beds 7 and 8 are together 150 ft.
9. Sandstone or duststone, like 6, ... 5 ft.
10. Beds covered with grass and earth. Pieces of white quartzite and rotten ash seen amongst the grass, ... 100 ft.
11. Limestone of the Zeewan group with *Productidæ*, *Fenestellidæ*,

Orthidæ, etc. It is much fractured and fissured, and is evidently but the remnant of larger beds removed by denudation. It dips S. S. W. 50° and it is about, ... 25 ft.

Any further beds which may exist are covered by the lacustrine deposit, which is here 150 feet above the level of the Jhelum.

The Sheri Bal is a small mountain close to the Kamlawan, to which it is united by a connecting ridge. It is entirely composed of the same semi-columnar trachy-dolerite which forms the bulk of the Kamlawan. The compact, smooth, grey, laterite or baked clay-stone, described in the section as No. 2 and 4, is seen extending on the flank of the hill, both to the west and to the east. It forms a conspicuous belt along the side of the Sheri Bal, appearing, from the high angle of its dip, to rest against the trachy-dolerite. Some of the volcanic and azoic rocks, described in the section of the Kamlawan as superior to the laterite, were seen on the slopes of the Sheri Bal, but no limestone was observed, it having probably been denuded.

43. Crossing the valley of the Lidar River, we find the next mountains to be the Hapatikri and Saijnarh group. The whole of this system of hills appears to be composed of limestone. It is continued to the S. W. by a low ridge, which is mostly buried under lacustrine deposits, but rises above these at Islamabad, forming a small hill at the foot of which the town is built.

The following section (fig. 8) will, I hope, give a good idea of the rocks composing these hills. The section is above the celebrated Tank of Mutton, near which locality the lacustrine deposit is about 120 feet thick. Above the lacustrine we find:

1. A limestone, coarse arenaceous and apparently much metamorphosed. It contains hardly any trace of fossils, excepting very crystalline rounded bodies which are altered stems of crinoids. The rock is divided into sub-beds by shaly or clayey partings, which are very false-bedded and very hard. Only a few feet of this rock appear above the lacustrine.

2. Limestone, jointed and cleaved; but hard specimens have a remarkably compact, smooth appearance, like hornstone.

These 2 beds dip E. N. E. 20°.

3. The bed No. 2 becomes gradually bluer and more argillaceous and less cleaved; towards the top of the bed it is the patchy blue and brownish rock which we have seen before repeatedly. It contains traces of fossils, but no shells sufficiently well preserved to be recognized. It has an enormous thick-

ness, varying however a good deal in places. There are remains of a Buddhist quarry in this bed.

The three beds have together a thickness of about ..... 200 ft.

4. White and friable sandstone, apparently a compressed quartzose sand without cement. It dips N. E. by E. 25°. It contains traces of fossils. It is remarkably well seen near the Karaise or Irrigation Canal which is cut on the flank of the hill.* It is a thin bed and presents variations of color and aspect. It is only one and half foot thick, ... 1½ ft.

5. Argillaceous blue limestone, ... 2 ft.

6. Yellow sandstone, calcareous, not very hard, much disturbed and faulted, the faults, which are small and short, being at right angles to the strike. The sandstone has a thickness of about ..... 10 ft.

In this sandstone, which, by the bye, does occasionally pass into lenticular patches of impure arenaceous limestone, a great many sections or outlines of large bivalves and some small ones were seen; but no shell in a tolerable state of perfection could be obtained; I, however, made drawings of the outlines presented by these bivalves, on the weathered flank of the rock. When I first saw these outlines, I did not know of the large *Anthracosiæ*, *Pectens* and *Aviculo-pectens* which exist in the Wecan group, and it appeared poor and ungrateful work to copy them. Soon after, however, I found the *Aviculo-pectens* and other bivalves represented at Pl. VI. fig. 3, and Pl. VII. fig. 4, 4a, and my sketches of the sections came in very opportunely, proving, in the absence of better fossil evidence, the Wecan nature of the Hapatikri limestone.

7. Very hard and brilliant white quartzose sandstone, ... 10 ft.

8. Sandstone, yellow and soft, like 6,..... 5 ft.

These sandstone beds are remarkably wavy and undulated, as if they had suffered from lateral pressure. The limestone above and below participates but very triflingly in these undulations.

9. Sandy limestone, blue and compact. The debris of small fossils, 10 ft.

10. Dark shales, slightly carbonaceous. In this bed, casts of roots of trees with a concentric arrangement and, in rare cases, the vegetable cells filled with coal, were seen. The roots are generally thoroughly petrified; they are numerous and mostly horizontally (to dip) arranged; they are branching and have generally a starry disposition like Stigmaria. Some pieces of these

* This canal was apparently intended to bring some of the waters of the Lidar to the Martand plateau; but it was never finished, and it is now falling into ruin. It is said to have been begun during the reign of the Mogul Emperors of Delhi; it is a work of considerable extent.

roots show a sort of epidermis, somewhat scaly like Lepidodendron. Large trunks were not seen. The bed is very thin, only 1½ foot, and is covered by a bed of limestone 25 feet thick. It appears therefore probable that, owing to littoral oscillations, the vegetable covering of the shale was denuded during the progress of the sinking of the coast and previous to the deposit of the limestone, ... 1 & ½ ft.

11. Argillaceous limestone, compact and weathering white. Shaly partings, ... 25 ft.

12. Calcareous sandstone, of a compact structure and a dark blue color when fresh, but weathering reddish in an irregular and patchy manner, the redder patches being due to shaly masses which are seen here and there imbedded in the sandstone: these shaly masses sometimes form lenticular thin beds, as thin-bedded as sheets of paper. No fossils, ... 10 ft.

13. Grey limestone; no fossils, ... 6 ft.

14. Limestone, patchy blue and pale brown, ... 15 ft.

These two beds of limestone are not quite conformable to the sandstone and preceding beds; they are nearly horizontal, with a trifling dip of about 3° to the E. N. E. This is probably due to littoral oscillations or earthquakes.

15. Sandstones, greyish-brown and pale, ... 2 ft.

16. Limestone, ... 4 ft.

17. Very arenaceous, grey limestone, weathering a deep yellowish grey; it shows no organisms. It dips E. N. E. 20°. It does not appear to participate at all in the faults and folds noted before. It has resisted atmospheric influence well and forms a prominent and striking wall near the top of the hill. It is about ..... 20 ft.

18. Pale blue sandstone, marly and shaly, weathering greyish-brown and patchy. It decays fast into a yellow sandy marl and forms a furrow at its outcrop, ... 15 ft.

19. Compact limestone, very hard and cherty. It is fawn-coloured, but sometimes greenish blue. It contains no fossils, ... 5 ft.

These three beds, 17, 18 and 19, form at their outcrop a ribbon similar to those described at Weean. Another ribbon is formed by the layers 14, 15 and 16, which appear to be the equivalent of the ribbon 7, 8, 9 at Weean (?)

20. Sandstone, brown, hard and micaceous, ... 2 ft.

21. Limestone in blue and brown patches, ... 4 ft.

22. Sandstone, shaly and much fissured. Color grey or brownish-grey. It is hard, cherty and calcareous. It has a slaty cleavage, cutting the stratification obliquely by striking W. E. and dipping N. with an angle of 60°. It contains a few fossils. This bed varies a great deal, being sometimes a pure enough sandstone, at other times a sandy shale, and again a coarse sandy slate. It goes to the top of the cliff..... 20 ft.

This section gives a thickness of Wecan limestone and calcareous sandstone, of 360 feet.

When I ascended the Hapatikri, I unfortunatly did so above Mutton, and only carried my section as far as the top of the hill at that place, that is as far as layer 22. A little swelling of the surface concealed from me the summits to my right, and I thought that layer 22 was the highest of the hill. From the top of the Islamabad hill, about four miles to the S. W., I could see, while sketching fig. 8, that the summit of the Hapatikri is considerably above the layer 22. Two dark layers or ribbons are well seen near the highest summit of the Hapatikri, and it is not impossible that some faults bring up again the same beds. It is, however, probable that some beds of the uppermost or Kothair Bed exist near the summit of the hill, as I found amongst *éboulis* and lose stones near Martand some corals, which are, I believe, highly characteristic of the Kothair bed. (Pl. VIII. fig. 4, 4a.)

44. The Sketch-Section (fig. 8) shows that all the ridges of the Saijnarh are well and regularly stratified limestone and calcareous sandstones; I did not, however, visit these spurs. Behind the Saijnarh and the Hapatikri are seen the rugged volcanic mountains which bound Kashmir on the east, separating the waters of the Jheelum from those of the Chenab. The Arpat river brings down boulders from these mountains, and the lacustrine conglomerates, which are so extensively developed at the point where the Arpat and other streams leave the mountainous gorges to emerge in the open valley, give us a good idea of the composition of these mountains. All the boulders and pebbles, both of the bed of the river and of the conglomerates, are volcanic rocks, of which many varieties of amygdaloid are the most frequent. I never saw a single pebble of granite, syenite or gneiss, but quartzite is common, as well as limestone. That the pebbles and boulders of the conglomerate have been brought down directly from these mountains by torrents and rivers, and have not been drifted to where they are by the waves of the ancient great lake of Kashmir,* is

* The valley of Kashmir has been a huge lake since the appearance of man in the Himalaya. It is probable that a lake filling up the whole of the valley existed before that period, and that it was drained or tapped by some cause or another, allowing the valley of Kashmir to dry up nearly to the same

sufficiently proved by the shape of the boulders, these being rounded and ovoid in form, and not worn into the flat lenticular stones which are found on the beach of lakes, and which are so much appreciated by persons fond of making "ducks and drakes in the water."

45. I have said before that a spur of the Hapatikri extends to Islamabad, concealed under the lacustrine plateau (see fig. 8,) for a few miles, but appearing as a small hill over the town. The following is a section of this Islamabad Hill, from the S. W. to the N. E., beginning with the lowest strata exposed to view. The general dip of the beds of this hill is N. Easterly.

1. Marly limestone; bright blue; debris of fossils,..... 15 ft.
2. Ditto ditto; white; no fossils, ... 20 ft.
3. Ditto ditto; grey; often reddish. Enormous number of *Foraminiferæ* forming ochrous bands in the rock, ... 1 ft.
4. Arenaceous, dark grey limestone, divided by partings of shaly pale-yellow limestone, very false-bedded and very thin. Rich in the debris of fossils, but very few in a good state of preservation, ... 25 ft.

These four beds dip N. E. 15°.

5. Limestone having a slaty cleavage and joints, white or pale grey, cherty in appearance, Fossils very numerous, but in comminuted fragments, 10 ft.
6. Marly, yellow, limestone. It is often flesh-coloured, and then shaly in appearance and weathering with a rough pitted surface,..... 2 ft.
7. Limestone like 4; full of the debris of fossils,..... 1 ft.
8. Limestone, brown and cherty; debris of fossils,..... 1½ ft.
9. Very pale blue limestone, often white; very hard and rough; weathers rugose like frosted glass. Thin and false-bedded; fragmentary shells, 15 ft.
10. Sandstone; yellowish white or greyish-white, ... 6 inches
11. Coarse, gritty limestone, full of the debris of fossils; great abundance of *Foraminiferæ*, crinoid stems, *Fusus* (?) and fragments of a small bivalve, ... 3 ft.
12. Marly, dark grey-blue limestone; slaty cleavage, ... 3 ft.

extent as it is now, and that the valley then became populated. The lakes, however, began to fill up again, and the whole of the valley was again converted into one immense lake. This in its turn was tapped and drained to its present state. The earthquake, which broke up the barrier or dam at Baramoola, is reported by tradition to have been the beneficient act of the Hindoo god Kashyapa. The Mahomedans, however, say that it is Kashaf, Solomon's minister, who performed the wonderful work, and it is very probable that both Hindoo and Musalmans borrowed the tradition from earlier inhabitants.

I hope to be able to prepare before long a paper "On the Lacustrine deposits of Kashmir," in which the proofs of two successive lakes having existed will be given in detail. See also my note to para 9. page 100.

13. Marly limestone, deep blue in colour, cherty in appearance and weathering rugose; it is compact and contains no fossils,..... 15 ft.

14. A portion of 13, in a brecciated state, ... 2 ft.

15. Same as 13,..... 12 ft.

16. Limestone similar to No. 2, ... 2 ft.

17. Foraminiferous limestone, similar to No. 3, ... 8 inches

This limestone contains many small yellow rounded bodies, mixed with the *Foraminifera* and appearing to have no organisation. They are perhaps excretions of mollusks. Also large patches of white, dotted, chalky, limestone which are, I believe, the remains of decomposed fossils of considerable size.

18. Argillaceous, pale grey, nearly white limestone. It gets coarse towards the top of the bed, and the uppermost layer is brecciated, ... 10 ft.

19. Indurated clay, ... 1 ft.

20. Limestone varying in colour, being white, yellow, flesh-coloured, grey or pale lustreless blue. It is very argillaceous, occasionally sandy. The debris of fossils mostly encrinite-stems, ... 10 ft.

21. Calcareous brown sandstone; no fossils, ... 4 ft.

22. Shales, hard and without fossils. These shales are in places, fine, silty and foliated; in other places sandy, coarse and thicker bedded, 10 ft.

23. Sandstone like 21, ... 5 ft.

24. Shales like 22, ... 10 ft.

25. A repetition of the beds 22, 23 and 24; but the materials are generally coarser, the shales never being fine and thin-bedded, but rough and thick-bedded; and the sandstone contains so much lime that it passes in some places into a very arenaceous limestone. It contains but little of the debris of fossils, but shows some flat impressions like those of large flat *Algæ*. These impressions are, however, ill-defined and could not be identified, ... 25 ft.

26. Pale but bright blue limestone; very argillaceous and interbedded with thin films of yellow silt, ... 10 ft.

27. A second repetition of the beds 22, 23 and 24. A few shells, but no imprints of algæ. It becomes gradually a coarse sandy limestone, and at the top of the bed it is an argillaceous and arenaceous limestone, pale blue or rather French-grey, weathering rugose like frosted glass and containing a very few fragments of shells only, ... 25 ft.

These three beds, 25, 26 and 27, seem to resist the influence of exposure better than the rocks above and below them, and they form at their outcrop a well defined ribbon; this, owing to the trifling angle of the dip, appears on the hill-side as a cliff which faces the city of Islamabad a little more than half way up the hill. These beds are slightly wavy along the strike, as if they had been pressed laterally. These undulations occasion trifling discrepancies in the dips taken in different parts of the hill. Along the line of our section, the cliff formed by the beds 25, 26 and 27 has a strike N. N. W.—S. S. E. and a dip E. N. E. 15°.

28. Limestone, patchy blue and yellow; argillaceous, ... 20 ft.

29. Limestone, very argillaceous and having a pure lustreless grey colour, and being striped on section, owing to bands of a lighter colour. The rock is so compact and fine-grained that it resembles a fine greenstone in structure. It is traversed by bands of rougher stone and also by bands of blue limestone. It weathers rugose and pitted,..... 20 ft.

30. Limestone like 28, ... 20 ft.

31. Limestone like 29, ... 15 ft.

32. Limestone, as white as chalk, but hard. It is full of geodes like an amygdaloid, the geodes being filled or lined with minute crystals of spar. The rock weathers in rounded bosses like granite or trap. It appears to have suffered a metamorphosis. It is probable that the calcareous mud which originally composed it was thrown into a bubbling condition by the infiltration of heated vapours or the immersion of hot volcanic products into a shallow sea. It presents no fossils or traces of fossils. The bed is not lenticular, but extends regularly along the strike the whole length of the hill, being conformable to the other beds, ... 5 ft.

33. Limestone similar to 31, ... 5 ft.

34. Marly, dark bluish grey and rough limestone, ... 5 ft.

35. Like 33 again ..... 15 ft.

36. Hard and cherty limestone, pale grey or flesh-coloured. It contains a few geodes like No. 32. It weathers pitted and rugose; no fossils (?) ..... 2 ft.

37. Limestone like 34, ... 5 ft.

The last three beds are a good deal denuded, owing to their being at the top of the hill, which is narrow and barren.

46. There can be no doubt of the Islamabad hill being composed of Wecan limestone; the argillaceous and arenaceous condition of the rocks is exactly what we have seen in other localities where this sort of limestone is developed. The fossils are very unsatisfactory, being extremely comminuted. I have found, however, one *Spirifera* and one *Athyris* which are to be seen in the beds at Wecan. I have seen also many sections and outlines of large bivalves (*Aviculo-pectens* and unio-like *Anthracosiæ*) similar to those found near Mutton. The *Foraminiferæ* are also extremely numerous, and the fossil shell which gives on the surface of rocks an outline resembling a small pair of spectacles, is very common amongst the debris of comminuted shells. The upper beds of the hill, from 29 upwards, contain no fossils and have a peculiar appear-

ance, suggestive of their having been baked, and they weather in rounded bosses like many volcanic rocks. I have suggested that their amygdaloidal condition and their "metamorphic weathering" may be accounted for by the hypothesis that hot ejecta of volcanoes, either hot water, steam, hot ashes or a current of lava, had found their way into a shallow sea and set it a-boiling. It might be said that these very impure calcareous muds might have had gases generated in their interior by the decomposition of organic matter or some other cause; but many layers which are much more fœtid and were therefore more likely to emit gases are not at all amygdaloidal, and besides, there is so much volcanic power manifested all over our tract of country, that it is more natural to invoke a little steam to boil mud with, than to look for less obvious hypotheses. But another reason in favour of volcanic metamorphism is, that these same white baked limestones have been observed in other localities, near Manus Bal in Kashmir and in the Kafir Kote mountain, in the Punjab, and in these localities they are disturbed by actions which appear to have taken place locally and to have affected these limestones much more than the rocks below them. The beds of Manus Bal will be described hereafter in these pages, and we shall be able to observe how faulted and twisted are the white limestones of that place. At the Kafir Kote there has been a similar local upheaval, and the disorder is very considerable. In this locality a felspathic sand, invaded by quartzite in tortuous branches, is the remains of the volcanic action which has taken place there, and the limestone, though much less marly than in Cashmir, is filled with geodes and veins of spar. I believe these actions to have been local and not very extensive; they had little effect on the Zeeawan bed which had, by the time they took place, become tolerably consolidated, and they merely fractured and pushed aside the nearest portion of the bed; but they acted powerfully on the yet soft and muddy Weean bed, curving it and twisting it in all sorts of manners and directions; and when these folds and twists were again disturbed, probably intensified and placed in new positions by the final upheaval of the Himalaya, they became what we see them now, viz. most incomprehensible doublings and reversings of strata. Let us also remember the beds which I mentioned as having been seen from the brow of the last spur of the Zebanwan

visited by me; these beds were the top or near the top of the series of Weean limestone seen along the section of the southern aspect of the Zebanwan between Zeeawan and Koonmoo. I said, "From the brow of the last spur I have visited, a fine view is obtained of the next spur, and this is remarkable for a great twist of the strata which compose it. The limestone is extremely white, and resembles chalk-cliffs at a distance." Is it not highly probable that there again we had the same altered limestone? The beds were wonderfully twisted and folded, whilst those above and below them were hardly affected.

I consider, therefore, that these altered limestones are portions of the Weean group, and I believe that the alteration was produced by bursts of water at a very high temperature, or of gases hot and compressed; the eruptive power of these agents being sufficiently powerful to displace and uplift the calcareous mud of the sea-bottom, a mud which must have been plastic, from the great admixture of clay it contained, and which was covered by no great depth of water. It is for such an action, as I have supposed, that Mr. Dumont has proposed the term of "Geyserian" action, and for the rocks precipitated from these watery volcanoes (such as the felspathic sand with quartzite of the Kafir Kote) the name of Geyserian rocks. The name is sufficiently suggestive and requires no explanation. It is probable that the quartzite which we have seen placed between the volcanic rocks and the limestone, belongs to that class of rocks.

47. The Arpat river runs through a district named Kothair or Kotehar, and it is from this district that I have named the uppermost bed of the Carboniferous(?) limestone of Kashmir. We have seen a small patch of this bed near Koonmoo, in the Zebanwan, but we will find the bed well developed in the next hills we are about to visit.

A few miles to the S. E. of Islamabad is a mass of well-wooded and picturesque mountains which separates the valley of the Arpat river from the Nowboog valley. Arckbal, Tippoo, Karpur, Dhar and Nawkan are summits which appear to form the centre of a small system of hills; their height is between 8 and 9000 feet, and they deserve careful study. I was unfortunately not able to do more than pay the most superficial visit to Arckbal and the iron mines of Kothair; and the following are the notes taken during that visit.

The rocks which overhang the well-known Arckbal Garden, near the western foot of the hill, are a rough grey limestone similar to the grey coarse limestone seen on the Islamabad hill, (see No. 27 of the section of that hill), full of sand and other impurities. It dips W. by S. 52°. There appear to be beds of shales between the limestone courses, and these shales by their decomposition furnish the fertile soil on which grow the fine forests of those hills.

The foot of the Arckbal hill is therefore Weean limestone and shales.

I then proceeded to the small village of Kothair, on the eastern side of the Arckbal hill, in a small valley situated between it and Karpur. The rock of the spur of Arckbal, which extends towards Pahaloo, is a whitish or greyish limestone with very few fossils, and interbedded with beds of calcareous slate, apparently belonging also to the Weean group.

From Kothair, the path to the mines, crosses a couple of small spurs which have a direction S. to N. until we arrive at the ridge which unites Dhar and Tippoo and has a direction W. N. W.—E. S. E. The spurs above mentioned are composed of marly limestone, either lustreless and velvety pale blue or dark blue, weathering frosted. The beds are very badly seen, on account of the vegetation and humus. Where the limestone crops out, it seems to be dipping S. E. or E. S. E. with a very variable but considerable angle. The beds of limestone appear to be separated one from the other by thick beds of shales and slate. The limestone has exactly the appearance of that seen a little higher up, and which we shall see contains fossils characteristic of the Kothair bed; but I failed, however, to find organisms in the present beds.

48. The iron-ore is obtained from the sides of the main ridge between Dhar and Tippoo. The ridge presents many beds of very argillaceous limestone of a lustreless bright blue colour, dipping S. S. W. with an angle of 45°. This limestone is remarkable for the large number of gasteropods it contains; it is also rich in corals, especially of the *Cyathophyllidæ*, but the fossils appear generally as sections or outlines on the surface of the rock, and I could not obtain any of them whole.

Between the courses of limestone are beds of slaty shales of various colours, but generally dark grey, brown or reddish. The outcrop of these shales has disintegrated and decomposed into a vegetable earth of a dark red colour and covered by grass and underwood, and this earth has to be removed to bring the shales into view. In these shales the iron-ore is found as flat bands or ribbons of great tenacity and hardness, accompanied by softer ochrous clayey earth which is also used as an ore. The richest ore is the steel grey variety; this is not continuous as a regular bed, but forms bands or ribbons in the shale, sometimes thickening into a trunk a foot thick, at other times thinning into a flat ribbon a quarter of an inch thick.

The shales containing the iron-ore are about four feet thick, and are between beds of an arenaceous limestone which is blue and compact when freshly fractured, but weathers into a coarse, brown, nearly friable sandstone in the neighbourhood of the iron-shales. This change in the limestone (evidently produced by the infiltrating water becoming charged with peroxide of iron in its passage though the shale, and then acting as an acid on the limestone below the iron bed), is the indication sought after by the miners to dig an exploring hole; they dig above the altered limestone, and after removing a few feet of vegetable mould, discover the iron-ore in the upper part of the shaly bed. They make a hole just large enough to creep in and use a short miner's pick; the ore is difficult to detach, and, from the cramped position of the miner, the work is excessively laborious. The mines do not extend any distance under ground, and are generally abandoned in favour of a fresh hole, when artificial light is required to work.

From the examination of three or four of these small mines, I feel satisfied that the ore does not form a bed, but is arranged in a succession of ribbons and bands which run in the direction of the dip, sometimes anastomosing into a broad plane two or three feet across, sometimes thickening into a trunk or pocket, and sometimes dividing into thin and narrow ribbons which become lost in the shale.

The mines are all situated high up the hill (on this side of the ridge at least), within about 200 feet of the summit. The miner I had for a guide told me that no iron-ore is found lower down.

49. The ore is carried in kilters or baskets, carried on the back, by the means of shoulder-straps, to Kothair, a distance of two miles on a bad hill-path. It is not smelted nearer the mines, on account of the want of water; though it seems that it would be very much easier to bring up water for the miners, who only know of that element as a drink and therefore require but little of it, than to take the ore down to the village. The ore is broken into small fragments by children, and mixed with the ochrous earth and with coarsely powdered limestone. These materials are piled up in a small furnace about two feet high, with intervening beds of charcoal, and two hand bellows are used to create a blast; the smelting lasts about 12 hours, and the produce of a furnace is only a few seers. The heat is not sufficient to make the iron run; and it remains at the bottom of the furnace as a viscous mass, full of scoriæ, and very brittle when cold, with a tufaceous aspect. The slag is a black glass, compact, and much less scoriaceous than is customary. The iron is heated and beaten with hammers to refine it. It is short, probably from bad manufacture.

Two or three men and children and some women, all of one family, working as miners, carriers and smelters, turn out about two maunds of iron in the month from one furnace. There are only three furnaces at Kothair, giving a supply of six maunds of iron per mensem. There are similar mines at Loap and at Kookur Nag in the Bringh valley, on the southern side of the same mass of mountains. From the dip of the beds, it is probable that these works are in a much more favourable position than those of Kothair; they are said to be much more considerable; the ore is obtained in the same manner as at Kothair, and there are no regular mines. The ore is the same, according to my guide, a miner who had worked at Loap, but it is obtained much more easily and is found in thicker beds. Mr. Turner showed me some iron from Kookur Nag, and it appeared identical to the pig-iron of Kothair.

The turn-out I have given of the smelting at Kothair is not to be regarded as an indication of the richness of the mines. I believe that the miners only work the ore to pay their taxes to the Maharajah's government, and that their most usual occupation is to grow a little rice and Indian corn. I have no doubt that the amount of ore is

considerable, and that a large quantity of iron could be obtained by increasing the mines, and adopting better furnaces with a blast worked by water-power, windmill or horse-power; but the miners and other inhabitants of the villages take great care not to mention to the Maharajah's officials any valuable deposit of ore which may be worked with advantage; they pretend that the Maharajah takes away all the iron for his arsenal and pays nothing for it, and that, when a supply of any ore is discovered near a village, the inhabitants have to work it by corvées, so that the discovery of a vein of valuable mineral is a calamity to the people of the neighbourhood. But this is probably untrue in many ways: the iron they supply is, as I have said before, taken in lieu of taxes; the care with which many of the holes are concealed with rubbish and branches, induces me to believe that a good deal of iron is smelted in a contraband way; and last but not least, making a secret of mineral wealth is quite consistent with the love of hoarding riches so prevalent amongst natives. The same concealment of ores is now going on in Huzara, where a little iron is known to exist, and where the reason of the Kashmir miners would certainly not avail; and it is reported by the geological surveyors of the Raniguni coal-field that it is impossible to believe negative reports from natives. In Kashmir, moreover, the Maharajah's government entertain the same childish fear, lest the mineral wealth of the country should become known, and I well remember with what silly recommendations of secrecy I was shown by one of the Maharajah's servants a small piece of iron pyrites of the most insignificant value.

50. The rocks we have described form the Kothair bed (of Carboniferous limestone?). They are a succession of courses of limestone, shales of a dark reddish or ochrous colour, dark slates and calcareous sandstones. I am sorry I cannot give a section, but the following remarks will, in a way, supply its want.

The limestones are of two descriptions, viz.: some coarse and very sandy, indeed so much so, that when the carbonate of lime is removed by water charged with peroxide of iron, a brownish sandstone is left; it contains no fossils, and passes gradually into a rough grey sandstone with a calcareous cement. The other variety of limestone is argillaceous, and passes into calcareous slate; it is dark blue or even

perfectly black when fresh-fractured, lustreless like a clay and with a strong earthy smell; it weathers much paler, becoming covered with an incrustation which is bright pale blue, yellowish or whitish; the surface being at first velvety or satin-like, and so fine-grained in some specimens, that drops of rain or of dew falling from grasses leave small blots or stains, which after a while becoming frosted. The fossils of this limestone are well brought out on the weathered surfaces, as outlines or sections which are slightly in relief. The shales when ochrous, are very sandy, sometimes calcareous, oftener not so; they contain beds of clay iron-stone in irregular and wavy tabular bands or ribbons of an iron black and bluish black colour, and also of yellow carbonate of lime, and iron in a more or less friable condition. These shales have a well-marked slaty cleavage cutting the strata at a right angle. The slate is black, thick and massive and contains no fossils. It often becomes pale green and unctuous, and is then very thin-bedded and exfoliating. The sandstone is composed of rounded grains of transparent glassy quartz which are brittle, and break across when the rock is fractured, and each broken grain reflects the light, so that the sandstone has somewhat the aspect of a micaceous sandstone.

The fauna of the Kothair bed is more remarkable for the abundance of certain animals than for any species that I can well define. *Gasteropoda*, generally small, and corals of the "*Cyathophyllidæ*" are nearly the only animals seen. A few bivalves, small and thin-shelled, also occur, but they are rare, compared to the quantity of gasteropods. A few roots and stems, generally small, have been observed in some beds, but could not be recognized.

The following fossils are the most usual in the Kothair bed.

Naticopsis?
Macrochilus?
Chemnitzia?
Loxonema?
Nerinæa?

The fragments of *Gasteropoda* in great number.

Cyathophyllum? sp. Pl. VIII. fig. 2.
" ? sp. Pl. VIII. fig. 3.
" ? sp. Pl. VIII. fig. 4.

It is evident that a list of fossils, such as is given here, is insufficient to determine the age of a bed. My calling the Kothair bed Carboniferous, is therefore only temporary, and it is possible, and indeed probable, that the bed is either Permian or Triassic. I have often felt inclined to regard it as Triassic; but the total absence of *Monotis*, *Ammonites* and other characteristic fossils prevents my doing so. I have therefore preferred to represent the Kothair bed as the top of the Carboniferous series, until some characteristic forms be discovered. The Kothair bed was examined much more superficially than the others, owing to want of time; yet it is worthy of notice that I have never heard of an ammonite having been found in the valley of Kashmir, though the mountains of Kothair limestone, at the extreme eastern end of the valley, are very often visited by tourists and amateur geologists.

51. The Kothair formation differs from the Zeewan and Weean by the great quantity of shales it contains, these being in thick strata between thin beds of limestone. The fauna is, I believe, strongly indicative of a low swampy shore bathed by a shallow brackish sea. The arrangement of the iron-ore is, I fancy, to be explained only by the hypothesis of a clayey shelving sea board: any one who has observed hot chalybeate springs issue from the earth, near a flat piece of ground, must have noticed the sluggish stream divide into rills and rillets, form shallow pools here and there, reunite and divide again, meandering over the clayey soil; he will have noticed the oxide of iron contained in the water precipitated along the rivulets and in the pools as a bright red peroxide, whilst the surface of the nearly stagnant water is covered by a many-coloured film. This, I would submit, is the very process by which the iron of the Kothair shales has been deposited on the flat muddy shore of the Carboniferous sea: the rills of chalybeate water have become the tabular ribbons of our iron-ore, and we have therefore the iron-stone arranged as a main flat vein, or rather in somewhat parallel veins, with irregular small shoots on both sides, and occasionally a thickened and widened mass representing a pool or a hole in the bed of the stream. Many springs, such as I have described, exist now-a-days in the Salt Range, near the Kafir Kote hill, and in several localities in the Himalaya; the iron mud they deposit would, under favourable circumstances, and in the course of long years, form beds

similar to the iron-ore of Kothair; and when it is remembered how essentially volcanic the Carboniferous period has been, it is no great stretch of imagination to assume, that much of the iron contained in the rocks of that period was derived from hot chalybeate springs, rather than from decomposed minerals on the surface of the earth.

Here ends the description of the Kothair bed. No rocks superior to it (excepting lacustrine and alluvial deposits) were seen in Kashmir, and the Kothair bed appears the most superficial stratum existing there. In other localities, both in the Himalaya and in the Punjab, Secondary and Tertiary rocks cover in the Palæozoic beds, but neither Oolitic, Nummulitic nor Miocene are to be seen in Kashmir proper, that is, between the Pir Punjal and the Ser and Mer chains, and between the northern branch of the Kaj Nag and the chain connecting the Ser and Mer chain to the Kistwar mountains.

52. As far as I could learn, the whole of the hills, which fill up with their spurs the south-eastern end of the valley, are composed of carboniferous limestone; this appears to go as far as the foot of the range which separates Kashmir from Maroo and Kistwar, where the limestone rests on volcanic rocks. *Producti* have been found among éboulis close to the volcanic rock high up the slopes, and it is therefore probable that the Zeeawan bed reappears under the Weean and Kothair beds, as we near the volcanic rocks. The river Bringh, which drains all the S. E. and a good deal of the east of the valley, carries in its bed boulders of volcanic rocks and of carboniferous limestone. No granite was seen.

As I have not visited these hills and possess only little information on their geology, I will not enter here into any detail of what may be inferred from reports received by travellers who are not geologists, and I must refer the reader to the map for the probable position of the several rocks which compose these hills.

53. To the N. W. of Srinuggur there is one more mountain belonging to the same catenated chain of summits which we have described in this chapter; it is the Safapoor, with its outlier, the Aha Tung, and the beautiful little lake of Manus Bal at its foot. This locality is interesting, and I will describe it in detail. (See Sections E and F; Section IV. of General Map). The Safapoor and the Aha Tung are both composed of volcanic rocks exactly similar to those which we have seen at the Tukt-i-Suliman and the

Zebanwan. In the small valley or gap between the two hills are beds of limestone which I will now describe. (See Section E; and also Sketch-Section F.)

Proceeding from S. to N., we first find at the northern end of the Aha Tung a limestone quarry. The limestone is about 120 feet thick, and dips south with a very high angle. It appears to be covered by beds of greenstone confusely stratified; but on examining the bottom of the quarry, the courses of limestone are seen to bend towards the N., and the limestone is therefore superior to the trap. The diagram here given fig. 9, represents the position of the rocks. I am indebted to Captain Godwin-Austen of the Great Trigonometrical survey for calling my attention to this bend of the courses of limestone at the bottom of the quarry. If this curving of the limestone was not seen, it would be nevertheless easy to understand the true position of these beds, as they are precisely similar to those on the other side of the road (see Section), but in an inverse position: the rock nearest the greenstone is a glaring white and much altered limestone. It is succeeded by a dark, greyish, argillaceous limestone, weathering bluish and rugose. On the other side of the road, the dark limestone appears first, and underneath it the bed of glaring white altered limestone. There is therefore every evidence of a synclinal; but, of course, the discovery of the bend of the beds in the quarry completes the evidence very satisfactorily.

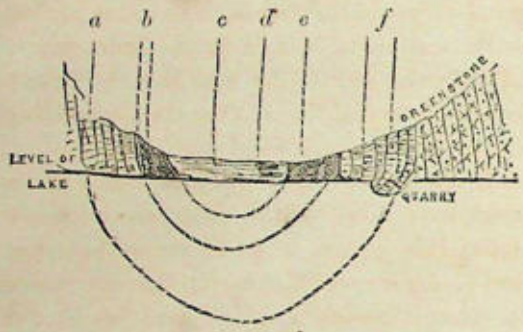


Fig. 9.*

Taking our Section from the S. to N., beginning at the road and leaving out the beds redressed against the Aha Tung which I have just described, we have the following strata:—

1 Greyish-blue limestone; marly, rugose, hard, dips S. 60°, increasing to 70°; much broken bed: about ... ... 20 ft. thick.

* *a* White Limestone. *b* Dark Limestone. *c* Alluvium. *d* Road. *e* Dark Limestone. *f* White Limestone.

2. Pale limestone, weathering glaring white; filled with geodes, lined with small spar-crystals. No fossils. Dips S. 80°, ... 100 ft.

3. Thin-bedded, shaly, striped limestone, ... 5 ft.

Fault. It runs E.—W. and is about 10 feet wide at the top. It is filled with rocks similar to No. 3, folded in all directions.

4. Limestone like 3; vertical, ... 15 ft.

5. Pale limestone; with geodes, like 2. Traces of fossils were observed, but much altered and not recognizable, ... 100 ft.

6. Pale blue, shaly limestone; dips N. 80°, ... 3 ft.

7. Like 5; dips N. 80°, ... 50 ft.

Fault; it runs E.—W.

8. Same as 7, ... 50 ft.

9. Argillaceous, thin-bedded, pale grey limestone, breaking in flat thin pieces, like pottery, ... 80 ft.

10. Sandy limestone, hard and dark, ... 20 ft.

11. Conglomerate limestone, varying from a coarse sandy limestone to a perfect conglomerate, the pebbles being rounded, pieces of limestone imbedded in a soft calcareous paste. It contains many sections of the *Aviculopecten* and other large bivalves peculiar to the Wecan bed. Portions of the bed are white and altered, ... 100 ft.

12. Sandy, micaceous, limestone; dark grey, ... 2 ft.

13. White limestone; no fossils, ... 15 ft.

14. Argillaceous limestone, blue and pale; weathering lustreless and velvety, ... 5 ft.

15. Conglomeratic limestone like 11, ... 50 ft.

16. Brecciated and sandy limestone; sometimes a coarse calcareous sandstone, ... 5 ft.

17. Ash-blue, pale, muddy limestone; weathering lustreless, ... 25 ft.

18. Brecciated and sandy limestone, ... 12 ft.

19. Ash-blue, pale and muddy; weathering lustreless, ... 25 ft.

All these beds dip S. with an angle diminishing gradually from 80° to 35°.

20. This bed is the top of a well defined anticlinal. The rock is a yellowish-grey limestone, with rolled pieces of limestone imbedded. It is sandy, sometimes quite a sandstone, oftener a sandy impure limestone. It contains a great many remains of fossils. The southern branch of the anticlinal dips S. 35°; the northern branch dips N. N. W. 25°. There is therefore a squeezing of the strata at the western end of the strike, and a divergence or opening of the fault at the eastern end. Thickness about 30 feet.

Then we get a repetition of the beds seen before, as follows:

21. Ash-blue, lustreless muddy limestone, ... 25 ft.

22. Brecciated and sandy limestone, ... 12 ft.

23. Ash-blue limestone, ... 25 ft.

24. Brecciated limestone,... ... ... 5 ft.

25. Conglomeratic limestone, with sections of large bivalves, ... 50 ft.
26. Ash-blue, lustreless limestone, ... 5 ft.
27. White limestone, ... 15 ft.
28. Micaceous and sandy limestone; thin-bedded dark grey; dips N. N. W. 80°, ... 2 ft.
29. Conglomeratic limestone; gritty; in places a conglomerate, in others a breccia; dips N. N. W. 85° at first; then it becomes vertical and at last dips S. 80°, ... 100 ft.
30. Arenaceous limestone, dark, rough and forming a prominent ridge; it dips south 80°, ... 20 ft.
31. Thin-bedded, muddy limestone, breaking in pieces like pottery; dip irregular; bed folded and wavy, much disintegrated, ... 80 ft.
32. Shaly limestone, very impure; dips N. 80°.
33. Sandy limestone, dark and rough and hard: dips N. 70 to 75°. These two beds together are about, ... 30 ft.
34. Limestone, generally sandy and grey, but sometimes more compact and bluer, and then showing innumerable white lines crossing each other in all directions. It dips N. 70°, ... 100 ft.
35. These several varieties of limestone, viz. shaly and sandy, and blue with white lines, repeat themselves continually as far as the top of the hill, but the rock becomes more and more massive and presents portions of crinoid stems well preserved and petrified into a black spar. Sometimes the rock is flesh-coloured, and then the crinoid stems are lighter in colour, and weather in relief on the surface of the rock. These are the sections of crinoid stems which have been taken for nummulites by Mr. Vigne and Dr. A. Fleming. 150 ft.

The strike of the beds of limestone wheels more and more to a N. to S. direction. As we approach the volcanic rocks of the Safapoor, the dip becoming more and more westerly. This wheeling of the strike is well shown by the Sketch-Section (Sect. F), where we see the face of the limestone-courses uncovered and exposed, and facing the W. N. W. The thickness of the Wecan bed is altogether 649 ft.

A large fault, well marked by a deep ravine, separates the limestone from the volcanic rocks. It runs N. E.—S. W. At the highest point the limestone is seen to attain, the fault is a mere crack, and the limestone is in contact with the volcanic rocks; but at the S. W. end of the fault, it widens considerably, and beds of limestone are to be observed on its northern side, applied against the trap and conformable and superior to it. The trap dips S. S. E.

On the western face of the Safapoor, long beds of well-stratified laterite and ash are conspicuous; they dip S. with an angle of 40.

54. Our section runs through the spur of limestone nearest to the lake; three other spurs, parallel to it, descend towards the village of Paturmoola (see Section F.). They present very won-

derful twists and foldings, but appear less altered than the beds which are bathed by the lake; their fossils are better preserved. I have not ascended these spurs, but amongst the *éboulis*, I saw many fossils characteristic of the Wecan limestone, amongst others large *Avicula-pectens* and *Anthracosiæ*, of which sections only had been discovered in the rocks in situ.

Some blocks of limestone were also found exhibiting *Gasteropoda*, so conspicuous in the Kothair bed, and it is therefore evident that this bed forms the uppermost layers of the limestone of the higher spurs. I need hardly say, that the beds of Manus Bal belong to the Wecan group, and that they have been folded and altered in part by volcanic action, subsequent to the formation of the volcanic rocks on which they rest. The order of the beds is from the anticlinal upwards on both sides of it, and the rocks nearest to the trap are the most superficial, excepting, however, the detached beds which are conformable to the volcanic rocks on the northern side of the great fault. If the limestone had been baked by the amgydaloid and the greenstone, we would naturally expect to find the beds nearest to these rocks most altered; the reverse is however the case; and we must therefore admit that a burst of hot gases or hot water had taken place at the time these limestones were still a soft and plastic mud, and that it upheaved, folded and metamorphosed them.

It must not be forgotten, that the limestone might have been much less folded by this first disturbing action than we see it now, when the last upheaval of the Himalaya took place: the beds then slightly folded would naturally give way in the same direction as they were already bent, especially if the space they occupied between two unyielding trappean hills had become so restricted that the limestone must of necessity either be folded or override the trap. On the application of such lateral pressure, a straight, flat, hard bed might have slided over the trap, but a bed already undulating would more naturally give way at the weakest parts, viz. the angles of the undulations, and thus become gathered in crumpling folds. Such folds are well shown in the Sketch-Section, (plate F).

55. Having terminated our examination of the several mountains which form the first catenated chain on the N. E. of the valley of Kashmir, we can now understand how this chain was once conti-

nuous, the several summits being re-united to one another by ridges of stratified ash, agglomerate and limestone. These connecting ridges have been denuded by the several streams which flow towards the bottom of the valley, and the limestone is now found only in limited beds, which have escaped denudation from the shelter they received of large and hard volcanic mountains. These streams and rivers, it is hardly necessary to mention, have had a volume very different from what we see now-a-days; the enormous layers of lacustrine conglomerate, which they have accumulated near their entrances into the valley, demonstrate plainly their former great denudating power. The direction of these streams being from the high mountains in the N. E., to the bottom of the valley in the S. W., they have cut for themselves channels which are directed from N. E.—S. W., and thus bands of the ridges, which united the summits of our first chain to those of the second chain, have remained between the channels of these streams, and given to those mountains the appearance of being long spurs descending from the N. E. to the S. W.

56. I shall, I hope, best terminate these detailed Sections, by appending a table of the fossiliferous and other rocks in Kashmir, together with such observations as the nature of the rocks or the fauna best justify.

For-mation	Masses, Beds, &c. &c.	Fossils.	Conditions indicated.
A. Volcanic Rocks.	*a.* Granitoid porphyry; trachyte and felstone.	.....	Melted masses which have not flowed, or have flowed under water. Centres of volcanic action.
	b. Greenstone amygdaloid, basalt.	.....	Melted masses which have flowed under water or in the air.
	c. Felspathic and augitic ash; agglomerate, &c.	.....	Volcanic ejecta falling in shallow water.
	d. Black slate, sometimes amygdaloidal.	.....	Mud derived from volcanic rocks, rearranged by shallow water, often heated by showers of hot ashes, vapours or currents of lava.
	e. Laterite, slate, baked clay.	.....	Same origin and same conditions.
	f. Quartzite.	.....	Geyserian action. End of the great volcanic eruptions approaches.
	g. Similar to *e.*	.....	Occasional eruptions and slight fall of ashes and dust in shallow seas.

Formation	Masses, Beds, &c. &c.	Fossils.	Conditions indicated.
		ORGANISMS APPEAR.	
B. ZEEAWAN BED.	*a.* Crystalline limestone, coarse and with very few fossils.	Few.	Open sea coast, not very deep.
	b. Massive limestone, granular, or crystalline.	*Productus, Orthis, Spirifera, Fenestellidæ, Orthoceras.*	Open sea coast. About 50 fathoms.
	c. Ferruginous calcareous brown shales.	Same fossils.	Sea coast, not distant. Heavy water-fall on Volcanic islands.
	d. Dark sandy shales.	Same fossils.	Sea coast, not distant. Drift near shore. Heavy water-fall on Volcanic islands.
	e. Limestone, shaly, with shaly partings. Thickness = 200—250.	Same fossils; no *Bryozoa.*	Sea becoming shallow; shore shelving and drifty.
		FAUNA CHANGES.	
C. WEEAN BED.	*a.* Shaly and sandy limestone.	*Encrinites;* small bivalves; Debris.	Shallow shelving, coast line.
	b. Black argillaceous limestone.	Debris.	Shallow sea between islands.
	c. Altered, amygdaloidal limestone.	None or mere traces.	Local volcanic action; geyserian bursts of water or vapours. Earthquakes.
	d. Flesh-colored limestone with lenticular beds of pale blue, nearly friable limestone.	*Anthracosiæ. Aviculo-pectens. Pecteus. Solenopsis.*	Proximity of land; banks and shallows on a shelving coast-line.
	e. Thin-bedded, argillaceous limestone, breaking in slabs.	*Goniatites.*	Slow formation of fine silt in well protected creeks.
	f. Shaly, muddy, very fœtid limestone, with gregarious fossils.	*Cyrtia* and small *Terebratulæ.*	Warm, damp and shallow sea, swamps, teeming with life.
	g. Argillaceous and arenaceous limestone paleless blue and yellow.	Debris of small thin bivalves. Roots of plants.	Very shallow sea-shore; sublittoral oscillations; frequent freshes of fresh water carrying mud to the sea.

Formation	Masses, Beds, &c. &c.	Fossils.	Condition indicated.
		FAUNA CHANGES.	
D. KOTHAIR BED.	*a.* Dark, blue or black argillaceous limestone.	*Gasteropoda* and *Cyathophyllidæ*.	Protected creeks, rather swampy.
	b. Slate and shale.	None.	Rivers bringing down mud to a shallow sea. Sublittoral oscillations.
	c. Sandy limestone without fossils.	.....	Drift on shallow shelving coast.
	d. Shales; sandy shales; clay iron-ore in ribbons.	.....	Shelving low land near seashore, traversed by rills from hot chalybeate springs. Sublittoral oscillations.
	e. Limestone like *a*; passing into calcareous slates.	*Gasteropoda* and *Cyathophyllidæ*.	Shallow creeks or protected sea coast. Swamp with grasses? Shallows between tides?
	Thickness = 500 feet.		

This succession of beds shows a steady shallowing of the sea. If we reflect for a moment how the sea bottom which received the limestone was formed, by volcanic ash and ejecta falling into the sea around the craters of numerous volcanoes, we would be led to expect a shallow shelving sea coast. Whether the volcanoes had existed for ages and prevented the development of life during the Silurian epoch, or whether they broke out after the Silurian beds had been deposited and buried these beds under their ejecta, I cannot say. It appears much more probable however that the volcanoes existed during the Silurian epoch, and prevented marine animals from living, by keeping the water at such a temperature or permeating it by such gases as were incompatible with life. However this may be, there can be no doubt that the volcanic ejecta were disposed in very gently sloping beds all around the volcanoes which produced them, and, as these ejecta were arranged by water, we would naturally expect the beds they formed to extend far into the sea. Hence a long shelving shallow coast would be formed, a coast which would speedily become more and more shallow from the enormous

amount of sand and clay which was washed into it from the volcanic islands which studded it, by a rain-fall of tremendous volume.

57. We have yet to describe the second and third catenated chains of Kashmir; the second is marked by the summits of Liwapatur (13,012), Churn Wolkalbul (14,310), Girdwali (14,060), Batgool (14,423), Boorwaz (13,087), Handil (13,273), Saijhaha (11,334), and joins the first parallel at the Safapoor on the eastern shore of the Woolar lake. On the other side of the lake, it is continued by the Kahoota, the Manganwar (8,728), and the Sheri Bal. These mountains are all composed of volcanic rocks and of azoic slate interbedded with ash and agglomerate. They need not therefore be described in detail. The Boorwaz, Handil and Batgool form a porphyritic mass which is generally described by travellers as granite; it passes gradually on the west into amygdaloid and greenstone to form the summits of Saijhaha over the village of Gunderbul. The transition between the porphyry and the greenstone is a feldspathic rock of a pale colour and imbedding very numerous transparent crystals of quartz, a description of rock which is also found to form a passage between the porphyry and the felstone of the Kaj Nag. From the examination of a few specimens, kindly given to me by travellers, I have no doubt that the whole of this mass of mountains is composed of volcanic rocks, volcanic ejecta and slate. I am not aware that limestone exists anywhere amongst the spurs of these hills. Between the valley of Thral or Trahal and the river Lidar, there is a great labyrinth of mountains with many of the summits enumerated above, but I could obtain no information regarding them. I therefore requested Captain MacQueen, of the Punjab Irregular Force, who had arranged a shooting expedition to these hills to be kind enough to bring me a few specimens of the commonest rocks of the country he was about to visit, and also any rock which appeared to him in any way remarkable. By the use of the specimens thus obtained, and the examination of Captain MacQueen's route on the map, I was enabled to ascertain that the whole mass of these mountains is composed of the same volcanic rocks, which I have described in detail at the Tukt-i-Suliman and the Zebanwan. Ashes appear to have been accumulated in enormous quantity; they are interbedded with bands of black compact slate such as is so well seen

in the Wastarwan and Zebanwan, and both ash and slate are occasionally cellular or amygdaloidal. There is neither limestone, granite or porphyry among Captain MacQueen's specimens, and I believe therefore that the two last rocks at any rate do not occur in these mountains, as pieces of granite and porphyry generally attract the attention amongst the dull ash-rocks and would not have failed to form part of the collection, if they had existed. It is very possible that remains of beds of limestone are to be found amongst the spurs of the hills.

On the north of the Woolar Lake, many mountains of no great height form a sort of amphitheatre. They are nearly entirely composed of amygdaloidal greenstone, ash and slate interbedded, but near the village of Bundipoor, about two miles east of the road, some beds of limestone are seen. Mr. Drew has kindly sent me some specimens of it that are a flesh-coloured, sometimes greenish, very arenaceous and argillaceous. They are not at all crystalline, but contain an enormous number of encrinite stems transformed into spar with a cleavage oblique to the axis of the stem, so that when the section of a stem weathers, it appears striated across. This crystallisation has destroyed the structure of the stem, but the central canal is seen in a few specimens. We have seen this rock well developed at Manus Bal, towards the end of our section, where the beds of flesh-coloured limestone alternate with grey sandy limestone containing crinoid-stems transformed into a spar as black as coal. (See 35 of the section of Manus Bal). The limestone of Bundipoor is therefore Wecan limestone.

On the west shore of the Woolar lake, the Taltiloo and the Chralkoot present perpendicular cliffs of volcanic rocks descending into the water. From a boat on the lake, it is easy to observe the usual thick and confusely bedded masses of greenstone and amygdaloid forming the centre of these hills, and the more sloping and regularly stratified layers of ash, laterite, agglomerate and slate well developed, in the long spurs which descend on all sides. The whole mass of hills appears to be made of volcanic rocks, and the lowest spurs which approach the shore of the lake present no fossiliferous beds. Of the higher peaks, the Kahoota, Manganwar and Sheri Bal, I know nothing, but there can hardly be a doubt, however, of their being volcanic in their formation.

58. The third catenated chain is composed of summits of great height, the Gwashbrari (17,839), the Harbagwan (16,055) the Basmai (15,652), and the Haramook (16,903), and many other peaks which, with their spurs and connecting ridges, separate Kashmir proper from Tillail and Gurais. All these high summits are formed by porphyry having a granitoid appearance, which passes, towards the north, into felstone generally earthy and similar to the earthy felstone of the Atala Mount near Baramoola. On the north-western extremity of the chain, this felstone becomes continued with that of the great chain of hills which unites the Kaj Nag to the Ser and Mer chain. This flaggy rock is continued to near the city of Gurais where, in the valley of the Kishengunga, beds of limestone appear extending from about 15 miles N. W. of Gurais to Tillail. The limestone is, after a break, continued at the Sono Murg and is in all probability identical to that of this locality. I have never seen any specimen or fossil from the Tillail limestone, but the Sono Murg limestone is Carboniferous, and it is most probable that the Tillail limestone, which appears to be the continuation of that bed, belongs to the same epoch.

Due north of Sono Murg, the limestone is much developed and forms the summit of a considerable peak.

The porphyry-centres of mountains pass towards the south to rocks of an appearance different from that of the northern spurs; while we have seen that, towards the north, the porphyry generally graduates to a felstone more or less earthy. Towards the south it changes, as we travel from the peaks towards the end of the spurs, into trachyte, greenstone, amygdaloid, basalt, ash and agglomerate, together with interstratified, azoic and often amygdaloidal slate.

The northern spurs of Gwashbrari, the Harbagwan and the Basmai are composed of felstone, and near the road to Drass, in the valley of the Sind Torrent, of amygdaloid and ash. On these beds of ejecta rest fossiliferous beds, and, near the small village of Sono Murg, the beds of limestone are well developed. Captain Godwin-Austen found in that locality some fossils which he was kind enough to show me. They were identical with the forms described as characteristic of the Kothair group of Carboniferous limestone, viz. the *Gasteropoda* and *Cyathophyllidæ* which are represented at Pl. VIII.

fig. 4, 4a. They occur in a thin-bedded, dark-grey, argillaceous limestone, having in some places the appearance of a calcareous slate. But beds of Wecan limestone must exist not far from Sono Murg and form propably some of the beds of limestone which are seen in the high valley between the Ambernath and the Gwashbrari, as blocks of limestone of this description, rounded by running water, were found in the bed of the Sind, near the traveller's home at Sono Murg.

To be continued.

Experimental investigations *connected with the supply of* water *from the Hooghly to* Calcutta, *by* David Waldie, *Esq. F. C. S. &c.*

[Received 31st August, 1866.]

The attention which of late years has been given amongst civilized communities to the preservation of health and prevention of disease, has naturally been directed amongst other subjects to that of the water employed for economical purposes, and more particularly to its purity and wholesomeness as a beverage and as the medium for the preparation of food. The subject has been under the consideration of the municipal authorities of Calcutta, who, as is well known, have organised a scheme for the supply of the town from the river Hooghly, for the carrying out of which arrangements are now in progress. The Sanitary Commission appointed some time ago in the Bengal Presidency, and I believe in the other Presidencies also, recommended to the several governments of the Subdivisions, that the water of the various cantonments and stations should be subjected to chemical analysis for the purpose of ascertaining their wholesomeness, and these recommendations are in course of being carried out.

In England, and more particularly in the metropolis, much attention has been given to the same subject, and also to another one closely connected with it, namely, the disposal of the sewerage of towns. This subject is connected with that of water supply, not only, because in the plan generally followed for getting rid of sewerage in towns, a large

supply of water is necessary, but also on account of the circumstance that in many cases the readiest way to dispose of the liquid sewerage is to turn it into rivers. And as it frequently happens that these rivers may afford the easiest or perhaps the only practicable source of supply of water for other towns, the pollution of their waters so produced may be not a little deleterious. From the enormous extent and population of the English metropolis, and the comparatively small size of the river on which it stands, the evil in that case has become palpable and notorious. The most eminent chemists and engineers have been engaged in the examination of the subject as respects both the supply of water and disposal of sewerage, and the results of their enquiries have been published and subjected to public criticism and discussion.

So far as I am aware, nothing has yet been published of the results obtained by the examination of the waters of the Military cantonments of India, nor do I know if it be intended that anything shall be. With respect to the Calcutta supply, as is well known, a series of analyses has been made, and a Report of results and conclusions drawn out, by the Chemical Examiner to Government, Dr. Macnamara. That report, no doubt from being intended for a non-professional, and (regarding it collectively and officially) not a professedly scientific body, gives only results and conclusions, omitting altogether the details of analyses and the specification of the methods employed. Dr. Macnamara's attention seems to have been directed chiefly to the water of the Hooghly, to ascertain the proper point nearest to the town from which a supply of water of sufficient purity all the year round could be obtained. The examinations were made on samples from Cossipore, Pultah Ghat near Barrackpore, and Chinsurah. The general conclusion arrived at is, that the influence of the tide is little felt at Chinsurah at any period of the year, not much more at Pultah Ghat, except towards the close of the hot season in May and June when it is decidedly perceptible though not great, and not only decided but to a large amount at Cossipore during the months of March, April, May and June; and that the river water from its admixture with sea water and the sewerage of Calcutta during that time is unfit for human consumption. The organic matter is stated to be much larger in quantity during these months than at other periods, and also to be highly nitrogenized; the quantity amounting to 6 or 7 grains or even 10 or

12 grains per Imp. gallon during the months of April, May and June; and this increase in quantity and deterioration in quality is considered to be due to the organic impurity from the sewers and banks at Calcutta. The analyses, I may observe, were chiefly made on samples taken at high water, obviously to get the water at its worst. Analyses are also given of the waters of two tanks in the Maidaun or plain round Fort William, namely Monohur Doss's Tank and General's Tank, which are considered as unquestionably superior to the river water.

I may observe that, when I commenced this investigation, it was not in connection with the water supply of Calcutta at all, or even in connection with the economical use of water or its wholesomeness as a beverage. These enquiries had been placed in the hands of others; but it occurred to me, that residing, as I did, on the banks of the Hooghly, and possessing certain facilities for the purpose, it might be a contribution to science of some small value to make a minute examination of the constituents of both the water and the mud of a great river draining so large an extent of country as the Ganges. The investigation is as yet far from completion, but during its course, it occurred to me that many of the results obtained might have some value in relation to the subject just adverted to—the economical use of water; and that the local interest attached to it might render it in some degree appropriate to publish these results, more particularly at a time when all the knowledge attainable connected with the subject is desirable.

This communication then is not intended to present a full statement of the composition of the Hooghly water, but only to treat of such points as are of more particular interest in connection with its application to supply the wants of the inhabitants of Calcutta. And indeed this is all that is necessary for the purpose in view. As regards the general composition of the river water at different seasons of the year, my own results only go to confirm those already given in Dr. Macnamara's Report, but in some particulars, not of minor importance, the results I have obtained and the conclusions drawn from them are somewhat different; and in other particulars it may be found that I have added to the stock of information on the subject.

It is scarcely necessary to allude to the course of the seasons in Bengal and the way in which they affect the river. But for

convenience I shall briefly state how I shall speak of them in what follows. From the middle of June when the rains generally commence and the river rises, till the end of October or middle of November, when the rains have ceased and the river is rapidly falling, I shall speak of as the rainy season; thence till the end of February as the cold season; and thence again till the rains recommence as the hot season. The first is identical with Dr. Macnamara's "Full season," the two latter with his "Low season."

During the rains, the river comes down in full stream from the parent Ganges through the effluents which unite to form the Hooghly, viz. the Bhagiruthy, Matabangah and Jellinghy, with contributions from other tributaries from the west. During that period, and more particularly during its earlier part, the water is loaded with mud in a very fine state of division and very slow in settling. As the season comes near its termination, the water becomes clearer, and remains so during the cold season, any mud in suspension rapidly settling. The water, which during the rains naturally contained the smallest proportion of saline matter, now contains more, the proportion gradually increasing till the end of February, the first increase having been more rapid at the stoppage of the rains. All this, of course, is the natural and obvious result of evaporation without any rainfall to supply the place of the lost water, aggravated by the diminished supply of water from the Ganges caused by the bars at the entrance to the tributary effluents. These causes operate with still greater power during the hot season, aided by strong southerly winds and powerful tides. During this season the mud is stirred up, and the water rendered more dirty, but the mud is not in the same state as during the rains, and settles without difficulty. The influence of the tides becomes increasingly felt as the season advances, and the admixture of sea water becomes unmistakable.

The following table exhibits the results I have obtained as respects the amount of solid residue obtained by evaporating the water. They are given for 100,000 grs. of water, instead of the Imperial gallon used by Dr. Macnamara. By multiplying by 7 and dividing by 10, the quantities per gallon are obtained.

The following Table showing the amount of solid matter dried at 212° *to* 220° *Fah. in the river water at ebb tide, at a point from two to three miles above Calcutta.*

TABLE I.

		For 100,000 grs.	For 70,000 grs. or Imp. gall.
1865			
August 31st, 1865, including very fine clay,*	Ebb,	12.13	8.41
December 6th,	Ebb,	24.00	16.80
1866			
February 25th,	Ebb,	30.00	21.00
May 2nd, spring tide,	Ebb,	36.20	25.34
	Flood,	88.50	61.95
24th, Neap tide,	Ebb,	21.25	14.88
June 14th, spring tide,	Ebb,	30.70	21.49
	Flood,	151.90	106.33
July 6th, including very fine clay,*	Ebb,	12.59	8.81
August 8th, clay and some silica deducted,	Ebb,	8.13	5.69

These numbers confirm the results exhibited by Dr. Macnamara's report, making allowance of difference of seasons. They shew clearly the increase of solid contents more especially during the dry season. And here I may remark that samples were chiefly taken during ebb tide, as my primary object was the examination of the river water proper, and it was only during the hot season that particular attention was paid to the state of tide, after my attention had been directed in part to what is the special object of this paper. And indeed, except during the hot season, the composition of the water is little affected by the tides.

And further, as the object was to make a full analysis of the water at several different seasons, I did not adopt the readiest or simplest methods of merely comparing the water at different periods for sanitary purposes, which would have been done, had that been my primary object. The methods adopted will be noticed in due course.

The preceding table exhibits a very great variation in the amount of solid constituents during the hot season, owing to the influence of the tides, a subject which will be separately considered.

* These waters had settled well—that of August 1865 for 19 days, that of July 1866 for about 35 days, yet by comparison with that of August 1866 it will be observed that about one third of their solid contents was fine clay.

Influence of the Tides.

It will indeed be convenient to take up this subject first in order. Dr. Macnamara's results exhibit very clearly the increased quantity of saline constituents during the hot season, commencing in March, and coming to its height just before the commencement of the rains. His table shews as much as 77.7 grs. dry saline residue from 1 gallon of water at high water on 12th June, 1862. I obtained from water taken at full spring tide, on 14th June of this year 1866, as much as 106.3 grs. per Imp. gallon. This is easily accounted for when it is found, as ascertained from examination of the rainfall, that from June 1861 to end of May 1862 there had fallen 87.4 inches of rain, while during the corresponding period of 1865-66 there had been only 47.9 inches: the river must have been much lower and its current feebler, and consequently the sea water had penetrated farther. My observations were all made on water taken from the river near my own residence at the village of Baranagur or Barnagore, with a few exceptions which I shall notice afterwards. The locality is about two miles above Cossipore. But I made observations also on the effect of time of tide.

This point is also noticed in Dr. Macnamara's report, though not very fully. He mentions that the water varies much in the degree of its impurity with the time of tide, falling as low during April and May as 23° at low water, that is, 23 grains of saline matter in 1 gallon. My observations indicate even a greater amount of variation than is by this suggested, as will be shown by the table I have prepared. As the evaporation to dryness and weighing the residue of numerous samples is very tedious and troublesome, another plan was adopted for estimating the amount of variation. The river water proper contains very little chlorine in its composition, while in the state of common salt this is the characteristic constituent of sea water. The quantity of chlorine was therefore ascertained by the usual volumetric process with nitrate of silver, and calculated as if it existed entirely as chloride of sodium or common salt, which afforded a very good means of comparing the samples and estimating the proportion of sea water present.

I endeavoured to make some observations further up the river, but found that it could not be done properly except with an expenditure of time, trouble, &c. that I could not devote to it. Any observations that I did make were only confirmatory of Dr. Macnamara's results.

The following table exhibits the results of my observations on the

influence of the tides. The change of course is gradual, commencing in March and increasing as shewn by Dr. Macnamara's report. I did not make observations until the first of May.

TABLE II.

To compare Ebb and Flood Tide.		Chlorine calc. as Chloride of Sodium. For 100,000 grs.	Saline matter dried at 220° F. For 100,000 grs.	Imp. gal.
1866 a mile above Baranagar—				
May 1st, second day of full moon.				
Low water nearly complete, ...			28.0	19.60
High water nearly complete,	Surface,		61.55	43.08
	Deep,		59.55	41.68
At Calcutta—				
2nd, third day of full moon,				
About ⅞ Ebb, stream,	Surface,		36.20	25.30
Opposite Bankshall.	Deep,	15.50		
About ¾ Flood, stream,	Surface,		88.50	62.19
Opposite Hatkolah.	Deep,	55.50		
At Baranagar—				
16th, third day of new moon,				
Above 1 or 1½ hour Ebb,	Surface,	40.00	66.40	46.48
	Deep,		68.60	
Above ¾ Flood,	Surface,	78.00	107.20	
	Deep,	75.00	109.00	76.30
Nearly high water complete,	Surface,	82.50	104.70	
	Deep,	80.00	106.20	
To shew state at Neap tide.				
24th, fourth day of first quarter of moon.				
1 hour after beginning of Ebb,	Surface,	17.50		
	Deep,	18.50		
3 hours after do.	Surface,	12.50	21.25	15.05
	Deep,	11.50		
To shew rate of change during Ebb and Flow.				
May 30th, third day of full moon.				
At shore 5 h. before tide begun, ...		27.00		
2 h. before do, ...		21.50		

Stream, above 4 hours flood,.....		64.00	83.85	58.7
June 1st, fifth day of full moon.				
5 h. 10 m. before tide begun, ...		35.00		
1-20 ditto ditto, ...		16.50		
2-10 after ditto, ...		26 50		
5-10 after ditto,	Surface,	69.50		
	Deep,	58.50		
14th, third day of new moon.*				
Tide commencing about noon,				
At 6 h. 40 m. A. M.	Surface,	63.50		
	Deep,	65.90		
11-5 A. M.	Surface,	15.00	30.7	21.49
	Deep,	14.00		
2-20 P. M.	Surface,	71.00		
	Deep,	85.50		
4-20 P. M.	Surface,	123.00	151.9	106.33
	Deep,	126.00		

The water was collected either by filling vessels from the surface, or in the case of the deep water by lowering a tin bucket provided with proper valves. The much larger quantity of heavier mud brought up by the bucket proved that it acted properly. The water was collected in almost every instance under my own personal superintendence.

The collection was made by means of an ordinary small boat or dinghy. The changes of position which could not be avoided account for the irregularities between the surface and deep waters, taking into account the strong currents and eddies that prevail.

The table exhibits the great influence of the tides: taking the extreme case of 14th June after long drought, just two days before the rains commenced, we have in 100,000 fl. grains of water 151.9 grs. solid matter at high water, and 30.7 gr. at low water, or nearly 5 to 1; while comparing the Chlorine as Chloride of Sodium or common salt, the proportion is fully 8 to 1. These great differences occur chiefly at spring tides. The results of 24th May shew how comparatively small this is at Neap tides, 19 grains of salt at nearly high water to 12 grs. at nearly low water.

* Highest tides are on third day of new or full moon.

A study of the particulars of this table shews that the period during which the water can be obtained with the smallest admixture of sea water is during the last three or four hours of ebb tide and the first one or two of flood. From tables of the analyses of the waters supplied to London which I shall have to refer to more particularly afterwards, it appears that the water of five Thames Companies contains at an average from 26.41 to 26.97 grs. of saline matter per 100,000; and that of four other Companies,—two river waters contain about 26 grs., and two artesian well waters contain from above 38 to 40 grains. The Hooghly water at Baranagur therefore even during the hot season at ebb tide contains little more solid matter than the Thames water, but probably a larger proportion of this is salt.

Constituents of River Water proper.

We have now to direct our attention to the river water proper, which we may consider that we can get from the Hooghly at different degrees of dilution all the year except three or four months of the hot season. The water of rivers is of course in greater part generally water fallen from the atmosphere. Aided by the carbonic acid of the atmosphere, it acts upon rocks, even silicious rocks, producing a certain amount of decomposition and carrying off their constituents partly in solution, partly in suspension as mud; it carries off similar constituents from the soil, which consists of decomposed rocks; and also from this source a quantity of organic matter, the result of the decomposition of vegetable and animal substances, as also the excrementious matters deposited there. Except in special circumstances the water of rivers generally contains a rather small proportion of alkaline salts in the state of silicates, sulphates, chlorides and carbonates, with a larger proportion of carbonates of lime and magnesia kept in solution by excess of carbonic acid gas. They differ from spring or deep well waters and agree with surface waters generally in containing a notable proportion of potash as well as soda, and also more silica, phosphates, earthy carbonates and organic matter, and sometimes ammonia and nitrates, than deep spring waters do. When brought in contact with argillaceous deposits, they part with their potash, ammonia, silica, phosphoric acid and organic matter, while the soda, lime, magnesia, sulphuric acid and chlorine are generally retained, forming the usual constituents of spring waters. This subject is treated of fully in an Essay on the

Chemistry of natural waters by Mr. T. Sterry Hunt, which will be found* well worthy of perusal.

I am not aware whether much consideration has been given to the peculiarities of the constitution of such surface waters in regard to their mineral constituents and their action on the animal economy, except in the case of the abundance of earthy carbonates. This, however, is perhaps the least characteristic of these constituents, as many spring waters abound in earthy carbonates, or at least in earthy salts, sulphates and muriates of lime and magnesia. More characteristic is the deficiency of muriate of soda or chloride of sodium in the surface waters and its comparative abundance in spring waters. Soda is the characteristic alkali of the components of the human body, but some curious observations have been made by physiological chemists on the relative proportions of the two alkalies in different parts or tissues of the system; and though it is stated in these cases that the peculiarities exist entirely irrespective of the nature of the food taken, it would scarcely be warrantable to assume as certain that such differences in the predominance of potash or soda in food or drink are entirely destitute of influence. The point is at least worth bearing in mind.

Phosphoric acid, when present, exists in such small quantity that only in very minute analyses is it sought for by the analyst. Silica is found much more generally. From its neutral and indifferent character, much attention has not been given to it in its influence on animal bodies. But attention has been given to all of these substances in relation to vegetable physiology, as plants draw their food directly from the soil in part at least, and the nature of its constituents is therefore of immediate importance.

To the other constituents I have mentioned, namely organic matter with the products of its decomposition, including ammonia and nitric acid, more attention has lately been paid in connection with water to be used for human consumption. Indeed this may be said to be the principal point to which the analysis of waters selected on sanitary considerations has of late been chiefly directed.

The water of the Hooghly has a composition similar to that already given as that of river waters generally. According to Dr.

* Silliman's American Journal of Science for March, July and Sept. 1865.

Macnamara's report, in the month of August there was in 1 gallon of water 1.2 grains of soluble salts and 5.4 grs. of insoluble earthy salts, beside silica and organic matter, and in February 1.8 of soluble and 13.4 of earthy. Or, as I prefer to express it, there was in August 1.7 grs. alkaline salt and 7.8 grs. earthy carbonates in 100,000 fl. grs., and in February 2.6 alkaline salt and 19.1 grs. earthy carbonates in the same volume. The first represents the water in its most diluted state during the height of the rains, the last in its most concentrated state at the end of the cold season, just before tidal influence begins to be felt. I do not intend to give any of my own results, partly because a full analysis of the water is not the object of this paper, and partly because a circumstance entirely unforeseen and unexpected has thrown doubts on the correctness of some of those obtained, and I do not wish to give them in an imperfect state, as they cannot be corrected until the return of the cold season gives me a new supply of water. It is sufficient to say that they do not appear to differ materially from those given in Dr. Macnamara's report. The only point to be noticed is, that Dr. Macnamara, in accordance with the usual custom, where minute accuracy is not required, assumes that the alkali is soda. Both potash and soda, however, are present in the river water; to what extent they vary, I have not yet ascertained. During the hot season, from the increase of common salt from tidal water, there is of necessity a great increase in the proportion of soda in the state of common salt.

The alkaline salts consist of potash and soda in combination with sulphuric acid, silicic, and probably hydrochloric acid (or more strictly their metals combined with chlorine) and perhaps some organic acid. The earthy salts are carbonates of lime and magnesia, kept in solution by excess of carbonic acid. On evaporation nearly the whole of the lime and magnesia separate as carbonates insoluble. Besides these there are a few minute constituents to be noticed afterwards. The only particular now to be noticed is, the different proportion of solid constituents in the water at the two extremes; in August there is 9.5 grains of alkaline and earthy salts in solution in 100,000 fl. grs. of water, in February there is 21.78 grs. or about two and a quarter times as much. This great difference is of course due to the nature of the seasons in Bengal, where almost all the rain falls during four or five continuous months.

It may be useful to refer for the purpose of comparison to the composition of some other waters supplied to towns, and I shall take for that purpose one of the most recently published reports on the subject, namely, that by Professor Frankland on the water supply of London during the year from February 1865 to January 1866.* The only points determined connected with the mineral constituents are the total amount of saline matters and the amount of earthy salts as ascertained by the soap test; this, as is well known, being the application of the familiar fact that hard water curdles soap, to ascertain its purity; a solution of known strength of soap being added to a measured quantity of the water to be examined from a graduated tube, until the curdling effect of the salts of lime and magnesia which cause the hardness is exhausted, and the water produces a lather on shaking. The quantity of soap required indicates the amount of earthy salts present; an easy and speedy means of obtaining a sufficiently good estimate of the amount of earthy salts in water.

By deducting from the total solid matter first the amount of organic matter, the total inorganic is obtained; and by deducting from this the amount of carbonate of lime, the remainder will indicate, with sufficient approximative accuracy, the amount of alkaline salts. Here are the results of this proceeding—for the waters of

	Five Thames Companies average.	New River and River Lea.	Kent and S. Essex Co.'s Artes. Wells.
Total solid matters, mean	26.63	26.11	39.03
Deduct organic and volatile, mean	1.60	1.30	1.73
	25.03	24.81	37.30
Carbonate of Lime	17.69	20.65	25.16
Alkaline salts	7.34	4.16	12.14

It will be observed that the alkaline salts are in much larger proportion to the earthy carbonates than in the Hoogly water, this being specially the case in the Artesian well waters. The waters of New River and River Lea come nearest the Hooghly. The amount of solid matter is much greater in the average than that of the Hooghly river

* Journal of the Chemical Society, June 1866.

water proper, the mean indeed being nearly as much as the maximum of the Hooghly before tidal influence begins. The amount of variation is much smaller in these waters: of the Thames water the highest quantity of solid matter was 32.62 grs. the lowest 18.78, and the well waters vary less. And it was observed that the quantity of solid matter tended to increase after heavy rain fall.

Other river waters contain more or less of such constituents, dependent on the nature of the rocks and soil they traverse. Mr. Sterry Hunt gives an analysis of the Ottawa water, taken before the melting of the snows, containing 6.12 grs. solid in 100,000. Bischoff, in his Chemical Geology, gives a pretty large list of analyses of river waters, showing a variation of from 2.61 to 54.5 grains solid matter in 100,000. The nature of their mineral constituents also varies greatly, but that will not engage our attention at present as it is more a geological question than a sanitary one. We shall proceed to the point more immediately connected with the object of the paper.

The substances treated of can scarcely be called impurities with reference to natural waters. They are rather constituents, and are only to be considered impurities in a sanitary point of view when they are excessive in quantity, as for instance exceeding 40 or even 60 grains in 100,000. The remaining substances to be noticed may in a purely chemical point of view be called constituents also with quite as much truth, but with reference to sanitary considerations may with propriety be termed impurities. They were enumerated before as organic matter, ammonia and nitric acid. It may be better to consider them as organic matter of vegetable origin and organic matter of animal origin, with the respective products of their decomposition.

Vegetable substances of all kinds mixed with the soil, exposed to air and moisture or immersed in water, dead animal bodies of every variety in similar circumstances, all rotting, fermenting and putrefying, with the excrementitious matters from living animals, constitute the materials from which river water derives that portion of its constituents called organic matter. Its nature is so heterogeneous and its quantity so small, that it would be hopeless to attempt to separate it into its proximate constituents. All we can attempt is to get some general idea of its nature, from which to form some judgment of its

properties, especially with reference to its action on the human system. Of late more attention has been paid to this subject, previously little thought of.

The first point requiring attention is to ascertain its quantity as correctly as practicable. The plan formerly followed was to dry the solid contents of the water obtained by evaporation carefully at a certain fixed temperature such as 212° or 250° F., or even about 300°, till the weight remained constant; then to burn off the organic matter by as moderate a heat as possible and weigh again: the loss of weight was considered organic matter. But this method is liable to great error, and may give grossly erroneous results. Other substances may be volatilised: salts of ammonia have been mentioned, but they may be included amongst organic matter; nitrates may be partially or wholly decomposed, but they generally exist in very small quantity. Earthy carbonates may lose carbonic acid:—carbonate of lime will not readily lose it if the heat be moderate, but carbonate of magnesia will very readily, and moreover chloride of magnesium (or muriate of magnesia) loses part of its acid easily. It is the magnesium salts which are the chief source of loss, but this can be prevented or remedied. If the contents of the water be not naturally sufficiently alkaline, a sufficient quantity of accurately weighed and perfectly dry carbonate of soda is added to the water on evaporating it; the soda combines with hydrochloric acid to form chloride of sodium and water, while the magnesia remains as carbonate; and by this means, as the chlorine is not separated by ignition from the sodium, the loss of chlorine is avoided. The only loss is of carbonic acid, which can be restored again. This is done by adding to the ignited residue in the platinum crucible distilled water charged with carbonic acid and evaporating to dryness by gentle heat, drying again at the same temperature as was employed at the first weighing before ignition till the weight is again constant. The loss of carbonic acid is by this means corrected, the acid being restored, and the difference of weight shows the quantity of organic matter, at least more correctly than by any other method known.

This plan is attributed to Dr. Thomas Clark, the inventor of the soap test, by Dr. W. Allen Miller in a paper* to which I shall have further occasion to refer. It is tedious and troublesome, requires a fine balance,

* Journal of the Chemical Society for May, 1865.

patience, and care; but it is not too much to say that the results obtained without the above detailed precautions are of no value, or rather worse than useless, as they mislead. The results which I shall give were obtained by this plan carefully carried out. It will be found that they differ materially from those given in Dr. Macnamara's report; and I can only account for the discrepancy, by supposing that some precaution requisite for ensuring accuracy in the process was omitted, either from inadvertance, or because it had not at that time (1862) been generally known to or used by chemists.

In the table in that report the smallest quantity of organic matter entered is 0.9 grain in 1 Imperial gallon, the largest 8.3 grains, generally however 3 or 4 grains per gallon, which are equal to respectively 1.23, 11.8 and 4.3 or 5.7 grains per 100,000 grains. My own results have yielded me only from 0.6 to 1.9 grains in 100,000 and Dr. Frankland's in the report already alluded to, vary from .54 to 3.3, or average about 1.6 for the Thames, and 1.3 for the other two river waters. The table which will be given will exhibit the results I have obtained. Remarks will be postponed till the whole subject is considered.

The time, trouble, and care necessary for estimating the amount of organic matter by weight is so great, that chemists have been desirous of finding some easier and speedier method of estimating its amount. Precipitation of the organic matter by salts of lead or reduction of salts of silver and gold have been proposed, but never come into general use. But another re-agent has of late been very generally employed, the permanganate of potash, which from the facility with which it yields its oxygen to organic substances has been made the means of estimating the amount of these; and as it can be very easily employed, it has come very much into favour. A good deal of difference of opinion prevailed at first as to the proper method of applying it and as to the value of its indications, but more agreement is being arrived at lately. It is used in the state of weak solution poured from a graduated tube, and the permanence of a slight pink tinge in the water to which it is added is the sign of the action being complete: the quantity by measure of the solution required indicates what is wanted. Dr. Letheby continues to add the solution at intervals for 24 hours: if the action was completed, then this would be very well, but it is not, as there are different kinds of organic water, some

of which act slowly on it, others more rapidly. Dr. Miller strictly enjoins that the water should not be warmed, without however stating any reason, and other English chemists seem also to practise it cold; Dr. Woods, who wrote a paper on it some years ago published in the Chemical Society's Journal, recommends warming the water, as also does Dr. Macnamara, and gives reasons for it. It now generally seems to be agreed that it is desirable to restrict the use of the permanganate to the oxidation of those substances that can be rapidly acted on; and after consideration and experiment, I have adopted with some small modifications the details of Dr. Frankland's practice, except that the water is heated to about 120° F. at the commencement. English chemists forget that what is our natural cold here, requires artificial heat with them, and that it is desirable to follow a plan that can be easily made uniform for all climates. The solution of permanganate is added in small portions at intervals, until a perceptible tinge of pink remains for ten minutes; when this is the case, the quantity used is read off. I use 4000 fluid grs. of water with 80 fluid grs. of diluted sulphuric acid, containing 1 grain concentrated acid by weight in 5 fl. grs., heat the whole to about 120° F. and having removed it from the lamp, proceed to add the solution. This is made of such strength that each measure of the tube (it may be, each equal to 1 cubic centimetre or to 10 fluid grains) yields .001 grain oxygen as ascertained by its action on oxalic acid in solution in similar circumstances, that is dissolved in a similar quantity of pure distilled water with the same quantity of sulphuric acid and treated in the same way. As .63 grains oxalic acid requires .08 grain oxygen, the solution will be of proper strength, if 80 measures are required for oxidizing that quantity of oxalic acid: that is, 80 measures are equal to .08 grain oxygen, or 1 measure is equal to .001 grain oxygen.

Although it is certain that in many or most cases the permanganate as used in this process does not oxidise all the organic matters, and that we cannot tell how much remains unacted upon; and though at present at least we do not know what is the particular chemical constitution of the matters oxidized, it is at least certain that it acts upon those substances which give the putrid odour to stagnant water, and renders them after a time, when the products of its action have settled, pure and transparent and quite free from offensive smell.

It thus removes the matters which are actually in a state of putrefaction, and I believe preserves the water from further putrefaction for at least a considerable time. For this purpose it is advantageously employed for the purpose of purifying water for domestic use. In such application it is used alone, no sulphuric acid being used: a very small quantity being added to the water, just sufficient to give it a very slight pink tinge, which will remain for above 15 minutes; the water is allowed to stand till next day, and is then decanted off and filtered and is fit for use. The minute quantity of potash salt produced can do no harm.

Provided it be properly understood what the use of this re-agent indicates, and it be not credited with more than it does effect, the permanganate test is a valuable addition to our means of examining the quality of drinking water. The results of my examination of the Hooghly water by means of it, and the amount of organic matter by weight, are given together in one table.

The quantity of oxygen required is very small. The results are given as obtained, but cannot be counted on too minutely, as there is a certain amount of error unavoidable, in not getting the colour exactly of one degree of intensity, in slight difference of quantity required dependent on rapidity of adding the liquid, and probably on other causes not very well ascertained. The purity of the waters as respects such offensive constituents is in proportion to the oxygen required to oxidize them: the purer the water the less oxygen is necessary.

TABLE III.

River water taken from the Hooghly two to three miles above the north end of the town, except when otherwise specified.

For 100,000 fl. gs. water.

	Organic matter dried at 212° to 220° Fah.	Oxygen required.
	Grains.	Grains.
6th July, 1866 Ebb, from surface, ...	.80	.0375
10th ditto, from shore, ...		.0338
8th August, Ebb tide, ...	.60	.0450
21st ditto ditto, ...	.86	.0345
31st August, 1865, Ebb tide; had stood in stoppered bottles ten months, and much vegetable growth had been removed, ...	.74	.0225

9th December, 1865, Ebb, Surface, ...		1.02	
	Deep, ...	.78	.0175
25th February, 1866 Ebb, Surface, ...		.92	
	Deep, ...	.45	
2nd May, Ebb at Bankshall, southern part of Calcutta, ...			.0325
Flood at Hatkolah, northern part of Calcutta,...		2.70	
30th May,	Ebb, ...	.90	.0238
	Flood, ...	2.60	.0275
14th June,	Ebb, ...	.90	.0250
	Flood, ...	2.20	.0225
6th June at Chandernagore, 20 miles above Calcutta, Ebb,	Surface, ...	.60	.0163
	Deep, ...	.67	.0213

From an inspection of this table, it will be observed that the permanganate test exhibits the largest quantity of organic matter in the river water during the rainy season, and the smallest quantity during the cold season, the hot season giving results intermediate.* The same ratio is not so distinctly perceptible in the weight of the organic matter. If the water at all these seasons were at the same state of dilution as regards saline matter, there would be the largest proportion of organic matter during the rainy season and the smallest during the hot season. The hot season is usually associated with ideas of corruption and concentration of impurities, the rainy season with purification by the abundance of pure water from the clouds. In point of fact it is directly the reverse. The same thing has been observed in England, as will be manifest from the following quotation from Dr. Frankland's report on the London waters. He says, "This

* It was with considerable hesitation that I left the indications given by the permanganate test in the table, on account of objections raised to my determinations of the organic matter which led to a supplementary paper read at the succeeding meeting of the Society. But after due consideration, they were allowed to remain as sufficient for the purpose required. The objections will be noticed as occasion calls for it, in notes or in the Supplement.

It is to be observed also that, as reported in the Proceedings of the Society for October, page 1866, I had stated 1.4 grains per gallon as the largest amount of organic matter obtained. Two of the results in the table, those of 2nd and 30th May somewhat exceed this, viz. 2.7 and 2.6 grains corresponding respectively to 1.89 and 1.82 grain per gallon. The correctness of these was doubted from supposed inaccuracy in the process, but this not being certain they have been introduced into the table. 30th Nov. 1866.

comparison shews clearly (as might be anticipated) how closely the condition of river waters is connected with the amount of rain-fall; but, in opposition to the commonly received opinion, it proves that the waters in question are much purer in dry than in wet weather, even if the drought occurs during a very hot summer." He seems, however, to hesitate a little about drawing general conclusions from the observations of one year; and in the report of the discussion which followed at the Chemical Society's meeting as reported in the Chemical News, some of the speakers seemed inclined to attribute it to special and particular causes. I have no doubt that it is owing to general causes, and that when we consider the circumstances, we cannot expect any other result.

Unfortunately in the case of the Hooghly at Calcutta, the question is complicated by the admixture of sea water during the hot season. This introduces two sources of error into the process of examination, namely an increased amount of saline matter, and a difference in its nature and properties. These will probably tend to cause indications of an amount of organic matter in excess of the truth. The point is under examination. There is also great difficulty in estimating correctly the amount of organic matter during the rainy season, on account of the impossibility of getting the water clear by filtration, and the very long time it requires to become clear by subsidence. This point is also under investigation.*

There can be no doubt also that the kind of organic matter in the sea water mixture is different in some respects from that of the river water proper. I was much struck with the observation made many months ago of the difference of colour presented by the different specimens of water when highly concentrated, that of the August water being so much deeper in colour than the others. On the contrary, a sample of water from the salt water lake to the east of Calcutta, though indicating both by the weighing and the permanganate processes much more organic matter than the river water, when concentrated, was almost colourless.

But to return to the greater proportion of organic matter during the rains, it seems to be nothing but what may be expected. During the

* For the reasons stated there is considerable uncertainty respecting the correctness of the weight of organic matter in the waters of July and August

remainder of the year, vegetable and animal matter of every kind is deposited in or upon the soil in all stages of decomposition. The amount of drainage is small and the flow of water gentle: the water carried thus to the river is comparatively pure, and that from the sources of the streams is from places bare of vegetation and part of it from melting snow. But when the rains come, they wash off all the accumulated products of decomposition of vegetable and animal substances in the state both of solution and suspension, of which the appearance alone of the water and its flavour give ample evidence. The increased proportion, it is true, is counteracted by the largely increased quantity of the water which dilutes it; for if, instead of looking to the proportion of organic matter to the water, we look to its amount in proportion to the inorganic or mineral saline matter, then in the rainy season the excessive proportion of organic matter is rendered much more evident. After the rains the mud subsides, which is favourable to the purification of the water, and the atmospheric oxygen contained in solution in the water, as it is in natural waters generally, acts upon the organic matter in solution, oxidizing and destroying it. And as heat in general materially increases the energy of chemical action, there can be little doubt that this purifying influence goes on more rapidly in tropical than in temperate climates, and that this explains why the organic matter in the Hooghly water is smaller in amount than that of the London waters, both of river and wells in their natural state.

But we have to consider not only the quantity but the quality of the organic impurity. We can scarcely expect to go more minutely into this than to endeavour to ascertain the relative proportions of vegetable and animal matter, and to get some idea of their state or of the stage of decomposition in which they exist in the water. The chemical constitution of these gives us some aid in this enquiry, the main constituents of vegetable compounds being carbon, hydrogen and oxygen, those of animal substances containing nitrogen in addition; a statement which, though not strictly exact, is sufficiently characteristic, so much so, that by azotized or nitrogenous substances are generally understood compounds of animal origin. The ultimate products of the decomposition of non-nitrogenous organic matter in presence of oxygen, namely water and carbonic acid, of course give us no help in this enquiry, nor are the intermediate products likely to be

possessed of any such striking properties as to aid us much, as they are mostly of a neutral nature without active chemical or physical characteristics. Nitrogenous bodies, however, yield products more readily recognised, and as it is this class of substances which are most likely to possess properties injuriously affecting the animal economy, their detection is also the most important.

The ultimate products of the decomposition of nitrogenous organic substances are, in addition to water and carbonic acid, also ammonia, and where excess of oxygen is present, nitric acid. But there are also numerous intermediate products, and these are often characterised by offensive smells which give a certain character to the putrefaction of animal substances, different from that yielded by the fermentation or corruption of vegetable bodies. The smell or flavour then of a water is a very good test of its purity, though it indicates rather the stage of decomposition in which its organic matter exists than the amount of organic matter present. And in connection with this I may mention the test of keeping the water and observing the changes which take place in it, the production of animalcules or of aquatic vegetation. Now I have kept samples of water taken from the river at all seasons for many months. Those taken during the cold and hot seasons settled easily and suffered very little further change; at the most a little greenish deposit at the bottom of the bottle formed, which is the case, however, with ordinary distilled water. It was very different, however, with the water of the rainy season. Some water taken from the river on 31st August, 1865, was kept for about two or three weeks, then syphoned off the deposited mud into other clean stoppered bottles in which it remained, the bottles being closed for about four months, when the bottles were found to have their sides covered with abundant green branching vegetation: the water was again syphoned off quite clear to other clean bottles and kept for about six months longer, when the same appearances were observed, though to a much smaller extent. There was abundant proof in this case of the presence of organic matter, probably both in the form of living germs and of chemical compounds dissolved in the water. The water taken during the hot season may have contained as much: possibly the presence of the excess of saline matter may prevent such development, but I am not prepared to give an opinion on the subject. The

water of the hot season shewed more indications of vegetation than that of the cold season, though greatly less than that of the rains.

Ammonia.

Ammonia, perhaps one of the most characteristic evidences of the presence of nitrogenous matter, can be detected in natural waters, and even when in such minute proportion as in natural waters, its quantity can be estimated. Dr. Miller has given a process for doing so with sufficient accuracy, and without the necessity of operating on very large quantities of water, which will be found in the paper I have already mentioned on the analysis of mineral waters in the Journal of the Chemical Society for May 1865. It depends on the great delicacy of the test for ammonia possessed by an alkaline solution of the Hydrarg-Iodide of Potassium, which produces a fine rich yellow brown colour with a very small quantity of ammonia, or a precipitate, if the quantity be larger. In the weaker solutions, the colour varies in depth of shade with the proportion of ammonia present, and by a comparison with another solution containing a known quantity of ammonia the proportion is estimated. Dr. Miller attributes the plan of proceeding to Mr. Hadow, and gives the details of procedure. He gives the formula for the preparation of the alkaline solution of Hydrarg-Iodide of Potassium, which I have strictly followed and adopted. His standard solution for comparison is a weak solution of pure muriate of ammonia of such strength that 1 fluid grain of the solution contains .0001 (one ten-thousandth of a) grain of ammonia or 3.17 grains muriate of ammonia in 10,000 fluid grains. I also adopt this solution, but have modified the plan of proceeding, it appears to me with advantage. It is thus:

A convenient quantity, 10,000 fluid grains is very suitable, of the water, to which a small quantity of pure hydrochloric acid has been added, is concentrated by a gentle heat to about 1,000 fluid grains: it must of course be slightly acid. This is put into a flask, some excess of pure milk of lime added, and the flask connected by a bent tube with a small Liebig's condenser, to the extremity of which is connected a small Woulfe's bottle, and to this another one furnished at its further neck with a tube containing broken glass moistened with water, this being to prevent escape of ammonia. About half or 500 fluid grains of

product is distilled over and emptied into a tube graduated into 100 divisions of 10 fluid grains each, the bottles washed out with distilled water and added to the tube to make up 100 measures of liquid which is to be thoroughly mixed together. Two wide mouthed bottles or jars of as nearly the same size as possible are provided, into each of which 25 fluid grains of the Hydrarg-Iodide solution is introduced with some distilled water. Then into one of these an aliquot part of the distilled liquid is poured, say $\frac{1}{10}$ or $\frac{1}{4}$, so as to produce a distinct colour, and the bottle is filled up with water. Another similarly graduated tube or burette has been prepared ready filled with the standard solution of muriate of ammonia, and this is carefully added to the second bottle, until the colour produced is as exactly as possible of the same shade as that of the first, both bottles being of course made equally full. The quantity added is then noted, and then calculated on the whole. Thus: suppose 74 fluid grains of the standard solution of muriate of ammonia has been required, this is equal to $74 \times .0001$ grains or .0074 grains ammonia. If 25 measures of the distilled liquor has been used for trial, this is $\frac{1}{4}$th of it, consequently the whole contains $.0074 \times 4 = .0296$ grains ammonia, and as this was from 10,000 fluid grains of water, by consequence the standard quantity of 100,000 fluid grains water contains .296 grains ammonia.

The process requires great care, that there be no accidental admixture of ammonia. The vessels must be scrupulously clean, the distilled water and the lime used must be carefully examined to make sure that they contain no ammonia. The plan of measuring the distillate enables the operator to repeat the trial in case of accident or uncertainty. It is better to work with rather weak colours, as the eye can better detect differences of shade: .0074 grains ammonia is too much for a 2000 grain bottle: any size of bottle may be used, provided the two bottles be as exactly as possible alike in size, shape and capacity.

TABLE IV.

The following table shews the results obtained by this process.

	Ammonia in 100,000 fl. grs.
River water of	
RAINY SEASON.	
	grains.
6th July, 1866, ...	.1133
21st August, ...	.1825
Average, ...	.1429
COLD SEASON.	
9th December, 1865, Shore, ...	.0162
Ditto, Stream, ...	.0220
Ditto, ditto, ...	.0208
27th ditto, ditto, ...	.0328
Average, ...	.0229
HOT SEASON.	
Ebb tide.	
30th May, ...	.0250
14th June, ...	.0189
Ditto repeated, ...	.0550
Average, ...	.0329
Flood Tide.	
30th May, ...	.0370
14th June, ...	.1850
Ditto repeated, ...	.1075
Average, ...	.1098

Now on an inspection of this table it will be easily observed that the discrepancies are so great that the results cannot be depended on as at all accurate. I have mentioned the difficulties and nicety of the process, and the errors manifestly point out the necessity of

carefully examining wherein they lie, in order to see if they can be avoided. Yet notwithstanding these inaccuracies, it seems to me that the general results are pretty evident, that the amount of ammonia is greatest in the rainy season, diminishes during the cold one, and again increases during the hot, which increase, however, is probably not in the river water proper. One examination of water from Chandernagore, which was very slightly if at all contaminated with tidal water, yielded only .0118 grain ammonia in 100,000 flood grains. This conclusion is not a certain one; to make it so, it would be necessary to have examinations of the Chandernagore water at all seasons; but other considerations, to be afterwards noticed, render it probable.*

I am disposed to attach a good deal of importance to the estimation of the ammonia, not only because it helps to indicate how far the nitrogenous matter has gone in the stage of decomposition, but because that stage is not improbably one of importance. It has been long known that many, I may say most, of the organic proximate principles found in vegetables are alkaloids possessing active properties and producing the most marked physiological effects, and that there are many similar principles produced in the decomposition of nitrogenised substances by destructive distillation or otherwise, which possess marked physical properties, and probably, if they were examined, also decided physiological actions. But by modern chemical research, it would appear that these alkaloids are all formed on the type of ammonia, or are ammonias having one or more atoms of its hydrogen replaced by some other organic combination or radical. Hence it seems not at all unlikely that such compound ammonias as they are called may be produced at the same time and along with the ultimate or ordinary ammonia. And even though no such compounds should exist, the amount of ammonia would give some probable indication of the stage of decomposition, and existence of compounds is a state of transition towards ammonia.

* The examinations for ammonia were all made about the same time in the month of August, consequently the waters were of different ages. The samples had been preserved mixed with a little Hydrochloric acid and mostly in a concentrated state. Of course objections may be made to their value on this account and possibly may be valid. This will again be referred to in the sequel. 30th November, 1866.

I have seen few published analyses of water indicating the presence or amount of ammonia. Such examinations have been made, but they do not seem to be common. In the case of waters examined for sanitary purposes it appears to me that the point should be attended to. One observation that has come under my notice on the subject is in a paper by Messrs. Lawes and Gilbert on town sewage,* in which is mentioned the quantity of ammonia found in the River Wandle before and after receiving the drainage water from the land irrigated by the sewage of Croydon. In both instances, it amounted to .18 grain per gallon or 70,000 grains, being therefore more than I have found at the worst in the Hooghly water viz. .185 grains per 100,000 grains.

Nitrates.

The presence of nitrates has been more noticed than that of ammonia, though it appears to me less worthy of attention. It is true that they indicate the existence of nitrogenous matter, but it is rather as a thing of the past: the animal matter has been there, but is no longer now, at least that part of it which now has the form of nitric acid; it is now fully oxydized, its animal essence and corruptibility destroyed: it ranks with water and carbonic acid, no longer an organic substance. A process has been devised for estimating small quantities, known as Pugh's process, which Dr. Miller in the above quoted paper recommends for application to water. I have not made use of it, indeed have not had time, but have satisfied myself with some other observations and experiments on the presence of nitrates in the river water. In many instances indeed very distinct deflagration has been observed during ignition of the residue obtained by evaporating the water. This alone does not give good grounds for forming an opinion as to the quantity of the nitrate, as it may be masked or altogether obscured by an excessive proportion of other salts, as of common salt during the hot season. The presence of nitrites can also be observed by the blue colour produced with starch and iodide of potassium by the water acidulated. But as nitrites are simply imperfectly oxydised nitrates, the same observations apply to the former as have been made respecting the latter.

* Journal of the Chemical Society, April, 1866.

I had intended, and still intend, to estimate the quantity of nitric acid for the complete analysis originally contemplated; but for the reasons just stated, I preferred, for the purpose of this communication to direct my attention to other points which appeared of greater importance. That of ammonia which has been just discussed was one of these, and a greater number of determinations of ammonia would have been made, but time did not permit: besides I wished first carefully to examine the ammonia process in order to ascertain the causes of the discrepancies already referred to, with a view to discover the precautions necessary to be taken to ensure more concordant results.

Other nitrogenous matter.

But ammonia and nitric acid are only the ultimate terms of the fermentative and oxydised decomposition of nitrogenous organic matter, and there may be much more present in all stages of decomposition intermediate between these and unchanged animal or vegetable constituents. The amount of these could be estimated by ascertaining the quantity of nitrogen they contain, but the operation is too troublesome to be generally applied to such minute quantities of matter as exists in drinking waters. Animal matters in being ignited or burnt, as is well known, emit a peculiar smell, different from that produced by burning non-nitrogenous substances such as wood, and this has been used as an indication of the presence of, and even as a means of forming a judgment respecting the proportion of matter of animal origin. But it affords a very uncertain means of judging, as even corrupting vegetable matter gives a different smell from fresh, and the peculiar animal odour may be more or less obscured by the greater or less proportion of vegetable matter mixed with the animal. Besides the most characteristic smell given by burning animal matters is that produced by albuminous or gelatinous substances such as muscular fibre, blood, skin, or in short the undecomposed tissues of animal bodies in general. But these substances are probably not to be found in sewage except in small quantity, its constituents are more nearly of the nature of urine and other excrementitious animal matters and the sour products of vegetable decomposition: many of them are volatile and evaporate by a moderate heat with a peculiar

nauseous smell, but one not so characteristic as that produced by burning horn or wool for instance.

Nevertheless not to neglect any means of obtaining information on the subject, I not only, in the course of ascertaining the weight of organic matter by burning it off, paid attention to the appearances then presented, but afterwards made a few experiments on purpose. But with all I cannot concur in the satisfaction expressed by Dr. Angus Smith on the results, as quoted by Dr. Macnamara in his review of the pamphlet.* He speaks of the remarkably clear insight given by boiling down a few thousand grains of water and burning the residue. He says, "We can by the eye and the smell detect humous and peaty acids, nitrogenous organic substances, and nitrates, and estimate their amount to a very useful degree of accuracy. We may even decide by it the animal or vegetable origin of the matter." Now I have carefully evaporated down repeatedly quantities of 50,000 and 100,000 grains of water and attended to these appearances, and the only conclusion I came to was, that the information obtained was very limited and unsatisfactory. I have also varied the experiment and instead of burning the matter in an open platinum crucible have heated it in a glass test tube. For some of the objects in view this is a better plan; and I compared in this way samples of water of the rainy season, of the cold season, and of the hot season during flood tide. For the latter, which is a mixture of river and sea water it is necessary to mix the saline matter with some dry carbonate of soda, or better, to evaporate the water to dryness with this admixture, in order to prevent the evolution of hydrochloric acid vapours. The mouth of the tube is to be loosely closed with a glass stopper which is removed from time to time to examine the smell and try with test papers. Examined in this way, all those samples gave some ammoniacal vapour with no very marked difference; all gave a somewhat urinous animal smell, but not one the characteristic smell of burning flesh or horn: there were slight variations, but none very distinct. The rainy season water gave more of the smell of burning vegetable matter than the others, this being the most distinctive point observed; but altogether the information obtained was very small.

After the failure of all these plans, there remained but one likely to

* Indian Medical Gazette, April, 1866.

be satisfactory, and that was to determine the amount of nitrogen existing in other forms than those of ammonia and nitric acid, this being the only way in which the amount of undecomposed or imperfectly decomposed animal matter can be estimated. The way in which this is usually done is by what is well known to chemists as the soda lime process, and depends on the circumstance that all such animal substances containing nitrogen (this not including nitric acid however), when heated to redness in contact with a hydrated alkali, yield up all their nitrogen combined with hydrogen as ammonia, and this ammonia can by suitable arrangement be collected and its amount ascertained. I am not aware that this plan has been much applied to the examination of animal matter in waters, no doubt on account of the minute quantity of nitrogen present; nevertheless it appeared to me that it might be modified so as to estimate it even in drinking water. I intended to have postponed the trial of this process altogether, as I had not time to make proper arrangements and test the accuracy of the plan. However I made three experiments in a rather hasty and crude manner with such means as I had at hand. They are not at all to be depended on, but I may give the results as obtained.

River water of 2nd June, Ebb, from Chandernagore, containing very little tidal water. 100,000 grains gave .028 grains ammonia.

River water of 21st August, Ebb, from Barnagore. 100,000 grains gave .030 grains ammonia.

River water of May and June, Flood tide, from Barnagore. 100,000 grains gave .010 grains ammonia.

The results, as I have already said, are not to be depended on. Yet it cannot be denied that they are in accordance with the results obtained in other ways, respecting the organic matter. The ready formed ammonia existing in the water had of course been previously removed.

In a practical point of view this portion of the subject is of the principal importance, as more than any other it bears on the question as to how far the river water is contaminated by the sewage of Calcutta. Judging from the results obtained and just mentioned respecting ammonia and fixed nitrogenous organic matter, the amount is not great: even at the highest tide at flood on the 14th June of this year, after twelve months of an unusually small amount of rain-

fall, it is no worse as regards ready formed ammonia than the water of the rainy season; and if the rough experiments on the other nitrogenous matter are to be trusted, it is no worse or not so bad even in this respect; and comparing the results with the one observation quoted respecting the river Wandle as regards ammonia, the Hooghly water even at the worst, has the advantage. In considering this point, it must be borne in mind that the refuse which Calcutta can yield must bear but a very insignificant proportion to the great volume of the waters of the Hooghly compared with that which a large English town will yield to an English river, and more particularly London to the Thames. And then the purifying influences here are so much more active that contaminating constituents are much more speedily destroyed; nature with her all pervading oxygen, its power exalted by a tropical temperature, burning all up. The water of the stream in constant motion presents perpetually renewed surfaces to the atmosphere to absorb the great purifying agent, and the importance of this will perhaps be more clearly manifested by comparison with another class of waters with which I shall conclude this paper.

Tank Waters.

This class is the tank waters, a few of which I have made a partial examination of, for the purpose of comparison. These are General's tank, near the entrance to Park Street; Monohor Doss' tank, near that to Lindsay Street, both of them on the plain round the Fort; Dalhousie Square tank, supplied by the river; Cornwallis Square Tank, at the northern part of the town; a newly cleaned and dug out tank at Dhurrumtollah (supplied by Mr. Dall); and a village tank near my own premises. Also I have examined slightly two well waters, and the water of the Salt Water Lake to the east of the town; the results of all will be given in one table and a few remarks appended afterwards.

The water of the two tanks from the plain in May and June had a slightly putrid flavour; in August this was much less. Cornwallis Square tank was very low in May and putrid, had not increased very much in August and was still bad. The Dhurrumtollah tank was bad flavoured and abounded in vegetation; the Barnagore tank in May and June was covered with a thick coat of floating vegetation, and was very dirty and bad smelled, quite unfit for use even by the villagers. In August during the rains its appearance improved somewhat.

Table V.

For 100,000 fluid grains.

	Date of collecting.	Solid matter.	Organic matter.	Oxygen reqd. to oxidise.	Ammonia.
	1866.				
General's Tank, ...	6 June,	12.05	1.35	.0825	.235
	14 Aug.			.1225	
Monohur Doss's Tank, ...	14 May,	24.60	2.00	.0913	
	6 June,			.1000	
	14 Aug.			.1400	.204
Dalhousie Square Tank, ...	14 May,	23 85	1.50		
	6 June,	25.80	.	.0750	
Cornwallis Square Tank, ...					
settled and veg. matter deposited, ...	14 May,	58.00	4.40	.1550	
not settled, ...	14 Aug.		5.15		
				.2975	.237
Dhurrumtollah Tank, ...	Aug.				
Barnagore, ...	11 May,	51.00	4.25	.3170	
	8 June,			.2938	
	17 Aug.			.3375	
Dhurrumtollah well, ...	Aug.			.0725	
Barnagore well, ...	18 Aug.			.0900	
Salt Water Lake, from Canal at Dhappa Toll House, ...	13 June,	908.00	20.00	.1250	
Ditch conveying sewerage of Calcutta, ...	1 June,	295.80	33.10	5.680	
* Ditto, ...	8 Sept.		27.33		
* Ditto, ..	13 Sept.		22.25		

On examining this table, it will be observed that even the best tank water contains more organic matter by weight, and requires more oxygen to oxydise it than does the river water during ebb tide; even Dalhousie Square water appears to deteriorate by being removed from the running stream into a stagnant reservoir. The excess of organic matter in the bad tanks is also very noticeable. The two well waters require more oxygen than the river water generally.

* Added since the date of the paper.

The Salt Water Lake water did not require more oxygen than the tank waters.*

I have little to add in the way of concluding remarks, as my object was not to report on any scheme or recommend any plan, but simply to communicate to a scientific society the results of numerous experiments and observations on a subject of practical importance. Some of these investigations are defective, but I intend to endeavour to remedy these defects by further investigation. And even after these are remedied, the results may indicate that there are yet other points o examine. There is work for the naturalist in the investigation of he animal and vegetable life in such waters, possibly exercising as great an influence on their salubrity as their chemical composition. Yet even this can only be aided by a full and accurate knowledge of their chemical constituents. There are also questions connected with the preservation and use of the water, and these too are more likely to be correctly answered, the more complete is our knowledge of the nature of its composition.

But I may briefly sum up the conclusions arrived at with reference to the application of the Hooghly water to the supply of the wants of Calcutta. As regards its inorganic constituents, the Hooghly water taken near Calcutta is at least as pure as any of the waters supplied to London, or indeed generally more pure for about eight or nine months of the year; during the hot season it is mixed with sea water under the influence of the tides and thereby rendered brackish. This can be avoided by taking the supply of water from further up the river.

As regards organic matter, again, my results, if correct, indicate that the state of the water seems to be worst during the rainy season, and that notwithstanding the influence of the tides and the sewerage of Calcutta, it is doubtful if even at the hottest part of the hot season in June its impurity equals that of the water during the rains; and it is

* I have already stated that it was with considerable hesitation that I left the indications of the permanganate Test in table III. on account of the objections raised to their value: similar hesitation was felt as to inserting Table IV. and it was the indications given in Table V. which determined me to retain them. The same objections indeed apply to the results shewn by it, but this does not materially affect the purpose for which it is introduced. It will serve sufficiently well for purposes of general comparison, the trials for oxidizable matter and ammonia having been made at the same times on both river and tank waters, so that generally both kinds were of the same age or nearly so. More exact determinations will be made in future. 30th Nov. 1866.

questionable if even in the nature or quality of the organic impurities it is worse. Now as it is not likely that during the rains the water is materially different at Barrackpore from what it is at Calcutta, there will be little or nothing gained by taking it from Barrackpore during these months, the chief advantage being therefore that the salt water of the hot season will be avoided. Still even as it is, there seems to be no better source; for the organic impurities of the tank waters, even the best of them, seem at least equal in amount to those of the river water during flood tide, and greater than the same during ebb tide. And so far as a judgment can be formed from the means of comparison within reach, the water during the rains probably contains less organic impurity than the London waters.*

Such are the conclusions I have arrived at, some of them unexpected even to myself, and which may be disputed by others. They are of course open to criticism and discussion. They may be suggestive of other things possibly of practical application, but into these I have not yet had time to enter.

* I have much doubt upon these points, as much of the organic matter of the rainy season is probably adherent to the finely divided mud in suspension in the water, which is so difficult to separate. With a view to the use of the water, the point would require to be investigated in connection with the process to be employed for the purification of the water. Judgment may be considered suspended on them, more particularly on that of the purity of the water of the *best* tanks at all seasons of the year, and of the nature and amount of the organic matter of the river water during the rainy season. Further remarks will be made on these subjects in subsequent communications. 30th Nov. 1866.

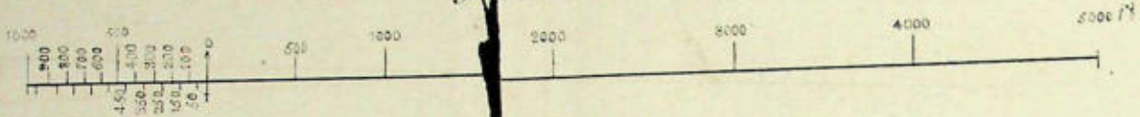
Section F.



1. The porphyritic Summit of Kurwal (14271 ft.). 2. The Northern Extremity of the Saij-aha (11334) composed of Greenstone Ash &c. 3. One of the Spurs of the Safapoor (10309) similarly composed. 4. The Spur of Safapoor which overhangs Manus Bal (Lake) Greenstone, Basalt, Ash, &c. 5. The Aha-Tang, similarly composed. 6. The bed of Limestone between the Safapoor and Aha-Tang, wonderfully contorted by having been squeezed between the two hills. 7. The spur of Limestone of which a detailed section is given, (see Section) 8. Four of the beds of Limestone, dipping WNW. 9 small beds of Limestone conformable to the Ash and Greenstone, dipping SSE. 10. Fault.

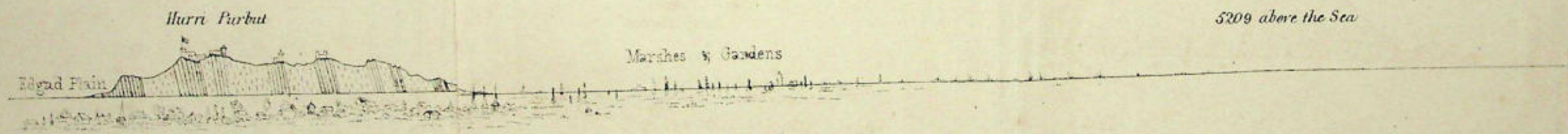
Albert H. Verchere

Scale . 1 English Inch = 1000 feet, or $\frac{1}{12000}$



A Burk M Vecchia

N 65° W



The Dal or small lake
5209 above the Sea

Vol XXXV Pl II.

Section A

(*Section II of General orjd) Map*)

SECT. across the HURRI PURBUT, TUKT-I-SULIMAN and W.N.W. portion of the ZEBANWAN

Buddist Ruin

Takt-i-Sulaiman 6063 ft. above the Sea

Road to Nishat Bagh

Fault

Alternate 10 feet thick Beds of brown Augitic Ash, often Calcareous & cupiform & of ascii slate.

Laterite and dark compact Slate

Fault

Slate, Ash & laterite

Fault

Ash

Basalt with beds of Ash interstratified

Green stone and Ash in alternate layers

Green stone and Basalt with but little Ash

Basaltic Grey rock, with thin beds of Augitic Ash.

Basaltic Grey rock passing into fine Green stone, often Amygdaloidal. Beds of Augitic Ash numerous

Basalt

Trachyte, showing in places a beginning of separation of Component Minerals, but no crystallization.

Zeaman Spur [See Section

Dip 60° - 70

Dip due E

65° - 70

Dip E 45°

Dip E 40°

Dip N E

Buddist Idol

Stone Quarry

Dip E

Pistachios

Chenar Trees

Map B

GEOLOGICAL MAP of the ZEBANWAN

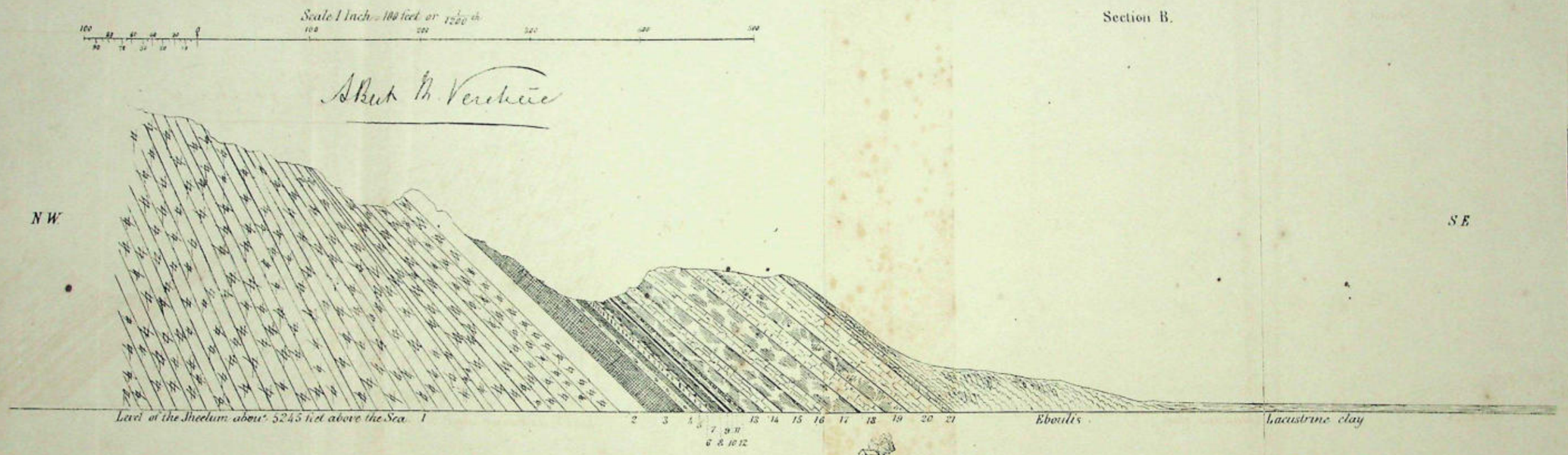
and Neighbouring Mountains.

Scale 1 inch = 2 English Miles

Alban M Vicar



Section B.

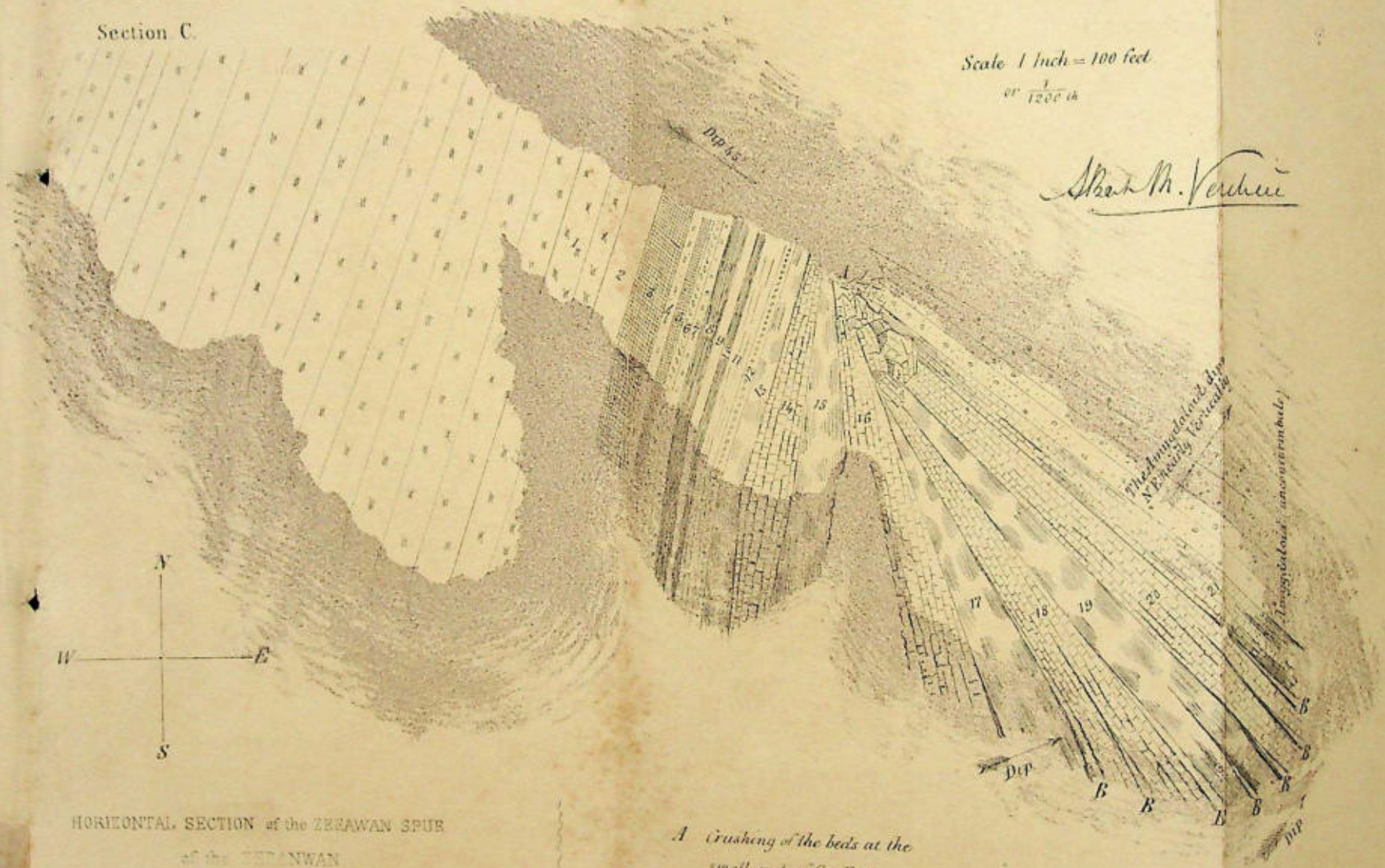


VERTICAL SECTION of the ZEEAWAN SPUR of the ZEBANWAN

Section C.

Scale 1 Inch = 100 feet
or $\frac{1}{1200}$ th

Albert M. Verdeil



HORIZONTAL SECTION of the ZEEAWAN SPUR
of the ZEEAWAN
Shewing the fan like disposition of the courses of limestone and Brown Shales

A Crushing of the beds at the small end of the Fan.
B B B Openings between the beds and courses of rocks at the expanded end of the Fan.

Map C.

GEOLOGICAL MAP of the WASTAR WAN in Kashmir

75° 5′

34°

Shar

Lodoo

Fault

Village

Mandikpoor

Reechpoor

Fault

Raja Kote

Buddist Quarry

Banda

Fault

Rampoor Knoll

Barus

Ling

Fault

Fault

R I V E R J H E E L U M

Tangar

Ruin

Jochier

Ruins

Avantipoor

Wastar Wan

34°

75° 5′

- Quartzite
- Volcanic Rocks
- Azoic Slate (Silurian)
- Carboniferous Limestone
- " " Slate

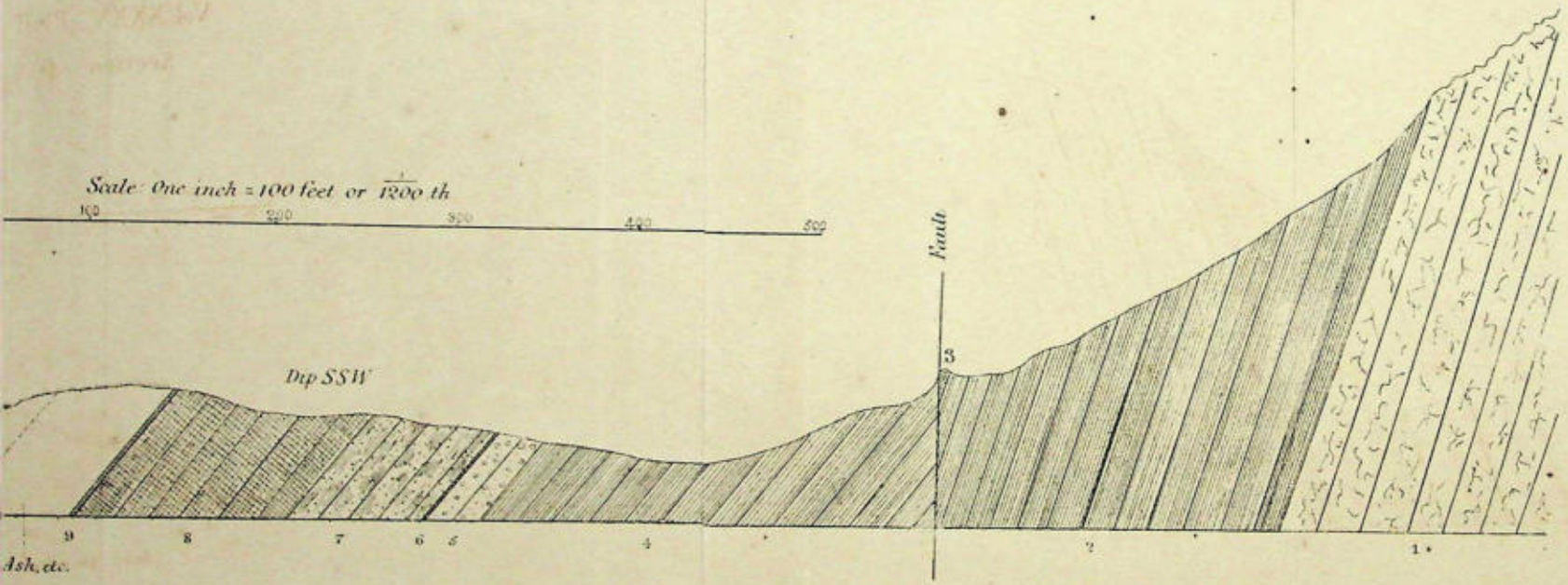
indicate Strike of Beds

indicate Dip

SCALE TWO INCHES = ONE ENGLISH MILE

(Multiplied from Captn Montgomeries Map of Kashmir)

Mark M. Verchère



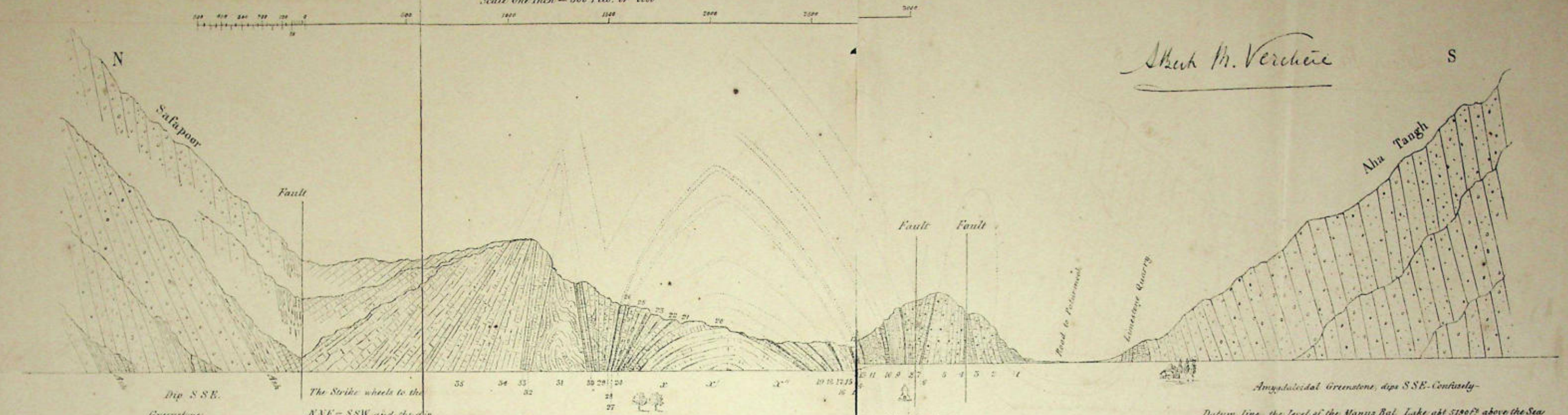
Level of the Jheelum, about 5250 feet above the Sea.

SECTION across the Spur of the KAMLAWAN above the Village of MURHAMMA.

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Section E (Sect IV of General Map)

Scale One Inch = 500 Feet. or 1/6000



SECTION of the MANUS BAL LIMESTONE
between the SAFAPOOR and AHA TANGH.

Lith: by H. Niven Surv^r. General's Office Calcutta Augt 1866.

Fig. 7.

Sketch Section of the hills above Wecan and Kohew, bearing N.; to illustrate the descriptive Section of these mountains. (Not drawn to scale.)

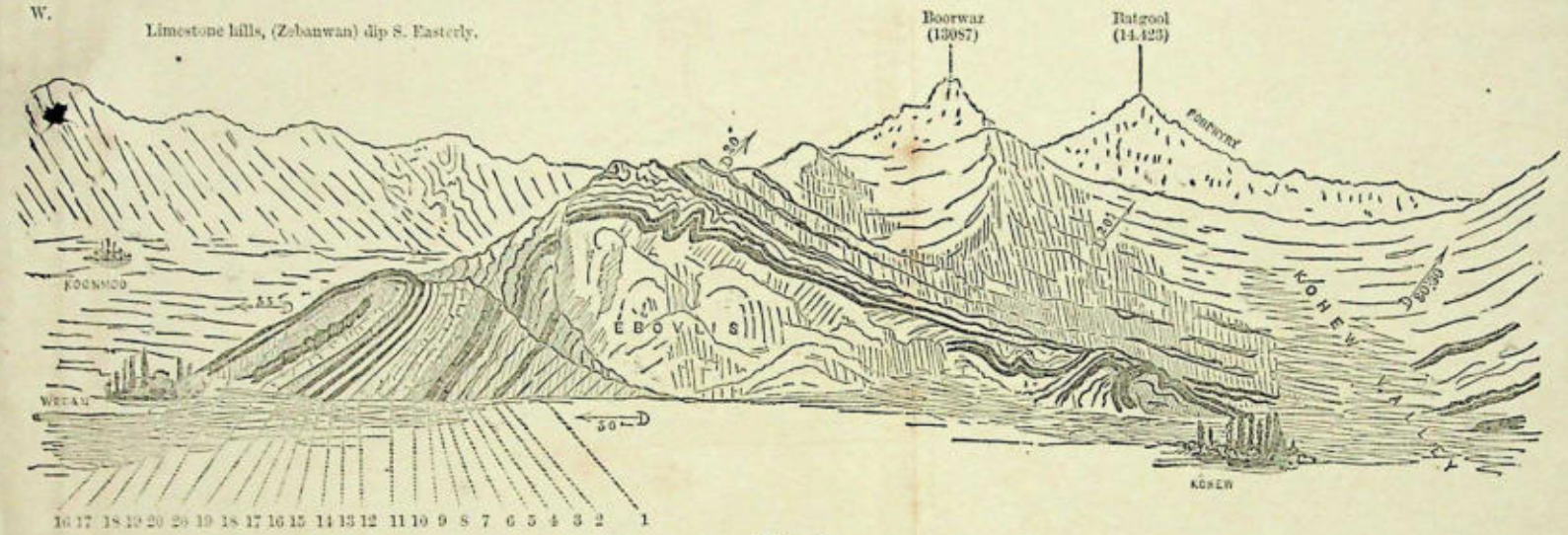
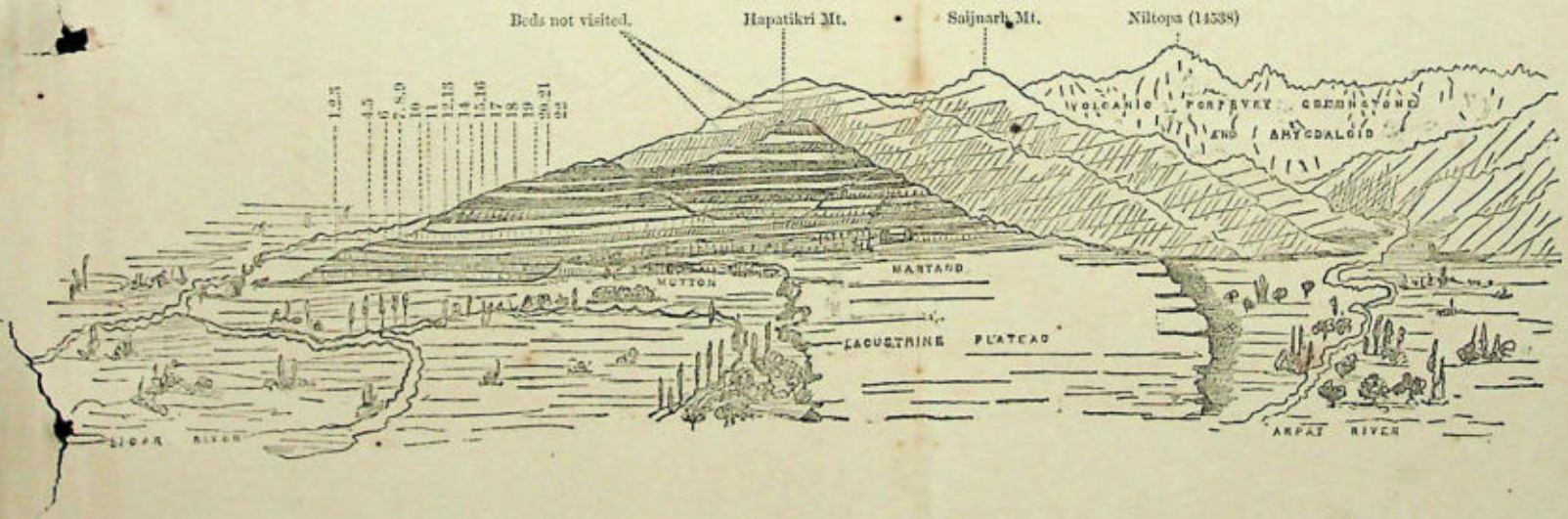


Fig. 8.

Sketch-Section of the Hapatikri and Saijnarh Mountains, bearing N. E. as seen from the top of the Ishlamabad Hill. (Not drawn to scale.)

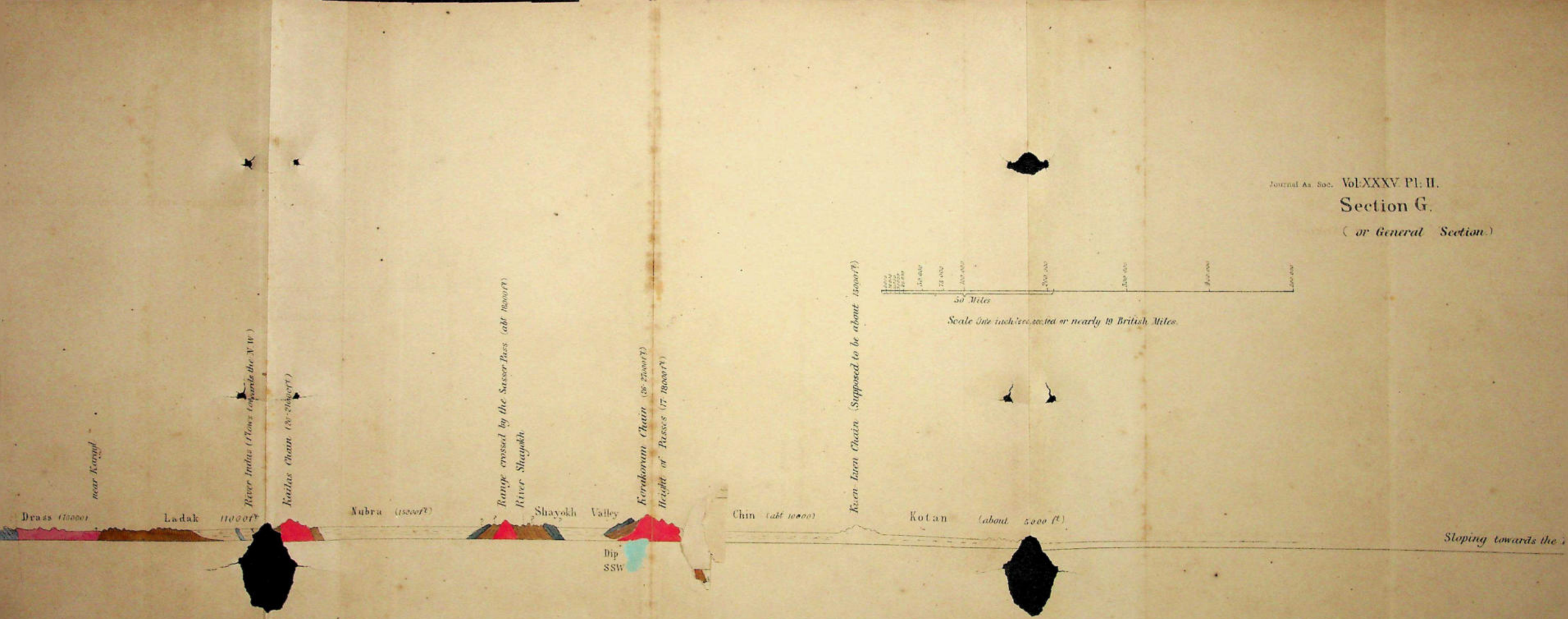


Journal As. Soc. Vol. XXXV Pl. II.

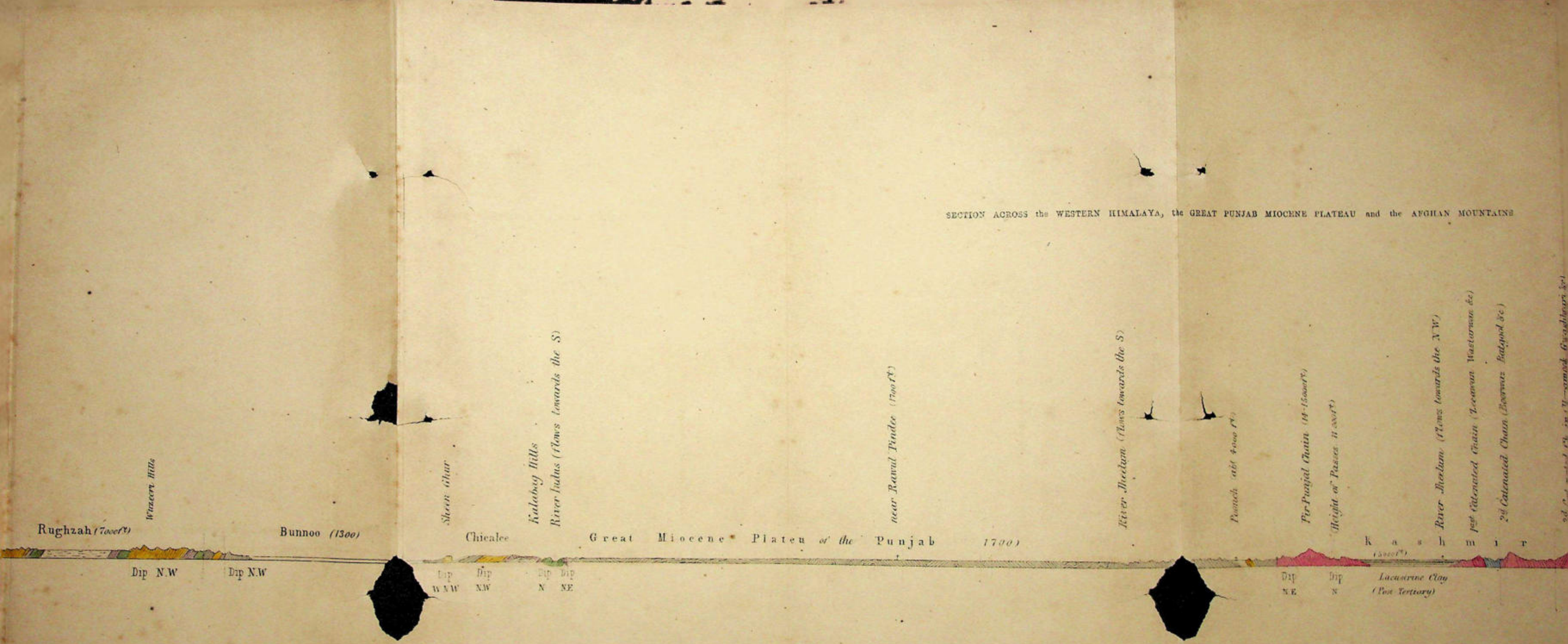
Section G.

(or General Section.)

Scale One inch ... or nearly 19 British Miles.



SECTION ACROSS the WESTERN HIMALAYA, the GREAT PUNJAB MIOCENE PLATEAU and the AFGHAN MOUNTAINS



Granite

Metamorpic

Volcanic

Siturian

Carboniferus

Salifèrian *(Permian or Triasic ?)*

Jurassic *(Middle Oölite)*

Nummulitic

Miocene *(perhaps the Upper bed is Older Pliocène)*

New *(perhaps Post- Pliocene)*

Sloping towards the Swamps of the Zarrah Lake & the deserts of Eastern Persia

Plains *towards* Kandahar *(7000ft)*

Pir Ghaul (abt 10000ft)

Sea level

Meteorological Observations.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of January, 1866.

Latitude 22° 23′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the Sea-level, 18 ft. 11 in.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	30.056	30.147	30.006	0.141	68.3	76.4	61.0	15.4
2	.045	.134	29.993	.141	68.0	77.8	60.4	17.4
3	.029	.113	.987	.126	69.1	79.4	60.2	19.2
4	.001	.082	.930	.152	72.0	82.8	62.8	20.0
5	29.961	.061	.886	.175	73.4	83.6	65.8	17.8
6	.906	29.971	.848	.123	73.1	81.2	66.4	14.8
7	30.007	30.073	.948	.125	68.4	73.8	64.6	9.2
8	.113	.221	30.057	.164	64.0	73.0	55.8	17.2
9	.119	.219	.064	.155	63.4	72.9	56.0	16.9
10	.068	.158	.004	.154	65.2	75.5	57.6	17.9
11	.042	.112	29.992	.120	66.9	77.0	58.6	18.4
12	.068	.158	30.003	.155	66.1	76.6	57.0	19.6
13	.060	.140	.015	.125	65.5	76.8	56.0	20.8
14	.060	.133	29.995	.138	67.8	79.0	58.0	21.0
15	.082	.183	30.019	.164	68.8	78.6	60.0	18.6
16	.036	.123	29.969	.154	67.5	77.2	59.2	18.0
17	.012	.098	.955	.143	67.1	77.4	58.9	18.5
18	.018	.107	.959	.148	68.2	78.7	59.2	19.5
19	29.990	.056	.923	.133	69.9	81.4	61.0	20.4
20	30.028	.106	.967	.139	70.1	81.2	61.0	20.2
21	.044	.113	.962	.151	71.3	81.0	62.6	18.4
22	.080	.161	30.033	.128	73.1	81.3	65.0	16.3
23	.096	.165	.029	.136	70.5	79.8	62.2	17.6
24	.105	.185	.020	.165	71.6	81.2	62.8	18.4
25	.077	.148	29.989	.159	73.1	82.0	64.4	17.6
26	.085	.173	30.013	.160	74.5	83.8	66.4	17.4
27	.066	.152	29.983	.169	74.0	84.7	67.0	17.7
28	.042	.083	30.001	.082	68.3	77.8	63.4	14.4
29	.005	.079	29.935	.144	68.6	75.2	63.4	11.8
30	29.975	.056	.929	.127	68.2	72.2	63.8	8.4
31	30.003	.094	.937	.157	63.4	64.6	62.2	2.4

The Mean Height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived, from the hourly observations made, during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of January, 1866.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*Continued.*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of vapour.	Mean Weight of Vapour in a Cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	62.5	5.8	57.9	10.4	0.488	5.38	2.22	0.71
2	61.8	6.2	56.8	11.2	.470	.19	.34	.69
3	63.2	5.9	58.5	10.6	.498	.48	.30	.70
4	67.3	4.7	63.5	8.5	.588	6.43	.07	.76
5	68.2	5.2	64.0	9.4	.597	.53	.34	.74
6	68.2	4.9	64.3	8.8	.603	.60	.19	.75
7	62.2	6.2	57.2	11.2	.476	5.25	.37	.69
8	56.8	7.2	50.3	13.7	.377	4.20	.45	.63
9	57.3	6.1	51.8	11.6	.397	.42	.11	.68
10	58.7	6.5	53.5	11.7	.421	.68	.23	.68
11	60.3	6.6	55.0	11.9	.442	.90	.38	.67
12	58.8	7.3	53.0	13.1	.414	.59	.51	.65
13	58.4	7.1	52.7	12.8	.409	.55	.43	.65
14	62.1	5.7	57.5	10.3	.481	5.32	.16	.71
15	61.8	7.0	56.2	12.6	.461	.07	.64	.66
16	60.5	7.0	54.9	12.6	.441	4.87	.55	.66
17	60.6	6.5	55.4	11.7	.449	.96	.36	.68
18	61.1	7.1	55.4	12.8	.449	.95	.63	.65
19	64.4	5.5	60.0	9.9	.523	5.75	.23	.72
20	64.1	6.0	59.3	10.8	.511	.61	.42	.70
21	66.7	4.6	63.0	8.3	.578	6.35	1.98	.76
22	65.6	7.5	59.6	13.5	.516	5.64	3.15	.64
23	63.1	7.4	57.2	13.3	.476	.23	2.90	.64
24	64.2	7.4	58.3	13.3	.494	.42	.98	.65
25	67.2	5.9	62.5	10.6	.568	6.21	.58	.71
26	69.5	5.0	66.0	8.5	.638	.95	.23	.76
27	69.3	4.7	66.0	8.0	.638	.97	.07	.77
28	65.5	2.8	63.3	5.0	.584	.44	1.16	.85
29	66.5	2.1	64.8	3.8	.613	.78	0.89	.88
30	66.2	2.0	64.6	3.6	.609	.73	.85	.89
31	61.8	1.6	60.4	3.0	.530	5.91	.62	.91

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of January, 1866.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	30.046	30.119	29.921	0.198	65.5	72.4	60.0	12.4
1	.039	.113	.902	.211	64.8	72.4	58.8	13.6
2	.030	.106	.886	.220	64.2	72.0	57.8	15.2
3	.021	.099	.867	.232	63.6	71.8	57.4	14.4
4	.014	.094	.848	.246	62.9	70.4	57.0	13.4
5	.022	.103	.861	.242	62.3	69.7	56.4	13.3
6	.038	.120	.867	.253	62.1	69.5	55.8	13.7
7	.059	.156	.885	.271	61.8	67.4	56.0	11.4
8	.088	.190	.927	.263	63.7	69.2	57.8	11.4
9	.114	.215	.957	.258	67.2	73.2	61.2	12.0
10	.122	.221	.971	.250	70.8	77.7	63.8	13.9
11	.105	.197	.960	.237	73.2	79.4	63.6	15.8
Noon.	.075	.167	.935	.232	75.2	81.6	62.6	19.0
1	.035	.124	.897	.227	76.5	82.8	62.4	20.4
2	.007	.091	.871	.220	77.5	84.0	62.8	21.2
3	29.989	.077	.861	.216	78.0	84.7	63.8	20.9
4	.983	.064	.851	.213	76.8	82.8	64.4	18.4
5	.992	.077	.864	.213	75.5	81.5	63.8	17.7
6	.999	.076	.880	.196	72.6	79.2	62.6	16.6
7	30.018	.088	.904	.184	70.9	77.0	62.8	14.2
8	.035	.109	.929	.180	69.5	75.3	62.8	12.5
9	.050	.121	.941	.180	68.1	74.1	62.6	11.5
10	.056	.137	.940	.197	67.0	73.4	61.8	11.6
11	.052	.132	.927	.205	66.1	72.5	60.6	11.9

The Mean Height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived from the Observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of January, 1866.

Hourly means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a Cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Mid-night.	62.1	3.4	59.4	6.1	0.513	5.69	1.29	0.82
1	61.7	3.1	59.2	5.6	.509	.66	.17	.83
2	61.2	3.0	58.5	5.7	.498	.53	.16	.83
3	60.7	2.9	58.1	5.5	.491	.46	.11	.83
4	60.2	2.7	57.8	5.1	.486	.43	.00	.84
5	59.7	2.6	57.4	4.9	.480	.36	0.95	.85
6	59.7	2.4	57.5	4.6	.481	.38	.89	.86
7	59.4	2.4	57.2	4.6	.476	.32	.89	.86
8	60.7	3.0	58.0	5.7	.489	.44	1.15	.83
9	62.7	4.5	59.1	8.1	.508	.62	.73	.77
10	64.4	6.4	59.3	11.5	.511	.60	2.60	.68
11	65.3	7.9	59.0	14.2	.506	.53	3.29	.63
Noon.	65.9	9.3	59.4	15.8	.513	.58	.79	.60
1	66.3	10.2	59.2	17.3	.509	.54	4.21	.57
2	66.7	10.8	59.1	18.4	.508	.50	.54	.55
3	66.8	11.2	59.0	19.0	.506	.47	.72	.54
4	66.2	10.6	58.8	18.0	.503	.45	.38	.55
5	65.9	9.6	59.2	16.3	.509	.55	3.91	.59
6	65.8	6.8	60.4	12.2	.530	.81	2.85	.67
7	65.1	5.8	60.5	10.4	.532	.85	.38	.71
8	64.4	5.1	60.3	9.2	.528	.82	.06	.74
9	63.7	4.4	60.2	7.9	.527	.82	1.73	.77
10	63.1	3.9	60.0	7.0	.523	.79	.51	.79
11	62.5	3.6	59.6	6.5	.516	.72	.38	.81

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of January, 1866.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	°	Inches		
1	138.0	...	N. & W. & N. W.	Clear, slightly foggy at midnight & 1 A. M. and from 8 to 11 P. M.
2	134.0	...	N. & W.	Clear, slightly foggy from 8 to 10 P. M.
3	134.0	...	S. W. & S.	Clear, slightly foggy at 1 A. M.
4	138.4	...	S.	Clear to 8 P. M. Scatd. \i afterwards.
5	139.0	...	S.	\i to 8 A. M. _i to 4 P. M. clear afterwards.
6	129.5	...	S. & variable.	Clear to 9 A. M. Scatd. ~i afterwards, slightly foggy at 5 A. M.
7	139.0	...	N. & N. W.	Various clouds to 7 A. M., clear afterwards.
8	129.0	...	N. & N. W.	Clear.
9	124.8	...	N. & N. W.	Clear.
10	131.0	...	N. W. & N.	Clear, slightly foggy from 8 to 10 P. M.
11	133.2	...	W.	Clear, slightly foggy at 9 P. M.
12	131.0	...	N. W. & N. & N. E.	Clear.
13	129.0	...	W. & N. E. & N.	Clear.
14	133.4	...	W. & variable.	Clear, foggy at 5 and 6 A. M.
15	133.0	...	N. & N. E.	Clear to 10 A. M. Scatd. \i to 5 P. M. clear afterwards, slightly foggy at 10 & 11 P. M.
16	126.0	..	N. & S.	Clear to 6 A. M. Scatd. \i to 11 A. M., clear afterwards.
17	129.0	...	N. & W. & N. W.	Clear to 9 A. M. Scatd. \i to 6 P. M. clear afterwards.
18	130.8	...	W.	Clear, slightly foggy at 6 A. M.
19	129.5	...	S. & N.	Clear to 5 A. M. ~i to 6 P. M. clear afterwards.
20	134.5	...	E. & N. E.	Clear, slightly foggy from 5 to 9 A. M.
21	130.0	...	S. W. & W.	Clear to noon, Scatd. ~i to 4 P. M. clear afterwards.
22	134.0	...	N.	Clear, foggy from 2 to 4 A. M.
23	127.2	...	W. & N.	Clear to Noon, Scatd. \i to 5 P. M. clear afterwards, slightly foggy from 8 to 11 P. M.
[redacted]		...	W.	Clear to 3 P. M. Scatd. \i to 8 P. M. clear afterwards, slightly foggy at 7 & 8 P. M.
25	135.2	...	W. & S. W.	Clear to 10 A. M. Scatd. ~i to 7 P. M. Scatd. _i afterwards.

\i Cirri, —i Strati, ~i Cumuli, _i Cirro-strati, ~i Cumulo-strati, _i Nimbi, \i Cirro-cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of January, 1866.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Guage 5 feet above Ground.	Prevailing direction of tion Wind.	General Aspect of the Sky.
	o	Inches		
26	139.5	...	E. & S. & W.	Clear to 5 A. M. Scatd. ⌒i afterwards.
27	129.5	...	S.	Scatd. ⌒i to 7 P. M. clear afterwards, slightly foggy at 7 A M. and thin rain at 6 P. M.
28	...	0.45	E. & S. E.	Clear to 10 A. M. Overcast to 6 P. M. ⌒i afterwards rain between 1 & 2 P. M. and from 4 to 6 P. M. Thunder at 3 & 5 P. M.
29	...	0.80	S. E. & S.	Overcast. Lightning towards N. at 8 & 9 P. M. rain after intervals.
30	...	0.20	N.	Scatd. ⌒i to 5 A. M. overcast to 11 A. M. ⌒i to 3 P. M. overcast afterwards. Light rains from 7 to 10 A. M. and from 5 to 9 P. M.
31	...	0.46	N. & N. E.	Overcast, rain at 4, 8, 9, 11 and Noon.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of January, 1866.

Monthly Results.

	Inches
Mean height of the Barometer for the month, ...	30.041
Max. height of the Barometer occurred at 10 A. M. on the 8th, ...	30.221
Min. height of the Barometer occurred at 4 A. M. on the 6th, ...	29.848
Extreme Range of the Barometer during the month, ...	0.373
Mean of the daily Max. Pressures, ...	30.123
Ditto ditto Min. ditto	29.979
Mean daily range of the Barometer during the month, ...	0.144

	o
Mean Dry Bulb Thermometer for the month, ...	69.0
Max. Temperature occurred at 3 P. M. on the 27th, ...	84.7
Min. Temperature occurred at 6 A. M. on the 8th, ...	55.8
Extreme range of the Temperature during the month, ...	28.9
Mean of the daily Max. Temperature, ...	78.2
Ditto ditto Min. ditto, ...	61.4
Mean daily range of the Temperature during the month, ...	16.8

Mean Wet Bulb Thermometer for the month, ...	63.4
Mean Dry Bulb Thermometer above mean Wet Bulb Thermometer, ...	5.6
Computed Mean Dew-point for the month, ...	58.9
Mean Dry Bulb Thermometer above computed mean Dew-point, ...	10.1
	Inches
Mean Elastic force of Vapour for the month, ...	0.504

	Troy grains
Mean Weight of Vapour for the month, ...	5.56
Additional Weight of Vapour required for complete saturation, ...	2.20
Mean degree of humidity for the month, complete saturation being unity,	0.72

	Inches
Rained 5 days, Max. fall of rain during 24 hours, ...	0.80
Total amount of rain during the month, ...	1.91
Total amount of rain indicated by the Gauge attached to the Anemometer during the month, ...	1.70
Prevailing direction of the Wind, ...	N. & W. & S.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of January, 1866.

Monthly Results.

Tables showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Rain on.	Missed.
	No. of days.																		
Midnight,	7		4		2		3		6				9						
1	9		3		3		2		6				8						
2	9		4		1		1		9				7						
3	11		2		4		1		7		2		4						
4	11		3		4	1			7		1		4		1	1			
5	11		3		3				6		2		4		1	1			1
6	11		6		2				6		2		4						
7	10	1	3		5		2		3		2		4		2				
8	11	2	1		7		2		2		3		3		2				
9	12	2	4		3		4		2		2		3		1				
10	10	1	5		3		4	1	2		2		4		1				
11	8	1	4		2				6		1		2		8				
Noon.	13	1	3				1	1	6		1				7				
1	11		2		1				4	1	3		3		7				
2	1		3		3	1			3		3		7		11				
3	3		2		1				4		1		7		13				
4	5		1		2	1			3		2		10		8				
5	7	2			1				4				10		9				
6	8	2			1	1			5				12		5				
7	9		1		2		2		3		1		10		3				
8	9	1	2		1		2		2		2		10		3				
9	9	1	1		2		1		3		1		11		3				
10	7		3	1	2		2		4		2		8		3				
11	7	1	3		2		3		6		1		8		1				

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of February, 1866.

Latitude 22° 23′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the Sea-level, 18 ft. 11 in.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.982	30.052	29.934	0.118	63.1	66.9	60.0	6.9
2	.994	.067	.946	.121	64.3	71.6	58.4	13.2
3	.921	.013	.840	.173	65.3	73.8	57.2	16.6
4	.833	29.898	.787	.111	63.6	70.6	60.4	10.2
5	.848	.925	.766	.159	66.3	75.8	58.6	17.2
6	.983	30.062	.915	.147	69.2	78.4	61.8	16.6
7	30.045	.138	.985	.153	70.5	80.2	61.4	18.8
8	.024	.101	.967	.134	70.8	80.4	63.0	17.4
9	.060	.132	.997	.135	68.1	75.2	64.6	10.6
10	.051	.122	.982	.140	71.5	81.7	62.0	19.7
11	29.987	.041	.915	.126	69.9	80.0	65.4	14.6
12	.943	.013	.850	.163	66.8	71.2	62.4	8.8
13	30.037	.124	.986	.138	63.8	71.1	56.4	14.7
14	.006	.075	.937	.138	64.7	73.5	56.2	17.3
15	29.975	.057	.919	.138	67.3	76.4	58.6	17.8
16	.952	.040	.888	.152	69.3	78.4	59.8	18.6
17	.966	.046	.925	.121	72.6	82.0	63.2	18.8
18	.981	.073	.930	.143	72.8	78.3	68.8	9.5
19	.981	.062	.886	.176	74.9	86.0	67.4	18.6
20	.953	.039	.896	.143	71.9	80.2	67.8	12.4
21	.945	.023	.897	.126	73.7	81.8	67.8	14.0
22	.923	29.992	.856	.136	72.0	81.0	63.2	17.8
23	.945	30.021	.894	.127	72.7	82.6	62.2	20.4
24	.967	.056	.916	.140	73.0	84.8	62.8	22.0
25	.937	.009	.874	.135	75.1	87.2	64.8	22.4
26	.887	29.959	.824	.135	77.0	88.2	67.5	20.7
27	.843	.914	.791	.123	77.9	89.2	68.4	20.8
28	.815	.900	736	.164	79.6	91.4	70.8	20.6

The Mean Height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived from the hourly observations made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of February, 1866.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*Continued.*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of vapour.	Mean Weight of Vapour in a Cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	61.4	1.7	59.9	3.2	0.521	5.81	0.66	0.90
2	59.3	5.0	54.8	9.5	.440	4.88	1.84	.73
3	59.9	5.4	55.6	9.7	.452	5.02	.91	.72
4	59.9	3.7	56.6	7.0	.467	.21	.36	.79
5	61.7	4.6	58.0	8.3	.489	.42	.73	.76
6	63.5	5.7	58.9	10.3	.504	.56	2.25	.71
7	62.6	7.9	56.3	14.2	.462	.08	3.05	.63
8	64.0	6.8	58.6	12.2	.499	.49	2.71	.67
9	63.9	4.2	60.5	7.6	.532	.87	1.68	.78
10	65.9	5.6	61.4	10.1	.548	6.02	2.36	.72
11	65.6	4.3	62.2	7.7	.563	.19	1.79	.78
12	62.8	4.0	59.6	7.2	.516	5.72	.54	.79
13	56.2	7.6	49.4	14.4	.366	4.08	2.53	.62
14	58.8	5.9	54.1	10.6	.429	.77	.03	.70
15	60.8	6.5	55.6	11.7	.452	5.00	.37	.68
16	62.9	6.4	57.8	11.5	.486	.35	.48	.68
17	67.8	4.8	64.0	8.6	.597	6.53	.13	.75
18	70.2	2.6	68.1	4.7	.684	7.47	1.24	.86
19	68.4	6.5	63.8	11.1	.593	6.46	2.82	.70
20	67.5	4.4	64.0	7.9	.597	.54	1.94	.77
21	66.3	7.4	61.1	12.6	.543	5.92	3.04	.66
22	62.9	9.1	55.6	16.4	.452	4.96	.54	.58
23	62.7	10.0	54.7	18.0	.438	.79	.89	.55
24	62.9	10.1	54.8	18.2	.440	.80	.96	.55
25	64.9	10.2	57.8	17.3	.486	5.29	4.05	.57
26	67.3	9.7	60.5	16.5	.532	.77	.12	.58
27	69.8	8.1	64.1	13.8	.599	6.48	3.68	.64
28	73.2	6.4	68.7	10.9	.697	7.52	.17	.70

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of February, 1866.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	29.964	30.079	29.831	0.248	66.3	74.2	59.8	14.4
1	.954	.070	.821	.249	65.8	74.0	59.0	15.0
2	.943	.051	.794	.257	65.2	74.0	58.7	15.3
3	.931	.046	.778	.268	64.6	73.5	58.0	15.5
4	.925	.039	.766	.273	64.1	72.4	57.4	15.0
5	.936	.071	.797	.274	63.7	71.6	56.8	14.8
6	.954	.079	.827	.252	63.3	71.2	56.6	14.6
7	.974	.085	.845	.240	63.3	70.8	56.2	14.6
8	30.000	.106	.868	.238	65.6	71.0	58.8	12.2
9	.026	.132	.898	.234	68.9	75.2	60.6	14.6
10	.031	.138	.883	.255	71.6	78.6	60.8	17.8
11	.021	.127	.884	.243	74.0	82.0	62.0	20.0
Noon.	29.994	.099	.847	.252	76.1	86.4	62.9	23.5
1	.962	.063	.813	.250	77.4	88.8	65.0	23.8
2	.931	.028	.778	.250	78.3	90.6	66.8	23.8
3	.911	.012	.748	.264	78.6	91.4	64.4	27.0
4	.905	.022	.740	.282	77.9	91.2	63.8	27.4
5	.907	.062	.736	.326	77.0	90.6	62.8	27.8
6	.915	.070	.742	.328	74.6	87.6	62.5	25.1
7	.929	.111	.760	.351	72.6	84.6	62.2	22.4
8	.948	.122	.784	.338	70.9	80.6	62.0	18.6
9	.962	.117	.798	.319	69.7	78.4	62.1	16.3
10	.969	.080	.809	.271	68.6	77.2	61.8	15.4
11	.964	.071	.804	.267	67.6	76.0	61.4	14.6

The Mean Height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived from the Observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of February, 1866.

Hourly means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a Cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Mid-night.	62.9	3.4	60.2	6.1	0.527	5.84	1.31	0.82
1	62.7	3.1	60.2	5.6	.527	.84	.20	.83
2	62.5	2.7	60.3	4.9	.528	.87	.04	.85
3	61.9	2.7	59.7	4.9	.518	.76	.02	.85
4	61.5	2.6	59.2	4.9	.509	.67	.00	.85
5	61.3	2.4	59.1	4.6	.508	.65	0.94	.86
6	60.9	2.4	58.7	4.6	.501	.58	.93	.86
7	61.0	2.3	58.9	4.4	.504	.62	.89	.86
8	62.2	3.4	59.5	6.1	.515	.71	1.29	.82
9	63.6	5.3	59.4	9.5	.513	.64	2.10	.73
10	64.4	7.2	58.6	13.0	.499	.47	.93	.65
11	65.0	9.0	58.7	15.3	.501	.47	3.57	.61
Noon.	65.4	10.7	57.9	18.2	.488	.29	4.34	.55
1	65.8	11.6	57.7	19.7	.485	.24	.77	.52
2	66.1	12.2	57.6	20.7	.483	.21	5.07	.51
3	66.1	12.5	57.3	21.3	.478	.16	.22	.50
4	65.9	12.0	57.5	20.4	.481	.21	4.95	.51
5	66.0	11.0	58.3	18.7	.494	.35	.54	.54
6	66.4	8.2	60.7	13.9	.536	.83	3.37	.63
7	66.3	6.3	61.3	11.3	.546	.99	2.67	.69
8	65.4	5.5	61.0	9.9	.541	.94	.29	.72
9	64.6	5.1	60.5	9.2	.532	.86	.07	.74
10	64.3	4.3	60.9	7.7	.539	.94	1.73	.77
11	63.9	3.7	60.9	6.7	.539	.96	.48	.80

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of February, 1866.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Guage 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches		
1	...	0.49	N. & N. E.	Overcast to 5 P. M. clear afterwards. Rain from 5 to 10 A. M.
2	124.0	...	N. W. & N.	Clear, slightly foggy at 3 A. M.
3	134.0	...	W. & S. E.	Clear.
4	...	0.33	E.	Clear to 2 A. M. ⌒i to 10 A. M. Overcast afterwards. Rain at 11 A. M. and from 1 to 4 P. M.
5	128.0	...	E. & N. E. & N.	Clear.
6	131.3	...	E.	Clear to 9 A. M. ⌒i to 2 P. M. ⌒i to 7 P. M. clear afterwards.
7	133.0	...	E.	Clear to 11 A. M. ⌒i to 6 P. M., clear afterwards.
8	125.5	...	E. & N. E.	Clouds of different kinds to 6 P. M., clear afterwards.
9	...	0.10	N. & E.	⌒i to 3 P. M. overcast afterwards. Thin rain at 11 A. M., 4 and from 7 to 9 P. M.
10	133.8	...	E. & N.	Clear nearly the whole day.
11	122.0	1.56	E. & N.	Clear to 4 A. M. Scatd. ⌒i to 1 P. M. Overcast afterwards. Thunder at 3 & 7 P. M. Rain from 4 to 7 & 10 & 11 P. M.
12	...	1.26	N. & N. W.	Overcast to noon. ⌒i to 5 P. M. clear afterwards. Lightning and Thunder at 2 A. M. Rain at midnight from 2 to 5 & at 7 A. M.
13	128.0	...	N. & N. W.	Clear.
14	136.5	...	W. & N.	Clear.
15	128.5	...	N. & E. & W.	Clear.
16	137.5	...	W. & S.	Clear.
17	139.0	...	W. & E.	Clear to 8 A. M. Scatd. ⌒i to 4 P. M. clear afterwards.
18	...	...	E. & S. & N.	Clear to 7 A. M. overcast to 5 P. M. clear afterwards foggy at 6 & 7 A. M.
19	145.0	...	N. & E. & S.	⌒i and ⌒i to noon. ⌒i to 7 P. M. clear afterwards.
20	...	...	S. & N.	Overcast to 3 P. M. clear afterwards. Thin rain at 9 A. M. & 2 P. M.
21	136.0	...	N. & N. W.	Clear, slightly foggy from 9 to 11 P. M.
22	136.4	...	N. W. & W. & N.	Clear to 9 A. M. Scatd. ⌒i to 3 P. M. clear afterwards. Slightly foggy at 8 P. M.

⌒i Cirri, —i Strati, ⌒i Cumuli, ⌒i Cirro-strati, ⌒i Cumulo-strati, ⌒i Nimbi, ⌒i Cirro-cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of February, 1866.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of
	o	Inches		
23	140.0	...	N. & N. W. & S.	Clear.
24	139.0	...	N. & W.	Clear, slightly foggy at 10 & 11 P. M.
25	139.9	...	N. W. & W. & N.	Clear, slightly foggy at midnight.
26	142.2	..	W.	Clear.
27	141.5	...	W.	Clear, slightly foggy at 6 & 7 A. M.
28	145.0	...	S.	Clear, slightly foggy at midnight and at 6 & 7 A. M.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of February, 1866.

Monthly Results.

	Inches
Mean height of the Barometer for the month, ...	29.956
Max. height of the Barometer occurred at 10 A. M. on the 7th, ...	30.138
Min. height of the Barometer occurred at 5 P. M. on the 28th, ...	29.736
Extreme Range of the Barometer during the month, ...	0.402
Mean of the daily Max. Pressures, ...	30.034
Ditto ditto Min. ditto	29.894
Mean daily range of the Barometer during the month, ...	0.140

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	o
Mean Dry Bulb Thermometer for the month, ...	70.3
Max. Temperature occurred at 3 P. M. on the 28th, ...	91.4
Min. Temperature occurred at 7 A. M. on the 14th, ...	56.2
Extreme range of the Temperature during the month, ...	35.2
Mean of the daily Max. Temperature, ...	79.2
Ditto ditto Min. ditto, ...	62.9
Mean daily range of the Temperature during the month, ...	16.3

Mean Wet Bulb Thermometer for the month, ...	64.0
Mean Dry Bulb Thermometer above mean Wet Bulb Thermometer, ...	6.3
Computed Mean Dew-point for the month, ...	59.0
Mean Dry Bulb Thermometer above computed mean Dew-point, ...	11.3
	Inches
Mean Elastic force of Vapour for the month, ...	0.506

	Troy grains
Mean Weight of Vapour for the month, ...	5.56
Additional Weight of Vapour required for complete saturation, ...	2.52
Mean degree of humidity for the month, complete saturation being unity,	0.69

	Inches
Rained 5 days, Max. fall of rain during 24 hours, ...	1.56
Total amount of rain during the month, ...	3.74
Total amount of rain indicated by the Gauge attached to the Anemometer during the month, ...	3.34
Prevailing direction of the Wind, ...	E. & N. & W.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of February, 1866.

Monthly Results.

Tables showing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Rain on.	Missed.
	No. of days.																		
Midnight.	3		3		7	1	3		5				5		2				
1	3		3		7		2		5				5		3				
2	3		3		7	1	3		4				5		3				
3	5		2		6		2		3				5	1	4				1
4	6	1	2		7		1		4				4		3				1
5	7	1	2	1	6		1		5				4		3				
6	8		3	1	5		1		2				4		5				
7	7	1	3	1	6				2				6		4				
8	4		5	1	6				2				6		5				
9	4	2	2		8				2				6		6				
10	5		2	1	10		1		2				6		2				
11	4		1		8	2	3		3				5		4				
	4		4		6		1		4		1		5		3				
1	2		3		4	1	1		3		1		7		7				
2	3		2		5	1	1		3	1			9		5				
3	7		1		5	1			2		1		8		4				
4	6	2	4		2				2				8		6				
5	7		2	1	6		1		1		1		5		5				
6	11		1	1	7				1		1		4		3				
7	14	1			7	1			2				4		1				
8	13	1	1		7				2				4		1				
9	10	1			11				4				3						
10	8		1		9	1			6				3		1				
11	7		1		9	1			6				4		1				

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of March 1866.

Latitude 22° 23′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the sea level, 18·11 feet

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.789	29.866	29.740	0.126	81.4	93.6	72.8	20.8
2	.821	.898	.748	.150	82.3	92.8	74.5	18.3
3	.821	.927	.745	.182	81.4	91.7	72.4	19.3
4	.756	.818	.678	.140	81.8	93.6	72.0	21.6
5	.786	.865	.732	.133	82.4	94.8	72.4	22.4
6	.816	.892	.757	.135	81.8	94.0	71.4	22.6
7	.792	.860	.724	.136	82.6	94.0	75.4	18.6
8	.793	.876	.719	.157	83.4	95.2	72.5	22.7
9	.890	.872	.732	.140	83.8	95.0	75.4	19.6
10	.784	.859	.719	.140	83.4	94.4	76.7	17.7
11	.858	.937	.775	.162	83.6	92.4	76.8	15.6
12	.977	30.060	.900	.160	83.4	92.4	77.4	15.0
13	.967	.056	.872	.184	83.3	92.2	77.8	14.4
14	.845	29.945	.764	.181	86.4	96.4	77.9	18.5
15	.828	.924	.761	.163	84.3	94.0	76.6	17.4
16	.871	.952	.812	.140	84.5	94.0	79.0	15.0
17	.885	.970	.822	.148	84.0	94.4	77.0	17.4
18	.820	.899	.750	.149	83.4	92.9	77.0	15.9
19	.798	.869	.729	.140	84.5	95.0	77.6	17.4
20	.842	.921	.779	.142	84.3	94.0	76.6	17.4
21	.798	.878	.703	.175	85.5	96.5	76.8	19.7
22	.717	.803	.619	.184	86.7	98.6	77.8	20.8
23	.715	.790	.663	.127	86.4	98.4	77.8	20.6
24	.751	.838	.684	.154	84.9	95.3	77.6	17.7
25	.748	.827	.678	.149	86.4	96.2	81.0	15.2
26	.709	.769	.626	.143	87.4	97.4	80.7	16.7
27	.730	.811	.668	.143	86.1	95.1	79.5	15.6
28	.812	.914	.743	.171	84.9	93.2	76.0	17.2
29	.859	.960	.771	.189	81.9	91.6	73.8	17.8
30	.855	.927	.775	.152	81.0	91.0	72.4	18.6
31	.806	.887	.739	.148	83.7	93.0	77.0	16.0

The Mean Height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived, from the hourly observations, made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of March 1866.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of vapour.	Mean Weight of Vapour in a Cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	72.9	8.5	66.9	14.5	0.657	7.06	4.21	0.63
2	72.8	9.5	66.1	16.2	.640	6-87	.71	.59
3	70.3	11.1	62.5	18.9	.568	.11	5.16	.54
4	69.4	12.4	60.7	21.1	.536	5.75	.65	.50
5	70.2	12.2	61.7	20.7	.554	.93	.68	.51
6	69.4	12.4	60.7	21.1	.536	.75	.65	.50
7	76.9	5.7	72.9	9.7	.797	8.56	3.12	.73
8	74.5	8.9	68.3	15.1	.688	7.37	4.59	.62
9	77.2	6.6	72.6	11.2	.790	8.47	3.63	.70
10	77.3	6.1	73.0	10.4	.801	.58	.38	.72
11	72.8	10.8	65.2	18.4	.621	6.66	5.37	.55
12	75.3	8.1	69.6	13.8	.717	7.68	4.28	.64
13	76.7	6.6	72.1	11.2	.778	8.34	3.59	.70
14	77.1	9.3	70.6	15.8	.741	7.89	5.17	.60
15	75.0	9.3	68.5	15.8	.692	.41	4.87	.60
16	73.5	11.0	65.8	18.7	.634	6.77	5.58	.55
17	74.2	9.8	67.3	16.7	.666	7.12	.05	.59
18	74.8	8.6	68.8	14.6	.699	.48	4.48	.63
19	75.6	8.9	69.4	15.1	.713	.62	.73	.62
20	73.6	10.7	66.1	18.2	.640	6.84	5.44	.56
21	75.4	10.1	68.3	17.2	.688	7.34	.38	.58
22	76.3	10.4	70.1	16.6	.729	.76	.42	.59
23	75.6	10.8	68.0	18.4	.681	.26	.80	.56
24	78.6	6.3	74.2	10.7	.832	8.89	3.60	.71
25	79.6	6.8	74.8	11.6	.849	9.04	4.02	.69
26	80.8	6.6	76.8	10.6	.905	.61	3.84	.71
27	76.3	9.8	69.4	16.7	.713	7.59	5.36	.59
28	79.1	5.8	75.0	9.9	.854	9.12	3.37	.73
29	75.1	6.8	70.3	11.6	.734	7.89	.55	.69
30	75.1	5.9	71,0	10.0	.751	8.09	.05	.73
31	77.3	6.4	72.8	10.9	.795	.52	.55	.71

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of March 1866.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	29.821	30.007	29.706	0.301	79.1	82.8	72.5	10.3
1	.807	.001	.696	.305	78.6	82.0	72.4	9.6
2	.794	29.985	.682	.303	78.1	81.6	72.8	8.8
3	.784	.978	.671	.307	77.5	81.5	72.8	8.7
4	.781	.982	.668	.314	77.2	81.6	72.8	8.8
5	.796	.995	.687	.308	76.8	81.4	71.6	9.8
6	.815	30.009	.707	.302	76.4	81.1	71.5	9.6
7	.839	.025	.730	.295	76.7	81.4	71.4	10.0
8	.869	.043	.748	.295	78.8	82.8	73.8	9.0
9	.885	.055	.761	.294	81.9	86.6	76.6	10.0
10	.889	.060	.751	.309	85.1	89.8	80.0	9.8
11	.878	.056	.769	.287	87.9	92.4	83.8	8.6
Noon.	.851	.031	.740	.291	90.3	94.6	87.6	7.0
1	.818	.003	.711	.292	92.0	96.0	89.2	6.8
2	.784	29.976	.666	.310	93.4	97.4	91.0	6.4
3	.761	.957	.642	.315	94.1	98.4	90.6	7.8
4	.748	.933	.625	.308	94.0	98.6	89.8	8.8
5	.745	.939	.619	.320	92.5	97.4	87.6	9.8
6	.752	.950	.624	.326	88.9	93.6	84.6	9.0
7	.769	.964	.633	.331	86.0	90.6	82.6	8.0
8	.793	.990	.666	.324	84.0	87.0	81.6	5.4
9	.819	30.009	.693	.316	82.1	84.8	73.8	11.0
10	.830	.021	.707	.314	80.9	83.8	76.2	7.6
11	.831	.019	.706	.303	79.8	83.0	74.2	8.8

The Mean Height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of March 1866.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a Cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Mid-night.	75.8	3.3	73.5	5.6	0.814	8.79	1.74	0.84
1	75.6	3.0	73.5	5·1	.814	.81	.57	.85
2	75.4	2.7	73.5	4.6	.814	.81	.41	.86
3	75.0	2.5	73.2	4.3	.806	.75	.29	.87
4	74.7	2.5	72.9	4.3	.797	.66	.29	.87
5	74.5	2.3	72.9	3.9	.797	.66	.17	.88
6	74.2	2.2	72.7	3.7	.792	.61	.11	.89
7	74.6	2.1	73.1	3.6	.803	.72	.08	.89
8	75.2	3.6	72.7	6.1	.792	.58	.86	.82
9	75.8	6.1	71.5	10.4	.763	.21	3.23	.72
10	75.7	9.4	69.1	16.0	.706	7.53	5.04	.60
11	75.0	12.9	67.3	20.6	.666	.06	6.58	.52
Noon.	74.9	15.4	65.7	24.6	.632	6.68	7.95	.46
1	74.6	17.4	64.2	27.8	.601	.32	9.04	.41
2	74.5	18.9	63.2	30.2	.582	.11	.88	.38
3	74.3	19.8	62.4	31.7	.567	5.93	10.39	.36
4	74.9	19.1	63.4	30.6	.586	6.13	.14	.38
5	75.1	17.4	64.7	27.8	.611	.43	9.16	.41
6	75.1	13.8	66.8	22.1	.655	.94	7.10	.49
7	75.5	10.5	68.1	17.9	.684	7.28	5.63	.56
8	75.1	8.9	68.9	15.1	.701	.51	4.66	.62
9	75.3	6.8	70.5	11.6	.739	.93	3.58	.69
10	75.8	5.1	72.2	8.7	.781	8.40	2.70	.76
11	75.9	3.9	73.2	6.6	.806	.70	2.05	.81

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of March 1866.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Guage 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
	o	Inches		
1	146.0	...	N. W. & W. & S.	Clear.
2	142.0	...	W.	Clear.
3	142.8	...	W. & S. W.	Clear.
4	141.6	...	W. & S. W & S.	Clear.
5	148.5	...	W. & S.	Clear.
6	142.0	...	W.	Clear.
7	141.5	...	S. & S. W.	Clear. Scuds from S.between 4 &7 A.M.
			S. & W.	Clear to 4 A. M., scatd. ⌣i to 9 A. M., clear afterwards.
8	142.4	...		
9	136.4	...	S. W.	Clear, slightly foggy from 4 to 6 A. M.
10	137.2	...	S. & N.	Clear, slightly foggy from 3 to 8 A. M.
11	140.0	...	N. & W.	Clear, slightly foggy at 4 A. M.
12	142.0	...	S. & N.	Clear.
13	137.0	...	S. & S. W.	Clear to 2 A. M., overcast to 6 A. M., clear afterwards.
14	140.0	...	S. & W.	Clear, slightly foggy at 1 A. M.
15	141.0	...	S. & W.	Clear, slightly foggy from 3 to 5 A. M.
16	150.0	...	S. W. & W.	Scatd. clouds to 8 A. M., clear afterwards.
17	137.0	...	S. & N.	Clear to 7 A. M. ⟍i to 7 P. M., clear afterwards.
18	134.7	...	S. & S. W.	⟍i to 8 P. M., clear afterwards.
19	142.0	...	W. & S. & S. W.	⟍i to 8 A. M., clear afterwards.
20	149.0	...	S.W.& W.& N. W.	Clear, foggy from 4 to 7 A. M.
21	142.0	...	W. & S. W. & S.	Clear to 1 P. M., scatd. ⟍i to 6 P. M., clear afterwards.
22	142.0	...	S. W. & W. & S.	Clear.
23	146.0	...	S. & W.	Clear.
24	140.5	...	S.	Clear.
25	141.0	...	S. & S. W.	Scatd. ⌒i to 9 A. M., clear afterwards.
26	146.0	...	S.	Clouds of different kinds.
27	142.5	...	S.	Clear.
28	137.0	...	S.	Clear to 6 A. M., scatd. ⌒i to 5 P. M., overcast afterwards. Thin rain Lightning and Thunder at 10 & 11 P. M.
29	132.0	...	S.	Overcast to 6 A. M., scatd. ⌒i to 8 P. M. over cast afterwards Thin rain at 11 P. M.

⟍i Cirri, —i Strati, ⌒i Cumuli, ⌣i Cirro-strati, ⌒i Cumulo strati, ⌒i Nimbi, ⌣i Cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of March 1866.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	General Aspect of the Sky.
30	135.0	...	S.	◡i to 10 A. M. ◠i to 4 P. M., clear afterwards.
31	137.0	...	E. & S. & S. W.	Clear to 4 A. M. ◡i to 1 P. M. Scatd. ◡i afterwads.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of March 1866.

MONTHLY RESULTS.

	Inches.
Mean height of the Barometer for the month,...	29.811
Max. height of the Barometer occurred at 10 A. M. on the 12th, ...	30.060
Min. height of the Barometer occurred at 5 P. M. on the 22nd, ...	29.619
Extreme range of the Barometer during the month, ...	0.441
Mean of the daily Max. Pressures, ...	29.893
Ditto ditto Min. ditto	29.740
Mean daily range of the Barometer during the month, ...	0.153

	o
Mean Dry Bulb Thermometer for the month, ...	83.9
Max. Temperature occurred at 4 P. M. on the 22nd, ...	98.6
Min. Temperature occurred at 7 A. M. on the 6th, ...	71.4
Extreme range of the Temperature during the month, ...	27.2
Mean of the daily Max. Temperature	94.3
Ditto ditto Min. ditto.	76.1
Mean daily range of the Temperature during the month,... ...	18.2

Mean Wet Bulb Thermometer for the month.	75.1
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer,	8.8
Computed Mean Dew-point for the month, ...	68.9
Mean Dry Bulb Thermometer above computed mean Dew-point. ...	15.0

	Inches.
Mean Elastic force of Vapour for the month, ...	0.701

	Troy grains.
Mean Weight of Vapour for the month	7.51
Additional Weight of Vapour required for complete saturation, ...	4.62
Mean degree of humidity for the month, complete saturation being unity	0.62

	Inches.
Drizzled 2 days.—Max. fall of rain during 24 hours	Nil
Total amount of rain during the month, ...	Nil
Prevailing direction of the Wind, ...	S. & W. & S. W.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of March 1866.

Monthly Results.

Tables shewing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

Hour.	N.	Rain on.	N. E.	Rain on.	E.	Rain on.	S. E.	Rain on.	S.	Rain on.	S. W.	Rain on.	W.	Rain on.	N. W.	Rain on.	Calm.	Rain on.	Missed.
									No. of days										
Midnight.					1		2		18		7		3						
1					1		2		18		8		2						
2					1				20		8		2						
3							1		17		8		4						1
4							1		15		9		5						1
5							1		13		10		6						1
6	1		1						14		9		5						1
7	1				1				12		11		5						1
8	3								11		11		6						
9	1								9		9		10		2				
10	2								5		10		10		4				
11	5		1				1		3		6		9		6				
Noon.	5		2		1		1		5		4		7		6				
1	2		2		2				3		6		11		5				
2	2		1		2		1		3		3		15		4				
3	4				2		1		2		6		15		1				
4	3				2		1		6		3		15		1				
5	3		1		1		1		8		2		14		1				
6	2		1		2				9		2		13		2				
7	2		1		2				14		1		9		2				
8	2				1				17		1		9		1				
9	1				1				21		3		4		1				
10	1						1		21		5	1	3						
11							1		19		6		4	2	1				

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of April 1866.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the sea level, 18·11 feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	°	°	°	°
1	29.842	29.976	29.781	0.195	82.5	89.9	76.9	13.0
2	.844	.915	.796	.119	82.6	91.8	76.4	15.4
3	.853	.955	.801	.154	77.4	83.4	73.6	9.8
4	.811	.882	.753	.129	78.6	89.0	71.4	17.6
5	.806	.879	.725	.154	82.1	93.0	72.8	20.2
6	.738	.834	.620	.214	83.9	95.0	78.2	16.8
7	.695	.772	.617	.155	85.6	96.8	77.2	19.6
8	.688	.760	.621	.139	86.6	97.6	78.0	19.6
9	.707	.794	.629	.165	88.2	98.8	81.0	17.8
10	.655	.730	.562	.168	89.3	102.6	81.8	20.8
11	.615	.685	.545	.140	89.1	102.3	78.8	23.5
12	.642	.709	.576	.133	88.1	100.2	77.4	22.8
13	.730	.810	.671	.139	87.7	100.2	77.0	23.2
14	.716	.799	.634	.165	88.5	101.8	79.2	22.6
15	.674	.747	.581	.166	88.8	102.6	80.6	22.0
16	.676	.736	.630	.106	86.3	93.8	80.7	13.1
17	.700	.766	.642	.124	85.3	90.8	81.4	9.4
18	.723	.796	.618	.178	85.1	92.1	80.8	11.3
19	.734	.812	.679	.133	86.4	95.6	81.2	14.4
20	.803	.894	.732	.162	86.8	94.0	81.4	12.6
21	.914	30.062	.806	.256	82.4	91.4	69.6	21.8
22	.983	.074	.899	.175	75.5	84.4	68.4	16.0
23	.951	.039	.845	.194	79.3	88.2	73.0	15.2
24	.902	29.973	.804	.169	82.5	91.2	75.0	16.2
25	.835	.917	.721	.196	83.6	94.2	75.7	18.5
26	.766	.853	.660	.193	85.7	96.4	77.4	19.0
27	.796	.858	.731	.127	86.1	94.4	77.8	16.6
28	.853	.995	.788	.207	80.3	89.8	72.2	17.6
29	.874	.959	.792	.167	78.2	87.0	73.0	14.0
30	.839	.900	.751	.149	81.0	90.6	72.0	18.6

The Mean Height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived, from the hourly observations, made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of April 1866.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of vapour.	Mean Weight of Vapour in a Cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	75.1	7.4	69.9	12.6	0.725	7.77	3.87	0.67
2	75.1	7.5	69.8	12.8	.722	.74	.94	.66
3	71.1	6.3	66.7	10.7	.653	.07	2.94	.71
4	69.9	8.7	63.8	14.8	.593	6.41	3.97	.62
5	73.2	8.9	67.0	15.1	.659	7.08	4.43	.62
6	77.3	6.6	72.7	11.2	.792	8.49	3.64	.70
7	75.2	10.4	67.9	17.7	.679	7.24	5.52	.57
8	79.2	7.4	74.8	11.8	.849	9.04	4.10	.69
9	81.2	7.0	77.0	11.2	.910	.67	.09	.70
10	80.4	8.9	75.1	14.2	.857	.08	5.13	.64
11	76.7	12.4	69.3	19.8	.711	7.52	6.60	.53
12	75.3	12.8	67.6	20.5	.672	.13	.59	.52
13	77.6	10.1	71.5	16.2	.763	8.11	5.45	.60
14	78.2	10.3	72.0	16.5	.776	.21	.67	.59
15	79.8	9.0	74.4	14.4	.838	.89	.11	.64
16	80.7	5.6	76.8	9.5	.905	9.63	3.39	.74
17	79.7	5.6	75.8	9.5	.876	.35	.29	.74
18	79.7	5.4	75.9	9.2	.879	.40	.17	.75
19	80.1	6.3	75.7	10.7	.873	.30	.76	.71
20	80.4	6.4	76.6	10.2	.899	.57	.64	.72
21	76.2	6.2	71.9	10.5	.773	8.29	.32	.71
22	70.7	4.8	67.3	8.2	.666	7.25	2.21	.77
23	74.6	4.7	71.3	8.0	.758	8.20	.39	.77
24	76.1	6.4	71.6	10.9	.766	.22	3.42	.71
25	78.0	5.6	74.1	9.5	.830	.89	.14	.74
26	78.7	7.0	73.8	11.9	.822	.76	4.04	.68
27	80.6	5.5	76.7	9.4	.902	9.62	3.33	.74
28	76.3	4.0	73.5	6.8	.814	8.78	2.13	.81
29	74.0	4.2	71.1	7.1	.753	.16	.09	.80
30	74.1	6.9	69.3	11.7	.711	7.64	3.50	.69

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of April 1866.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	29.783	30.042	29.623	0.419	79.5	83.4	68.8	14.6
1	.771	29.963	.608	.355	79.0	83.0	68.4	14.6
2	.761	.982	.593	.389	78.8	82.6	68.8	13.8
3	.752	.959	.580	.379	78.5	82.2	68.4	13.8
4	.755	.960	.587	.373	78.2	82.0	69.0	13.0
5	.770	.982	.600	.382	78.0	82.2	69.0	13.2
6	.790	30.035	.620	.385	77.8	82.2	68.6	13.6
7	.811	.038	.640	.398	78.8	83.4	70.4	13.0
8	.833	.068	.665	.403	81.2	85.8	70.7	15.1
9	.849	.074	.684	.390	84.3	88.8	73.3	15.5
10	.851	.070	.685	.385	86.9	92.2	75.0	17.2
11	.841	.044	.683	.331	89.1	95.6	76.3	19.3
Noon.	.822	.007	.662	.345	90.6	98.9	77.6	21.3
1	.791	29.971	.627	.344	91.9	100.2	78.0	22.2
2	.757	.947	.585	.362	92.7	101.8	82.0	19.8
3	.729	.918	.565	.353	93.0	102.3	82.8	19.5
4	.709	.899	.555	.344	92.4	102.6	81.0	21.6
5	.705	.905	.545	.360	90.6	100.8	79.0	21.8
6	.727	.917	.557	.360	87.7	96.4	77.2	19.2
7	.741	.918	.577	.371	84.7	91.6	72.8	18.8
8	.768	.963	.605	.358	82.6	89.8	73.6	16.2
9	.783	.989	.632	.357	81.6	87.0	73.4	13.6
10	.796	30.016	.641	.375	80.6	85.0	72.2	12.8
11	.795	.062	.639	.423	80.0	84.4	73.3	11.1

The Mean Height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of April 1866.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a Cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Mid-night.	76.1	3.4	73.7	5.8	0.819	8.85	1.81	0.83
1	76.0	3.0	73.9	5·1	.824	.92	.58	.85
2	76.1	2.7	74.2	4.6	.832	9.00	.44	.86
3	76.1	2.4	74.4	4.1	.838	.08	.27	.88
4	76.0	2.2	74.5	3.7	.840	.11	.14	.89
5	75.8	2.2	74.3	3.7	.835	.05	.14	.89
6	75.8	2.0	74.4	3.4	.838	.10	.03	.90
7	76.3	2.5	74.5	4.3	.840	.11	.33	.87
8	77.2	4.0	74.4	6.8	.838	.02	2.19	.81
9	77.8	6.5	73.2	11.1	.806	8.63	3.65	.70
10	78.1	8.8	72.8	14.1	.795	.47	4.78	.64
11	78.1	11.0	71.5	17.6	.763	.08	6.04	.57
Noon.	77.7	12.9	70.0	20.6	.727	7.66	7.10	.52
1	77.9	14.0	69.5	22.4	.715	.53	.79	.49
2	77.7	15.0	68.7	24.0	.697	.32	8.36	.47
3	77.6	15.4	68.4	24.6	.690	.25	.56	.46
4	77.4	15.0	68.4	24.0	.690	.23	.29	.47
5	77.3	13.3	69.3	21.3	.711	.50	7.26	.51
6	77.5	10.2	71.4	16.3	.761	8.08	5.48	.60
7	76.9	7.8	71.4	13.3	.761	.13	4.29	.66
8	76.7	5.9	72.6	10.0	.790	.49	3.19	.73
9	76.5	5.1	72.9	8.7	.797	.57	2.77	.76
10	76.3	4.3	73.3	7.3	.809	.72	.29	.79
11	76.1	3.9	73.4	6.6	.811	.75	3.06	.81

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of April 1866.

Solar Radiation. Weather, &c.

Date.	Max. Solar radiation.	Rain Guage 5 feet above Ground.	Prevailing direction of the Wind.	Max. Pressure of Wind.	General Aspect of the Sky.
	o	Inches		lb	
1	132.0	...	W. S. W. & E.S.E.	2.75	Overcast to Noon, |i to 5 P. M., clear afterwards.
2	141.0	...	S. S. E. & W. S. W.	1.25	|i to 7 A. M., scatd. ⌒i to 4 P. M., overcast to 8 P. M. |i afterwards.
3	121.5	...	N. & N. N. W.	2.25	|i to 3 P. M., overcast afterwards. Thin rain between 6 & 7 A. M. & at 8 & 10 P. M.
4	128.0	...	W. S. W.	0.25	|i to 5 A. M., ⌒i to Noon, clear afterwards.
5	135.0	...	W. S. W. & S. S. W.	...	Clear to 11 A. M., scatd. ⌒i to 5 P. M., clear afterwards.
6	132.0	...	S. S. W. & S. W.	2.25	Clear to 7 A. M., scatd. ⌒i to 7 P. M. clear afterwards, lightning to the S. E. at 10 & 11 P. M.
7	141.0	...	S. W. & W. N. W.	0.50	Clear scuds, from S. W. from 4 to 7 A. M, Foggy at 6 A. M.
8	145.6	...	S. & W. S. W.	0.25	Clear to 10 A. M. Scatd. ⌒i to 5 P. M., clear afterwards.
9	140.0	...	S. by E. & S.	...	Scuds from S. to N. to 9 A. M. clear afterwards.
10	143.0	...	S. & S. S. W.	...	Scuds from S. W. to N. E. to 8 A. M. clear afterwards.
11	144.6	...	S. & N. W.	...	Clear.
12	140.5	...	S. & variable	0.50	Clear. Foggy at 6 & 7 A. M.
13	145.5	...	S. & variable	0.50	Clear. Foggy from 5 to 7 A. M.
14	140.5	...	S. & W.	0.75	Clear.
15	148.4	...	S. S. W. & S. by E.	...	Clear to 3 A. M. Scatd. clouds to 8 A. M., clear afterwards.
16	132.4	...	S. & S. S. W. (high)	2.00	Clear to 9 A. M. Scuds from S. to N. to 3 P. M. clear afterwards.
17	122.0	...	S. (high)	4.50	Clear to 4 A. M. Scuds from S. to N. to 3 P. M. Overcast to 7 P. M. clear afterwards, lightning to the S. at 7 & 8 A. M., thin rain between 4 & 5 A. M.
18	128.7	...	S. S. W. & S.	3.25	Clouds of different kinds.
19	130.2	...	S. & S. S. W. & S. by W.	2.00	Clouds of different kinds to 6 P. M., clear afterwards. Lightning to the S. E. at 4 A. M.
20	138.0	...	S. & S. S. W.	1.80	Clouds of different kinds. Lightning to the E.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of April 1866.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Guage 5 feet above Ground.	Prevailing direction of the Wind.	Max. Pressure of Wind.	General Aspect of the Sky.
	o	Inches		lb	
21	.....	0.51 *	S. & S. S. E.	10.50	Overcast Lightning Thunder & rain at 10 & 11 P. M. Hails at 10 P. M.
22	123.2	...	S. E. & variable	2.00	Overcast to Noon ⌒i & ⌒i afterwards, Lightning & Thunder at Midnight light rain at Midnight, 1 & from 4 to 6 A.M.
23	128.0	0.14	S. W. & N. N. W.	2.80	⌒i & ⌒i to 6 P. M. clear afterwards. Lightning to S. at 9 P.M. Rain at 4 & 5 P. M.
24	135.8	...	E. S. E. & variable.	1.00	Overcast to 3 A. M. clear to 9 A. M. Scatd. ⌒i to 6 P. M. clear afterwards, Lightning to S. W at 1 A. M.
25	132.0	...	E. & S. S. W.	1.00	Clear to 6 A. M. Scatd. ⌒i to 4 P. M. clear afterwards.
26	128.5	...	S. S. W. & S.	1.25	Clear to 1 P. M. ⌒i afterwards Lightning to the W. & S. at 7 & 8 P. M. Thunder at 7 P. M. Light rain between 7 & 8 P. M.
27	131.6	...	S. S. E. & S.	1.00	⌒i to A. M. Scuds from S. to 10 A. M. ⌒i to 4 P.M. clear afterwards.
28	.....	1.16	S. E. & E.	2.75	Clear to 7 A. M. Scuds from S. to 10 A. M. Overcast afterwards Lightning to the E. from 6 to 9 P.M. Thunder at 5 & 6 P. M. rain at Noon, 5, 6 & 8 P. M.
29	128.0	...	W. & variable.	2.00	Scatd. ⌒i to 5 A. M. ⌒i & ⌒i to 1 P. M. overcast afterwards Lightning to the E. at 8 & 9 P. M. Thin rain at 6 P. M.
30	131.0	...	S. W. & N. N. E.	5.00	Scatd. ⌒i & ⌒i to 1 P. M. Scatd ⌒i to 5 P. M. overcast afterwards Lightning to the S. W. at 9 P. M. Thin rain at 10 & 11 P. M.

⌒i Cirri, —i Strati, ⌒i Cumuli, ⌒i Cirro-strati, ⌒i Cumulo strati, ⌒i Nimbi, ⌒i Cirro cumuli.

* Fell from 10 P. M. of the 21st to 6 A. M. of the 22nd.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of April 1866.

Monthly Results.

	Inches.
Mean height of the Barometer for the month,... ...	... 29.779
Max. height of the Barometer occurred at 9 A. M. on the 22nd,	... 30.074
Min. height of the Barometer occurred at 5 P. M. on the 11th,	... 29.545
Extreme range of the Barometer during the month, ...	... 0.529
Mean of the daily Max. Pressures, ...	... 29.863
Ditto ditto Min. ditto	... 29.700
Mean daily range of the Barometer during the month, ...	... 0.163

	°
Mean Dry Bulb Thermometer for the month, ...	... 84.1
Max. Temperature occurred at 4 P. M. on the 10th & 15th ...	... 102.6
Min. Temperature occurred at 1 & 3 A. M. on the 22nd ...	... 68.4
Extreme range of the Temperature during the month, ...	... 34.2
Mean of the daily Max. Temperature	... 94.0
Ditto ditto Min. ditto, ...	... 76.7
Mean daily range of the Temperature during the month,...	... 17.3

Mean Wet Bulb Thermometer for the month, ...	... 76.9
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer,	7.2
Computed Mean Dew-point for the month, ...	... 71.9
Mean Dry Bulb Thermometer above computed mean Dew-point. ...	12.2

	Inches.
Mean Elastic force of Vapour for the month, ...	... 0.773

	Troy grains.
Mean Weight of Vapour for the month	... 8.28
Additional Weight of Vapour required for complete saturation, ...	3.93
Mean degree of humidity for the month, complete saturation being unity	0.68

	Inches.
Rained 9 days,—Max. fall of rain during 24 hours ...	... 1.16
Total amount of rain during the month, ...	... 1.81
Total amount of rain indicated by the Gauge attached to the anemometer during the month.	... 1.37
Prevailing direction of the Wind, ...	S. & S. S. W. & W. S. W.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of April 1866.

MONTHLY RESULTS.

Tables shewing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

Hour.	N.	Rain on.	N. by E.	Rain on.	N. N. E.	Rain on.	N. E.	Rain on.	E. N. E.	Rain on.	E. by N.	Rain on.	E.	Rain on.	E. by S.	Rain on.	E. S. E.	Rain on.	S. E.	Rain on.	S. S. E.	Rain on.	S. by E.	Rain on.	S.	Rain on.	S. by W.	Rain on.	S. S. W.	Rain on.	S. W.	Rain on.	W. S. W.	Rain on.	W. by S.	Rain on.	W.	Rain on.	W. by N.	Rain on.	W. N. W.	Rain on.	N. W.	Rain on.	N. by W.	Rain on.	Rain on.
Mid night	12						1		2										3		3				6		4		4		3		12											
1	12						1		1										3		3				7		4		4		3		12											
2	12								1										3		3				7		5		4		3		12											
3	12																		3		3				7		5		4		3		12											
4	12																		3		3				7		5		4		3		12											
5	12				1														3		3				7		5		4		3		12											
6	12				1														3		3				7		5		4		3		12											
7	12				1														3		3				7		5		4		3		12											
8	12				1														3		3				7		5		4		3		12											
9	12				1														3		3				7		5		4		3		12											
10	12				1														3		3				7		5		4		3		12											
11	12				1														3		3				7		5		4		3		12											
Noon.	12				1														3		3				7		5		4		3		12											
1	12				1														3		3				7		5		4		3		12											
2	12				1														3		3				7		5		4		3		12											
3	12				1														3		3				7		5		4		3		12											
4	12				1														3		3				7		5		4		3		12											
5	12				1														3		3				7		5		4		3		12											
6	12				1														3		3				7		5		4		3		12											
7	12				1														3		3				7		5		4		3		12											
8	12				1														3		3				7		5		4		3		12											
9	12				1														3		3				7		5		4		3		12											
10	12				1														3		3				7		5		4		3		12											
11	12				1														3		3				7		5		4		3		12											

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of May 1866.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the sea level, 18-11 feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.827	29.900	29.736	0.164	81.4	91.0	72.4	18.6
2	.838	.890	.807	.083	78.8	87.4	73.6	13.8
3	.769	.855	.686	.169	78.9	88.9	71.7	17.2
4	.705	.758	.628	.130	79.5	89.8	74.6	15.2
5	.659	.726	.569	.157	82.2	91.2	72.7	18.5
6	.579	.630	.482	.148	84.2	93.2	76.6	16.6
7	.563	.607	.514	.093	84.4	93.0	76.0	17.0
8	.583	.634	.542	.092	87.2	94.9	82.0	12.9
9	.611	.701	.552	.149	88.3	98.6	82.4	16.2
10	.674	.733	.606	.127	88.8	99.2	81.8	17.4
11	.672	.739	.564	.175	86.9	97.8	78.4	19.4
12	.622	.675	.543	.132	87.7	96.7	80.8	15.9
13	.643	.694	.588	.106	88.5	96.6	82.0	14.6
14	.681	.740	.612	.128	87.4	96.4	76.0	20.4
15	.680	.751	.595	.156	84.8	95.0	76.4	18.6
16	.652	.693	.561	.132	85.8	96.3	74.2	22.1
17	.666	.735	.600	.135	85.9	94.3	78.2	16.1
18	.665	.720	.586	.134	87.0	95.8	77.0	18.8
19	.661	.720	.604	.116	87.9	97.3	79.2	18.1
20	.681	.740	.624	.116	89.3	97.8	83.0	14.8
21	.670	.734	.576	.158	89.3	97.2	83.8	13.4
22	.621	.672	.532	.140	89.2	95.8	83.8	12.0
23	.577	.642	.495	.147	89.8	96.4	83.8	12.6
24	.599	.647	.497	.150	88.3	96.8	80.4	16.4
25	.595	.657	.523	.134	90.0	97.8	84.0	13.8
26	.614	.680	.553	.127	90.7	102.6	83.0	19.6
27	.585	.660	.505	.155	92.0	105.8	83.0	22.8
28	.553	.617	.479	.138	91.2	101.0	84.4	16.6
29	.547	.623	.476	.147	90.3	98.2	84.6	13.6
30	.610	.677	.542	.135	90.2	98.4	83.0	15.4
31	.633	.690	.537	.153	90.6	98.0	85.0	13.0

The Mean Height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived, from the hourly observations, made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of May 1866.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of vapour.	Mean Weight of Vapour in a Cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	72.7	8.7	66.6	14.8	0.651	6.99	4.28	0.62
2	74.4	4.4	71.3	7.5	.758	8.20	2.24	.79
3	72.6	6.3	68.2	10.7	.686	7.41	3.06	.71
4	74.1	5.4	70.3	9.2	.734	.93	2.73	.74
5	76.2	6.0	72.0	10.2	.776	8.33	3.21	.72
6	79.3	4.9	75.9	8.3	.879	9.42	2.82	.77
7	80.7	3.7	78.1	6.3	.943	10.10	.21	.82
8	82.4	4.8	79.5	7.7	.986	.49	.88	.79
9	82.0	6.3	78.2	10.1	.946	.05	3.75	.73
10	81.7	7.1	77.4	11.4	.922	9.79	4.21	.70
11	80.2	6.7	76.2	10.7	.887	.45	3.80	.71
12	81.5	6.2	77.8	9.9	.934	.93	.63	.73
13	81.7	6.8	77.6	10.9	.928	.85	4.03	.71
14	79.6	7.8	74.9	12.5	.851	.04	.41	.67
15	78.5	6.3	74.1	10.7	.830	8.87	3.59	.71
16	80.5	5.3	76.8	9.0	.905	9.65	.18	.75
17	80.9	5.0	77.4	8.5	.922	.83	.04	.76
18	81.5	5.5	78.2	8.8	.946	10.07	.22	.76
19	82.3	5.6	78.9	9.0	.967	.28	.36	.75
20	83.3	6.0	79.7	9.6	.992	.51	.70	.74
21	82.7	6.6	78.7	10.6	.961	.18	4.03	.72
22	83.1	6.1	79.4	9.8	.983	.41	3.75	.74
23	83.2	6.1	79.5	9.8	.986	.45	.76	.74
24	80.4	7.9	75.7	12.6	.873	9.26	4.54	.67
25	83.2	6.8	79.1	10.9	.973	10.30	.20	.71
26	83.6	7.1	79.3	11.4	.979	.36	.44	.70
27	83.8	8.2	78.9	13.1	.967	.20	5.16	.66
28	85.0	6.2	81.3	9.9	1.043	11.02	4.00	.73
29	84.2	6.1	80.5	9.8	.017	10.76	3.87	.74
30	82.7	7.5	78.2	12.0	0.946	.00	4.59	.69
31	83.3	7.3	78.9	11.7	.967	.22	.54	.69

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of May 1866.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	29.660	29.868	29.545	0.323	82.2	86.8	73.2	13.6
1	.650	.858	.534	.324	81.9	86.2	73.2	13.0
2	.639	.839	.525	.314	81.7	85.6	72.9	12.7
3	.630	.826	.511	.315	81.4	85.8	72.6	13.2
4	.635	.823	.531	.292	81.1	85.8	72.2	13.6
5	.646	.830	.540	.290	81.0	85.6	71.7	13.9
6	.660	.846	.571	.275	81.1	86.6	72.0	14.6
7	.677	.868	.573	.295	82.5	88.2	73.4	14.8
8	.693	.895	.582	.313	85.2	89.8	77.0	12.8
9	.700	.900	.582	.318	88.1	93.6	80.7	12.9
10	.701	.896	.582	.314	90.5	96.5	83.6	12.9
11	.690	.874	.568	.306	92.6	97.4	85.2	12.2
Noon.	.673	.851	.548	.303	94.1	101.4	85.6	15.8
1	.650	.827	.535	.292	95.1	103.0	86.8	16.2
2	.626	.820	.521	.299	95.3	104.4	74.3	30.1
3	.604	.818	.512	.306	95.4	105.8	76.7	29.1
4	.585	.811	.481	.330	94.3	105.0	75.6	29.4
5	.576	.812	.476	.336	92.7	101.5	75.7	25.8
6	.589	.813	.488	.325	89.8	96.5	74.8	21.7
7	.613	.822	.496	.326	86.8	91.6	74.2	17.4
8	.635	.838	.516	.322	84.6	90.0	74.2	15.8
9	.653	.843	.549	.294	83.7	88.2	73.6	14.6
10	.661	.842	.561	.281	83.3	88.0	74.2	13.8
11	.663	.856	.573	.283	82.7	87.6	73.8	13.8

The Mean Height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of May 1866.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a Cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Mid-night.	78.6	3.6	76.1	6.1	0.885	9.51	2.03	0.82
1	78.7	3.2	76.5	5·4	.896	.65	1.79	.84
2	78.7	3.0	76.6	5.1	.899	.67	.70	.85
3	78.7	2.7	76.8	4.6	.905	.73	.54	.86
4	78.7	2.4	77.0	4.1	.910	.81	.36	.88
5	78.7	2.3	77.1	3.9	.913	.84	.30	.88
6	79.0	2.1	77.5	3.6	.925	.96	.21	.89
7	79.9	2.6	78.1	4.4	.943	10.14	.50	.87
8	81.0	4.2	78.1	7.1	.943	.08	2.53	.80
9	81.8	6.3	78.0	10.1	.940	9.99	3.73	.73
10	82.3	8.2	77.4	13.1	.922	.75	4.97	.66
11	83.0	9.6	77.2	15.4	.916	.65	5.98	.62
Noon.	83.2	10.9	76.7	17.4	.902	.47	6.85	.58
1	83.6	11.5	76.7	18.4	.902	.45	7.34	.56
2	83.2	12.1	75.9	19.4	.879	.21	.68	.55
3	83.1	12.3	75.7	19.7	.875	.13	.81	.54
4	82.9	11.4	76.1	18.2	.885	.28	.13	.57
5	82.5	10.2	76.4	16.3	.893	.41	6.27	.60
6	81.8	8.0	77.0	12.8	.910	.63	4.79	.67
7	80.5	6.3	76.7	10.1	.902	.60	3.61	.73
8	79.4	5.2	75.8	8.8	.876	.37	.02	.76
9	79.1	4.6	75.9	7.8	.879	.42	2.65	.78
10	78.9	4.4	75.8	7.5	.876	.39	.54	.79
11	78.8	3.9	76.1	6.6	.885	.50	.22	.81

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of May 1866.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Guage 5 feet above Ground.	Prevailing direction of the Wind.	Max. Pressure of Wind.	General Aspect of the Sky.
	o	Inches		lb	
1	130.5	...	S. & variable.	3.50	Overcast to 2 A. M., scatd. ⟍i to 3 P. M., scatd. ⟍i & ⟍i afterwards. Thin rain at Midnight.
2	126.0	...	S. by W. & N. E.	3.00	Scatd. ⟍i to 6 A. M. ⟍i to Noon ⟍i & ⟍i afterwards. Lightning to S. E. at 1 P.M. Thunder at 2 P.M. Thin rain at 2 & 8 P.M.
3	126.0	...	N. W. & S. by E.	1.75	⟍i to 5 A. M. scatd. ⟍i to 11 A. M. ⟍i & ⌒i afterwards. Lightning to W. at 8 & 9 P. M.
4	129.6	0.88	S. by E. & E.	2.20	⟍i to 3 A. M. Scatd. ⌒i to 1 P. M. ⟍i afterwards. Thunder at 3 & 4 P. M. Lightning at 4 & 8 P. M. Hail at 4 P. M. Rain from 3 to 5 P. M.
5	130.2	...	E. & S.	0.50	Scatd. ⌒i to 7 P. M., clear afterwards.
6	127.0	0.31	S. S. E. & S.	2.70	Clear to 1 A. M. Scuds from S. to 11 A. M., scatd. ⌒i to 3 P. M. Overcast afterwards. Thunder at 7 & 8 P. M. Lightning from 7 to 11 P. M. Rain from 6 to 8 P. M.
7	129.0	...	S. & S. S. E. & E.	1.00	Scatd. ⌒i to 4 P. M., clear afterwards.
8	135.0	...	S. by E. & S.	1.00	Clear to 4 A. M. Scuds from S to A.M., scatd. ⌒i to 4 P. M., clear afterwards.
9	135.0	...	S. & variable	1.50	Clear to 3 A. M. Scuds from S. to 10 A. M., clear afterwards.
10	140.0	...	S.	0.50	Clear to 2 P. M. Scatd. ⌒i to 7 P. M., clear afterwards. Lightning to N. at 8 P. M.
11	137.0	0.12	S. & variable.	3.60	Clear to 5 A.M. Scatd. ⌒i to 8 P.M., clear afterwards. Lightning to N. E. at 7 & 8 P. M. Rain at 7 P. M.
12	136.0	...	S.	0.60	Clear.
13	128.2	...	S. & S. S. E.	0.50	Scatd. ⌒i to 6 A. M. Scuds from S. to 10 A. M. Scatd. ⌒i afterwards. Lightning to N. W. at 8, 9 & 11 P. M.
14	130.0	0.55	S. E. & S. by E.	19.50	Clear to 6 A. M. ⌒i to 7 P. M. Overcast afterwards. Lightning from 7 to 11 P. M. Thunder from 8 to 10 P. M. Rain at 8 P. M.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of May 1866.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	Max. Pressure of Wind.	General aspect of the Sky.
	o	Inches		lb	
15	129.2	...	Variable.	2·00	Overcast to 4 A.M. Clear to Noon. Scatd ⌒i to 6 P. M. Scatd \i afterwards.
16	134.9	0.58	S. & S. by E.	12.00	Scatd. \i to 5 A. M., scatd. ⌒i to 6 P. M. Overcast aferwards. Lightning from 7 to 10 P. M. Thunder at 7 & 8 P. M. Rain between 6 & 7 P. M.
17	130.2	...	S. by E. & S. by W.	0.25	Clear to 7 A. M., scatd. ⌒i to 6 P. M., clear afterwards.
18	128.0	0.12	S. & S. S. W.	3.00	Clear to 6 A. M., scatd ⌒i to 6 P. M. Overcast afterwards. Rain between 7 & 8 P. M.
19	132.0	...	S. S.W. & S.W. & S.	0.70	Clear to 11 A. M., scatd ⌒i to 2 P. M., clear afterwards.
20	130.0	...	S. S. W. & S.	0.50	Clear.
21	130.2	...	S. & S. S. W.	0.30	Scatd. \i to 4 A. M., clear afterwards.
22	134.0	...	S. & S. S. W.	0.70	Clear.
23	129.0	...	S. & S. S. W.	3.50	Clear to 5 A. M., scuds from S. to 11 A. M., clear afterwards. Shock of an earthquake, felt at 3-41 from N. W. to S. E., the shock, or shocks, lasted several minutes and there was apparently a cross wave from N. to S.
24	132.0	...	S. & S. S. E.	1.25	Scatd. ⌒i to 11 A. M., clear afterwards. Lighting to N. W. at 8 & 9 P. M.
25	130.0	...	S. & S. S. W.	1.00	Clear.
26	141.6	...	S. & S. S. W.	1.00	Clear.
27	143.0	...	S. & S. W.	0.60	Clear.
28	132.0	...	S.	0.25	Clear to 3 A. M., scuds from S. to 7 A. M., clear to 6 P. M.,, scuds from S. afterwards.
29	128.0	...	S. & S. S. W.	1.50	Scuds from S. to 9 A. M. Clouds of different kinds afterwards.
30	133.0	...	S. & S. S. W.	1.30	Clear to 4 A. M., scatd. ⌒i to 6 P. M. Overcast afterwards. Lightning to N. W. at 8 & 9 P. M. Thin rain between 1 & 9 P. M.
31	130.0	...	S. & S. S. W.	0.80	Scatd. ⌒i.

\i Cirri, —i Strati, ⌒i Cumuli, ⌣i Cirro-strati, ~i Cumulo strati, ⌣i Nimbi, ⌣i Cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of May 1866.

MONTHLY RESULTS.

	Inches.
Mean height of the Barometer for the month,...	29.646
Max. height of the Barometer occurred at 9 A. M. on the 1st, ...	29.900
Min. height of the Barometer occurred at 5 P. M. on the 29th, ...	29.476
Extreme range of the Barometer during the month, ...	0.424
Mean of the daily Max. Pressures, ...	29.708
Ditto ditto Min. ditto	29.571
Mean daily range of the Barometer during the month, ...	0.137

	°
Mean Dry Bulb Thermometer for the month, ...	87.0
Max. Temperature occurred at 3 P. M. on the 27th	105.8
Min. Temperature occurred at 5 A. M. on the 3rd	71.7
Extreme range of the Temperature during the month, ...	34.1
Mean of the daily Max. Temperature	96.1
Ditto ditto Min. ditto, ...	79.6
Mean daily range of the Temperature during the month,... ...	16.5

Mean Wet Bulb Thermometer for the month, ...	80.7
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer,	6.3
Computed Mean Dew-point for the month, ...	76.9
Mean Dry Bulb Thermometer above computed mean Dew-point. ...	10.1

	Inches.
Mean Elastic force of Vapour for the month, ...	0.908

	Troy grains.
Mean Weight of Vapour for the month	9.66
Additional Weight of Vapour required for complete saturation, ...	3.63
Mean degree of humidity for the month, complete saturation being unity	0.73

	Inches.
Rained 9 days,—Max. fall of rain during 24 hours	0.88
Total amount of rain during the month, ...	2.56
Total amount of rain indicated by the Gauge attached to the anemometer during the month.	1.85
Prevailing direction of the Wind, ...	S. & S. S. W. & S. S. E.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of May 1866.

MONTHLY RESULTS.

Tables shewing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

Hour.	N.	Rain on.	N. by E.	Rain on.	N. N. E.	Rain on.	N. E.	Rain on.	E. N. E.	Rain on.	E. by N.	Rain on.	E.	Rain on.	E. by S.	Rain on.	E. S. E.	Rain on.	S. E.	Rain on.	S. S. E.	Rain on.	S. by E.	Rain on.	S.	Rain on.	S. by W.	Rain on.	S. S. W.	Rain on.	S. W.	Rain on.	W. S. W.	Rain on.	W. by S.	Rain on.	W.	Rain on.	W. by N.	Rain on.	W. N. W.	Rain on.	N. W.	Rain on.	N. N. W.	Rain on.	N. by W.	Rain on.
	No. of days																																														
Mid night							1										1			5	5		12		2		3		1	1							1										
1													1						2	2	6		14		1		2																			
2													1						1	1	4		14		1		6																			
3													1							3	5		13		1		3		1																	
4													2							2	5		12		2		3		1														1			
5							1						1				1			2	4		11		2		4		1						1										
6	1						1						1						2	2	4		10		3		4		1																
7	1				1		1						2		1				2	2	2		9		3		1		5																
8	1				1		1										1		2	2	4		8				6		6															
9	1		1		1		1												1	2	2		8		3		5		4		2				1									
10			1								1		2							3	1		10				9		3						1									
11													1		1				1	4			11		2		9		2		1				1									
Noon.																	1		1	5	3		3		5		7		4						1									
1													1						1	5	3		5		3		7		3		1			1							1			
2									1		1						1		3	3	1		10				5		6															
3													1		1		1		3	1	1		13		3		5										1				1			
4	2	1											1						4		2		8		6		4								1						1			
5																	1		2		3		15	1	1		5																	
6					1		1	1	1				1						1		3		5		9		4		4																
7					1		1	1	1	1							1		1	1	5		3		14		2				1														
8													2								4	1	6		12	1	1		3														1	1		
9							1										1		2		2		5		15		1		1						1						1		1		
10													2				2		1		2		6		12		3		1						1									
11																			3		4		9		9		3		2															

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of June 1866.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the sea level, 18·11 feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.610	29.662	29.548	0.114	89.9	99.2	83.0	16.2
2	.629	.682	.557	.125	87.4	98.0	79.6	18.4
3	.625	.678	.555	.123	87.8	98.4	79.2	19.2
4	.593	.647	.480	.167	88.9	98.2	81.4	16.8
5	.571	.628	.499	.129	90.2	98.4	83.4	15.0
6	.599	.557	.404	.153	90.4	98.6	84.0	14.6
7	.494	.551	.431	.120	91.1	99.8	84.2	15.6
8	.551	.612	.479	.133	91.4	101.6	83.6	18.0
9	.570	.622	.497	.125	90.5	97.8	82.0	15.8
10	.546	.621	.447	.174	89.5	98.6	76.2	22.4
11	.503	.573	.423	.150	88.3	96.8	80.2	16.6
12	.499	.550	.425	.125	89.1	95.6	85.4	10.2
13	.532	.604	.462	.142	89.4	98.4	83.0	15.4
14	.538	.596	.450	.146	89.9	98.2	84.6	13.6
15	.492	.544	.440	.104	83.4	86.5	80.8	5.7
16	.494	.533	.443	.090	83.3	87.3	79.6	7.7
17	.515	.571	.451	.120	82.2	85.0	79.6	5.4
18	.531	.575	.476	.099	82.9	87.2	78.4	8.8
19	.503	.563	.436	.127	82.7	84.8	80.0	6.8
20	.425	.485	.350	.135	84.3	89.0	81.8	7.2
21	.375	.416	.319	.097	80.9	82.4	79.0	3.4
22	.429	.519	.365	.154	82.1	89.2	79.0	10.2
23	.502	.557	.446	.111	83.3	90.8	79.4	11.4
24	.483	.545	.408	.137	82.9	87.8	79.6	8.2
25	.441	.489	.380	.109	85.7	91.2	81.8	9.4
26	.431	.477	.376	.101	85.3	89.5	81.2	8.3
27	.465	.520	.415	.105	83.3	85.1	80.6	4.5
28	.514	.579	.452	.127	84.1	88.6	82.0	6.6
29	.573	.637	.503	.134	87.2	93.4	83.4	10.0
30	.607	.667	.560	.107	83.9	87.4	81.8	5.6

* The Mean Height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived, from the hourly observations, made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of June 1866.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of vapour.	Mean Weight of Vapour in a Cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	82.2	7.7	77.6	12.3	0.928	9.83	4.63	0.68
2	80.7	6.7	76.7	10.7	.902	.58	3.87	.71
3	81.0	6.8	76.9	10.9	.908	.64	4.04	.71
4	82.7	6.2	79.0	9.9	.970	10.29	3.75	.73
5	83.7	6.5	79.8	10.4	.995	.54	4.05	.72
6	83.1	7.3	78.7	11.7	.961	.16	.51	.69
7	84.1	7.0	79.9	11.2	.998	.54	.43	.70
8	83.6	7.8	78.9	12.5	.967	.20	.90	.68
9	82.8	7.7	78.2	12.3	.946	.00	.72	.68
10	82.4	7.1	78.1	11.4	.943	.00	.29	.70
11	81.6	6.7	77.6	10.7	.928	9.85	3.95	.71
12	83.2	5.9	79.7	9.4	.992	10.53	.79	.75
13	83.0	6.4	79.2	10.2	.976	.35	.90	.73
14	82.3	7.6	77.7	12.2	.931	9.86	4.60	.68
15	80.6	2.8	78.6	4.8	.958	10.28	1.68	.86
16	80.1	3.2	77.9	5.4	.937	.06	.87	.84
17	79.7	2.5	77.9	4.3	.937	.08	.46	.87
18	79.5	3.4	77.1	5.8	.913	9.80	.99	.83
19	80.5	2.2	79.0	3.7	.970	10.42	.30	.89
20	80.6	3.7	78.0	6.3	.940	.07	2.21	.82
21	78.8	2.1	77.3	3.6	.919	9.90	1.20	.89
22	79.9	2.2	78.4	3.7	.952	10.23	.28	.89
23	80.4	2.9	78.4	4.9	.952	.21	.72	.86
24	79.9	3.0	77.8	5.1	.934	.03	.76	.85
25	80.3	5.4	76.5	9.2	.896	9.57	3.23	.75
26	80.4	4.9	77.0	8.3	.910	.73	2.91	.77
27	81.2	2.1	79.7	3.6	.992	10.63	1.30	.89
28	81.7	2.4	80.0	4.1	1.001	.72	.49	.88
29	81.0	6.2	77.3	9.9	0.919	9.78	3.59	.73
30	79.8	4.1	76.9	7.0	.908	.72	2.41	.80

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of June 1866.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	29.532	29.646	29.407	0.239	83.4	87.2	79.2	8.0
1	.518	.630	.397	.233	83.2	87.0	79.2	7.8
2	.507	.621	.383	.238	83.0	87.0	79.2	7.8
3	.500	.633	.367	.266	82.8	86.8	78.8	8.0
4	.497	.641	.365	.276	82.7	86.8	78.4	8.4
5	.507	.644	.365	.279	82.7	86.4	78.8	7.6
6	.524	.651	.379	.272	82.7	86.6	79.0	7.6
7	.539	.664	.397	.267	83.7	88.0	80.0	8.0
8	.553	.678	.397	.281	85.2	90.8	80.6	10.2
9	.561	.676	.396	.280	86.9	95.0	81.0	14.0
10	.561	.682	.394	.288	88.5	97.2	80.4	16.8
11	.552	.676	.379	.297	89.8	98.6	80.6	18.0
Noon.	.539	.651	.362	.289	90.9	100.6	81.3	19.3
1	.520	.632	.352	.280	91.6	101.6	82.4	19.2
2	.499	.618	.339	.279	91.9	101.2	81.6	19.6
3	.481	.579	.329	.250	91.9	101.0	80.8	20.2
4	.463	.565	.319	.246	91.0	100.2	80.4	19.8
5	.459	.652	.323	.329	90.0	98.2	81.0	17.2
6	.475	.578	.343	.235	88.2	95.2	81.4	13.8
7	.500	.601	.362	.239	85.9	92.7	76.2	16.5
8	.520	.614	.382	.232	85.1	90.8	79.4	11.4
9	.538	.656	.401	.255	84.4	89.8	79.0	10.8
10	.549	.651	.411	.240	83.9	88.4	79.2	9.2
11	.547	.656	.416	.240	83.5	87.8	79.4	8.4

The Mean Height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of June 1866.

Hourly Means, &c. of the Observations and of the Hygrometrical Elements dependent thereon.—*(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a Cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Mid-night.	80.3	3.1	78.1	5.3	0.943	10.12	1.84	0.85
1	80.3	2.9	78.3	4·9	.949	.18	.71	.86
2	80.5	2.5	78.7	4.3	.961	.33	.49	.87
3	80.5	2.3	78.9	3.9	.967	.39	.36	.88
4	80.5	2.2	79.0	3.7	.970	.42	.30	.89
5	80.6	2.1	79.1	3.6	.973	.45	.27	.89
6	80.6	2.1	79.1	3.6	.973	.45	.27	.89
7	81.1	2.6	79.3	4.4	.979	.51	.56	.87
8	81.4	3.8	78.7	6.5	.961	.26	2.35	.81
9	81.8	5.1	78.7	8.2	.961	.24	3.01	.77
10	82.0	6.5	78.1	10.4	.943	.02	.86	.72
11	82.3	7.5	77.8	12.0	.934	9.89	4.53	.69
Noon.	82.8	8.1	77.9	13.0	.937	.90	.99	.67
1	82.9	8.7	77.7	13.9	.931	.82	5.37	.65
2	83.1	8·8	77.8	14.1	.934	.85	.47	.64
3	82.9	9.0	77.5	14.4	.925	.76	.56	.64
4	82.9	8.1	78.0	13.0	.940	.93	.00	.67
5	82·5	7.5	78.0	12.0	.940	.95	4.55	.69
6	82.2	6.9	78.6	9.6	.958	10.17	3.59	.74
7	80.9	5.9	77.4	8.5	.922	9.83	.04	.76
8	80.4	4.7	77.1	8.0	.913	.76	2.81	.78
9	80.0	4.4	76.9	7 5	.908	.70	.61	.79
10	80.1	3.8	77.4	6.5	.922	.87	.26	.81
11	80.2	3.3	77.9	5.6	.937	10.04	1.96	.84

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of June 1866.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Guage 5 feet above Ground.	Prevailing direction of the Wind.	Max. Pressure of Wind.	General aspect of the Sky.
	o	Inches		lb	
1	136.0	...	S. & S. S. E.	0.80	Clear to 5 A. M. Scatd. \i to 9 A. M. Scatd. _i to 4 P. M. Clear afterwards.
2	132.0	0.32	S. S. E. & S.	2.00	Clear to 5 A. M. Scatd ⌒i to 4 P. M. Overcast afterwards. Thunder & Lightning at 6, 7 & 9 P. M. Rain from 5 to 9 P. M.
3	137.0	...	S. & S. E.	1.25	Overcast to 5 A. M. \i to 6 P. M. Clear afterwards.
4	135.0	...	S. by E. & S.	5.00	\i to 10 A. M. clear to 3 P. M. Overcast afterwards. Lightning to the E. at 9 P. M.
5	130.0	...	S. & S. S. W.	1.25	Scatd. \i to 11 A. M. Scatd. ⌒i to 5 P. M. Overcast afterwards. Lightning to the N at 7 & 8 P. M.
6	...	...	S. S. W. & S.	4.25	Clouds of various kinds. Thin rain at 9. P. M.
7	130.0	...	S. S. E. & S.	2.00	Clear to 3 A. M. Scatd. \i to 5 P. M. _i & _i afterwdrds.
8	132.0	...	S. by E. & variable	3.00	_i to 6 A. M. Thin clouds to 10 A. M. Clear to 5 P. M. Overcast afterwards. Lightning to N. E. at 8 & 9 P. M. Thunder at 8 P. M. Light rain at 10 & 11 P. M.
9	135.0	0.15	S. W. & S.	3.00	Overcast to 3 A. M. Scatd. ⌒i & _i to 5 P. M. Overcast afterwards. Lightning at 8 & 10 P. M. Thunder at 10 P. M. Rain at 9 P. M.
10	128.0	0.24	S. & S. S. E.	23.00	Overcast to 4 A. M. Scatd. ⌒i & _i to 5 P. M. Overcast afterwards. Rain from 7 to 9 P. M.
11	126.0	...	E. & S. S. E.	0.25	Scatd. \i to _i to 10 A. M. ⌒i to 7 P. M. Overcast afterwards. Lightning to the N. at 8 P. M.
12	128.0	...	E. S. E. & variable.	0.30	Overcast to 8 A. M. _i to 7 P. M. Clear afterwards. Thunder at 3 P. M. Thin rain from 7 to 9 A. M. & at 3 P. M.
13	136.0	...	E. N. E. & S. & E.	0.50	Clear to 4 A. M. \i to 8 A. M. Scatd. ⌒i afterwards. Lightning to the N. E. at 9 & 10 P. M.
14	131.0	...	E. S. E. & S. E.	0.50	Overcast to 3 A. M. Scatd. ⌒i to 7 P. M. Clear afterwards. Lightning to the N. at 1 A. M.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of June 1866.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	Max. Pressure of Wind.	General aspect of the Sky.
	o	Inches		lb	
15	...	0.38	E. S. E. & E.	0.80	Clear to 4 A. M. _i to 11 A. M. Overcast afterwards. Thunder at 1 P. M. Rain at 6 & 9 A. M. & from 1 to 5 P. M.
16	...	0.18	S. E. & E. by S.	0.80	Clear to 3 A. M. Overcast afterwards. Thunder at 7 A. M. Rain at 5, 6 & 7 A. M. & at 2 P. M.
17	...	0.53	S E & S S E & S by E	0.90	Overcast. Light rain from 2 to 9 A. M. & at 1 and 2 P. M. Lightning at 2, 3, & 4 A. M. Thunder at 2 & 11 A. M.
18	...	...	S.S.E.&S.S.W.&W.	0.50	_i & _i to 7 P. M. Overcast afterwards. Light rain at 11 A. M.
19	...	0.23	W. & S. W.	0.40	Overcast. Light rain after intervals.
20	...	*	W. S. W.	0.40	Overcast. Thin rain at 3 A. M. & from 7 to 11 P. M.
21	...	0.96	W. by S. & W. N. W.	0.60	Overcast. Light rain after intervals.
22	...	0.58	W. N. W. & S.	0.80	Overcast to 5 A. M. _i & ⌒i to 1 P. M. Overcast to 7 P. M. Clear afterwards. Rain at 3, 4 & 7 P. M.
23	121.0	2.41	S. S. W. & W.	0.80	⌒i to 3 A. M. Overcast to 11 A. M. ⌒i to 4 P. M. Overcast afterwards. Rain at 5 & from 8 to 11 P. M. Thunder & Lightning at 8 & 9 P. M.
24	...	0.28	W. by S. & W. S. W.	0.80	Overcast nearly the whole day. Light rain from 6 to 11 A. M.
25	117.0	...	W. S. W. & W. by S.	0.40	Clear to 5 A. M. _i to 9 A. M. ⌒i to 3 P. M. Overcast afterwards. Slight rain between 2 & 3 P. M.
26	117.8	...	S. W. & W. N. W.	0.40	⌒i & _i to 6 P. M. Overcast afterwards. Slight rain at 3, 10, & 11 P. M.
27	...	0.64	W. S. W. & N. N. W.	1.25	Overcast rain at 1, 4, 5 & from 7 to 9 A. M. & at 8 P. M.
28	...	...	W. S. W. & S. W.	0.50	Overcast. Slight rain at 6, 10 & 11 A. M.
29	126.0	...	W. by S. & N. N. W.	0.50	_i to 3 A. M. Overcast to 7 A. M. _i & ⌒i to 5 P. M. Overcast afterwards.
30	...	0.12	W. by N. & variable	0.50	Overcast to Noon. _i, to 5 P. M. Thin clouds afterwards. Rain at 6 & 7 A. M.

_i Cirri, — i Strati, ⌒i Cumuli, _i Cirro-strati, ~ i Cumulo strati, ~ i Nimbi, _i Cirro cumuli.

*Fell from 7 P. M. of the 20th to 10 P. M. of the 21st.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of June 1866.

Monthly Results.

	Inches.
Mean height of the Barometer for the month,... ...	... 29.518
Max. height of the Barometer occurred at 10 A. M. on the 2nd,	... 29.682
Min. height of the Barometer occurred at 4 P. M. on the 21st,	... 29.319
Extreme range of the Barometer during the month, ...	... 0.363
Mean of the daily Max. Pressures, ...	... 29.575
Ditto ditto Min. ditto	... 29.449
Mean daily range of the Barometer during the month, ...	... 0.126

	°
Mean Dry Bulb Thermometer for the month, ...	86.4
Max. Temperature occurred at 1 P. M. on the 8th	101.6
Min. Temperature occurred at 7 P. M. on the 10th	76.2
Extreme range of the Temperature during the month, ...	25.4
Mean of the daily Max. Temperature	92.8
Ditto ditto Min. ditto, ...	81.3
Mean daily range of the Temperature during the month,... ...	11.5

Mean Wet Bulb Thermometer for the month, ...	81.4
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer,	5.0
Computed Mean Dew-point for the month, ...	77.9
Mean Dry Bulb Thermometer above computed mean Dew-point. ...	8.5

	Inches.
Mean Elastic force of Vapour for the month, ...	0.937

	Troy grains.
Mean Weight of Vapour for the month	9.98
Additional Weight of Vapour required for complete saturation, ...	3.08
Mean degree of humidity for the month, complete saturation being unity	0.76

	Inches.
Rained 21 days,—Max. fall of rain during 24 hours	2.41
Total amount of rain during the month, ...	7.02
Total amount of rain indicated by the Gauge attached to the anemometer during the month.	6.25
Prevailing direction of the Wind, ... S. S. E. & S. & W. S. W.	

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of June 1866.

MONTHLY RESULTS.

Tables shewing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

Hour.	N.	Rain on.	N. by E.	Rain on.	N. N. E.	Rain on.	N. E.	Rain on.	E. N. E.	Rain on.	E. by N.	Rain on.	E.	Rain on.	E. by S.	Rain on.	E. S. E.	Rain on.	S. E.	Rain on.	S. S. E.	Rain on.	S. by E.	Rain on.	S.	Rain on.	S. by W.	Rain on.	S. S. W.	Rain on.	S. W.	Rain on.	W. S. W.	Rain on.	W. by S.	Rain on.	W.	Rain on.	W. by N.	Rain on.	W. N. W.	Rain on.	N. W.	Rain on.	N. N. W.	Rain on.	N. by W.	Rain on.
	No. of days																																														
Mid night							1										5		2		3		3		2		4		2		3				1											
1							1						4		1				3		1		4		2		4		2		4	1			1											
2							1				1				1				1		3		3	1	2		4		2		5															
3							1				1				1				1		4	1	3		2		4		2		4	1														
4									1	2	2				1				2	1	3		3		2		4		2		3															
5									1	2	2				1				3	1	2		3		2		4		2		3															
6	1	1					1									1		2	4	1	3		4		2		4		2		3														
7			1	1			1			1							1		3	1	4	1	5		2		4		2		3														
8	3	1					1										1		3		3		1		1		4		2		3														
9	1		1							1									4	2	1		1		1		4		2		3														
10					1	1	1												2		1		1		1		3		2		3														
11							1						2				1		3		2		1		1		5		2		4														
Noon.																																														
1									1				1				2		3		2	1	3		2		3		2		4														
2									1	2					1	1	2	1	2		2		5		1		6		2		3														
3															1		2		4		3	1	2		1		3		2		3														
4					1													1	4	1	3		5		2		3		2		4														
5								1									1		1		4		4		2		3		2		3														
6															1				2		4		5		2		4		1		3														
7					1							2							2		4		1		1		4		2		3														
8					1	1	1					1			1				2		2		4	1	3		6		2		5														
9							1	1	1						1				2		2		3		2		4		1		3														
10	1				1				1						1				2		4	1	2		1		4		1		2														
11	1																4		3		3		4		2		4		1		4														

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July 1866.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the sea level, 18.11 feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.602	29.642	29.551	0.091	77.7	81.0	75.6	5.4
2	.597	.646	.537	.109	76.2	77.8	75.2	2.6
3	.569	.613	.517	.096	79.1	85.6	74.4	11.2
4	.538	.576	.476	.100	81.2	85.4	78.0	7.4
5	.529	.580	.484	.096	81.3	86.6	77.4	9.2
6	.604	.665	.564	.101	81.6	87.6	78.4	9.2
7	.635	.698	.570	.128	83.2	89.0	79.8	9.2
8	.572	.634	.482	.152	85.1	93.0	80.0	13.0
9	.520	.575	.433	.142	85.8	93.2	80.6	12.6
10	.494	.547	.436	.111	86.2	91.6	83.2	8.4
11	.505	.558	.441	.117	85.1	90.5	81.0	9.5
12	.555	.616	.506	.110	84.5	90.0	81.0	9.0
13	.646	.697	.593	.104	84.6	89.8	81.2	8.6
14	.660	.714	.602	.112	85.0	90.4	80.2	10.2
15	.575	.651	.489	.162	83.4	86.0	81.2	4.8
16	.521	.560	.469	.091	84.2	86.7	82.0	4.7
17	.555	.597	.522	.075	83.2	91.0	78.6	12.4
18	.563	.600	.516	.084	82.9	86.2	80.4	5.8
19	.580	.631	.509	.122	83.3	88.6	79.0	9.6
20	.604	.654	.547	.107	82.3	86.0	80.2	5.8
21	.615	.662	.555	.107	82.7	86.8	79.2	7.6
22	.587	.634	.534	.100	83.4	87.0	79.8	7.2
23	.614	.664	.545	.119	84.5	89.4	80.0	9.4
24	.638	.681	.584	.097	84.6	87.8	81.8	6.0
25	.634	.670	.573	.097	84.0	90.4	81.6	8.8
26	.597	.645	.517	.128	82.2	85.0	81.2	3.8
27	.597	.639	.533	.106	83.7	88.6	79.2	9.4
28	.611	.668	.555	.113	83.2	87.5	80.4	7.1
29	.631	.691	.560	.131	84.3	90.2	79.8	10.4
30	.629	.673	.573	.100	84.8	90.8	80.3	10.5
31	.631	.668	.575	.093	83.0	87.8	80.6	7.2

The Mean Height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived, from the hourly observations, made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July 1866.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of vapour.	Mean Weight of Vapour in a Cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	75.3	2.4	73.6	4.1	0.817	8.86	1.24	0.88
2	75.0	1.2	74.2	2.0	.832	9.05	0.61	.94
3	77.0	2.1	75.5	3.6	.868	.38	1.15	.89
4	78.9	2.3	77.3	3.9	.919	.90	.31	.88
5	78.1	3.2	75.9	5.4	.879	.47	.77	.84
6	79.3	2.3	77.7	3.9	.931	10.02	.32	.88
7	80.4	2.8	78.4	4.8	.952	.21	.68	.86
8	81.0	4.1	78.1	7.0	.943	.08	2.49	.80
9	81.6	4.2	78.7	7.1	.961	.26	.57	.80
10	82.1	4.1	79.2	7.0	.976	.41	.58	.80
11	80.8	4.3	77.8	7.3	.934	9.99	.58	.80
12	80.1	4.4	77.0	7.5	.910	.73	.62	.79
13	80.6	4.0	77.8	6.8	.934	.99	.40	.81
14	80.7	4.3	77.7	7.3	.931	.96	.57	.80
15	81.2	2.2	79.7	3.7	.992	10.63	1.33	.89
16	81.4	2.8	79.4	4.8	.983	.51	.73	.86
17	80.4	2.8	78.4	4.8	.952	.21	.68	.86
18	80.1	2.8	78.1	4.8	.943	.12	.67	.86
19	80.8	2.5	79.0	4.3	.970	.42	.51	.87
20	80.6	1.7	79.4	2.9	.983	.56	.02	.91
21	80.4	2.3	78.8	3.9	.964	.36	.36	.88
22	80.2	3.2	78.0	5.4	.940	.09	.87	.84
23	81.4	3.1	79.2	5.3	.976	.45	.90	.85
24	81.5	3.1	79.3	5.3	.979	.48	.91	.85
25	81.1	2.9	79.1	4.9	.973	.42	.75	.86
26	80.3	1.9	79.0	3.2	.970	.44	.10	.91
27	80.3	3.4	77.9	5.8	.937	.04	2.03	.83
28	80.0	3.2	77.8	5.4	.934	.03	1.86	.84
29	80.7	3.6	78.2	6.1	.946	.13	2.15	.83
30	80.5	4.3	77.5	7.3	.925	9.90	.56	.80
31	79.9	3.1	77.7	5.3	.931	10.00	1.82	.85

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July 1866.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	29.605	29.674	29.515	0.159	81.2	84.5	76.0	8.5
1	.593	.663	.491	.172	81.0	83.8	75.8	8.0
2	.583	.656	.466	.190	80.7	83.5	75.4	8.1
3	.573	.650	.456	.194	80.4	83.3	74.8	8.5
4	.570	.659	.476	.183	80.2	83.2	74.6	8.6
5	.577	.664	.480	.184	80.4	83.4	74.4	9.0
6	.591	.680	.493	.187	80.6	83.4	74.5	8.9
7	.603	.700	.504	.196	81.2	84.0	74.6	9.4
8	.618	.705	.516	.189	82.5	85.3	75.8	9.5
9	.626	.712	.530	.182	84.1	87.4	76.6	10.8
10	.629	.714	.535	.179	84.9	88.8	77.0	11.8
11	.620	.702	.529	.173	85.7	90.2	76.8	13.4
Noon.	.608	.686	.509	.177	86.1	91.2	77.2	14.0
1	.591	.675	.491	.184	86.5	92.2	76.4	15.8
2	.569	.657	.460	.197	86.3	93.0	76.6	16.4
3	.548	.632	.433	.199	85.9	93.2	75.2	18.0
4	.536	.616	.439	.177	85.6	91.0	75.6	15.4
5	.534	.608	.443	.165	85.3	89.6	75.5	14.1
6	.542	.616	.456	.160	84.5	88.0	75.5	12.5
7	.560	.637	.480	.157	83.3	86.0	75.4	10.6
8	.581	.660	.505	.155	82.7	85.2	75.6	9.6
9	.602	.684	.527	.157	82.3	84.7	75.6	9.1
10	.616	.697	.540	.157	81.8	85.2	75.6	9.6
11	.616	.689	.542	.147	81.4	85.0	75.6	9.4

The Mean Height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July 1866.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a Cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Mid-night.	79.4	1.8	78.1	3.1	0.943	10.16	1.05	0.91
1	79.3	1.7	78.1	2·9	.943	.16	0.98	.91
2	79.1	1.6	78.0	2.7	.940	.13	.91	.92
3	79.1	1.3	78.2	2.2	.946	.21	.73	.93
4	78.9	1.3	78.0	2.2	.940	.15	.73	.93
5	79.0	1.4	78.0	2.4	.940	.15	.79	.93
6	79.2	1.4	78.2	2.4	.946	.21	.80	.93
7	79.5	1.7	78.3	2.9	.949	.22	.99	.91
8	80.2	2.3	78.6	3.9	.958	.30	1.34	.89
9	80.7	3.4	78.3	5.8	.949	.16	2.05	.83
10	80.8	4.1	77.9	7.0	.937	.02	.47	.80
11	81.2	4.5	78.0	7.7	.940	.03	.77	.78
Noon.	81.2	4.9	77.8	8.3	.934	9.97	.98	.77
1	81.2	5.3	78.0	8.5	.940	10.01	3.09	.76
2	81.1	5.2	77.5	8.8	.925	9.86	.16	.76
3	81.1	4.8	77.7	8.2	.931	.94	2.93	.77
4	80.8	4.8	77.4	8.2	.922	.85	.91	.77
5	80.8	4.5	77.6	7.7	.928	.91	.73	.78
6	80.3	4.2	77.4	7.1	.922	.87	.48	.80
7	79.8	3.5	77.3	6.0	.919	.86	.07	.83
8	79.8	2.9	77.8	4.9	.934	10.03	1.69	.86
9	79.7	2.6	77.9	4.4	.937	.08	.50	.87
10	79.6	2.2	78.1	3.7	.943	.14	.26	.89
11	79.6	1.8	78.3	3.1	.949	.22	.05	.91

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July 1866.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	Max. Pressure of Wind.	General aspect of the Sky.
	o	Inches		lb	
1		0.80	W. & S. W.	4.20	Overcast. Rain day & night.
2		*4.20	S. W. & W. N. W.	2.60	Overcast. Rain day & night.
3		†1.32	W. S. W. & S. S. E.	2.25	Overcast to 11 A. M. Scatd. |i & |i afterwards. Rain from 5 to 10 A. M.
4			S. E. & E. S. E.	2.00	Scatd. |i to 4 A. M. Overcast to 5 P. M. clear afterwards. Light rain at 6 & 10 A. M. & at 1 & 3 P. M.
5	118.4	0.13	S. S. E. & S. by E.	1.50	Overcast to 8 A. M. ⌒i afterwards. Light rain at 2, 7 & 10 A. M. and at 4 & 10 P. M.
6	...	0.87	S. by E. & S. by W.	1.00	Overcast to 2 P. M. Scatd. ⌒i to 6 P. M. clear afterwards. Rain at 2, 5, 8 & 11 A. M. & at 2 & 5 P. M.
7	...	0.61	S.S.E.&S.& S.byW.	0.25	Clear to 4 A. M. ⌒i to 7 P. M. clear afterwards. Rain between 10 & 11 A. M. & at 2 P. M.
8	119.0	...	S. by W. & S.	0.30	Overcast to 5 A. M. |i to 11 A. M. ⌒i afterwards. Light rain at 4 A. M.
9	134.0	...	S. S. W. & S.	0.50	|i to 4 P. M. overcast afterwards Thunder at 6 P. M. Lightning to the N. W. at 8 P. M.
10	125.4		S. S. E. & S. E.	0.50	Scatd. ⌒i to 7 P. M. clear afterwards.
11	128.0	0.10	S. E. & E. by S.	1.20	Clear to 3 A. M. Scatd. ⌒i to 8 P. M. clear afterwards. Rain between 10 & 11 A. M. & between 2 & 3 P. M.
12	112.0	0.09	S. E. & E. S. E.	2.10	Clear to 3 A. M. |i to 11 A. M. Scatd. ⌒i & ⌣i to 5 P. M. |i afterwards. Rain at 5 A. M. & between 9 & 10 A. M.
13	129.8	...	S. E. & S. S. E.	0.70	Scatd. ⌒i & |i to 7 P. M. clear afterwards. Light rain at 6½ & 11½ A. M.
14	121.0	...	S. & S. S. E.	0.50	Clear to 4 A. M. Scatd. ⌒i & |i to 7 P. M. clear afterwards. Light rain at 6 P. M.
15		0.16	S. by E. & S.	0.50	Scatd |i to 4 A. M. |i & ⌒i to 8 P. M. clear afterwards. Light rain from 9 to 11 A. M.

*Fell from 1 P. M. of the 1st to 4 P. M. of the 2nd.
† Do. 5 P. M. of the 2nd. to 10 A. M. of the 3rd.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July 1866.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	Max. Pressure of Wind.	General aspect of the Sky.
	o	Inches		lb	
16	...	0.18	S.	1.00	⌒i to 3 A. M. \i to 10 A. M. overcast to 7 P. M. clear afterwards. Rain from 9 A. M. to Noon.
17	118.0	0.78	S. S. W. & S. by W	4.30	Clear to 3 A. M. \i to 2 P. M. overcast afterwards. Rain from 3 to 5 P. M.
18	...	...	S. W.	1.00	Overcast, slight rain at 6½, 7½ & 10 A. M.
19	...	0.88	S. & S. W. & W.	1.00	Overcast nearly the whole day. Rain from 2 to 6 A. M. & at 8 A. M.
20	...	0.85	S. by E.&S.&S.S.E.	0.20	Overcast to 4 P. M. ⌒i afterwards. Rain at 10 & 11, A. M. & at 1, 3, 4 & 7 P. M.
21	...	...	S. & S. S. E.	0.50	⌒i & \i nearly the whole day. Slight rain at 7 A. M. & at 3 P. M.
22	...	0.18	S. & S. S. E.	0.50	\i & ⌒i. Rain at 6 & 10½ A. M. & between Noon & 1 P. M.
23	113.7	...	S. & S. S. W.	0.50	⌒i & \i.
24	...	...	S. S. W. & S.	0,50	Scatd. ⌒i to 5 A. M. overcast afterwards.
25	...	0.50	S. by W. & S.	0.60	Overcast nearly the whole day. Rain at 3, 10 & 11 A. M. & from 2 to 4 P. M.
26	...	1.94	S. & S. S. E.	0.40	Overcast nearly the whole day, Rain at 6 & from 8 to 11½ A. M.
27	120.0	...	S. byW. & E. S. E.	0.40	Scatd. \i to 10 A. M. ⌒i to 5 P. M. Scatd. ⌒i & \i afterwards.
28	114.0	...	S. S. E. & S.	0.70	⌒i to 4 P. M. Scatd. \i & ⌒i afterwards. Light rain at 5 & 7 A. M. & at 3 P. M.
29	134.0	...	S. E. & S. S. E.	0.70	Scatd. ⌒i to 4 P. M. Scatd. \i afterwards. Rain between midnight & 1 A. M. & at 4 P. M.
30	127.0	0.10	E. S. E. & S. E.	0.40	Scatd. \i to 8 A. M. ⌒i to 4 P. M. Scatd. \i afterwards. Rain at 11 A. M. & at 1 P. M.
31	...	...	E. N. E. & N. E.	0.25	Clear to 5 A. M. \i & \i to 10 A. M. Overcast afterwards. Thunder at 2 P. M. Light rain from 1 to 3 P. M.

\i Cirri, ⌒i Strati, ⌒i Cumuli, ⌒i Cirro-strati, ⌒i Cumulo strati, \i Nimbi, \i Cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July 1866.

Monthly Results.

	Inches.
Mean height of the Barometer for the month, ...	29.587
Max. height of the Barometer occurred at 10 A. M. on the 14th, ...	29.714
Min. height of the Barometer occurred at 3 P. M. on the 9th, ...	29.433
Extreme range of the Barometer during the month, ...	0.281
Mean of the daily Max. Pressures, ...	29.637
Ditto ditto Min. ditto	29.527
Mean daily range of the Barometer during the month, ...	0.110

	°
Mean Dry Bulb Thermometer for the month, ...	83.1
Max. Temperature occurred at 3 P. M. on the 9th	93.2
Min. Temperature occurred at 5 A. M. on the 3rd	74.4
Extreme range of the Temperature during the month, ...	18.8
Mean of the daily Max. Temperature	88.0
Ditto ditto Min. ditto, ...	79.7
Mean daily range of the Temperature during the month,... ...	8.3

Mean Wet Bulb Thermometer for the month, ...	80.1
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer,	3.0
Computed Mean Dew-point for the month, ...	78.0
Mean Dry Bulb Thermometer above computed mean Dew-point. ...	5.1

	Inches.
Mean Elastic force of Vapour for the month, ...	0.940

	Troy grain.
Mean Weight of Vapour for the month	10.09
Additional Weight of Vapour required for complete saturation, ...	1.77
Mean degree of humidity for the month, complete saturation being unity	0.85

	Inches.
Rained 26 days,—Max. fall of rain during 24 hours	3.43
Total amount of rain during the month, ...	13.42
Total amount of rain indicated by the Gauge attached to the anemometer during the month.	12.06
Prevailing direction of the Wind, ... S. & S. S. E. & S. E.	

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of July 1866.

MONTHLY RESULTS.

Tables shewing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

Hour.	N.	Rain on.	N. by E.	Rain on.	N. N. E.	Rain on.	N E.	Rain on.	E. N. E.	Rain on.	E. by N.	Rain on.	E.	Rain on.	E. by S.	Rain on.	E. S. E.	Rain on.	S. E.	Rain on.	S. S. E.	Rain on.	S. by E.	Rain on.	S.	Rain on.	S. by W.	Rain on.	S. S. W.	Rain on.	S. W.	Rain on.	W. S. W.	Rain on.	W. by S.	Rain on.	W.	Rain on.	W. by N.	Rain on.	W. N. W.	Rain on.	N. W.	Rain on.	N. N. W.	Rain on.	N. by W.	Rain on.
	No. of days																																														
Mid night	1	1															4		4		5		4		6		3		1				12					1	1									
1	1	1													1		2		6	1	5		3		7		2				1		1			1	1									
2	1	1											1		1		2		3		7	1	3	1	6		3						1			1	1									
3	1	1													2		2		6		5		3		4		3		2	1	2		1			1	1									
4										1					4	1	2		4		4		3		5	1	4	1	1		1		1			1										
5								1					1		2	1	2	1	3		6		1		7	2	4		1		1		1								1	1				
6							1						1	1	1		3		5	1	3	1	2		5	1	5	1	2	1	2		1								1	1				
7							1								1		3		4	2	5	2	1		2		6		1		1		1													
8				•			1										3		4		3		1	1	6	1	1		3		5		3			1		1							
9							1				•						2		7		1		1		6	1			4		6		3			1		1							
10							1								1	1	2		5		2	2	1		5	2	1		3	2	5		2	3												
11								1							1				6	1	3	1	3	1	4	2	2	1	2	1	5		2	3	1						1	1				
Noon.										1						1	1		4	1	2		4		7	1			3		2		1							1	1				
1								1	1		1			1	1		4	1	4				5	1	2	1	3		5		3		1								1	1				
2											1	1			1		3		3		3	1	2		6				6	2	3		1			1										
3								1	1								1		7	2	1		5	1	9	1			3	1	2		1			1									
4													1		1	1	1	1	6	1	2		3	1	7		1		4	1	3		1								1	1				
5													1				1		4		7		4	2	4		1		5		2		1	1	1	1									
6													1				1		4		6		5		4		2	1	2		3		1								1				
7								1							1				3		5	1	6		7				4		3		1			1	1								
8								1							1		1		2		9		1		7		2		5		1		1			1	1								
9								1							1		1		3		7		2		8		3		2		2		1			1	1								
10								1							1		4		1		6	1	2		9		3		1		2	2		1											
11								1									2		5		6		2		8		3		1																

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of August 1866.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of vapour.	Mean Weight of Vapour in a Cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	79.8	3.4	77.4	5.8	0.922	9.89	2.00	0.83
2	79.1	1.6	78.0	2.7	.940	10.13	0.91	.92
3	79.0	1.4	78.0	2.4	.940	.15	.79	.93
4	78.5	1.5	77.4	2.6	.922	9.95	.86	.92
5	79.8	1.7	78.6	2.9	.958	10.32	.99	.91
6	80.0	2.2	78.5	3.7	.955	.27	1.27	.89
7	79.2	2.0	77.8	3.4	.934	.07	.14	.90
8	79.0	1.9	77.7	3.2	.931	.04	.06	.91
9	80.1	3.5	77.6	6.0	.928	9.95	2.08	.83
10	80.9	3.4	78.5	5.8	.955	10.23	.05	.83
11	81.3	3.3	79.0	5.6	.970	.37	.02	.84
12	80.0	3.6	77.5	6.1	.925	9.92	.11	.83
13	79.9	3.1	77.7	5.3	.931	10.00	1.82	.85
14	80.3	3.0	78.2	5.1	.946	.15	.78	.85
15	80.4	3.0	78.3	5.1	.949	.18	.78	.85
16	79.8	2.6	78.0	4.4	.940	.11	.50	.87
17	80.3	3.2	78.1	5.4	.943	.12	.88	.84
18	79.7	2.9	77.7	4.9	.931	.00	.68	.86
19	81.0	2.8	79.0	4.8	.970	.40	.70	.86
20	81.5	1.7	80.3	2.9	1.011	.84	.05	.91
21	80.2	1.8	78.9	3.1	0.967	.41	.06	.91
22	80.8	2.9	78.8	4.9	.964	.34	.73	.86
23	81.2	3.4	78.8	5.8	.964	.31	2.08	.83
24	81.3	3.7	78.7	6.3	.961	.29	.24	.82
25	80.7	3.6	78.2	6.1	.946	.13	.15	.83
26	80.4	3.2	78.2	5.4	.946	.15	1.88	.84
27	79.9	2.4	78.2	4.1	.946	.17	.41	.88
28	79.4	2.6	77.6	4.4	.928	9.99	.48	.87
29	79.8	2.1	78.3	3.6	.949	10.20	.24	.89
30	80.6	3.5	78.1	6.0	.943	.10	2.11	.83
31	82.1	4.1	79.2	7.0	.976	.41	.58	.80

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of August 1866.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	29.601	29.760	29.399	0.361	81.3	83.7	79.0	4.7
1	.589	.751	.389	.362	80.9	83.8	79.2	4.6
2	.580	.744	.379	.365	80.7	83.0	79.2	3.8
3	.570	.738	.372	.366	80.5	82.6	78.9	3.7
4	.566	.741	.368	.373	80.2	82.2	78.2	4.0
5	.574	.750	.378	.372	80.1	81.8	77.4	4.4
6	.588	.771	.378	.393	80.3	82.4	77.8	4.6
7	.603	.801	.393	.408	81.0	83.2	78.8	4.4
8	.616	.809	.411	.398	82.0	84.8	79.0	5.8
9	.626	.816	.424	.392	83.6	87.0	79.6	7.4
10	.629	.822	.432	.390	84.7	88.4	79.2	9.2
11	.618	.812	.408	.404	86.1	89.6	80.5	9.1
Noon.	.603	.796	.384	.412	85.7	90.4	81.4	9.0
1	.583	.766	.378	.388	86.1	91.0	81.2	9.8
2	.560	.733	.353	.380	85.8	91.2	79.2	12.0
3	.540	.713	.339	.374	85.8	90.8	79.4	11.4
4	.525	.694	.332	.362	85.7	91.0	79.6	11.4
5	.527	.693	.343	.350	85.0	91.8	80.0	11.8
6	.540	.713	.355	.358	83.8	89.7	79.6	10.1
7	.558	.723	.367	.356	83.1	87.7	79.2	8.5
8	.583	.748	.388	.360	82.6	86.4	79.6	6.8
9	.604	.758	.400	.358	82.2	85.6	79.6	6.0
10	.617	.809	.411	.398	81.9	84.8	79.6	5.2
11	.613	.767	.415	.352	81.6	84.4	79.2	5.2

The Mean Height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of August 1866.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a Cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Mid-night.	79.7	1.6	78.6	2.7	0.958	10.32	0.92	0.92
1	79.5	1.4	78.5	2.4	.955	.31	.79	.93
2	79.4	1.3	78.5	2.2	.955	.31	.73	.93
3	79.2	1.3	78.3	2.2	.949	.24	.74	.93
4	79.0	1.2	78.2	2.0	.946	.21	.67	.94
5	78.9	1.2	78.1	2.0	.943	.18	.66	.94
6	79.0	1.3	78.1	2.2	.943	.18	.73	.93
7	79.5	1.5	78.4	2.6	.952	.25	.89	.92
8	80.0	2.0	78.6	3.4	.958	.32	1.15	.90
9	80.5	3.1	78.3	5.3	.949	.18	.85	.85
10	80.8	3.9	78.1	6.6	.943	.08	2.34	.81
11	81.5	4.6	78.3	7.8	.949	.12	.83	.78
Noon.	81.3	4.4	78.2	7.5	.946	.09	.71	.79
1	81.6	4.5	78.4	7.7	.952	.15	.80	.78
2	81.2	4.6	78.0	7.8	.940	.03	.80	.78
3	81.2	4.6	78.0	7.8	.940	.03	.80	.78
4	81.2	4.5	78.0	7.7	.940	.03	.77	.78
5	80.7	4.3	77.7	7.3	.931	9.96	.57	.80
6	80.4	3.4	78.0	5.8	.940	10.07	.03	.83
7	80.2	2.9	78.2	4.9	.946	.15	1.71	.86
8	80.1	2.5	78.3	4.3	.949	.20	.48	.87
9	79.9	2.3	78.3	3.9	.949	.20	.34	.88
10	80.0	1.9	78.7	3.2	.961	.35	.09	.91
11	79.9	1.7	78.7	2.9	.961	.35	0.99	.91

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of August 1866.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Guage 5 feet above Ground.	Prevailing direction of the Wind.	Max. Pressure of Wind.	General aspect of the Sky.
	o	Inches		lb	
1	126.0	0.34	E. N. E. & E.	0.50	⸌i nearly the whole day. Rain between 11 & Noon & between 5 & 6 P. M.
2	...	0.43	E. S. E. & E.	0.80	Overcast. Rain constantly.
3	...	0.67	E. S. E. &S. by E.	0.75	Overcast. Rain at 2, 5, 7, 9, & 10 A. M. & from 1 to 3 P. M. Thunder at 8 A. M.
4	...	1.56	S. S. E. & S. by E.	0.75	Overcast. Rain from 4 A. M. to 5 P. M. Thunder & Lightning at 4 A. M.
5	...	0.21	W.N.W. & S. S. E.	0.40	Clear to 2 A. M. Overcast to 10 A. M. ⸌i to 8 P. M. Overcast afterwards. Rain at 10 A. M. at 2 & 3 P.M. Thunder at 2 & 3 P. M. Lightning at 9 P. M.
6	...	0.44	N. N. E.	0.50	Overcast to 11 A. M. ⸌i to 8 P. M. Overcast afterwards. Rain at 8 & 11 A. M. & at 2, 6 & 9 P. M. Lightning at midnight.
7	...	0.58	N. N. E. & E. S.E.	2.12	Overcast. Rain constantly.
8	...	0.18	E. S. E. & S. S. E.		Overcast to 3 P. M. ⁀i to 6 P. M., clear afterwards. Rain from midnight to 4 A. M. at 8 A. M. & at 3 P. M.
9	130.0	0.12	S. S. E. & S. E.		Scatd. ⁀i to 5 P. M. clear afterwards. Rain at 4, 6 & 11 A. M. & between 4 & 5 P. M.
10	125.0	...	S.S.E.&S.E.&SSW.		Clear to 7 A. M. Scatd. ⁀i to 8 P. M. clear afterwards. Light rain at 5 P. M.
11	126.0	...	S. S. W. & variable & S. by E.		Clear to 2 A. M. ⸌i to 7 P. M. clear afterwards. Light rain between Noon & 1 P. M. & at 6 P. M.
12	124.0	0.25	S. E. & E.		Clear to 4 A. M. Scuds from E to 11 A. M. Scatd. ⁀i to 8 P. M. clear afterwards. Rain at 7, 11 & Noon.
13	130.0	0.17	S. S. E. & E. by S,		Scatd. ⸌i & ⸍i to 6 A. M. clouds of different kinds afterwards. Rain at 9 & between 11 & Noon & between 10 & 11 P.M.
14	...	...	S. E. & S. by E.		Overcast to 10 A. M. ⸌i & ⁀i to 6 P. M. clear afterwards. Slight rain at 3 & 4 A. M.
15	131.0	0.14	S. S. E. & S. E.		Clear to 3 A. M. ⸌i afterwards. Rain between 5 & 6 AM & at 2 PM.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of August 1866.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Guage 5 feet above Ground.	Prevailing direction of the Wind.	Max. Pressure of Wind.	General aspect of the Sky.
	o	Inches		lb	
16	...	...	S. S. W.	...	Overcast to 3 P. M. \~i to 7 P. M. \i afterwards. Light rain at 2 & 9½ A. M. & at 1½ P. M.
17	...	...	S. S. W. & S. S. E.	...	\~i nearly the whole day.
18	...	1.36	S. S. W. & S. W.		\~i to 3 A. M. \~i to 10 A. M. Overcast afterwards. Rain at 11 A. M. 12½ P. M. & from 5 to 11 P. M.
19	...	...	S. S. W. & variable	Instruments out of order	Overcast nearly the whole day. Lightning & Thunder at midnight. Slight rain from midnight to 2 A. M. & at 6 P. M.
20	...	0.44	W. & variable		Overcast to 4 P. M. ⌒i & \~i afterwards. Rain at 2 & 3 A. M. & at Noon.
21	...	0.63	S. &. S. by W.		Overcast nearly the whole day. Rain from midnight to 2 & at 5 & from 7 to 9 A. M.
22	...	...	S. by E. &. S. S. E.		Scatd. \i to 8 A. M. ⌒i to 1 P.M. Overcast to 6 P. M. Thin clouds afterwards.
23	133.0	...	S. S. E. & S. by E.		\~i to 9 A. M. ⌒i afterwards.
24	...		E. &. E. S. E.		\~i & ⌒i nearly the whole day. Light, rain at 3 P. M.
25	...	0.12	E. N. E. & E. S. E.		⌒i & \~i nearly the whole day. Rain at 3 & 4 P. M.
26	...	0.10	S. E. & E. N. E.		Scatd. clouds to 7 A. M. ⌒i to Noon. Overcast at 5 P. M. Scatd. clouds afterwards, Rain at 1 & 4½ P. M.
27	...	0.30	E. & S. S. E.		Scatd. clouds to 11 A. M. Overcast to 3 P. M. Thin clouds afterwards, Rain at 11½ A. M.
28	...	0.30	S. E. & S. S. E.		Overcast to 6 A. M. \~i & Scuds from E to 11 A.M. Thin clouds to 4 P. M. Scatd. ⌒i afterwards. Rain from 2 to 5 A. M. at 10 A. M. Noon 3½ P. M. & at 10½ P. M.
29	...	3.14	S. by W. & variable.		Overcast to 1 P. M. ⌒i to 6 P. M. clear afterwards, rain from 3 to 5 A.M. at 8 A.M. & at 3½ P.M.
30	133.0	...	S. & S. S. W.		⌒i to 7 P. M. clear afterwards. Light rain at Noon.
31	134.6	...	S.S. W. & S. by W.		Clear to 2 A. M. Scatd. ⌒i to 6 P. M. clear afterwards.

\~i Cirri, —i Strati, ⌒i Cumuli, _i Cirro-strati, ⌒~i Cumulo strati, \~i Nimbi, \~i Cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of August 1866.

Monthly Results.

	Inches.
Mean height of the Barometer for the month,... ...	29.584
Max. height of the Barometer occurred at 10 A. M. on the 30th,	29.822
Min. height of the Barometer occurred at 4 P. M. on the 7th,	29.332
Extreme range of the Barometer during the month, ...	0.490
Mean of the daily Max. Pressures, ...	29.642
Ditto ditto Min. ditto	29.519
Mean daily range of the Barometer during the month, ...	0.123

	°
Mean Dry Bulb Thermometer for the month, ...	82.9
Max. Temperature occurred at 5 P. M. on the 31st, ...	91.8
Min. Temperature occurred at 5 A. M. on the 28th, ...	77.4
Extreme range of the Temperature during the month, ...	14.4
Mean of the daily Max. Temperature	87.6
Ditto ditto Min. ditto, ...	79.9
Mean daily range of the Temperature during the month,... ...	7.7

Mean Wet Bulb Thermometer for the month, ...	80.2
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer,	2.7
Computed Mean Dew-point for the month, ...	78.3
Mean Dry Bulb Thermometer above computed mean Dew-point. ...	4.6

	Inches.
Mean Elastic force of Vapour for the month, ...	0.949

	Troy grain.
Mean Weight of Vapour for the month	10.18
Additional Weight of Vapour required for complete saturation, ...	1.61
Mean degree of humidity for the month, complete saturation being unity	0.86

	Inches.
Rained 27 days,—Max. fall of rain during 24 hours	3.14
Total amount of rain during the month, ...	11.48
Total amount of rain indicated by the Gauge attached to the anemometer during the month.	10.67
Prevailing direction of the Wind, ...	S. S. E. E. S. E. & S. by E.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of August 1866

MONTHLY RESULTS.

Tables shewing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

Hour.	N.	Rain on.	N. by E.	Rain on.	N. N. E.	Rain on.	N. E.	Rain on.	E. N. E.	Rain on.	E. by N.	Rain on.	E.	Rain on.	E. by S.	Rain on.	E. S. E.	Rain on.	S. E.	Rain on.	S. S. E.	Rain on.	S. by E.	Rain on.	S.	Rain on.	S. by W	Rain on.	S. S. W.	Rain on.	S. W.	Rain on.	W. S. W	Rain on.	W. by S.	Rain on.	W.	Rain on.	W. by N.	Rain on.	W. N. W.	Rain on.	N. W.	Rain on.	N. N. W.	Rain on.	N. by W.	Rain on.
	No. of days																																														
Mid night							1	1	1				2	1	1		5		2		5		6	1	1		2		3										1									
1	1						1		1		1		4	1	1		4	1	1		5		4		1		1		4	1	1																	
2									2				4		2	1	2	1	2	1	5		4		1		2	2	3		1	1																
3									2				4		3		3		3	1	5		1		1		1		4																			
4							1	1	3		1		4		1		4		3		6	2	1		3				4						1												
5							1	1	3		1		4		1		4		2		4		2	1	1				5	1					1												
6							3	1	2				4		1		4		1		5		2	1	3	1	1		4	1			1		1												
7							1	1	3		1		3		1		6		1		3		1		4	1	1		3	1	1		1		1												
8						1	1	1	3				2		2		6		1		5	1			1		3	1	1		1		1		2												
9							1	1	2				4				3				5	1	3		2	1	4	2	1				1		1												
10			1		1		1		2		1		1				4	1	5	2	5				3				2		4		2		1										
11							3	2	3		1	1	2				3		7		2	2	2		2		2		1				2	1	1										
Noon.			1						3		1	1	2	1	1		2		5	3	2	1	5	2			2		3		1		1												
1	1								3	1	1		2	1	1		3	1	6	1	3		2	1	2		2		2		2	2		1											
2			1	1		1			2		1		2	1	1		4	1	3		4	1	3		3	1	1		3	1	2	2			1									
3					1				1				1				3	1	5	1	6	4	4		1		3		2		1	1					1		1					
4							1		1				3	1	2	1	2		5	1	4		2	1	2		1		5		1	1												
5					1				1						2		4		1		6	1	3	1	4	1	3	1	3		1	1			1									
6					1	1							1		3	2	2	1	2		4		6		5	1			5	1	1				1									
7					1								2		1		2		2		4		7		3		5	1	3						1									
8					1												4		3		5		7		4		2		4						1								
9			1	1	1								1				4	2	2		6		6		2		2		5						1	1							
10					1				1								3	1	4		5		7		1		2		5						1	1							
11					1										1		5	2	3	2	6		5		1		2		5						1	1							

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September 1866.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 31″ East.

Height of the Cistern of the Standard Barometer above the sea level, 18.11 feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.669	29.730	29.582	0.148	87.0	93.2	82.2	11.0
2	.646	.715	.576	.139	86.8	93.0	82.2	10.8
3	.598	.669	.517	.152	86.5	92.0	82.0	10.0
4	.570	.627	.494	.133	83.1	87.2	80.0	7.2
5	.612	.683	.550	.133	83.3	89.4	79.9	9.5
6	.666	.726	.615	.111	83.9	88.4	80.6	7.8
7	.667	.726	.584	.142	85.7	90.2	81.6	8.6
8	.571	.652	.473	.179	83.5	89.0	79.6	9.4
9	.498	.555	.444	.111	80.8	82.8	79.0	3.8
10	.548	.607	.504	.103	83.3	87.3	80.2	7.1
11	.626	.687	.569	.118	83.2	87.0	80.6	6.4
12	.615	.672	.534	.138	84.2	90.1	80.5	9.6
13	.638	.691	.586	.105	84.9	91.8	81.8	10.0
14	.642	.694	.575	.119	84.8	88.0	81.8	6.2
15	.579	.618	.515	.103	85.8	91.6	81.8	9.8
16	.579	.622	.511	.111	84.5	92.8	80.2	12.6
17	.599	.645	.523	.122	82.9	86.2	80.2	6.0
18	.643	.724	.576	.148	82.9	86.8	79.8	7.0
19	.730	.786	.674	.112	83.2	89.0	80.6	8.4
20	.741	.797	.681	.116	82.5	87.6	80.4	7.2
21	.712	.762	.645	.117	82.6	87.5	79.0	8.5
22	.763	.812	.713	.099	84.1	89.8	79.6	10.2
23	.802	.855	.746	.109	85.1	90.8	80.2	10.6
24	.773	.834	.698	.136	84.1	89.0	79.0	10.0
25	.729	.776	.657	.119	82.2	84.0	79.2	4.8
26	.731	.782	.652	.130	83.9	90.0	78.0	12.0
27	.767	.842	.688	.154	85.4	91.2	80.8	10.4
28	.752	.811	.676	.135	86.2	91.4	82.2	9.2
29	.751	.803	.676	.127	86.5	93.2	81.4	11.8
30	.760	.831	.677	.154	86.5	93.6	81.8	11.8

The Mean Height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived, from the hourly observations, made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September 1866.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of vapour.	Mean Weight of Vapour in a Cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	82.9	4.1	80.4	6.6	1.014	10.79	2.50	0.81
2	82.7	4.1	80.2	6.6	.998	.73	.48	.81
3	82.5	4.0	80.1	6.4	.995	.71	.39	.82
4	81.6	2.5	78.8	4.3	0.964	.36	1.50	.87
5	80.5	2.8	78.5	4.8	.955	.25	.68	.86
6	81.4	2.5	79.6	4.3	.989	.60	.53	.87
7	82.4	3.3	80.1	5.6	1.005	.71	2.09	.84
8	80.6	2.9	78.6	4.9	0.958	.28	1.72	.86
9	79.3	1.8	78.2	2.6	.945	.19	0.88	.92
10	80.7	2.6	78.9	4.4	.967	.39	1.54	.87
11	79.1	4.1	76.2	7.0	.887	9.52	2.37	.80
12	80.8	3.4	78.4	5.8	.952	10.19	.05	.83
13	81.5	3.4	79.1	5.8	.973	.49	.09	.83
14	82.1	2.7	80.2	4.6	1.008	.77	1.69	.86
15	82.1	3.7	79.5	6.3	0.986	.53	2.30	.82
16	81.4	3.1	79.2	5.3	.976	.45	1.90	.85
17	81.0	1.9	79.7	3.2	.992	.66	.13	.90
18	80.5	2.4	78.8	4.1	.964	.36	.43	.88
19	80.7	2.5	78.9	4.3	.967	.39	.50	.87
20	80.2	2.3	78.6	3.9	.958	.30	.34	.89
21	79.4	3.2	77.2	5.4	.916	9.85	.83	.84
22	80.4	3.7	77.8	6.3	.934	10.01	2.20	.82
23	81.5	3.6	79.0	6.1	.970	.37	.20	.83
24	79.7	4.4	76.6	7.5	.899	9.61	.60	.79
25	79.4	2.8	77.4	4.8	.922	.91	1.63	.86
26	79.3	4.6	76.1	7.8	.887	.48	2.65	.78
27	80.8	4.6	77.6	7.8	.928	.91	.77	.78
28	81.9	4.3	78.9	7.3	.967	10.32	.67	.79
29	81.5	5.0	78.5	8.0	.955	.18	.92	.78
30	81.8	4.7	79.0	7.5	.970	.33	.77	.79

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September 1866.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	29.681	29.807	29.537	0.270	82.2	84.6	79.0	5.6
1	.672	.805	.519	.286	82.0	84.2	79.2	5.0
2	.663	.800	.503	.297	81.7	83.8	78.8	5.0
3	.655	.791	.488	.303	81.4	83.2	78.4	4.8
4	.648	.781	.469	.312	81.2	83.0	78.2	4.8
5	.656	.798	.464	.334	81.1	82.8	78.0	4.8
6	.671	.811	.479	.332	81.0	83.0	78.2	4.8
7	.687	.824	.499	.325	82.0	84.8	79.6	5.2
8	.705	.846	.506	.340	83.8	87.0	81.3	5.7
9	.716	.851	.519	.332	85.3	88.2	81.8	6.4
10	.718	.855	.523	.332	86.3	90.2	82.2	8.0
11	.708	.846	.516	.330	87.2	91.0	82.2	8.8
Noon.	.688	.836	.502	.334	87.8	91.2	80.4	10.8
1	.661	.808	.481	.327	88.2	92.8	81.2	11.6
2	.633	.782	.461	.321	88.1	92.8	80.0	12.8
3	.611	.769	.444	.325	88.2	93.6	80.7	12.9
4	.603	.758	.448	.310	87.7	93.0	81.4	11.6
5	.604	.746	.456	.290	86.8	92.6	80.2	12.4
6	.622	.760	.480	.280	85.2	90.7	80.5	10.2
7	.642	.774	.490	.284	84.1	89.0	80.5	8.5
8	.666	.786	.519	.267	83.6	88.4	80.4	8.0
9	.686	.801	.551	.250	83.0	85.8	80.0	5.8
10	.695	.812	.555	.257	82.7	85.6	79.6	6.0
11	.690	.809	.550	.259	82.4	85.0	79.2	5.8

The Mean Height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September 1866.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a Cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Mid-night.	80.4	1.8	79.1	3.1	0.973	10.47	1.07	0.91
1	80.2	1.8	78.9	3.1	.967	.41	.06	.91
2	80.2	1.5	79.1	2.6	.973	.47	0.90	.92
3	80.0	1.4	79.0	2.4	.970	.46	.81	.93
4	79.8	1.4	78.8	2.4	.964	.40	.81	.93
5	79.8	1.3	78.9	2.2	.967	.43	.74	.93
6	79.8	1.2	79.0	2.0	.970	.46	.68	.94
7	80.4	1.6	79.3	2.7	.979	.53	.94	.92
8	81.0	2.8	79.0	4.8	.970	.40	1.70	.86
9	81.5	3.8	78.8	6.5	.974	.29	2.35	.81
10	81.6	4.7	78.3	8.0	.949	.12	.90	.78
11	81.8	5.4	78.6	8.6	.958	.19	3.18	.76
Noon.	82.0	5.8	78.5	9.3	.955	.16	.44	.75
1	82.3	5.9	78.8	9.4	.964	.25	.51	.75
2	81.9	6.2	78.2	9.9	.946	.07	.65	.73
3	82.2	6.0	78.6	9.6	.958	.17	.59	.74
4	81.9	5.8	78.4	9.3	.952	.12	.44	.75
5	81.4	5.4	78.2	8.6	.946	.07	.14	.76
6	81.2	4.0	78.4	6.8	.952	.17	2.44	.81
7	81.2	3.2	79.0	5.4	.970	.40	1.91	.85
8	80.9	2.7	79.0	4.6	.970	.40	.63	.87
9	80.5	2.5	78.7	4.3	.961	.33	.49	.87
10	80.5	2.2	79.0	3.7	.970	.42	.30	.89
11	80.5	1.9	79.2	3.2	.976	.50	.11	.90

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September 1866.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Guage 5 feet above Ground.	Prevailing direction of the Wind.	Max. Pressure of Wind.	General aspect of the Sky.
	o	Inches		lb	
1	139.0	...	S. by W. & S.		Clear to 7 A. M. Scatd. ⌒i to 1 P. M. \⌒i & i afterwards. Lightning to E at 7 & 11 P.M.
2	141.0	3.08	S. & S. W.		Scatd. \i to 6 A. M. Scatd. ⌒i to 6 P. M. Overcast afterwards. Thunder at 9 & 10 P. M. Lightning at 9, 10 & 11 P. M. Rain from 7 to 11 P. M.
3	130.6	...	W. S. W. & N. W.		\⌒i & ⌒i. Lightning at 10 P. M. Light rain at midnight & 8 A. M.
4	...	0.42	S. S. W. & S. W.		Overcast nearly the whole day. Thunder & Lightning from midnight to 3 A. M. Rain at 1, 2 & 4 & from 8 to 10 A. M.
5	128.0	0.20	Variable.		\⌒i to Noon. ⌒i to 6 P. M. Overcast afterwards. Rain at 7 A. M. & at 3 & 8 P. M.
6	...	...	E. S. E. & variable		Clear to 3 A. M. ⌒i to 8 P. M. Clear afterwards. Slight rain at 9 A. M. & 5 P. M.
7	129.2	...	S. & S. W.		Clear to 5 A. M. \⌒i to 3 P. M. ⌒i afterwards. Lightning to N W from 8 to 11 P. M.
8	...	0.73	Variable.		⌒i to 4 P. M. Overcast afterwards. Thunder at 11 P. M. Lightning from 9 to 11 P. M Rain at 1, 2 & 11 A. M. & at 5 & 11 P. M.
9	...	3.84	Variable.		Overcast. Rain constantly from midnight to 4 P. M.
10	...	...	S. S. E. & E. S. E.		Scatd. \i to 6 A. M. Scatd. ⌒i to 1 P. M. Overcast to 8 P. M. Clear afterwards.
11	140.2	...	S.S.E,S., & S. by E.		⌒i nearly the whole day. Slight rain at 11 P. M.
12	149.2	0.18	S. S. E. & S. by E.		Scatd. i to 6 P. M. Clear afterwards. Rain at midnight, 1 & 6 A. M. & between 3 & 4 P. M.
13	142.7	...	S. S. E. & S. E.		Clear to 5 A. M. Scatd. ⌒i to 7 P. M. Clear afterwards.
14	133.8	0.27	S. S. E. & S.		Clear to 4 A. M. Scatd. ⌒i to 6 P. M. Scatd. \i to 9 P.M. Clear afterwards. Rain at Noon & 1½ P. M.
15	143.2	...	S. S. W. & S.		Clear to 7 A. M. ⌒i afterwards. Light rain at 8 P. M.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September 1866.

Solar Radiation. Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 5 feet above Ground.	Prevailing direction of the Wind.	Max. Pressure of Wind.	General aspect of the Sky.
	o	Inches		lb	
16	148.2	2.52	S. & variable.	...	Clear to 5 A. M. Scatd. ⌒i to 1 P. M. Overcast afterwards. Thunder at 4, 6 & 7 P. M. Lightning at 7 P. M. Rain at 3, 4, 7 & 8 P. M.
17	...	0.39	N. E. & N. N. E.	...	Overcast nearly the whole day. Rain from 11½ A. M. to 2 P.M. & at 5 P. M.
18	...	1.29	E. N. E. & S. E.		Clear to 3 A. M. Scatd. \i to 7 A. M. ⌒i afterwards. Rain from 9½ A. M. to 12½ A. M.
19	142.4	0.78	E. S. E. & variable		Clear to 5 A. M. ⌒i to 11 A. M. Overcast afterwards. Lightning & Thunder at 5 P. M. Rain at 7 A.M. Noon, 1 & from 5 to 7 P. M.
20	143.7	1.00	S. S. E. & S. E.		⌒i & \i. Rain at 1 & 3 P. M.
21	136.2	0.09	S. S. E.		Clouds of different kinds. Rain at 12½ & at 5½ P. M.
22	147.8	...	S. E. &. S. by E.		Clear to 4 A. M. ⌒i to 6 P. M. Clear afterwards.
23	140.2	...	S. by E. & S. S. W.		Clear to 7 A. M. ⌒i to 4 P. M. _i afterwards.
24	140.0	...	N. W. & W.		_i to 9 A. M. Clouds of different kinds afterwards. Light rain at 7 P. M.
25	...	0.03*	W. & variable.		Scatd. \i to 2 A. M. Overcast to 4 P. M. Scatd. _i afterwards Slight rain at 4 & 5 A. M.
26	140.2	0.14	E. S. E. & S. E.		Scatd. \i to 5 A. M. Scatd. ⌒i to 1 P. M. Scatd. \⌒i afterwards. Rain at 8 & 9 P. M.
27	846.2	0.84	S. by E., S.S.E.&S.		Clear to 7 A. M. Scatd. _i to 10 A. M. Scatd. ⌒i to 5 P. M. \⌒i afterwards. Thunder at 6 P.M Rain at 6 & 7 P. M.
28	147.4	0.05	S. & S. E.		Clear to 7 A. M. Scatd. ⌒i to 6 P. M. Clear afterwards. Light rain at 5 P. M.
29	138.2	0.12	S. & variable.		Scatd. \i to 7 A. M. Scatd. ⌒i to 6 P. M. Overcast afterwards. Lightning & Thunder from 7 to 9 P.M. Rain between 8 & 9 PM
30	145.2	...	S. S. W. & variable		Clear to 8 A. M. Scatd. ⌒i afterwards.

\i Cirri, —i Strati, ⌒i Cumuli, _i Cirro-strati, ⌒i Cumulo strati, \⌒i Nimbi, \⌒i Cirro cumuli.

* Rain Gauge 1 Foot 2 Inches above ground.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of September 1866.

Monthly Results.

	Inches.
Mean height of the Barometer for the month	29.666
Max. height of the Barometer occurred at 10 A. M. on the 23rd ...	29.855
Min. height of the Barometer occurred at 3 P. M. on the 9th ...	29.444
Extreme range of the Barometer during the month	0.411
Mean of the daily Max. Pressures	29.724
Ditto ditto Min. ditto	29.597
Mean daily range of the Barometer during the month	0.127

	°
Mean Dry Bulb Thermometer for the month	83.4
Max. Temperature occurred at 3 P. M. on the 30th	93.6
Min. Temperature occurred at 5 A. M. on the 26th	78.0
Extreme range of the Temperature during the month	15.6
Mean of the daily Max. Temperature	89.5
Ditto ditto Min. ditto.	80.5
Mean daily range of the Temperature during the month	9.0

Mean Wet Bulb Thermometer for the month	81.0
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer	3.3
Computed Mean Dew-point for the month	78.7
Mean Dry Bulb Thermometer above computed mean Dew-point ...	5.6

	Inches.
Mean Elastic force of Vapour for the month	0.961

	Troy grain.
Mean Weight of Vapour for the month	10.29
Additional Weight of Vapour required for complete saturation ...	1.99
Mean degree of humidity for the month, complete saturation being unity	0.84

	Inches.
Rained 23 days.—Max. fall of rain during 24 hours	3.84
Total amount of rain during the month	15.97
Total amount of rain indicated by the Gauge attached to the anemometer during the month	15.07
Prevailing direction of the Wind	S. S. E. & S.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of Sept. 1866.

MONTHLY RESULTS.

Tables shewing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

Hour.	N.	Rain on.	N. by E.	Rain on.	N. N. E.	Rain on.	N. E.	Rain on.	E. N. E.	Rain on.	E. by N.	Rain on.	E.	Rain on.	E. by S.	Rain on.	E. S. E.	Rain on.	S. E.	Rain on.	S. S. E.	Rain on.	S. by E.	Rain on.	S.	Rain on.	S. by W.	Rain on.	S. S. W.	Rain on.	S. W.	Rain on.	W. S. W.	Rain on.	W. by S.	Rain on.	W.	Rain on.	W. by N.	Rain on.	W. N. W.	Rain on.	N. W.	Rain on.	N. N. W.	Rain on.	N. by W.	Rain on.
	No. of days																																														
Mid night											1				1		4		2		4		6	1	4		2		2				1	1			1		1									
1									1						1		4		3		5	1	3		4		1		3				1				1	1	1	1			1	1				
2	1	1					1		1				1				4		2		5	1	4		4		1		3				1				1				1	1				
3									2	2							3		2		5		2		5		1		4				1				1									
4									3	2					1		3		1		5		2		5		1		3	1			1				1				1	1				
5									3	2							3		3		2		2		5		2		3				1				1	1								
6					1	2	1		3	2			1				5		3		3	1	1		6		1		4		1		1				1				1					
7	1	1			1				2	2			1				4	1	2		3		2		5		2		4	1			1				1				1					
8	1		1	1			1		1		1		1				4		4		4		1		4				2	1	3									1	1		1			
9			1				1		2	2			1	1		1	2	1	8		2		1		3		1		2	1	2		1									2	1			
10									3				1	2	2		6		6		1		2		2				3	1	2		1									1				
11							1		3				3	2	1		3		6	1	4		2		2		1		2		2		1								1	1				
Noon.									2		1	1	1	1	1		1		6	1	3	1	3	1	2						2									2					
1	1						1	1	1		2	1	1		2		2	1	5	2	4	1	2		3				1		1				1				1	1					
2					2		2		1				1				1		3	1	5		2		2				2		2				1				2		1				
3					2		1												1		6		5	1	3				1		4		3	1					1	1	2		1		
4					1		1								1						5	1	2		4				5	1	5								1			2	1		
5			1	1	1	1	1		1	1							1		3		4		2		3				1		5	1			1	1			1		1		1			
6	1						2		1										2		6	2	1		6		2		1		2		1		2	1			1		1				
7	1						2	1					1						4	1	6	1	2		6	1	2		2		1				1	1			1		1				
8			1				1		1				1	1			1		4	2	5	1	4		5		1		4		1	1										1				
9			1						2		1		1	1			2		1		4	1	5		4		2		6	1									1						
10			1						1				1				3				8	1	4		5		2		3																
11			1						2								2		1		6	1	5		7	1	1		3						2	1									

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October 1866.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the sea level, 18.11 feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.759	29.808	29.689	0.119	85.2	91.2	82.0	9.2
2	.795	.857	.745	.112	84.3	92.2	81.4	10.8
3	.853	.915	.791	.124	85.6	90.4	81.0	9.4
4	.849	.913	.785	.128	84.0	90.6	80.0	10.6
5	.815	.864	.733	.131	84.4	91.2	80.4	10.8
6	.821	.884	.759	.125	83.7	88.0	81.0	7.0
7	.819	.882	.748	.134	84.1	89.8	79.6	10.2
8	.847	.901	.780	.121	82.7	87.4	79.4	8.0
9	.841	.903	.782	.121	81.5	89.2	77.8	11.4
10	.779	.854	.705	.149	80.2	85.4	77.0	8.4
11	.799	.875	.743	.132	82.5	88.6	78.0	10.6
12	.876	.938	.832	.106	83.1	89.8	78.0	11.8
13	.877	.953	.808	.145	84.1	89.9	79.2	10.7
14	.855	.923	.797	.126	85.0	90.5	81.0	9.5
15	.839	.902	.773	.129	84.4	90.2	80.7	9.5
16	.869	.928	.816	.112	81.9	88.4	78.8	9.6
17	.905	.951	.857	.094	83.2	90.0	78.0	12.0
18	.936	.998	.880	.118	82.4	88.0	77.4	10.6
19	.909	.981	.841	.140	82.6	88.8	77.0	11.8
20	.869	.965	.787	.178	83.7	90.2	77.6	12.6
21	.820	.875	.751	.124	81.5	85.6	77.7	7.9
22	.778	.836	.706	.130	80.5	84.2	78.0	6.2
23	.749	.810	.668	.142	80.2	87.0	75.8	11.2
24	.638	.715	.566	.149	75.9	77.5	74.0	3.5
25	.628	.802	.514	.288	79.2	82.7	76.5	6.2
26	.850	.915	.778	.137	75.8	79.4	71.9	7.5
27	.924	.982	.848	.134	78.2	83.4	73.6	9.8
28	.950	30.004	.900	.104	78.9	86.0	73.6	12.4
29	.922	29.994	.879	.115	79.6	85.6	74.0	11.6
30	.904	.966	.849	.117	79.3	85.4	74.8	10.6
31	.895	.954	.843	.111	79.6	84.6	75.4	9.2

The Mean Height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived, from the hourly observations, made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October 1866.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of vapour.	Mean Weight of Vapour in a Cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	81.4	3.8	78.7	6.5	0.961	10.26	2.35	0.81
2	80.7	3.6	78.2	6.1	.946	.13	.15	.83
3	81.1	4.5	77.9	7.7	.937	.00	.76	.78
4	80.7	3.3	78.4	5.6	.952	.19	1.98	.84
5	80.6	3.8	77.9	6.5	.937	.02	2.29	.81
6	80.7	3.0	78.6	5.1	.958	.28	1.79	.85
7	79.8	4.3	76.8	7.3	.905	9.69	2.52	.79
8	79.5	3.2	77.3	5.4	.919	.88	1.84	.84
9	78.5	3.0	76.4	5.1	.893	.62	.69	.85
10	77.8	2.4	76.1	4.1	.885	.55	.53	.88
11	79.5	3.0	77.4	5.1	.922	.91	.73	.85
12	79.2	3.9	76.5	6.6	.896	.61	2.25	.81
13	79.6	4.5	76.4	7.7	.893	.56	.65	.78
14	80.0	5.0	76.5	8.5	.896	.57	.96	.76
15	79.4	5.0	75.9	8.5	.879	.40	.91	.76
16	77.9	4.0	75.1	6.8	.857	.21	.23	.81
17	77.0	6.2	72.7	10.5	.792	8.49	3.40	.71
18	75.7	6.7	71.0	11.4	.751	.07	.54	.70
19	76.1	6.5	71.5	11.1	.763	.20	.48	.70
20	77.6	6.1	73.3	10.4	.809	.66	.41	.72
21	78.2	3.3	75.9	5.6	.879	9.46	1.85	.84
22	77.6	2.9	75.6	4.9	.871	.39	.59	.86
23	77.2	3.0	75.1	5.1	.857	.25	.63	.85
24	74.3	1.6	73.2	2.7	.806	8.77	0.80	.92
25	75.8	3.4	73.4	5.8	.811	.76	1.80	.83
26	72.6	3.2	70.4	5.4	.736	.02	.52	.84
27	74.2	4.0	71.4	6.8	.761	.23	2.02	.80
28	73.7	5.2	70.1	8.8	.729	7.89	.58	.75
29	74.3	5.3	70.6	9.0	.741	8.00	.69	.75
30	74.4	4.9	71.0	8.3	.751	.12	.47	.77
31	73.2	6.4	68.7	10.9	.697	7.52	3.17	.70

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October 1866.

rly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	29.842	29.953	29.560	0.393	79.8	84.4	75.2	9.2
1	.834	.949	.534	.415	79.5	84.2	74.6	9.6
2	.826	.946	.522	.424	79.2	83.8	74.0	9.8
3	.819	.939	.421	.408	78.9	84.0	73.0	11.0
4	.817	.936	.514	.422	78.7	83.8	72.7	11.1
5	.830	.954	.523	.431	78.5	83.6	72.4	11.2
6	.846	.970	.533	.437	78.3	83.0	71.9	11.1
7	.861	.987	.562	.425	79.1	83.8	72.6	11.2
8	.881	30.001	.596	.405	80.9	86.8	73.8	13.0
9	.891	.004	.627	.377	82.7	87.8	74.6	13.2
10	.895	.004	.648	.356	84.0	90.4	76.0	14.4
11	.880	29.998	.645	.353	85.1	91.0	75.8	15.2
Noon.	.856	.965	.631	.334	85.6	91.2	76.2	15.0
1	.825	.937	.621	.316	86.3	91.4	76.8	14.6
2	.800	.921	.606	.315	86.8	92.2	75.8	16.4
3	.785	.911	.577	.334	86.4	91.2	74.8	16.4
4	.787	.904	.577	.327	84.7	90.4	74.9	15.5
5	.791	.913	.573	.340	84.2	90.4	75.1	15.3
6	.804	.923	.571	.352	82.5	88.0	75.1	12.9
7	.821	.935	.566	.369	81.7	86.6	76.8	9.8
8	.842	.945	.590	.355	81.1	86.0	76.2	9.8
9	.856	.954	.597	.357	80.6	85.3	75.4	9.9
10	.862	.961	.588	.373	80.2	85.2	75.0	10.2
11	.855	.958	.576	.382	79.8	85.0	74.7	10.3

The Mean Height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October 1866.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a Cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Mid-night.	77.7	2.1	76.2	3.6	0.887	9.58	1.17	0.89
1	77.5	2.0	76.1	3.4	.885	.57	.09	.90
2	77.3	1.9	76.0	3.2	.882	.54	.02	.90
3	77.1	1.8	75.8	3.1	.876	.48	0.99	.91
4	76.9	1.8	75.6	3.1	.871	.42	.99	.91
5	76.8	1.7	75.6	2.9	.871	.42	.93	.91
6	76.7	1.6	75.6	2.7	.871	.42	.86	.92
7	77.0	2.1	75.5	3.6	.868	.38	1.15	.89
8	77.2	3.7	74.6	6.3	.843	.09	2.01	.82
9	77.9	4.8	74.5	8.2	.840	.03	.69	.77
10	78.2	5.8	74.1	9.9	.830	8.89	3.28	.73
11	78.4	6.7	73.7	11.4	.819	.76	.81	.70
Noon.	78.4	7.2	73.4	12.2	.811	.66	4.10	.68
1	78.5	7.8	73.0	13.3	.801	.53	.49	.66
2	78.5	8.3	73.5	13.3	.814	.67	.54	.66
3	78.3	8.1	72.6	13.8	.790	.42	.64	.65
4	77.6	7.1	72.6	12.1	.790	.45	3.97	.68
5	77.7	6.5	73.1	11.1	.803	.60	.64	.70
6	77.8	4.7	74.5	8.0	.840	9.03	2.61	.78
7	77.9	3.8	75.2	6.5	.860	.24	.13	.81
8	77.9	3.2	75.7	5.4	.873	.41	1.76	.84
9	78.0	2.6	76.2	4.4	.887	.58	.43	.87
10	77.8	2.4	76.1	4.1	.885	.55	.33	.88
11	77.5	2.3	75.9	3.9	.879	.49	.26	.88

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October 1866.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 1 ft. 2 in. above Ground.	Prevailing direction of the Wind.	Max. Pressure of Wind.	General aspect of the Sky.
	o	Inches		lb	
1	148.4	0.05	S. by W.		Scatd. ⌒i to 2 P. M. Overcast to 6 P.M. Clear afterwards. Rain at Noon & 6 P. M. Thunder from 1 to 5 P. M. Lightning at 4 P. M.
2	148.0	0.45	S. & variable		Clear to 5 A. M. Scatd. ⌒i to 6 P. M. Clear afterwards. Rain from 3 to 5 P. M.
3	143.7	...	W. by N. & variable		Clear to 7 A. M. Scatd. ⌒i to 5 P. M. Clear afterwards.
4	127.2	1.14	W. by N. & S. S. E.		Clear to 7 A. M. ⌒i & \i to 2 P. M. Overcast afterwards. Rain from 4 to 6 P. M.
5	154.2	...	S. S. E. & S. W.		Clear to 5 A. M. Scatd. ⌒i to 7 P. M. Clear afterwards.
6	...	...	S. & variable.		Clear to 5 A. M. Scatd. ⌒i to Noon. \i & _i afterwards.
7	149.2	...	S. & S. S. E.		Scatd. ⌒i to 6 P. M. _i afterwards. Light rain between Noon & 1 P. M.
8	120·1	...	S. & variable.		Clear to 7 A. M. Scatd. ⌒i to 7 P. M. Clear afterwards. Light rain at 4 P. M.
9	126.2	1.23	E. by N. & E. S. E.		Scatd. _i to 3 A. M. Scatd. \i to 9 A. M. Scatd. ⌒i to 3 P.M. Overcast to 7 P. M. Clear afterwards. Rain from 3 to 7 P. M.
10	115.2	1.39	N. N. E. & N. E.		Clear to 5 A. M. Overcast to 6 P. M. _i afterwards. Rain between 3 & 4 P. M.
11	...	...	N. N. E. & E.		Overcast to 3 A. M. ⌒i to 6 P. M. Clear afterwards.
12	144.0	...	N. E.		Clear to 6 A. M. Scatd. ⌒i to 6 P. M. Clear afterwards.
13	143.0	...	N. E. & N. N. W.		Clear to 7 A. M. Scatd. ⌒i to 4 P. M. Scatd. _i afterwards.
14	143.5	...	W. N. W. & N. W.		Scatd. ⌒i to 5 P. M. Clear afterwards.
15	126.0	...	S. E. & E. S. E.		Clouds of different kinds till 10 A. M. Scatd. ⌒i to 9 P. M. Clear afterwards.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October 1866.

Solar Radiation. Weather, &c.

Date.	Max. Solar radiation.	Rain Guage 1 ft. 2 in. above Ground.	Prevailing direction of the Wind.	Max. Pressure of Wind.	General aspect of the Sky.
	o	Inches		lb	
16	145.2	...	S. by E. & N. W.	...	Clear to 5 A. M. Scatd. |i to 9 A. M. ⌒i to 3 P. M. Scatd. |i afterwards.
17	144.6	...	E. N. E. & S. by E.		Clear nearly the whole day. Foggy from 9 to 11 P. M.
18	140.2	...	N. E. & N. by E.		Clear to 11 A. M. |i to 3 P. M. Clear to 8 P. M. Scatd. _i afterwards. Foggy at 11 P. M.
19	144.8	...	N. by E. & N. E.		Clear to 10 A. M. Scatd. ⌒i to 4 P. M. Clear afterwards.
20	142.2	...	NE.&ENE.&NNE.		Clear to 5 A. M. |i & ⌒i afterwards.
21	...	0.77	S. & N. E.& S. S. E.		Overcast to 11 A. M. Scatd. ⌒i to 6 P. M. Thin clouds afterwards.
22	...	0.15	N.NE.&SSE&ESE.		Thin clouds to 3 A. M. Overcast to 10 A. M. |i afterwards. Rain from 5 to 8 A. M.
23	146.8	0.57	N. N. E. & N. E.		Overcast & |i. Rain from 7 to 9 A. M. & between 3 & 4 P.M.
24	...	2.00	E. N. E.		Overcast. Low scuds from E. from Noon to 6 P. M. Rain nearly the whole day.
25	...	0.08	W. S. W. & S. W.		|i & ⌒i Low scuds from S from 7 A. M. to 2 P. M. Light rain at midnight, 4 & 5 A. M. & at 8 P. M.
26	115.0	...	N. N. W. & N. W.		Clouds of different kinds to 6 P. M. Clear afterwards.
27	130.0	...	N. N. W.		Scatd. |i to Noon. Scatd. |i to 5 P. M. Clear afterwards.
28	...	...	N. N. W. & N. W.		Clear to 10 A. M. Scatd. |i to 7 P. M. Clear afterwards. Foggy at midnight.
29	146.5	...	N. N. W.		Clear to 9 A. M. Scatd. ⌒i to 4 P. M. Clear afterwards.
30	147.0	...	N. N. W.		Clear to 7 A. M. Scatd. ⌒i to 4 P. M. _i & |i afterwards.
31	146.0	...	N.W.&N.byW.&N.		|i & ⌒i to 5 P. M. Clear afterwards.

\|i Cirri, — i Strati, ⌒i Cumuli, _i Cirro-strati, ⌒ i Cumulo strati, ~i Nimbi, ~i Cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of October 1866.

MONTHLY RESULTS.

	Inches.
Mean height of the Barometer for the month	29.838
Max. height of the Barometer occurred at 9 & 10 A. M. on the 28th ...	30.004
Min. height of the Barometer occurred at 4 A. M. on the 25th ...	29.514
Extreme range of the Barometer during the month	0.490
Mean of the daily Max. Pressures	29.905
Ditto ditto Min. ditto	29.773
Mean daily range of the Barometer during the month	0.132

	o
Mean Dry Bulb Thermometer for the month	81.9
Max. Temperature occurred at 2 P. M. on the 2nd	92.2
Min. Temperature occurred at 6 A. M. on the 26th	71.9
Extreme range of the Temperature during the month	20.3
Mean of the daily Max. Temperature	87.5
Ditto ditto Min. ditto, ...	77.8
Mean daily range of the Temperature during the month	9.7

Mean Wet Bulb Thermometer for the month	77.7
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer	4.2
Computed Mean Dew-point for the month	74.8
Mean Dry Bulb Thermometer above computed mean Dew-point ...	7.1

	Inches.
Mean Elastic force of Vapour for the month	0.849

	Troy grain.
Mean Weight of Vapour for the month	9.13
Additional Weight of Vapour required for complete saturation ...	2.31
Mean degree of humidity for the month, complete saturation being unity	0.80

	Inches.
Rained 12 days,—Max. fall of rain during 24 hours	2.00
Total amount of rain during the month	7.83
Total amount of rain indicated by the Gauge attached to the anemometer during the month	7.25
Prevailing direction of the Wind	N. N. W. & N. E.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of Oct. 1866.

MONTHLY RESULTS.

Tables shewing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

Hour.	N.	Rain on.	N. by E.	Rain on.	N. N. E.	Rain on.	N. E.	Rain on.	E. N. E.	Rain on.	E. by N.	Rain on.	E.	Rain on.	E. by S.	Rain on.	E. S. E.	Rain on.	S. E.	Rain on.	S. S. E.	Rain on.	S. by E.	Rain on.	S.	Rain on.	S. by W.	Rain on.	S. S. W.	Rain on.	S. W.	Rain on.	W. S. W.	Rain on.	W. by S.	Rain on.	W.	Rain on.	W. by N.	Rain on.	W. N. W.	Rain on.	N. W.	Rain on.	N. N. W.	Rain on.	N. by W.	Rain on.
	No. of days																																														
Mid night			1		2		2						2						4	1	2		1		5		1										1		1		2		3		1	
1			1		2		2				1		1						1		4		2		5		1										1		1		2		3		1	
2			1		2		1		4		2								1		2		2		5		1				1						1		1		2		3		1	
3	1		1		1		2		4		1								2		2		3		3		1										1		1		2		4		1	
4	2		1		3		3		2		2		1						1		1		3	1	3		1										1		1		1		4			
5			1		4	1	3		2		1		1						1		1		2		4	1	1				1						1		1		1		3		2	
6	1		2		1		4		2		2		1						1		2				4	1	2				1		1				1		1		1		3		1	
7	4						6	1	5		2						1		1		1				2		1		1		1						1		1		1		1		3	
8	6				2		4		3		2		1		1				3								2				1		1				1		1		1		1			
9	2		1		1		5		2		3		2		1				1		2						1		1		1		1				1				1		3		1	
10	1				2		5		3		1		2		1		1		4						1						2		1								2		5			
11					4		7	1					2		1				3		2										2		1								4		4		1	
Noon.			2		3		5		1				4		1				1		1		1				1		1		1				2				2		4		3		1	
1	1		3		3		3		4				2				1		2	1	1								1				1				2				4		4	1		
2	2				4		4		4		1	1					3				2								1		1						2				6				1	
3	1		2		1		3		4								3	1	3		2	1			1				2		1						1		1		4		2			
4	2		1		1		2		3		2				2	1	3	1	2	2	2		2		1						1		2		1		1		1				6			
5	1		1	1	3		2		4				1				2		2	2	1		1		2								1				1		1		5					
6			1		2		4		5								1	1			3	1	1		2				1				1				1		1		6					
7			1		4		3		2		1		1				1	1			2		1		3		2						1				1		1		6					
8			1		3		3		3		1								1		4		1		2		2						1		1		1		2		6					
9			1		3		2		4				1				2	1			3		1		2						1		1		1		1		1		6					
10			1		3		3		3		1						2	1			2		1		4								1		1				1		1					
11			1		2		3		2				1				2	1	3	1	2		1		4												1				2		5			

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of November 1866.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the sea level, 18.11 feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	29.907	29.963	29.861	0.102	80.0	86.0	74.2	11.8
2	.954	30.013	.911	.102	79.9	85.4	74.8	10.6
3	.989	.059	.943	.116	81.7	88.6	75.9	12.7
4	30.002	.074	.945	.129	82.1	87.8	77.0	10.8
5	29.972	·045	.921	.124	79.9	84.0	76.5	7.5
6	.946	.001	.888	.113	79.5	85.0	75.6	9.4
7	.936	.009	.872	.137	78.9	84.9	73.4	11.5
8	.910	29.979	.847	.132	78.6	86.6	72.0	14.6
9	.900	.961	.846	.115	78.3	85.8	72.0	13.8
10	.859	.915	.786	.129	76.7	84.0	70.0	14.0
11	.885	.944	.829	.115	75.7	83.6	68.0	15.6
12	.983	30.047	.925	.122	76.6	83.6	70.8	12.8
13	30.021	.096	.965	.131	77.2	84.8	70.8	14.0
14	.011	.074	.953	.121	77.4	85.2	71.2	14.0
15	.054	.124	30.003	.121	77.1	84.8	70.4	14.4
16	.082	.143	.037	.106	77.0	84.1	71.0	13.1
17	.097	.163	.029	.134	76.2	83.9	70.2	13.7
18	.063	.142	29.991	.151	76.0	83.6	70.0	13.6
19	.050	.121	30.007	.114	76.0	83.4	70.0	13.4
20	.032	.106	29.971	.135	75.5	82.6	69.2	13.4
21	.026	.094	.959	.135	75.4	82.6	69.8	12.8
22	.021	.083	.964	.119	74.1	81.8	67.2	14.6
23	.000	.058	.939	.119	73.1	81.0	66.7	14.3
24	29.990	.064	.931	.133	71.4	80.1	64.8	15.3
25	.985	.059	.919	.140	71.3	79.6	64.0	15.6
26	.936	29.999	.876	.123	70.4	79.0	62.8	16.2
27	.945	.991	.890	.101	70.1	78.0	62.0	16.0
28	30.000	30.060	.955	.105	72.0	80.0	64.4	15.6
29	.029	.095	.983	.112	71.8	80.4	64.2	16.2
30	.038	.107	.974	.133	71.7	81.0	65.0	16.0

The Mean Height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived, from the hourly observations, made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of November 1866.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of vapour.	Mean Weight of Vapour in a Cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	73.3	6.7	68.6	11.4	0.695	7.50	3.31	0.69
2	73.8	6.1	69.5	10.4	.715	.72	.06	.72
3	76.4	5.3	72.7	9.0	.792	8.52	2.85	.75
4	76.2	5.9	72.1	10.0	.778	.36	3.15	.73
5	74.0	5.9	69.9	10.0	.725	7.82	2.96	.73
6	73.3	6.2	69.0	10.5	.704	.59	3.07	.71
7	72.2	6.7	67.5	11.4	.670	.26	.21	.69
8	72.4	6.2	68.1	10.5	.684	.38	.00	.71
9	71.8	6.5	67.2	11.1	.664	.19	.09	.70
10	68.1	8.6	62.1	14.6	.561	6.08	.72	.62
11	67.8	7.9	62.3	13.4	.565	.15	.36	.65
12	69.6	7.0	64.7	11.9	.611	.64	.13	.68
13	70.2	7.0	65.3	11.9	.623	.76	.19	.68
14	70.6	6.8	65.8	11.6	.634	.87	.14	.69
15	70.5	6.6	65.9	11.2	.636	.90	.02	.70
16	70.5	6.5	65.9	11.1	.636	.90	2.99	.70
17	68.9	7.3	63.8	12.4	.593	.45	3.21	.67
18	69.6	6.4	65.1	10.9	.619	.74	2.86	.70
19	70.2	5.8	66.1	9.9	.640	.96	.64	.73
20	69.4	6.1	65.1	10.4	.619	.75	.71	.71
21	68.8	6.6	64.2	11.2	.601	.54	.89	.69
22	67.1	7.0	62.2	11.9	.563	.14	.93	.68
23	66.2	6.9	60.7	12.4	.536	5.86	.93	.67
24	64.3	7.1	58.6	12.8	.499	.47	.88	.66
25	64.8	6.5	59.6	11.7	.516	.66	.67	.68
26	63.4	7.0	57.8	12.6	.486	.34	.76	.66
27	64.2	5.9	59.5	10.6	.515	.65	.38	.70
28	65.9	6.1	61.0	11.0	.541	.93	.57	.70
29	65.7	6.1	60.8	11.0	.537	.89	.56	.70
30	65.4	6.3	60.4	11.3	.530	.82	.61	.69

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of November 1866.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Midnight.	29.990	30.104	29.861	0.243	73.2	80.8	67.4	13.4
1	.984	.102	.852	.250	72.6	80.2	66.6	13.6
2	.977	.100	.845	.255	72.0	79.4	65.6	13.8
3	.971	.100	.833	.267	71.6	79.0	64.8	14.2
4	.969	.105	.829	.276	71.0	78.0	64.0	14.0
5	.978	.111	.850	.261	70.4	77.4	64.0	13.4
6	.994	.122	.872	.250	69.9	77.0	63.2	13.8
7	30.016	.144	.894	.250	70.3	77.4	62.0	15.4
8	.037	.154	.902	.252	73.0	79.8	64.4	15.4
9	.052	.163	.910	.253	75.6	81.8	67.0	14.8
10	.050	.157	.915	.242	78.7	85.2	69.9	15.3
11	.028	.132	.893	.239	80.7	87.0	73.2	13.8
Noon.	.002	.105	.860	.245	82.0	87.4	75.0	12.4
1	29.971	.072	.825	.247	82.6	87.8	76.7	11.1
2	.949	.049	.801	.248	83.1	87.4	77.4	10.0
3	.936	.037	.786	.251	83.0	88.6	78.0	10.6
4	.932	.043	.789	.254	81.5	87.0	76.4	10.6
5	.941	.059	.798	.261	80.3	85.8	75.8	10.0
6	.953	.072	.805	.267	78.2	84.2	73.3	10.9
7	.971	.087	.840	.247	76.8	83.0	71.6	11.4
8	.989	.095	.853	.242	75.9	82.3	69.6	12.7
9	30.001	.112	.866	.246	75.1	81.6	69.4	12.2
10	.007	.111	.867	.244	74.3	81.2	68.6	12.6
11	.002	.108	.868	.240	73.6	80.8	68.2	12.6

The Mean Height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of November 1866.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a Cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Mid-night.	69.1	4.1	65.8	7.4	0.634	6.94	1.88	0.79
1	68.6	4.0	65.4	7.2	.626	.85	.81	.79
2	68.2	3.8	65.2	6.8	.621	.81	.69	.80
3	67.7	3.9	64.6	7.0	.609	.69	.71	.80
4	67.3	3.7	64.3	6.7	.603	.63	.62	.80
5	66.9	3.5	64.1	6.3	.599	.59	.51	.81
6	66.6	3.3	64.0	5.9	.597	.57	.41	.82
7	66.8	3.5	64.0	6.3	.597	.57	.51	.81
8	68.1	4.9	64.2	8.8	.601	.57	2.19	.75
9	69.4	6.2	65.1	10.5	.619	.74	.74	.71
10	70.7	8.0	65.1	13.6	.619	.70	3.71	.64
11	71.3	9.4	64.7	16.0	.611	.58	4.46	.60
Noon.	71.3	10.7	63.8	18.2	.593	.37	5.10	.56
1	71.0	11.6	62.9	19.7	.576	.17	.51	.53
2	71.0	12.1	62.5	20.6	.568	.08	.78	.51
3	70.9	12.1	62.4	20.6	.567	.06	.76	.51
4	70.4	11.1	62.6	18.9	.570	.13	.18	.54
5	70.7	9.6	64.0	16.3	.597	.44	4.47	.59
6	71.2	7.0	66.3	11.9	.644	.98	3.27	.68
7	70.9	5.9	66.8	10.0	.655	7.11	2.72	.72
8	70.5	5.4	66.7	9.2	.653	.10	.33	.74
9	70.0	5.1	66.4	8.7	.646	.04	.30	.75
10	69.7	4.6	66.5	7.8	.648	.07	.05	.78
11	69.3	4.3	66.3	7.3	.644	.05	1.88	.79

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of November 1866.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Guage 1 ft. 2 in. above Ground.	Prevailing direction of the Wind.	Max. Pressure of Wind.	General aspect of the Sky.
	o	Inches		lb	
1	150.8	...	N. by W. & N. W.		_i to 5 A. M. _i to 1 P. M. ⌒i & \i to 5 P. M., clear afterwards.
2	145.0	...	N.&N.E.&N.by W.		Clear to 3 A. M. \i to 5 P. M., clear afterwards.
3	145.0	...	N. & N. N. W.		Clear to 5 P. M. \i to 10 A. M. \i & ⌒i to 7 P. M., clear afterwards.
4	147.0	...	N. N. W.		Clear to 7 A. M. \i to 6 P. M. ⌒i afterwards.
5	141.0	...	N.&N.N.W.&N.W.		⌒i to 7 A. M. \i to 3 P. M. Overcast afterwards, Thin Rain at 5, 6 & 11 P. M.
6	145.5	...	N. by W.		Overcast to 6 A. M., \i to 2 P. M., clear afterwards, Slight Rain at 4 A. M.
7	145.0	...	N. by W. & N.		Clear to 9 A. M. Scatd. \i to 1 P. M., clear afterwards.
8	146·0	...	N. N. W. & N.		Clear
9	148.0	...	N. N. E. & N.		Clear to 7 A. M. Scatd. \i to 6 P. M., clear afterwards.
10	143.0	...	N. N. W.		Clear.
11	138.0	...	N. W. & N N. W.		Clear.
12	140.0	...	N. W. & W.		_i to 8 A. M. clear to 11 A. M. ⌒i to 5 P. M. _i afterwards.
13	140.0	...	W.		Clear to 10 A. M. Scatd. _i to 7 P. M., clear afterwards.
14	142.8	...	W. & N. & N. by W.		Clear, slightly foggy at 10 P. M.
15	147.0	...	N. by E. & N. W.		Clear to 10 A. M. Scatd. ⌒i to 4 P. M. Scatd. \i afterwards.
16	149.0	...	N.&N.N.W.&NNE.		Clear to 4 A. M. Scattered _i to 7 A. M. Scatd. ⌒i & \i afterwards.
17	138.0	...	NW&NbyE&EN.E.		Clear to 9 A. M. Scatd. _i to 6 P. M. Scatd. \i afterwards. Slightly foggy at 7 & 8 P. M.
18	1[illegible]8.0	...	N.		Clear to 11 A. M. Scattered ⌒i afterwards.
19	[illegible]4.4	...	N. E.		Scatd. ⌒i & _i to 2 P. M., clear afterwards.
20	148.0	...	N. N. W.&N.by W.		Clear to 10 A. M. Scatd. ⌒i to 3 P. M. _i afterwards.
21	145.5	...	N. N. E. & N. N W.		Clear to 10 A. M Scatd. ⌒i to 4 P. M., clear afterwards.
22	141.4	...	N. W. & N.		Clear to Noon. Scatd. \i afterwards. Slightly Foggy from 8 to 11 P. M.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of November 1866.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Guage 1 ft. 2 in. above Ground.	Prevailing direction of the Wind.	Max. Pressure of Wind.	General aspect of the Sky.
	o	Inches		lb	
23	142.0	...	N. N. E. & N. by W.	...	Clouds of different kinds to 5 P. M., clear afterwards, Foggy at 11 P. M.
24	140.2	...	N.		Scatd. ⌣i to 9 A. M., \i afterwards. Foggy at 8 P. M.
25	137.0	...	N. by W. & N. W.		Clear to 10 A. M. Scatd. ⌒i to 6 P. M., clear afterwards.
26	139.8	...	N. W. & N. N. W.		Clear to 11 A. M. Scatd. ⌒i to 3 P. M., clear afterwards.
27	133.0	...	N. N. W. & N. W.		Chiefly clear.
28	145.0	...	N. by W. & N. by E.		Clear to 11 A. M. Scatd. ⌒i to 5 P. M., clear afterwards.
29	140.0	...	N. by E. & N. W.		Clear.
30	142.0	...	N.W. & N. by E.		Clear.

\i Cirri, — i Strati, ⌒i Cumuli, ⌣i Cirro-strati, ⌢ i Cumulo strati, ⌣i Nimbi, ⌣i Cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of November 1866.

Monthly Results.

	Inches.
Mean height of the Barometer for the month... ...	... 29.988
Max. height of the Barometer occurred at 9 A.M. on the 17th	... 30.163
Min. height of the Barometer occurred at 3 P. M. on the 10th	... 29.786
Extreme range of the Barometer during the month ...	... 0.377
Mean of the daily Max. Pressures	... 30.053
Ditto ditto Min. ditto	... 29.930
Mean daily range of the Barometer during the month ...	... 0.123

	°
Mean Dry Bulb Thermometer for the month	76.1
Max. Temperature occurred at 3 P. M. on the 3rd	88.6
Min. Temperature occurred at 7 A. M. on the 27th	62.0
Extreme range of the Temperature during the month	26.6
Mean of the daily Max. Temperature	83.4
Ditto ditto Min. ditto, ...	69.8
Mean daily range of the Temperature during the month... ...	13.6

Mean Wet Bulb Thermometer for the month	69.5
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer	6.6
Computed Mean Dew-point for the month	64.9
Mean Dry Bulb Thermometer above computed mean Dew-point ...	11.2

	Inches.
Mean Elastic force of Vapour for the month	0.615

	Troy grain.
Mean Weight of Vapour for the month	6.70
Additional Weight of Vapour required for complete saturation ...	2.93
Mean degree of humidity for the month, complete saturation being unity	0.70

	Inches.
Drizzled 2 days.—Max. fall of rain during 24 hours	Nil
Total amount of rain during the month	Nil
Total amount of rain indicated by the Gauge attached to the anemometer during the month	Nil
Prevailing direction of the Wind	N. W. N. N. W. & N.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of Nov. 1866.

MONTHLY RESULTS.

Tables shewing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

Hour.	N.	Rain on.	N. by E.	Rain on.	N. N. E.	Rain on.	N. E.	Rain on.	E. N. E.	Rain on.	E. by N.	Rain on.	E.	Rain on.	E. by S.	Rain on.	E. S. E.	Rain on.	S. E.	Rain on.	S. S. E.	Rain on.	S. by E.	Rain on.	S.	Rain on.	S. by W.	Rain on.	S. S. W.	Rain on.	S. W.	Rain on.	W. S. W.	Rain on.	W. by S.	Rain on.	W.	Rain on.	W. by N.	Rain on.	W. N. W.	Rain on.	N. W.	Rain on.	N. N. W.	Rain on.	N. by W.	Rain on.
	No. of days																																														
Mid night	3		2		1		2								1		1		1												1				2						4		7		4	
1	6		2		1		2		1								1		1												1				2						1		6		5	
2	6		3		3		2		1										1												1				2						2		5		5	
3	6		4		3		2		1																										2						3		4		6	
4	9		5		3		3		1																										2						3		2		4	
5	7		5		3		1																												2				1		4		6		6	
6	8		5		4																														2				1		2		6		6	
7	7		5		3																														2						3		1		4	
8	8		6		4				1																										2						1		2		6	
9	7		4		7		2		2																										2						2		7		3	
10	4		2		2		2		3		1																								2						7		6		3	
11	5		3		5		4		4		1																								2						6		7		6	
Noon.	6		3		4		2		1								1																		2				1		6		6		3	
1	8		2		2		1										1																		2				1		6		5		9	
2	8		3		5		1																												2				1		5		7		5	
3	7		5		1		1																												2						7		4		10	
4	8		1		1		2																												2						4		5		10	1
5	3		1		2		1																												2						5		7		9	
6	12		1				1																												2						7		8		8	
7	12		2				1																												2						8		10		8	
8	12		2				1																												2						10		10		7	
9	12		2		1												1																		2						10	1	6			
10	12		2														1																		2											
11	12		1						1								1																		2											

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of December 1866.

Latitude 22° 33′ 1″ North. Longitude 88° 20′ 34″ East.

Height of the Cistern of the Standard Barometer above the sea level, 18.11 feet.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Date.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer during the day.			Mean Dry Bulb Thermometer.	Range of the Temperature during the day.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
1	30.023	30.072	29.962	0.110	71.7	82.0	64.0	18.0
2	.017	.088	.935	.153	71.8	80.6	64.6	16.0
3	.014	.100	.947	.153	69.8	80.6	61.4	19.2
4	.011	.065	.941	.124	68.4	78.0	60.2	17.8
5	29.985	.062	.911	.151	68.2	78.0	60.0	18.0
6	.961	.044	.904	.140	67.0	76.6	60.6	16.0
7	30.006	.071	.944	.127	65.9	77.0	57.6	19.4
8	.071	.159	30.000	.159	65.8	76.0	57.0	19.0
9	.071	.131	.029	.102	65.4	76.0	56.8	19.2
10	.104	.173	.054	.119	67.1	76.4	59.0	17.4
11	.130	.185	.085	.100	67.9	78.0	60.0	18.0
12	.113	.195	.045	.150	67.0	76.8	59.0	17.8
13	.025	.096	29.955	.141	67.5	77.0	59.6	17.4
14	.014	.078	.959	.119	68.0	77.2	60.6	16.6
15	.065	.122	30.022	.100	67.2	77.2	58.7	18.5
16	.136	.208	.087	.121	67.9	77.5	59.8	17.7
17	.145	.222	.076	.146	66.7	76.6	58.8	17.8
18	.144	.217	.088	.129	68.0	77.2	61.0	16.2
19	.171	.256	.119	.137	67.5	77.3	58.4	18.9
20	.195	.273	.121	.152	66.9	76.6	58.6	18.0
21	.164	.226	.108	.118	67.1	76.0	58.8	17.2
22	.164	.232	.117	.115	67.1	76.0	58.8	17.2
23	.158	.231	.097	.134	66.5	76.0	58.2	17.8
24	.170	.254	.124	.130	66.0	75.6	58.0	17.6
25	.163	.249	.096	.153	65.3	74.2	57.4	16.8
26	.119	.186	.050	.136	65.4	75.8	56.6	19.2
27	.075	.138	.012	.126	65.4	75.4	56.0	19.4
28	.088	.159	.035	.124	65.1	75.4	56.4	19.0
29	.023	.113	29.952	.161	64.8	75.8	56.8	19.0
30	29.969	.033	.890	.143	65.4	77.4	55.6	21.8
31	.979	.049	.934	.115	67.1	77.0	58.0	19.0

The Mean Height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived, from the hourly observations, made during the day.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of December 1866.

Daily Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Date.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of vapour.	Mean Weight of Vapour in a Cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
1	65.6	6.1	60.7	11.0	0.536	5.87	2.56	0.70
2	64.4	7.4	58.5	13.3	.498	.45	3.00	.65
3	63.2	6.6	57.9	11.9	.488	.36	2.59	.67
4	60.6	7.8	54.4	14.0	.434	4.78	.84	.63
5	61.6	6.6	56.3	11.9	.462	5.10	.48	.67
6	59.8	7.2	54.0	13.0	.428	4.73	.57	.65
7	59.3	6.6	54.0	11.9	.428	.74	.32	.67
8	58.8	7.0	53.2	12.6	.416	.62	.42	.66
9	59.4	6.0	54.6	10.8	.437	.85	.10	.70
10	61.3	5.8	56.7	10.4	.469	5.18	.14	.71
11	62.7	5.2	58.5	9.4	.498	.50	.01	.73
12	61.9	5.1	57.8	9.2	.486	.38	1.92	.74
13	61.5	6.0	56.7	10.8	.469	.17	2.25	.70
14	61.5	6.5	56.3	11.7	.462	.10	.43	.68
15	61.0	6.2	56.0	11.2	.458	.07	.28	.69
16	61.6	6.3	56.6	11.3	.467	.16	.35	.69
17	60.7	6.0	55.9	10.8	.456	.05	.18	.70
18	61.5	6.5	56.3	11.7	.462	.10	.43	.68
19	60.9	6.6	55.6	11.9	.452	.00	.42	.67
20	60.1	6.8	54.7	12.2	.438	4.85	.43	.67
21	60.6	6.5	55.4	11.7	.449	.96	.36	.68
22	60.8	6.3	55.8	11.3	.455	5.04	.28	.69
23	59.9	6.6	54.6	11.9	.437	4.84	.35	.67
24	58.9	7.1	53.2	12.8	.416	.62	.46	.65
25	58.3	7.0	52.7	12.6	.409	.55	.38	.66
26	58.1	7.3	52.3	13.1	.404	.49	.46	.65
27	58.9	6.5	53.7	11.7	.423	.70	.25	.68
28	59.3	5.8	54.7	10.4	.438	.87	.02	.71
29	59.6	5.2	55.4	9.4	.449	.99	1.84	.73
30	59.9	5.5	55.5	9.9	.450	5.00	.95	.72
31	61.6	5.5	57.2	9.9	.476	.26	2.06	.72

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of December 1866.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.

Hour.	Mean Height of the Barometer at 32° Fahr.	Range of the Barometer for each hour during the month.			Mean Dry Bulb Thermometer.	Range of the Temperature for each hour during the month.		
		Max.	Min.	Diff.		Max.	Min.	Diff.
	Inches.	Inches.	Inches.	Inches.	o	o	o	o
Mid-night.	30.082	30.205	29.958	0.247	63.2	68.6	58.6	10.0
1	.076	.195	.952	.243	62.6	68.4	58.4	10.0
2	.069	.188	.946	.242	61.9	68.0	58.2	9.8
3	.063	.186	.943	.243	61.2	67.4	58.0	9.4
4	.060	.182	.940	.242	60.6	67.0	57.4	9.6
5	.070	.196	.949	.247	60.0	66.3	56.7	9.6
6	.085	.212	.968	.244	59.2	65.0	56.4	8.6
7	.103	.231	.982	.249	59.0	64.6	55.6	9.0
8	.126	.253	.993	.260	62.2	66.5	57.6	8.9
9	.148	.266	30.033	.233	65.9	69.8	62.6	7.2
10	.150	.273	.031	.242	69.6	73.2	65.0	8.2
11	.131	.259	.008	.251	72.6	76.4	69.2	7.2
Noon.	.097	.231	29.973	.258	74.7	79.0	71.0	8.0
1	.064	.186	.930	.256	75.8	80.0	73.2	6.8
2	.040	.157	.908	.249	76.8	81.2	74.2	7.0
3	.026	.135	.891	.244	76.8	82.0	74.1	7.9
4	.021	.124	.890	.234	75.2	80.2	72.9	7.3
5	.030	.129	.904	.225	73.3	77.6	71.3	6.3
6	.044	.142	.914	.228	70.3	74.7	68.5	6.2
7	.060	.162	.932	.230	68.3	73.0	66.0	7.0
8	.076	.174	.949	.225	66.9	72.0	64.2	7.8
9	.091	.194	.967	.227	65.8	70.7	62.6	8.1
10	.101	.221	.969	.252	64.9	69.8	59.9	9.9
11	.093	.212	.961	.251	64.1	69.2	59.0	10.2

The Mean Height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived from the observations made at the several hours during the month.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of December 1866.

Hourly Means, &c. of the Observations and of the Hygrometrical elements dependent thereon.—*(Continued.)*

Hour.	Mean Wet Bulb Thermometer.	Dry Bulb above Wet.	Computed Dew Point.	Dry Bulb above Dew Point.	Mean Elastic force of Vapour.	Mean Weight of Vapour in a Cubic foot of air.	Additional Weight of Vapour required for complete saturation.	Mean degree of Humidity, complete saturation being unity.
	o	o	o	o	Inches.	T. gr.	T. gr.	
Mid-night.	59.6	3.6	56.4	6.8	0.464	5.17	1.32	0.80
1	59.1	3.5	55.9	6.7	.456	.09	.28	.80
2	58.6	3.3	55.6	6.3	.452	.06	.17	.81
3	58.1	3.1	55.3	5.9	.447	.01	.09	.82
4	57.6	3.0	54.9	5.7	.441	4.94	.04	.83
5	57.1	2.9	54.5	5.5	.435	.88	0.99	.83
6	56.7	2.5	54.4	4.8	.434	.87	.86	.85
7	56.4	2.6	54.1	4.9	.429	.83	.86	.85
8	57.9	4.3	54.0	8.2	.482	.78	1.51	.76
9	59.9	6.0	55.1	10.8	.444	.93	2.13	.70
10	61.7	7.9	55.4	14.2	.449	.94	.96	.63
11	62.8	9.8	55.0	17.6	.442	.84	3.82	.56
Noon.	63.3	11.4	55.3	19.4	.447	.88	4.35	.53
1	63.4	12.4	54.7	21.1	.438	.76	.78	.50
2	63.8	13.0	54.7	22.1	.438	.75	5.08	.48
3	63.7	13.1	54.5	22.3	.435	.72	.11	.48
4	63.2	12.0	54.8	20.4	.440	.78	4.59	.51
5	63.8	9.5	56.2	17.1	.461	5.03	3.81	.57
6	63.6	6.7	58.2	12.1	.493	.42	2.66	.67
7	62.9	5.4	58.6	9.7	.499	.51	.09	.73
8	62.1	4.8	58.3	8.6	.494	.46	1.82	.75
9	61.6	4.2	58.2	7.6	.493	.46	.58	.78
10	61.0	3.9	57.9	7.0	.488	.41	.44	.79
11	60.3	3.8	56.9	7.2	.472	.25	.42	.79

All the Hygrometrical elements are computed by the Greenwich Constants.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of December 1866.

Solar Radiation, Weather, &c.

Date.	Max. Solar radiation.	Rain Guage 1 ft. 2 in. above Ground.	Prevailing direction of the Wind.	Max. Pressure of Wind.	General aspect of the Sky.
	o	Inches		lb	
1	141.0	...	N. by W. & N. N. W.		Clear to 4 P. M. Scatd. _i to 8 P. M., clear afterwards.
2	141.2	...	N. & N. by W.		Clear to 7 A. M. \i & _i to 3 P. M., clear afterwards.
3	143.4	...	N. & N. by E.		Clear to 11 A. M. _i to 3 P. M., clear afterwards.
4	138.4	...	W. N. W. & N. N. W.		Clear. Slightly foggy at 9 & 10 P. M.
5	138.0	...	W. by N. & N. W.		Clear.
6	138.8	...	W. & W. N. W.		Clear
7	139.0	...	N. W. & N. N. W.		Clear. Foggy from 7 to 11 P. M.
8	138·0	...	N. N. E. & N. N. W.		Clear.
9	135.0	...	N. W.		Clear.
10	134.2	...	N. W. & W. & N.		Clear.
11	136.0	...	N. & N N. W.		Clear. Slightly foggy at 7 P. M.
12	138.0	...	N. & N. W.		Clear. Slightly foggy at 10 & 11 P. M.
13	137.0	...	W. N. W. & W. S. W.		Clear. Foggy at 6 & 7 A. M. & from 7 to 11 P. M.
14	140.0	...	W. S. W. & variable.		Clear.
15	131.2	...	N. by E. & W. by N.		Clear. Slightly foggy from 7 to 10 P. M.
16	138.0	...	N. & variable.		Chiefly clear. Foggy from 7 to 10 P. M.
17	135.5	...	N. by E & N. W.		Clear. Foggy at 6 A. M. & from 7 to 11 P. M.
18	134.0	...	N. & N. N. E.		Clear to 5 A. M. _i to 1 P. M., clear afterwards. Foggy from Midnight to 4 A. M. & at 9 & 10 P. M.
19	139.0	...	N. by W. & N.		Clear.
20	136.0	...	N. by W. & N. N. W.		Clear.
21	133.0	...	N. N. W. & N W.		Clear.
22	135.0	...	N. by W. & N & N N W.		Clear to 9 A. M. Scatd. _i to 6 P. M., clear afterwards.
23	136.0	...	N. by W.		Clear to 6 A. M. Scatd. _i to 6 P. M., clear afterwards. Foggy at 8 & 9 P. M.
24	136.8	...	N. W.		Clear.
25	133.0	...	N. N. W. & N. by W.		Clear.
26	137.6	...	N.		Clear.
27	136.0	...	N. by W.		Clear. Slightly foggy from 8 to 11 P. M.
28	135.2	...	N. by W. & N. N. W. & N. W.		Clear. Foggy from Midnight to 2 A. M. & from 7 to 11 P. M.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of December 1866.

Solar Radiation. Weather, &c.

Date.	Max. Solar radiation.	Rain Gauge 1 ft. 2 in. above Ground.	Prevailing direction of the Wind.	Max. Pressure of Wind.	General aspect of the Sky.
	o	Inches		lb	
29	133.0	...	N.W.&N.N.W.&N.	...	Clear. Foggy from Midnight to 4 A. M. & from 8 to 11 P. M.
30	138.2	...	W.N.W.&SSW.&S.		Clear. Slightly foggy from Midnight to 6 A. M. & at 8 & 9 P. M.
31	138.0	...	S.		Chiefly clear.

≈i Cirri, —i Strati, ⌒i Cumuli, ⎯i Cirro-strati, ∼i Cumulo strati, ≋i Nimbi, ≻i Cirro cumuli.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of December 1866.

MONTHLY RESULTS.

	Inches.
Mean height of the Barometer for the month	30.079
Max. height of the Barometer occurred at 10 A.M. on the 20th ...	30.273
Min. height of the Barometer occurred at 4 P. M. on the 30th ...	29.890
Extreme range of the Barometer during the month	0.383
Mean of the daily Max. Pressures	30.151
Ditto ditto Min. ditto	30.019
Mean daily range of the Barometer during the month	0.132

	o
Mean Dry Bulb Thermometer for the month	67.1
Max. Temperature occurred at 3 P. M. on the 1st	82.0
Min. Temperature occurred at 7 A. M. on the 30th	55.6
Extreme range of the Temperature during the month	26.4
Mean of the daily Max. Temperature	77.0
Ditto ditto Min. ditto.	58.9
Mean daily range of the Temperature during the month	18.1

Mean Wet Bulb Thermometer for the month	60.7
Mean Dry Bulb Thermometer above Mean Wet Bulb Thermometer	6.4
Computed Mean Dew-point for the month	55.6
Mean Dry Bulb Thermometer above computed mean Dew-point ...	11.5

	Inches.
Mean Elastic force of Vapour for the month	0.452

	Troy grain.
Mean Weight of Vapour for the month	5.00
Additional Weight of Vapour required for complete saturation ...	2.32
Mean degree of humidity for the month, complete saturation being unity	0.68

	Inches.
Rained No. days,—Max. fall of rain during 24 hours	Nil
Total amount of rain during the month	Nil
Total amount of rain indicated by the Gauge attached to the anemometer during the month	Nil
Prevailing direction of the Wind ...	N. & N. N. W. & N. W.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of Dec. 1866.

MONTHLY RESULTS.

Tables shewing the number of days on which at a given hour any particular wind blew, together with the number of days on which at the same hour, when any particular wind was blowing, it rained.

Hour.	N.	Rain on.	N. by E.	Rain on.	N. N. E.	Rain on.	N. E.	Rain on.	E. N. E.	Rain on.	E. by N.	Rain on.	E.	Rain on.	E. by S.	Rain on.	E. S. E.	Rain on.	S. E.	Rain on.	S. S. E.	Rain on.	S. by E.	Rain on.	S.	Rain on.	S. by W	Rain on.	S. S. W.	Rain on.	S. W.	Rain on.	W. S. W.	Rain on.	W. by S.	Rain on.	W.	Rain on.	W. by N.	Rain on.	W. N. W.	Rain on.	N. W.	Rain on.	N. N. W.	Rain on.	N. by W.	Rain on.
Mid night	5																				No.of days				1										1				6		7		5	
1	6												1												1										1				1		4		3		2	
2	6						1						1												1										1				1		4		3		6	
3	5		2	2	2	2	1						1												1								1		1				1		2		4		7	
4	7		3	2	2	2	1				1														1														1		1		3		3	
5	6		3																						1								1						1		2		4		3	
6	7		3		2	2															1				1								1						1		3		3		6	
7	5		1		2	2	1						1								1				1								1						1		3		4		6	
8	4				3	2	1				1						1				1				1								1			2	2		1		3		5		4	
9	4				3	2			2								1								1								1			1	2		1		3		5		4	
10	6		1		4		1		1				2												1		1						1			1			1		4		7		4	
11	7		1				3						1				1								1		1						1			2			2		4		7		2	
Noon.	8		4		3		2		1														1						1				1			1			2		7		8		1	
1	8		4				1														2										1			1			3		8		7		1	
2	5		1																1														1			1			3		6		5		4	
3	9				1		1																		1		1		1										6		5		4		1	
4	8		2		1														1						1		1						1						3		8		4			
5	8		1		1																				1				1				1						3		8		3		3	
6	6		1		1																				1				1				1						3		6		4		3	
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11	4																								2				1				1						4		5		5		5	

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SPECIAL NUMBER.

ETHNOLOGY.

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EDITOR'S NOTE.

It is hoped that farther communications on Ethnological subjects may be received and published in continuation of the present special number, so as to form in all a separate and special Ethnological volume of the Journal of the Society. The paging is therefore kept distinct.

JOURNAL

OF THE

ASIATIC SOCIETY.

SUPLEMENTARY NUMBER.

VOL. XXXV. PART II.

The Ethnology of India.—*By* MR. JUSTICE CAMPBELL.

[Received 4th June, 1866.]

I trust that the great subject of Indian Ethnology has been taken up by the Society in a serious and earnest manner, with a view to that actual observation and practical inquiry which is only possible in the countries and on the spots where the various races are found, or where specimens of them may be collected together. The Government has already consented to take the first step in aid of the movement by collecting from its officers, in all parts of India, lists of the races and classes existing in the various districts. The present paper is designed to assist both Government officers and private persons in making classified and descriptive lists in such a uniform manner, and with such a uniform nomenclature and arrangement, that it may be afterwards possible to weld together the whole of the information thus obtained. Without some common plan and nomenclature, without, as it were, some Ethnological skeleton to serve as the guide and model into which the various details may be fitted, and by which they may be classed, I fear that there may be much confusion and error in bringing together lists which must necessarily often be made by officials who have little knowledge of Ethnology as a science, and whose practical knowledge and nomenclature are limited to their own particular parts of India. My object then is, to supply a sort of rough

hand book of existing information on the subject, particularly as regards the North of India, and my hope is, that such a guide may render much more easy, intelligible, and uniform, the collection of a mass of details, which will render our knowledge ample and complete. It happens that my personal experience has been wider than that of most officers; I have also travelled much in those parts of India in which I have not served, and have made the people a constant subject of observation and inquiry. I have farther, for some time past, noted the information on this subject which I could collect from books. And lastly, I have received much aid in my inquiries from many kind friends. During a late visit to the Punjaub frontier, I was under great obligations to many of the officers employed there, and feel that I can always look for assistance in that quarter. Recent papers by Colonel Dalton, Commissioner of the Chota-Nagpore territories, have given much information respecting several of the tribes of that locality of which I have made free use, and I had looked also to use another paper on the Coles promised by Colonel Dalton. It has not been received, but I hope that it will soon add to the information which I am now able to give. During a tour in the Bombay Presidency, I was fortunate enough to make the acquaintance and to obtain the assistance of Mr. Perceval of the Civil Service there, since Private Secretary to His Excellency Sir B. Frere, and through Mr. Perceval I have received a series of very interesting notes on the aborigines of that part of India by Captain Probyn, Major Keatinge, Mr. Ashburner, Mr. Probert, and the Rev. Messrs. Moore and Taylor, containing information not elsewhere procurable. During a former tour in the Mysore country and in some of the Madras districts adjoining, I received much kind assistance, and Mr. Bowring has since been good enough to point out to me some very interesting additional information. With respect, however, to the Telinga country, and the extreme South of India, I have not been fortunate enough to obtain all the information that I could desire.

It will be understood, moreover, that as respects every part of India, I by no means profess to give a complete sketch. I have not the necessary information, and have not time for the necessary study to enable me to attempt that. Indeed, in this as in so many other things, the more one learns, the more one sees one's ignorance and the vast

amount of inquiry that still remains. I only desire to tell so much as I know, and to suggest points on which inquiry is desirable. Although I have always been much interested in the people, I have usually not had time and opportunity to commit all that I have observed to writing; it is in fact only of late years that I have in some degree done so. I am obliged therefore frequently to use such expressions as 'I think,' not because I do not speak from personal observation, but because, writing from memory, I must give my impressions subject to the chance of error. In attempting too so wide and general a subject without great opportunities of study, I am at every turn liable to error. I would at once avow that I warrant nothing, even when I do not specially qualify my phrases. I only give my impressions for what they are worth. It is true that it would have been possible to verify many doubtful points, to fill up many gaps, and to solve some difficulties which occur to me in writing this paper, by farther enquiries in the proper quarters; but looking to the character of my paper, as an avowedly imperfect sketch, designed to elicit the information which may afterwards render possible something more complete, I have preferred not to delay, but to give what I now can, *as* I now can. In truth, my object is to suggest our deficiencies, to point to them, and to prospect the quarters where valuable strata of information may be found. I shall say what I have to say in the most simple and least technical form—in a rough and unpolished way.

My philological acquirements are very deficient. As respects Southern India, Dr. Caldwell, by his comparative grammar, has made comparison easy. But there is no such synthetical account of the Northern languages. The character of each can only be separately learned. The Rev. Mr. Trump has done much for the languages of the extreme North West, but as respects the characteristics of Bengallee, Maratta, Guzeratee, &c. when compared to Hindee and Punjabee, I find no easy guide, and have not been able to acquire any adequate knowledge. —Cashmiree is still scarcely known at all. We very much want such an account of the languages of the North as Dr. Caldwell has given us for the South.

In the mere matter of nomenclature, it is surprising how much confusion arises, both from calling the same tribes by different names, and also from calling different tribes by the same name. The former

error can only be met by explaining in detail the tribes variously known in various localities; but in respect to the latter, some general caution seems necessary. It often happens that the same term is applied both to a Tribe or Caste, and to the profession usually exercised by that caste, and that while in one sense the term is proper to the caste, whether exercising the same or any other profession, in another sense it is applied to all exercising the profession, whether of the same or of any other caste. For instance, in the greater part of the Punjaub, the great agricultural tribe is the Jat, and there the words 'Jat' and 'Zemeendar' have come to be used by the people as almost synonymous. A man who is asked of what caste he is, will reply 'a Zemeendar,' meaning a Jat. And, *vice versâ*, a Punjabee will sometimes call a man a Jat, meaning only that he is a Zemeendar. When I pressed some of the servants of the Maharajah of Cashmere regarding the Ethnology of the valley of the Upper Indus and other little known parts, I was at first much puzzled by finding them declare that the great mass of the people there are 'Jats,' but I presently discovered that they meant merely Zemeendars or cultivators, there being in fact no Jats within the Hills. In the West and South too, I believe that the terms 'Koonbee' and 'Wocal' are used both to designate certain agricultural tribes, and cultivators generally; so that while "the Wocals are by the Mahommedans called Koonbees," that circumstance gives no assurance that the tribes are the same. The term Bunneah or Banian is properly applied to the great trading caste, but it also means a trader, and is often so applied. Again in India *religious* denominations are often applied in a way which confounds them with proper tribal denominations. The character of the Hindoo religion is such that it is a pretty safe Ethnological guide, converts not being ordinarily received. Mahommedan and other proselytising religions, on the other hand, are no guide in Ethnology; on the contrary, the Mahommedan Laws of Marriage and Legitimacy are such as to tend very much to efface Ethnological demarcations. For our purposes therefore, Mahommedan denominations may be entirely put aside. But the mere fact, that people are Mahommedans, should not deter us from seeking their Tribal denominations in the back ground. Many Mahommedan tribes still retain their Hindoo caste names, some Hindoo laws, and something of caste exclusiveness.

Though not so pure or characteristic as their Hindoo brethren, many Mussulman Rajpoots and Jats are just as well known as such as the Hindoos; while many whole tribes have become Mahommedans without changing their tribal designations and occupations. Most of the modern Sikhs in no way separate from their tribes, and are known as 'Jat,' or 'Khatrie,' or 'Braman Sikhs,' one member of a family being frequently a 'Sing,' while others are not. Jains, I believe, are not ethnologically distinguished from Hindoos. Among the Bunneahs, it appears that some are Hindoos and some Jains, in the same tribes and sections of tribes. Very puzzling in the South is the term 'Lingaiyat' applied to those Ultra-Sivites who wear the Lingam, who seem *almost* to form a caste, and who are generally spoken of as such. So far, however, as I can gather, the term is really a mere religious denomination, and the Lingaiyats are of various castes, which should be distinguished.

In all inquiries then, great care is necessary in sifting out tribal, as distinguished from mere professional and religious denominations. When we arrive at proper tribal titles, it is farther desirable to inquire into the aliases or varieties of title often possessed by the tribes; for it may happen that while an obscure local title is in the most common use, another, less frequently used, will at once indicate identity with some well known and widely spread caste.

It is also very necessary to attend to the distinctions between great caste titles, and the sub-divisions of those castes. All the great castes have numerous gotes or sub-divisions; and when a man is asked to what caste he belongs, he will sometimes give the name of the general, and sometimes of the special caste or gote. Some of these sub-divisions really are or may be ethnological sub-divisions, others, from the peculiarity of Hindoo laws, are not so. On the principle which forbids the marriage of relations (carried by Hindoos to an extreme) men of the Rajpoot and other castes cannot marry in their own 'gotes,' but must seek their wives in other gotes. In blood therefore such castes really form but one race—so far at least as the intermarriages are carried—for there are many tribes claiming to be Rajpoots whom the higher tribes will not recognize. Of other castes, the primary sub-divisions keep altogether apart. I apprehend that under the general term 'Bunneah,' are to be found many separate

tribes who would on no account eat together or intermarry. I think, however, that throughout all the great Hindoo castes, a strong ethnological resemblance exists. I do not propose in this sketch to attempt to notice the sub-divisions, except in any case in which they may suggest marked ethnological features.

The details of Rajpoot and Bramin heraldry and hierology have been amply given in several excellent works, and I shall touch on nothing of that kind.

A caution which seems to me to be necessary is, that the accounts of their origin given by many tribes, and especially by their Chiefs, must be received in a very guarded way, because there is a great tendency to invent origins illustrious in the eyes of men of the races and religions to which they belong. Among the Hindoos, the Rajpoot rule is so famous, that almost all tribes which have taken to soldiering or acquired power, pretend to a Rajpoot origin. At this day, some of the followers of Maratta Chiefs have the impudence to tell strangers that they are really Rajpoots, as if their origin was not matter of the most recent history; and almost all the aboriginal tribes who have risen to any power (or at least the chief families among them) affect a Rajpoot descent. As Colonel Dalton describes it, they are undergoing a gradual process of '*refining into Rajpoots*,' a process probably founded on a very small Rajpoot immigration and alliance, and a very large amount of invention. Even the Jats and other tribes who need hardly descend to such stories, frequently make themselves out to be Rajpoots who have been separated from the orthodox for some looseness of practice; but my impression is, that most of these stories are quite idle. Even acknowledged Rajpoots of the North-Western hills who are, in an Ethnological point of view, a much finer and purer race than any in the plains, assert that their ancestors came from Ajoodea or Onde. So in Cashmere, the Bramins there, whose mere features at once proclaim them to be one of the highest and purest races in the world, instead of adopting the more ancient and better traditions which would point to their country as the common origin of the Bramin races of India, prefer the story that when Kashyapa dried up the Lake (a geological fact patent even to Hindoos) detachments of all the most famous and most sacred of the different Bramin classes were brought into Cashmere, who, amalgamating, formed the present

Cashmeeree Bramins. The real cause of all these stories, I take to be this. The Hindoos, as Hindoos and from an orthodox Hindoo point of view, did not attain their highest religious, literary, and political development, till they were settled in the plains of India; consequently the early Bramins of the valleys of the Himalayas are not considered nearly so orthodox, so sacred, or in the Hindoo scale so high, as the more famous Bramins of the plains. And the Rajpoots of the Punjab and the adjoining hills, are not so high in the scale of strict Rajpoot orthodoxy as the Solar and Lunar races of Ajoodea. Hence it is that the races, really earlier and purer, think it necessary to claim descent from those who, in our point of view, are really very inferior.

Again, most tribes which have been for many centuries converted to Mahommedanism, set up some origin founded on the traditions and literature of the dominant Mahommedan races. They are generally descended from Soleiman or Nooshervan, or something of that kind. Jewish names and traditions are particularly in vogue among the Mahommedans (Abraham, Jacob, Joseph, and many others known to us, are their most common names, in the form of Ibraheem, Yacoob, Yoosoof, &c. &c.) and it has been pointed out, that the Affghan assertion of Jewish descent loses most of its significance, when we find how many other tribes have stories of the same kind. I have not been able to ascertain whether the "Soleiman's Throne" met with in so many places is to be specially referred to the Jewish Solomon, or whether the term is merely the "Suleh-man" or wise man of the East. At any rate I believe that most of the pretended Mahommedan genealogies are in brief 'bosh.'

I do not mean that popular traditions are to be neglected, on the contrary, I think that they often lead us far towards the truth; but I say that we must use caution and discrimination, to sift the wheat from the merest chaff.

I should add that I believe that the claim of aboriginal and other tribes to Rajpoot and such like origin, is not always without some foundation in fact. The Rajpoots seem, like the Normans, to have frequently found their way in small numbers among inferior races, and there amalgamating and intermarrying with them, to have acquired by force of character a leadership over them, and to have considerably

raised the position of such tribes. There is, I think, a good deal to suggest that during the various invasions of Southern India by a succession of Northern 'Yavanas,' small tribes of these latter may have taken up their position in difficult parts of the country, and there, amalgamating with the aboriginal tribes, have formed half-breed races of much robber-like and semi-military energy.

Before going farther, I would suggest the following as especially deserving the attention of those who are willing to aid in a popular way in classing the various tribes and castes in India.

1. Physical appearance. The three main types, Caucasian, Mongolian, and Negro or Negrito, are well-known. In India we have, in the extreme North, the finest and purest Caucasian type, the handsomer and more open form of that which we know as the Jewish cast of countenance; fine head and features, high brow and nose, long beard, tall, lithe, powerful figure, colour generally light. Throughout India, we have this type modified and subdued by every variety of straight and snub nose and plebeian features, much as in Europe, and with a dark skin unknown in Europe. Sometimes the skin becomes very black, and the lips are thick and protuberant; *there* may be marked the infusion of blood of the Negrito type which probably modifies the higher phase of the Caucasian type, even when actual Negrito features cannot be traced.

This Negrito type we find in India not accompanied with the muscular form of many Africans, but in a small slight race. The principal points to be marked, in addition to colour, are the lips, already alluded to, shape of face, nose, and eyes, presence or absence of a considerable beard, character of the hair.

Among the Thibetans and Nipalese we have extreme examples of the type which I call generically Mongolian. The eyes particularly there is no mistaking. The hair is straight. The colour is yellowish, but never dark.

2. Language is liable to disturbances, and has been perhaps too much taken as a sure guide, but it is always of great assistance, and in 19 cases out of 20 tells a true tale. In practice I think that no considerable philological acquirements are necessary to enable an observer to make most useful observations of a language quite unknown to him, if he can only get the rudest interpreter. There are certain

words which may almost be taken as unfailing tests in classifying language; for instance, the first few numerals, the names for the commonest parts of the human body—as hand, foot, nose, eyes, mouth, head, &c.—the names of the commonest family relations—father, mother, brother, sister—sun and moon, fire and water—the personal pronouns, and one or two others. I shall try to add to this paper some of Mr. Hodgson's lists. I do not know that they are all the best selected words, but they are uniform lists of different languages in parallel columns, and will enable any observer to determine on the spot whether the savage he has caught, *primâ facie*, seems to belong to one or other of the classes represented in the columns. I shall also make a smaller list of English words, a translation of which I would recommend to be sent with each account of a tribe or race, speaking a language in any degree peculiar.

It should be observed that it may not unfrequently happen that men who seem to speak but a rough jargon of some well known language may, on close observation, be found to use peculiar terms for some of the most familiar objects, and that these latter may be invaluable as containing the remnants of their original language, all but absorbed in another which they have for the most part adopted. Especially will such words be valuable, if they can be in any degree identified with those in any of the Aboriginal Vocabularies.

Grammatical structure is somewhat more difficult of observation, and so far as I know, the general structural character of all the modern Indian languages is in a considerable degree similar. I mean that there is no such radical difference of formation as there is between Hindee and Arabic. But those who can give a little attention to the subject, might supply small grammars of declension, conjugation, and derivation, which would be eminently useful. And on the Eastern Frontier, the distinction between Indian and Indo-Chinese grammatical forms might probably be readily marked.

3. Religion. There is so much similarity in the religions of so many rude tribes, that there may be doubt whether such worship as that of the Sun, Moon, and the lord of Tigers represents a wide spread religion, or merely a coincidence of very obvious ideas repeated again and again; but it is worth noticing these ideas, in the hope that some

substantial inductions may be formed from putting together many observations.

And among the more civilised races, I think it not improbable that an accurate observation of the prevalence of Sivite and Vishnuite ideas respectively, among particular tribes and castes, may be found to have an ethnological significance. I cannot help thinking that these two forms of modern Hinduism may in fact represent entirely different religions derived from widely different sources, and that while the Vishnuite faith came from the north, the Sivite may have had some other origin, and may be the special property of races which of old peculiarly affected it. Sivite monuments certainly seem to be marks of a very old faith in the greater part of India, and the essential element of it, the reverence for and deification of the procreative power, seems to be the same idea of natural progression which is carried on by the Buddhist doctrine of gradual perfectibility (raising man almost to the rank of a god) in opposition to the Vishnuite or Vedic creed of a separate creation of gods and their occasional incarnation in the form of man. If then pure Sivites, Buddhists, and Jains are in some way connected, and they all prevail most in the West, who are those who brought their doctrines there? and whence did they come?

4. Laws. I believe that, laws are among the most persistent ethnological marks, and that, as such, they have been too much neglected. Caste, and Marriage as a sacrament strictly limited by caste, seem to be Arian institutions. Arian are strict rules of inheritance, resulting from that sacred form of marriage and subject to none of the caprices of Mahommedan and similar laws. Arian is the private property in land, as distinguished from the Tribal; the property first of the village—then of the family—then of the individual; and a consequence is, the attachment of the Arian to his native soil. Especially Arian is the form of what we call constitutional, as opposed to patriarchal and arbitrary government. The Indian village or Commune is a constitutional unit, common to all the Arians. A main distinction, as I think, between two great classes of Arians is to be traced in the constitution of these Communes—Aristocratic among the one—among the other democratic, and recognizing as equals al free citizens, to the exclusion of Helots only.

Among the non-Arians, on the other hand, the rule of the Chiefs

seems to be patriarchal and arbitrary—property in the soil is tribal rather than individual. There is little local attachment to the soil. he aboriginal tribes of India move from place to place, abandoning one location and taking up another in a light way; they are even ready to give up their land, to become labourers, and to emigrate in a way to which the Arians are by no means prone. They seem to have among themselves no caste, they eat anything and every thing. Marriage is, I fancy, but a loose tie. On all these points, however, we want much information.

5. Manners and mental characteristics. Under this I must include so much that I cannot attempt to detail it. Suffice it to say, that any information regarding the temperament and bearing, the intelligence, the customs and habits, the amusements and the ceremonies of little known tribes, may be in many ways most useful.

It is patent in India to the most superficial observer that, owing to the peculiar institution of castes, mere vicinage (even lasting many hundred years) has not, as in Europe, led to the welding of different races and tribes into proper local nationalities: that, in fact, in the same locality many different races exist together without complete intermixture, while a single race may frequently be traced through many different provinces and countries, always retaining its own peculiarities under a great variety of circumstances and in contact with many varying races. On the other hand, language can never be exclusive, it must be the means of inter-communication between man and man, caste and caste, without distinctions of race or creed. Hence, however much by religion and race a tribe may be segregated, if it be politically and to a great extent socially united with other peoples, it almost always in the end adopts their language, or a common language is formed by intermixture. That is the ordinary state of Indian society. In the business of life, the different castes are united in one society; some are in the upper, some in the lower strata; one is the lord, another the priest, another the free cultivator, another the hewer of wood and drawer of water; but still they form one social whole. Farther, although the rules of caste and marriage may hinder the inter-communication of blood, it cannot but be that in the long course of time, during which different tribes live in the closest intercourse, there must be some irregular percolation from one

to the other; in the course of thousands of years, something of the blood and features of one will be infiltrated into the other.

Thus it has happened that in India there is a sort of double classification of the people, similar to that which we sometimes see in rocks in which there is a double stratification, one line of strata running say horizontally, and another line crossing the same rock say vertically. When we trace a tribe or caste from one Province to another, we shall find that in some things it retains the class character, in others it varies according to provincial character, the latter chiefly prevailing in point of language.

I propose to trace, so far as I can, the different tribes and classes throughout India, irrespective of local nationalities, and to some extent irrespective of language. I had thought that I might afterwards, when that is completed, remark on the quasi-nationalities created by the use of special languages and the social specialities of particular provinces; but I find that our information is as yet so imperfect, that I prefer to leave this latter task to another day. I shall merely make some casual remarks on language and a few other national features, as they occur in the course of my narrative.

Till we have accomplished an Ethnological Geography, whether Tribal or National, I shall for the most part use the ordinary terms of our Modern Political Geography, and speak of the Punjab and Scinde, Bengal and Mysore. But for facility of reference, I must make one or two explanations. I shall speak of Hindustan and the Hindustanees as the terms are applied by the natives, to the whole of the great Central region of Northern India from the Punjab on one side to Bengal on the other, and from the Himalayas to the Southern declivities of the Satpoora Range running across India in about the parallel of 22° Lat. I include in Hindustan, Bahar, (confining the term of Bengal to Bengal Proper) as well as Oude, Rajpootana, and Malwa. South of Hindustan to the West is the Maratta country, which may be roughly indicated as bounded by a line drawn from Nagpore to Goa. And farther South are the Southern countries, sometimes called Dravidian, first the Telinga or Telugu country to the East, the Canarese to the West; beyond them again the Tamil country to the East, the Malabar or Malayala country to the West.

As respects the physical features of these countries, it will be remem-

bered that the whole of Bengal proper, the N. W. Provinces and Oude, the Punjab and Scinde, with part of the adjoining desert country, form a great semi-circular plain in which there is no place of refuge (with little exception) for remains of aboriginal races; in all these countries the modern races live together as one social whole. But throughout Central and Peninsular India, while the most open plains and best cultivated parts of the country are similarly inhabited, there are scattered about, over every province, hills and jungles giving cover to aboriginal tribes which hold themselves aloof from the general population, and are very different in language, manners and other particulars.

It is well known that the great plain is bounded on the north by the line of the Himalayas, rising almost suddenly in great and rugged height, but yet habitable for a considerable distance inland before the snows are reached. That boundary is so uniform that more need not be said respecting it, except as regards the northern extremity of India. There the plain is not at once succeeded by the Himalaya. The range called the Salt Range runs across from Jhelum to Kala-Bagh on the Indus, and thence to the Affghan mountains, cutting off as it were and enclosing a sort of triangle, and supporting a somewhat elevated country something of the character of the Peninsular portion of India, and lying between this Salt Range and the Himalaya. The Salt Range, it will be presently seen, is an Ethnological boundary of some interest.

I now commence my survey according to Tribes and Castes.

First, I take as a great division the black aboriginal tribes of the interior hills and jungles. There can, I suppose, be no doubt that they are the remnants of the race which occupied India before the Hindus. I need not here go into any question, whether any portion of them had received any civilization from any other source. It is enough that all these tribes have many ethnological features in common. They are evidently the remains of an element, the greater portion of which has been absorbed by, and amalgamated with, the modern Indian race, and which, mixed in various degrees with the high-featured immigrants, has contributed to form the Hindoo of to-day. In the South their speech still forms the basis of the modern languages. If proof were wanting that the predominance of Caucasian

features has been attained, in a great part of India, but gradually, and that it is within the historical period that these features have altogether preponderated, it is only necessary to look at the ancient sculptures of the South and West. Take for instance the caves of Elephanta near Bombay. Who, looking at the faces there cut in stone, and observing the universal thick lip and peculiar feature, can doubt that when those were cut, the non-Caucasian element was still large even among the higher classes?

My scheme, however, is not to separate any of the tribes or castes of modern Indian society, and to designate them as aboriginal. All those people who have been either completely or partially amalgamated into Hindoo society, whether as proper Hindoos or as Helots and outcasts, I regard as coming within the designations of 'Modern Indians.' I shall class as Aborigines only those tribes which still live apart, forming communities by themselves, under their own leaders, and often speaking their own peculiar languages.

As Modern Indians again I class together all the high-featured northern races, and all the various tribes, castes, and nationalities formed by them after absorbing so much of the aboriginal element as has been amalgamated with them, whether they are now Hindoos, Mahommedans, or of any other religion. Of course they are mainly Hindoos. I draw no wide ethnological line between the Northern and Southern countries of India, not recognising the separate Dravidian classification of the latter as properly ethnological. It seems to me that among all the Hindoo tribes the Arian element now prevails, and that the presence, more or less, of the aboriginal element is only a question of degree. As a question of degree, I do not think that there is, at any geographical parallel, any decided line. It is remarked by Max Muller that languages are seldom properly speaking mixed. Vocables may be mixed, but a single grammar and structure usually prevails. Therefore the change from one language to another must in so far be sudden. It is still, I believe, open to dispute whether the grammar of the present languages of Northern India is of Sanscrit or of Aboriginal origin; but at any rate this we know, that in the North the Arians gained so rapid and complete an ascendancy as to introduce their own radical words, numerals, &c., and to render the language essentially Arian, while in the South the Aborigines held out

longer, the tide of Arian immigration was more gradual, and the Aboriginal grammar and radicals formed the mould which was only filled up by a large over-lay of Arian words. The change then of language takes place,* where passing southwards we exchange the Maratta for Telugu and Canarese. But looking at the people, we see no radical change of feature or characteristics. The last of those who are more properly Arian in language, are not essentially superior to the first of those whose language is by its structure classed as Dravidian. The Marattas who are classed as Northerners (though they probably take their name and much of their blood from the aboriginal Mhars and such like tribes, whose features survive in their monuments) have no decided advantage over their Canarese neighbours; on the contrary, the Canarese of Belgaum and Dharwar are deemed superior to the Marattas of the adjoining districts. And to a traveller in Mysore and most of the Southern countries, the general features and appearance of the people is, I think, not very greatly less Arian than that of the lower classes of Hindustanees. The truth I take to be, not only that in a mixture of races there is a tendency of the higher, more marked, and more prominent type to predominate, but also that it may well be that, although the people speaking a Dravidian language in the South, may always by force of numbers have linguistically prevailed over each separate batch of immigrants, and so far annexed them, still by successive immigrations, notwithstanding a Dravidian form of speech, the Arian blood has come in reality greatly to prevail. The mere fact that they are recognised as Orthodox Hindoos, seems to imply the Northern origin of all the better castes in the South, and that is their own account of their origin. I have no doubt that the Southern Hindoos may be generally classed as Arians, and that the Southern society is in its structure, its manners, and its laws and institutions an Arian society. After all, in their main characteristics, the Southern people are very like those of the North.

Among some of the inferior tribes of the South, the remains of the thick lips, the very black skin, and other features may, as I have said, still be traced, but, colour perhaps excepted, the aboriginal features are probably gradually wearing away.

Notwithstanding the identity in the main of the North and the

South, it will be seen when I come to details, that the change of language very much puzzles and baffles me in the attempt to trace the tribes and castes from North to South, and in fact causes a substantial gap in the contiguity of my survey, which I trust that others will fill. To return to a geological metaphor, there is as it were a serious *fault* at the point where the change of languages takes place. A similar series of strata goes on upon the other side, but I can't exactly identify the particular veins and say which is which. The same series of classes with similar characteristics prevail in the South, and, knowing that they must have come from the North in a continuous stream, one feels sure that they must be identical with Northern congeners. It remains for those who have an intimate knowledge of the country on either side of the Fault to connect the broken links. Meantime, with the exception of the Bramins (who may be traced all through India), I must notice the people of the Southern countries separately.

Commonly as the term is used, it may be well to say a word in justification of the use of the term 'Arians' as applied to all the Northern people. Not only are they known by the Southerners as Aryas, (see Buchanan,) but in fact I believe the term to be the correct one. I am aware that some have set down the Jats and others as Scythians and Turanians. I have no intention of quarrelling with any one who chooses to call them Scythians, for that is a very wide and uncertain word, which may have been applied to Germans as well as to Jats. But if the word Turanian is applied to Punjabees, in the sense of expressing that branch of the human race which we call Mongolian, the squat, flat-faced, peculiar eyed, beardless people of Central, Northern, and Eastern Asia, then I say that the term is wholly inapplicable. Anything more unlike Mongols than the tall, handsome, high featured, long bearded Punjabees it is impossible to imagine. To say, on the strength of some obscure similarity of names, that any of these people are Mongols and Tartars, is not only as unfounded as the connection between Monmouth and Macedon, but is opposed to the most palpable physical facts. It would be about as reasonable to say that the people of Tamworth are really Negroes of Timbuctoo, because Tam and Tim are clearly the same word. An Englishman is not more unlike a Negro, than a Punjabee is unlike a Mongol.

Assuming then that the North-Indians are what we call Caucasian in feature, the only question would be whether they may be in any degree Semitic. This there seems to be no ground for supposing; there is no radical trace of Semitic language, and we nowhere trace any considerable immigration by land of Arabian or other Semitic tribes. That being so, I hope that I may properly call the North-Indians Arians, and extend the title to all those Indians in whom Arian features predominate, even where they have been softened down and otherwise qualified by intermixture.

Although I believe any division of the Northern tribes in India into Arian and Turanian to be quite out of place, I have long had an impression that the result of a thorough examination may be to divide the Indian Arians into two classes; the earlier Arians, the descendants of the most ancient Hindus, a people acute, literary, skilled in arts, but not very warlike, and rather aristocratic than democratic in their institutions; and the later Arians, warlike people—possibly once Scythians—democratic in their institutions, and rather energetic than refined and literary. War does not seem to have been one of the earliest arts; we are told that the earliest Egyptians have left little in their monuments which suggests that art, and it may be that the earliest Hindus had little occasion for it, meeting with but simple and peaceful savages. The later Arians appear, in my view, in their manners and institutions more nearly to resemble the German tribes, and perhaps to them might more properly be applied the term Indo-Germanic. The earliest Hindus appear to have had an intimate connection with the hills immediately adjoining India on the North-west, and there may well have been gradual immigration from the hills to the plains. But at a later period, when the people in possession of the North of India had acquired considerable power, it seems hardly possible that large bodies of conquering immigrants should have found their way to India by Cabul and the Khyber Pass. Those defiles are far too difficult to be forced by strangers in large bodies accompanied by women and children. The Affghans, and those who have ruled the Affghans, have had the command of the direct route; but if Rajpoots, Jats &c. came as immigrant peoples, they probably came by the route of the Bolan, occupying the high pastoral lands about Quettah, and thence descending into the plains below. We shall find accordingly that the Jats

(whom on this theory we may suppose to have been the latest comers) occupy just the area which would tally with such a mode of immigration.

In physical appearance I would divide Indian Arians into two classes, as far as we can call that a division which is only a question of degree. The people of the extreme north, the pure Arians, large, fair, high-featured, I shall call "High-Arian" in type. The prominence and beauty of their features is remarkable. The brow is remarkably high and well shaped; the nose connected by a high bridge with the high brow is also well shaped, sometimes straight, more often slightly curved; the eyes are very fine, the lips thin, mouth of a good shape, the beard long and full. The type once seen cannot be mistaken. The prominence of the brow in adults somewhat conceals the eye, but in the children it is something marvellous. On the other hand, the more subdued features, more frequently approaching a low and snub-nosed type, and resembling those which are common among the lower classes in Europe, are in India generally accompanied by a shorter (but still pretty robust) form, a skin darker (but still more brown than black), and an appearance altogether inferior, but yet not aboriginal in its style. This I shall call the "Low-Arian" type.

In addition to the two main divisions, of aborigines, and modern Indians, I propose to put under a third division, those whom I shall generally describe as "Borderers," that is, the tribes on the borders, whose blood and manners show the influence of immigrants of races other than those already noticed. These meet and mix with the native populations, and form some marked classes. On the West Coast there has been a considerable immigration of Arabs and others; the same has been the case in Lower Sinde. Along the whole line of the Himalayas, and on the whole of the Eastern Frontier, Turanian races meet the Indians.

Thus then I have three main classes:—

1. Aborigines,
2. Modern Indians, and
3. Borderers.

The 2nd are of course by far the largest and most important class.

Besides making the distinction among modern Indians of high and low Arians, there are one or two other points which I would notice, before going into details.

I should like to class Hindus as High and Low Hindus. There is a full-blown style of Hindus (principally Hindustanees) who have adopted to the full all the modern Hindu superstitions and observances, who are very particular about their cooking and such matters, and in consequence generally eat but one large meal once a day, whose widows may not re-marry, and who are in a continual state of anxiety about the rules of their caste. These are high Hindus. There is another class of Hindus, much less particular, whose religion and religious observances sit very easy upon them, whose widows re-marry, and whose prejudices do not prevent their taking good wholesome meals as often as they can. Such are the Punjabees, some of the Hindustanees, and I believe a good many of the Southerners. These I would call low Hindus.

With respect to caste, whatever there may once have been, there is now no proper Military caste. The fighting and dominant tribes are, it may be said invariably, in the main Agricultural and are classed as such. Why the old Vaisyas are sometimes said to have been the Merchant class I do not understand. It is clear that they were the body of free people, whose duty it was to till the land, keep flocks, carry on trade, and many other things besides. The Soodras were the Helots, "whose duty is expressed in one word, viz., to serve the other three classes," evidently the conquered race. Now-a-days it seems to be considered that, except the Brahmins, almost all are Soodras, that is, all have more or less intermixed with the lower races and lost their purity of blood. Hindu Society then has lost its former great divisions, and has been split up into an infinite variety of decent castes of mixed parentage, who have absorbed the old Soodras, as well as the Vaisyas. Under them again new tribes of Helots are found, probably tribes more recently conquered.

The Agricultural tribes may, for the most part, be divided into three classes:—

1. Those whose proclivities were originally Pastoral, and generally somewhat predatory.

2. Agricultural tribes in the proper sense, that is, Farmers—men who both cultivate the soil on a large scale, and keep cattle and waggons when the country is favorable to that kind of Farming. These tribes are also most frequently those who have the greatest

Military vigor, and most democratic constitution, and generally occupy the dominant position in the country.

3. The gardening tribes, *i. e.*, those who do the smaller and finer farming and kitchen gardening. These are generally peaceable and unmartial people.

I shall not always exactly follow this order, but shall take first the tribes who are politically most important.

The Mercantile tribes I shall notice separately, and then the Writer tribes, where such tribes exist. When I speak of literate occupation, I mean exclusive of mercantile business, that being almost everywhere in the hands of mercantile castes. Next come the Artizans, and finally the Helots and inferior classes.

The Aborigines.

In giving any general description of the Aborigines, I must premise that it is by no means to be supposed that all or most of the individuals of the race will correspond to the description. The fact is that the Aboriginal tribes now remaining are but like scattered remnants of a substance floating here and there in a mass of water, into which they have been all but melted, and in which they are on the point of disappearing. By far the greater part of their substance has already commingled in the fluid around them, the remainder is saturated with it, and it is only in the very kernel and inner centre of the largest lumps, that something like the pure original substance is to be found. There is not in Peninsular India any very large tract of very high and difficult country; the Aboriginal tribes are for the most part not collected in any great masses supporting one another, but are found in small and detached tribes here and there, wherever a bunch of hills or an unhealthy jungle has given them a refuge. Even in these retreats, they are everywhere closely surrounded by, and to a considerable extent penetrated, or as I called it, saturated with an Arian element which modifies both their features and their language.

Another circumstance has perhaps almost as much contributed to modify many of these tribes. There seems to be no doubt that at points in Indian history, where one dominant race has given way and before another has been fully established, tribes of hardy aborigines from the hills, accustomed to the use of weapons in the chase and

probably to a good deal of robbery, have come down on the enervated people of the plains and valleys, and have established a temporary dominion over considerable tracts of country. Just as on the departure of the Romans and before the establishment of Teutonic rule, the Picts and Scots came down on the cultivated portions of Britain, so it seems certain that, at periods long subsequent to the glories of the Solar and Lunar Rajpoots, Aboriginal Bhurs and Cheroos established considerable principalities in parts of Oude and of the Benares and Behar Provinces. So also Bheels, Mairs, and Kolees seem to have had at one time considerable power in Rajpootana and Goojerat. In comparatively modern times, the Bedas or Beders (whose name is I believe really identical with that of the Vedahs or Vedders) seem to have established considerable power in the South, and the Gonds in Central India acquired quite a wide dominion. Under such circumstances, the savage conquerors are generally themselves socially conquered, and the tribes so situated, while gaining some civilisation, lose much of their peculiarities of blood and feature, and more of their language.

By far the largest tract in which the Aboriginal tribes prevail, and may be said to form the mass of the inhabitants, is that extending through the hilly country from the western and southern borders of Bengal, Behar and Benares to the frontiers of the Hyderabad and Madras territories, and from the Eastern Ghats inland to the civilised portions of the Nagpore territory; but even in this tract it appears that there are evident monuments of old Hindoo civilisation, showing that Hindoos, or at any rate Sivites, had at one time a far greater hold on much of this country than they now have, and that probably after being partially civilised, it was gained back by the Aborigines. Even now this country is intersected by settled and cultivated tracts. Hindoos are scattered about it, and there is an admixture of Hindoo blood. Still, in all this part of the country, Aboriginal tribes muster very strong, and they preserve their language, their manners, and their peculiarities much better than elsewhere. It is, however, as I have said, only in the heart and kernel of the best preserved tribes, that we must look for the real original characteristics existing in a palpable and little-diluted form. In less pure specimens, they will be found less distinct. My impression is that, if we look carefully, they will seldom be altogether wanting. The

thick-lipped expression of countenance lingers long. The Gond Raja of Nagpore is of a family for generations civilised and Mahommedan, doubtless of very far from pure Aboriginal blood, and rather fair-skinned, but even in him I noticed the thick lips as prominent as in an African. Major Tickell seems to describe the 'Hos,' who are identical with 'Lurka Coles' and closely allied to Moondahs and Sontals (one of the ugliest of races), as handsome; but everything is comparative, and I suspect that this beauty is of the same kind as that which enthusiastic African travellers are constantly discovering in Negro tribes. The Hos of the border land have probably much intermixed with Ooriahs, and are less ugly than their congeners are always described to be.

Setting aside then the numerous half-breeds, borderers, and people of imperfect type, I take it that the general physical type of all the purest Aboriginal tribes, is that which is commonly known as Negrito. They are small and slight, *very* black, face broad and flat, the thick lips already mentioned very prominent, noses broad and nostrils wide, beard scanty, hair very abundant and tangled, of a shock-headed appearance, sometimes curly or even woolly. The peculiar Mongolian or Chinese form of the eye is not conspicuous, and altogether the features and the face are rather what we best know as African than Mongolian. This description crops up everywhere in all the various descriptions of Aboriginal tribes. I have not collected all these testimonies, but I will give one or two on which I can lay my hands. Col. Dalton says, "The Jushpore Oraons are the ugliest of the race, with foreheads 'villainous low,' flat noses and projecting maxillaries, they approach the Negro in physiognomy." And again, "The Kaurs, next to the Jushpore Oraons, are the ugliest race I have seen, dark, coarse-featured, wide mouths and thick lips." In a note which he was good enough to send in answer to some inquiries which I made, he adds, "The Oraons have more of the African type of feature, and I have seen amongst them woolly heads." An isolated tribe on the East Coast, called 'Chenchwars,' are described in similar terms, and said to be "just what you might suppose to result from the crossing of the Malacca Aborigines with the common people of this country," the Malacca Aborigines being very marked Negritos. The Savage Gonds in the forests east of the Wyngunga seem to be of a similar type. So

in the papers with which I have been favoured from Bombay, I find that Major Keatinge, describing the three tribes of Gonds, Koors, and Bheels who meet about Asseerghur, says, "All three tribes are very black, with a decidedly African expression when met in the centres of their country." And Capt. Probyn, speaking of the more civilised Gonds who are now, he says, finer and fairer, still adds, "with somewhat African features." Major Keatinge adds what illustrates that which I have already said, "On the outskirts of their country, their features are much modified, showing plainly that they do not succeed in keeping their blood pure. The Chiefs have generally made it a point to get women of other castes into their households, and I have consequently observed that none of them have the national features."

In the South, the Chermars of Malabar are described as "very diminutive, with a very black complexion, with not unfrequently woolly hair." And of some of the tribes of the Kodagherry hills it is said that "flattened noses, dark complexion and large white teeth filed into the form of a saw give them an African appearance." The Nagadees are said to be "in complexion invariably of the deepest black, their hair thick and curly, their features brutish, their forms diminutive." That the type which I have described prevailed among the Aborigines generally in ancient times, is evident from the Purans, where they are described in extremely uncomplimentary terms as 'vile monsters,' 'allied to monkeys,' 'as black as crows,' 'of flattened features and of dwarfish stature.' Their long thick matted hair is also particularly mentioned.

The ancient Greeks also describe the South-Indians as like Ethiopians, and it is difficult to assign any other country to the Oriental Ethiopians of Herodotus.

It may be stated, as a physical peculiarity of the Aboriginal tribes, that most of them seem to have a remarkable power of resisting malaria, and thrive in the most malarious jungles where no other human beings can live. This may, however, be the result of long habit; some tribes inhabiting healthy localities sicken easily enough elsewhere.

The languages of the Aborigines seem to have all this much in common, that they are of the structure described as Turanian. They are neither like the Monosyllabic Chinese on the one hand, nor on the

other like those Arabian and African languages which seem to form their changes by variations in the body of the word. The Indian Aboriginal languages, in common with the Hindustanee, the Turkish, and some Arian tongues, seem to form declensions, conjugations, and derivations, and to supply the place of what we call 'prepositions' by *post-positions* and *post-inflections*. The verb or governing word comes at the end of the sentence, instead of at the beginning as in English, somewhat thus, our order being just reversed.

Rem	acu	tetigit
Cheez	sui-se	chuha
Thing	needle with	touched he.

The word 'Turanian,' as applied to an immense class of languages, does not, however, imply any immediate connection with Thibetans or Mongolians, from whom the Indian Aborigines are physically so world-wide asunder. It is used in that very wide sense which includes not only all the Mongolian races, but all the Polynesian races, and all the Negritoes of the Indian Archipelago, Australia, and Van Diemen's land. A few vocables are said to be found, common to the Dravidian tongues and to some other Turanian languages. But the greatest resemblance is said to be not to the nearer Mongolians, but to the most distant Finns, and it is at the same time admitted that there are at least as great indications of a special connection with the Australian Negritoes. It may then generally be said, that both in physique and in the structure of their language, the Aborigines present a type analogous to that of the Negritoes of the South Seas, Papuans, Tasmanians and others, as well as to the nearer Negritoes of Malacca and the Andamans.

That which I have already said of the general character of the laws and institutions of the Non-Arians as distinguished from the Arians, is all that I can give as common to all these tribes. On this and many other points, we require much more information.

One tribe only I must except, as quite without and beyond the general descriptions of the Aborigines which I have given, viz. the Todas of the upper plateau of the Neilgherry hills. They are not properly Hindoos, but no one who sees them, would for a moment suppose that they belong to the Negrito races. They are evidently Caucasians of a high type. In truth they are but a very small tribe; the

common tradition and consent of the country makes it clear that they came as conquering immigrants to their present position at a comparatively recent period, and their pastoral habit renders their migration easy. Their language, so small a body may well have almost lost during their wanderings among Dravidians. They may be anything Caucasian, and from anywhere; ordinary Aborigines they are not. It has been said, that in their speech some words have a resemblance to the Brahui dialect, but personally they do not seem to resemble Brahuis, they are rather like Greeks.

The points of structure which I have given, as common to all the Aboriginal languages, are, it will be observed, of the widest character. And this brings me to the fact that by the test of language the Aboriginal tribes may be divided into two great classes, having very few vocables in common. The first great division is that of the tribes speaking dialects radically allied to the civilised languages of the South, commonly called the Dravidian languages. These then I shall call the Dravidian Aborigines. There is no doubt that the wild tribes of the southern hills speak wild and primitive forms of the southern languages. The Carambers seem to be ancient Tamil speakers, the Malcasurs of the Western Ghats approach nearer to the Malayala. The Burghers and Kotahs speak a primitive Canarese, the Ramooses, a language which seems to be for the most part Telagoo.

The Gond language is as clearly Dravidian as Telagoo or Tamil, and the Gonds are so considerable a people that the Gondee might almost be added to the list of regular languages of the southern type. The name Khond is so like Gond that, next neighbours as they are, one would almost suppose the words to be the same. They are said to be different, but at any rate the Khonds also are shown by their language to be clearly Dravidian. More distant is the tongue of the Oraon tribe, to whose physical characteristics I have already alluded, and who are now found among tribes of the other division (to be presently noticed) in the Chota-Nagpore territory. But the radicals and main features of the Oraon language leave no doubt that they are of Dravidian stock—a circumstance which does not suprise us, as we learn that they are comparatively recent immigrants from the west into their present locations. East of them again, in the Rajmahal hills, we have the last of the Dravidian tribes (so far as has yet been

ascertained), speaking a language akin to that of the Oraons. Those hills form a kind of knot at the extreme eastern point of the hill country of Central India. It was known that the people were entirely different from their neighbours the Santals. The latter cultivate the lower lands, and it may at first sight seem surprising that the higher grounds should be in the possession of more recent settlers of a distant southern stock. The fact, however, seems to be explained by the plundering habits of the Rajmahal hillmen. They seem to have occupied those hills as a kind of stronghold, from which they could conveniently plunder the plains around them.

The greater part of the Chota-Nagpore division and adjoining tracts is occupied by tribes whom I take as representative of the second or northern division of the Aborigines. There are 'Lurka Coles,' 'Hos,' 'Bhoomiz,' 'Moondahs,' and Santals, and wilder tribes of the border hills, all speaking dialects of a language very different from the Dravidian. In fact, so far as vocables go, no substantial connection can be traced. Max Müller speaks of these tongues as quite unconnected with any other. Still I venture to think that there seems to be some similarity of structure between them and the Dravidian languages. Major Tickell has published in the Journal of the Society a grammar of the Hos or Lurka Col language; and I note the following as a few of the peculiarities common to it and to the Dravidian tongues, as the latter are set forth by Dr. Caldwell.

First, there is the general coincidence of structure, which I have already noticed as common to all the Aboriginal tongues as well as to Hindustanee, Turkish, &c. In this respect, the northern Aborigines do not differ, and they similarly use postpositions, &c.

Further. In the Dravidian tongues there is no regular gender, all inanimate things are neuter, and the terms male and female are prefixed when necessary.

It seems to be the same in the northern aboriginal tongues.

Adjectives do not decline, nor are there degrees of comparison.

It is the same in the northern tongues.

There are two forms of the first person plural, one to include, and the other to exclude the person addressed.

This peculiarity also is found among the northern tribes, as well as in the Australian tongues.

Relative participles are used instead of relative pronouns in both classes of languages.

The northern tongues seem to be considered more highly inflected than the Dravidian, and they have a regular dual form which the others have not. The verbs have no passive voice.

It would seem to imply a higher organisation in the northern aboriginal languages, that the vocabularies show them to be more complete, and less to borrow from their neighbours all words beyond the very simplest. For instance, in the matter of numbers, while the Gonds do not go beyond ten, the Oraons beyond four, nor the Rajmahalees beyond two in Dravidian numbers, (borrowing all the rest from the Hindee,) the Coles and Santals count up to high numbers in their own tongue, only using scores instead of the decimal notation of hundreds, as do many Arian tribes. I have seen it stated that the Dravidian Khonds count by dozens.

Max Müller remarks that savage tribes, with no letters to fix their tongues, alter their speech much more rapidly than civilised nations; and it may be that, when we have two groups of people adjoining one another and with a general physical similarity, such a general structural resemblance of language as I have noticed may mark a remote common origin, even when the community of vocables can no longer be traced. But at any rate, the difference is now so wide as to establish, as I have said, two distinctly marked groups.

The generic name usually applied to the Aborigines of the hill country of Chota-Nagpore, Mirzapore and Rewah is 'Coles' or 'Koles.' Europeans apply the term to the Dravidian Oraons as well as to the others, but perhaps erroneously. It is difficult to say to which tribes the name is properly applied, for most of them have other distinctive names. But in the south of the Chota-Nagpore country, about Singbhoom, &c. it is certainly applied to the 'Lurka Coles,' and I can myself testify that on the Mirzapore-Jubbulpore road, the Aborigines are called by the natives Coles or Kolees, which they volunteered to explain to me to be the same word "which you call Coolee." On the Bombay side again a very numerous class of Aborigines are styled Kolees. In the Simla hills also, the inferior people are known as Kolees. Altogether I have myself little doubt that the ordinary word Coolee, as applied to a bearer of burdens or labourer, is the same word,

and that in short it is the word generally applied by the Northern Indians to the Aboriginal tribes, most of whom they reduced to the condition of Helots.

There seems to be good reason to suppose that the original form of the word was 'Kola' or 'Kolar.' In fact, India seems to have been known to the ancients (who approached it coastwise from the West) as Colara or Coolee-land (Asiatic Researches, Vol. IX) and the people as Colaurians. If Kolar be the original form of Kolee, it would seem not improbable that, as in the mouths of some tribes by dropping the 'r' it became Kola or Kolee, so in the mouths of others, by dropping the 'l' it would become Koar, Kaur, Koor, Khar or Khor, a form which would embrace a large number of those tribes as now designated. I propose then to call the northern tribes Kolarian or Coolee Aborigines.

One may see frequent allusion to Kolarees or Colleries in the south of India. It appears that the word there used is properly 'Kallar.' In the Canarese language, the word 'Kallar,' it seems, simply means a thief or robber, and hence some of the predatory Aborigines of the hills, are designated Kallars or robbers, just as the thieves of Central Asia are called 'Kazaks' or 'Cossacks.' The word is applied so differently from that of Coolee, that there may fairly be doubt of its being the same. But the subject is worthy of farther inquiry, and if it prove that in fact the two words are identical, the term Coolee or Kolarian must be applied to the Aboriginal tribes generally, not to one division of them. Meantime, however, I apply it to the Northern tribes only, but I confess I have misgivings whether the more general sense may not prove to be the true one.

Beyond the difference of language, I am unable to state with confidence any very marked features distinguishing the Dravidian and Kolarian groups of tribes (each taken as a whole) from one another. But a marked difference in habits, manners, and national characteristics, has been found to exist where the two classes are in the closest contiguity. The Santals and Rajmahalees are known to present a marked contrast, and on the Chota-Nagpore plateau I am told that "the difference is so great, that they appeared to be quite another nation," and "their customs, appearance, even manners, are very different." Of these differences we have not the details, but I hope that they may be furnished in Col. Dalton's promised paper on the Coles.

The Kolarian Santals are a very ugly race, and I gather that their neighbours, the Dravidian Rajmahalees, have rather the advantage of them in this respect, but these latter have probably kidnapped a good many Arian women from the plains. I have fancied that I have noticed in some of the 'Dhangar' labourers in and about Calcutta, a peculiar little 'pique' 'retroussé' sort of nose, as distinguished from the flat broad-nosed features of the Santals, but this scarcely amounts to an observation. It may be noticed that in the passages which I have quoted in regard to the general type of the Aborigines, the African style was more especially attributed to Dravidian Oraons, Gonds and Chenchwars, &c. The Kolarians, Kaurs, Khairwars and Koors, are also represented as only one degree less ill-favoured; so, on the whole, I imagine that in point of personal appearance there is not much to choose between the two groups. Ethnographers seem to distinguish the Negritoes of the Southern Seas into two groups, a woolly or curly-haired group, and a straight-haired group; perhaps there may be found to have been some such division in India.

The Santals and most of their immediate congeners, are certainly a more simple, mild, and industrious race than the Rajmahalees, Gonds, Khonds, and Southern Kallar tribes; but again the Lurka Coles seem to be warlike, and the hill Khorewahs are described as wild savages, armed with battle axes and bows and arrows. On the whole, I should rather imagine that the Kolarians are more frequently good Coolees, and the Dravidians oftener troublesome Kallars.

The descriptions of the Aborigines as a good-natured people, ever dancing and singing (in a way that reminds one of the pleasanter descriptions of the Negroes,) I find to be applied to the Kolarians,—Santals, Moondahs, Khorewahs, &c.—more than to the Dravidian tribes.

As respects religion, although the indications are too slight for any confident generalisation, the accounts of the Kolarian creed seem pleasanter than those of the Dravidian beliefs and rites. The latter seem to deal in demonology, fetishism, frantic dances, bloody and even human sacrifices, in a way which reminds us of the worst African types; while several different accounts of Northern Aborigines, in widely different parts of the country, represent them as reverencing in an inoffensive way the sun, moon, and Lord of tigers, and mild and innocent Bhoots or household spirits. The superstitious belief in tigers' claws

as a charm, is shared with the Aborigines by all the Hindustanees. Another practice of the Aborigines the latter also have in hilly tracts, the heaping up cairns of stones at particular points, and tying bits of rag to a particular tree as votive offerings. This last may be seen anywhere, and these practices are probably very widely spread.

If there really be such a distinction between the Dravidian and Kolarian religions as that at which I have hinted, it is very like a similar distinction in Africa. In a work on South Africa by the Rev. Mr. Grout, we are told that the gods of the Hottentots are above, the sun, moon, &c. while those of the Kaffirs and more warlike Negroes south of the line are *below*, demons and evil spirits. Among some of the latter too are seen the horrid rites and bloody sacrifices. It strikes me that there is some resemblance in appearance between Hottentots and Santals.

A curious testimony to the ancient rights of the Indian '*Boomeas*' or people of the soil, is the practice in many parts of Central India where Hindu chiefs are dominant, that a new chief on his accession receives the *teka* or investiture from the blood of an Aboriginal Kole, Gond or Bheel.

I proceed to mention the various tribes in detail, so far as my imperfect knowledge of them permits.

The Aboriginal tribes now living apart from the general population in the South of India, appear to be very small and scattered. They are there for the most part absorbed in the general social system. Pariahs and others, as is well known, merely form a lower social grade. The robber tribes, Beders and such like, seem for the most part to have robbed themselves into a respectable and even aristocratical position. The Beders in some parts of Mysore now form a considerable portion of the population, and they have many Polygarships. There seems to be some doubt whether the Badagras and Kotas of the lower Neilgherry hills are properly Aborigines, they being, it appears, immigrants in those parts, and the Carambers the true Aborigines. I have not been able to meet with any very connected or detailed account of the thoroughly Aboriginal tribes of the hills and forests of the Neilgherries, Pulneys, and Western Ghats. The word *Maleasar* seems to mean simply a hillman, and the more proper tribal designations appear to be Carambers, Irulars, Puliars, and Veders. These seem to

be tribes in the very lowest stage of savageness, with in fact scarcely any agriculture, mere men of the woods. They are represented as of very diminutive stature, with thickly matted locks and supple limbs, living under trees in caverns or in the rudest wigwams, keeping sheep or collecting forest produce, very stupid but also very mild and inoffensive, except that they have a great reputation as sorcerers, and themselves believing in a religion of demons and witchcraft, are by their neighbours believed to be highly gifted that way. Altogether they seem to be very inferior to the simple but sturdy and industrious Coolees of the north.

The Chenchwars, already mentioned, and several very petty and isolated tribes exist in the Eastern Ghats about and north of Madras. I can only give the names of "Chendaurs" and "Yende" as near the Kistna and Pulicat Lake. Allusions seem to be made to the existence of Aboriginal or quasi-Aboriginal tribes at different points in the Western Ghats and Coasts; the name of "Chermars" and "Neade" are mentioned in Travancore and Cochin, but they are no doubt the same as Chermars and Nagadees, the slaves of Malabar. The Dhers and Ramooses of the centre and west of the Peninsula seem to be mixed with the general population. On all these points more precise information is much required.

It is not till we cross the Godavery to the north, that we come to the country really held by the Aborigines.

In the highlands between the Godavery and the Mahanaddee, the savage Khonds, notorious for their human sacrifices, are to the East, the barbarous and less known tribes of Gonds to the West and more in the interior.

The Khonds appear to be in contact with Hindus and to have some of that race among them. Their blood is probably somewhat mixed, and they are not described as so ugly and ultra-Aboriginal as some other tribes.

Of the Gonds of the forests of Bustar and thence running up towards the Wyngunga we know very little, except that they are extreme savages, black, ugly, barbarous and dangerous. The name "Marees" seems to be there applied to them, and they appear to be nearly independent, owning a scant allegiance to chiefs whose blood is for the most part Gond. From thence the Gonds extend a long way North, and

occupy a broad tract east and west wherever the country is jungly or hilly, but becoming more and more civilised and more dominant over others as we go northwards. The valley of Sumbhulpore may be taken as for the most part marking the division between the Gond country on one side, and that of the Aborigines of northern stock on the other.

On the east the Gonds, under the name of Gours, extend into the borders of the Chota-Nagpore agency in Oodeypore and Sirgoojah, but they are there much Hinduised and have lost their language. The Raja of Sirgoojah, though pretending to be a Rajpoot, is suspected to be a Gour; at any rate the Gours are there the dominant tribe. Thence westward along the line of the Sautpoora hills, through all the hilly country of the districts of Mandla, Jubbulpore, Seonee, Chandwara, Baitool and Hoshangabad, in fact in some degree to the neighbourhood of Asseerghur, the Gonds predominate. In the wilder parts, they speak their own Aboriginal language, and seem there to be a simple and not intractable people, following both pastoral and agricultural pursuits. In the older maps, the name Gondwana is given to a wider tract of country in this part of Central India, being that which was in modern times rather politically than ethnologically Gond. The Gonds (in a somewhat civilised form) were in fact for some time masters of all this part of the country, including the open and cultivated tracts about Nagpore, Raepore, Jubbulpore, &c. and perhaps as far as Ellichpore on the one hand, and on the other to the south of the Godavery, where some of them are found among the ordinary Telinga population. Deogurh in the Sautpooras was the chief seat of their power. They immediately preceded the Marattas. These latter ousted them from the open and valuable tracts, and they do not now form any considerable part of the population of the plain country, but they maintained a feudal dominion in much of the hilly country; and to this day not only the chiefs and large zemindars of the Sautpoora range, but most of the men of considerable position in parts of Saugor and other districts north of the Nerbudda are, I understand, Gonds, diluted or improved Gonds as the case may be, (most of them wish to become Rajpoots, and others have become Mussulmans), but still Gonds.

Following up the Dravidian tribes, we next come to the Oraons, now located in the midst of Kolarian tribes and much mixed up with

them. The Gonds or Gours have been mentioned as found in a not very pure form in the west of Oodeypore, and Sirgoojah of the Chota-Nagpore division. In the highlands to the east of those states and of Jushpore, the Oraons are found. Col. Dalton mentions them as forming the greater part of the population of a considerable portion of the Jushpore highlands, and it is these whom he describes as the ugliest of the race. Thence eastwards the Oraons have pushed themselves into the proper country of the Moondahs (of Kolarian race) in the plateau of the Chota-Nagpore district and adjoining country. They must have been strong, to effect an ingress to a country not originally their own, but I do not understand that they are now at all dominant over the others. In fact they seem to have very much adopted the habits of the Kolarians, among whom or in contact with whom they live, are industrious and laborious, and as much as the others contribute to the supply of the labour market of Bengal. I understand that they form a considerable proportion of the Calcutta *Dhangars;* that last term being one the proper meaning of which I cannot ascertain, but which, so far as I can learn, is applied generically to the aboriginal labourers in Calcutta.

Separated from the Oraons by a considerable space (principally of lower but still more or less hilly country, occupied by mixed tribes of Kolarians, Hindustanees, and Bengalees), are the Dravidian Rajmahalees, whose proper tribal name, I have not ascertained. They are sometimes called Maler, but that is merely the Dravidian form for mountaineers, the word applied to so many of these tribes.

These are the men who are well known in connection with Mr. Cleveland's endeavours to tame and reform them. They seem to have been in those days terrible depredators. That all the parts of India adjoining the Central hills, both at this point and throughout a considerably wider range, were in times of anarchy dreadfully subject to injury from the hill-men, is still attested by the numerous and extensive 'ghatwallee' tenures held all along the foot of the hills and about the Ghats and passes. They are particularly numerous in the Bhaugulpore and Beerbhoom districts, adjoining the Rajmahal hills on either side. Such estates pay little or no revenue, but are held on the condition of guarding the passes against hill robbers, murderers, and cattle-lifters. The hill-men have been successfully reclaimed,

I believe that they cultivate quietly, and there appears to be now little complaint against them. Organised and serious raids on the plains are, I understand, unknown. The Rajmahal men are those who were enlisted into the British military service to form the local corps known as the Bhaugulpore Hill Rangers; but when the usually quiet Santals were impelled by a sense of wrong to a headlong sort of rebellion, the other (and it was supposed more military) race forming the Rangers, when opposed to them, by no means distinguished themselves, and they have since, I think, been disbanded.

I now pass to the Kolarian tribes. The more civilised and numerous tribes of this race, occupying an extensive country about 150 miles west from Calcutta, and known as Moondahs, Bhoomiz, Hos, and Santals, speak languages so nearly identical, that they may all be regarded as Sub-divisions of one people. They are in fact very like one another in many ways. They occupy most of the British districts of Chota-Nagpore, Singbhoom, Maunbhoom, and the hilly part of Bhaugulpore (Rajmahal hills excepted) now known as the Santal Pergunnahs; also parts of West Burdwan, Midnapore and Cuttack. They are a simple industrious people, and are reputed to be remarkably honest and truthful. Their country is healthy and, unlike most aboriginal tribes in most parts of the world, they seem by no means to be dying out, but multiply and supply the labour market. Partly on account of the cheapness of labour in their country, partly on account of their tractable disposition and freedom from all caste and food prejudices, and more especially, I think, because of that want of attachment to the soil which distinguishes the Aboriginal from the Arian, they are much sought after and highly prized as labourers. Many of them are settled in the service of Bengal Indigo-planters; they are very well known as labourers on the Railways, roads, and other works of Western Bengal; and they are now, I believe, the favourite material for emigration to Assam. Unfortunately, however, coming from a healthy high and dry country, they have not that capacity for resisting malaria for which the wilder tribes are remarkable, and seem to die very rapidly.

In the Chota-Nagpore country, the 'Moondahs' seem to have so far adopted Arian manners, as to live together in considerable villages, instead of apart in detached houses or isolated hamlets, according to

the common practice of these tribes; but I am told that so great is their instability and want of attachment to any particular spot, that not unfrequently, on some petty quarrel with their zemindar, a whole village will abandon their houses and seek other locations, or put themselves under the guidance of a Coolee recruiting-agent. The Hos and Bhoomiz* of the lower parts of Singbhoom and Maunbhoom, seem to be tolerably civilised. The Santals, though geographically near the plains, seem to be among the most shy and socially-isolated of the race. They cultivate the lower lands of their country, but seem to have kept very much to themselves, and to prefer locations surrounded by jungle and segregated from the world. They too, however, have now taken much to labour for hire, and they must have become intimate with Europeans. In the case of these people is to be found practical illustration of a truth of wider application in India, viz. that in a mere pecuniary and commercial point of view, tact and scrupulous fairness in dealing with the natives are more effectual than all other means, and go farther than any laws and any administration. I believe that certain of the Railway Engineers, who have gained the special confidence of the Santals and allied tribes, construct the railway mile for mile infinitely cheaper than any others.

On the borders of the hills, a set of half-breeds seem to be not only by profession Ghatwals, but to constitute a sort of caste under that name.

I have alluded to the language of these Kolarian tribes. One would hope or expect here to find the origin of the non-Arian elements of the Hindee and other northern languages. This, however, has not yet been so. It is difficult to distinguish between words borrowed by the Aborigines from the modern Hindustanee or Bengalee and those of a common origin. A few of the words in Hodgson's lists are like Hindee, but most of them seem to be Arian words. Some words seem to be used throughout India as 'Donga,' a boat, and some are words of much wider use as 'Ka' 'Kahee' or 'Kova,' a crow and 'Pussi,' a cat. It is then no doubt the case that the very brief and imperfect vocabularies of the Kolarian tongues yet published, have not shown an immediate connection with any other known language. More

* Bhoomiz, I believe merely means 'people of the soil' from *Bhoomi*, being nearly the same word as the Persian 'Zemindar.' What the Hindoo tribes are to the Mahommedans, the aborigines are to the Hindoos.

minute inquiry would be very desirable. Besides a more exact and full grammar, I think it would be well to separate out from the Hindee a list of non-Sanscrit words of common use, (and which are not also common to the greater part of the world, such as "*kowa*," a crow, and some of the universal Turanian words), and having thus got what I may call a *Hindee proper* vocabulary, to compare it carefully with the dialects of the Santals, &c.

In addition to the semi-civilised tribes which I have mentioned, nearly the same language is spoken by the wilder Lurka Coles of the hills to the West of the Singbhoom district. North of these latter again, in the highest hills to the North of Jushpore, and in those between Sirgoojah and Palamow, Col. Dalton mentions a considerable tribe called Khorewahs, who speak much the same language, whose manners and habits are the same, and who are evidently of the same stock, though much less civilised; some, he says, utterly savage and almost Nomadic. They are said to be of small stature, but better looking and lighter than their neighbours, the Dravidian Oraons, with shaggy heads of hair and some beard.

Mention is made of some other very wild tribes scattered about the Chota-Nagpore division, Kherrias (who are a mystery even to Col. Dalton), Bendkurrs and Birhores in the south of the division, and Bhuhars or Boyars (not to be confounded with very different Bhuyas to be subsequently noticed) in the north; but the languages and affinities of these tribes have not been ascertained sufficiently to place them. They are described as "regularly wild inhabitants of the hills and jungles, who have no fixed villages, but move about from place to place, burning down the jungles, sowing in the ashes, and after reaping what is produced, going elsewhere."

On the Sumbulpore borders, the Coles, intermixed among the Gonds, are said to be known as "Kirkees."

Mr. Samuells mentioned a wild tribe in the jungles of Cuttack, whom he calls 'Janguas,' perfect savages, small, slender, nearly naked, and horrid in appearance. They speak a strange language, and he gives a few words, some of which seem like the language of the Santals, &c, as 'Minnah,' one, and 'Bana,' two.

The Aboriginal tribes near Cuttack strike a bargain by breaking a straw.

In some places the word 'Soor' or 'Sourah' seems to be used, as if the same as 'Santal;' and Mr. Stirling, in an article on Cuttack, (in the Asiatic Researches) enumerates 'Santals' and 'Soors' separately among the tribes of Coles. It would seem then as if Soors or Sourahs were a tribe of Santals on the borders of the Cuttack division. But the Soors under the hills north of the Mahanaddee, while described as small, mean, and very black, and like the Santals naturally harmless, peaceable and industrious, are also said to be without moral sense and ready to cut firewood or other men's throats indifferently, an accusation not, I think, brought against the Santals.

Again, Macpherson tells us, that the hill tribes *south* of the Khonds, and running up to near the Godavery, are *Sourahs*. That is quite a different location, and I have not found any farther account of these Sourahs. Caldwell says that the Tamil people were anciently called 'Sorahs,' but as they are the most Dravidian of all the southern people, they can hardly be allied to the Kolarian Santals, and the word must be different. The whole subject requires a good deal of fresh light.

Passing north, I have till now reserved, for separate notice, the tribes chiefly prevailing in the district of Palamow, the hilly country of Mirzapore and Rewah, and the borders of Benares and Behar. These are the Aboriginal tribes most directly in contact with the modern Hindustanees, and there is this difficulty about classifying them, that I have not been able to ascertain their original language. They now generally speak some sort of dialect of the Hindee, and are more mixed with the Hindustanees, perhaps I may say generally more civilised, than the tribes located farther in the interior of the hills. The principal tribe of these parts are called 'Kharwars' or 'Kharawars.' There is also a widely spread tribe of 'Rajwars.' A division of the Kharwars are called 'Bhogtahs.' The Kharwars seem to be altogether the dominant tribe of Palamow and Singrowlee (the Mirzapore hill country). Both Kharwars and Rajwars are also found in considerable numbers westward, in parts of Sirgoojah and Jushpore, while to the north-east, in the parts of the plains adjoining the hills, they are numerous. In the Gya district, near the hills, the Rajwars are the chief labouring class. They live in the

villages as a kind of serfs and bearers of burdens, carry palanquins, and when out of employ, are apt to be thieves and robbers. A little farther west, the Kharwars seem to perform the same functions; they are mentioned by Buchanan as in the outskirts of the Patna and Arrah Districts. On the road from Mirzapore to Jubbulpore, where it passes through Rewah, &c., the palanquin bearers and coolies are Aborigines. When I passed that way some time ago, not having then gone into the subject, I did not ask the particular tribe, nor have I since been able to ascertain it, but in all probability they are Kharwars.

All these people have in their faces unmistakeable marks of their aboriginal origin. But they speak Hindee. This then brings us to the difficulty about language. Col. Dalton is not aware of any Aboriginal language spoken by the Kharwars. I have had the impression that in the Mirzapore district they spoke their own language; and Capt. Blunt, who in the last century made a remarkable journey from Chunar right through the hills to the Godavery (see Asiatic Researches, Vol. 7), almost at the outset of his journey mentions the Kharawars of the Singrowlee hills as very savage, and speaking a separate and quite unintelligible language. But the Rev. R. C. Mather of Mirzapore, who has been good enough to write for me a note on the subject (of which I have already made use), and who refers to a tour made by the Rev. Mr. Jones, is unable to say that any aboriginal language exists in these parts. He says that both the Kharwars and another similar tribe, locally called 'Majhwars,' speak the Hindee, or at least understand it when spoken. It would be very interesting to ascertain if the remains of an original language exists among these people, for with them more especially we should expect to find the non-Aryan Hindee roots. If aboriginal tribes so situated have no separate language of their own, it may arise from either of two causes; either they may have abandoned their own language and adopted that of the people who are flooding over and as it were submerging them; or the fact may be that, in its most radical parts, the language of these latter having been the same as their own, an influx of vocables on this common basis may altogether obliterate the landmarks by which languages are distinguished. Till however, this is cleared up, I think that we must on other grounds

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class the Kharwars, &c. with Kolarians rather than with Dravidians. Mr. Mather, quoting Mr. Jones, says that, passing on from the Kharwars, he came to the 'Oraons,' in whom he found "the difference from the Mirzapore Hill people to be so great, that they appeared to be quite another nation." In fact, the Oraons are now a good deal interposed between the Kharwars and Kolarian Moondahs, but Col. Dalton also says that the Kharwars and Oraons, though in contact, are very unlike one another in language, appearance, manners and customs. The Kharwars, he says, are not quite so African looking as the Oraons, but some of them seem to be not much better favoured. A long connection with the plains would best account for the adoptions of the language and some of the manners of the plains-people by the Kharawars and Rajwars. And here the question has suggested itself to me, whether they may not perhaps be identified with the Cheroos and Bhurs, those aboriginal tribes whose dominion in the plain country to the north of these hills is matter of history, who seem certainly to have come from and to have gone to the country now inhabited by these tribes, and who from this point of their history almost or wholly disappear. Buchanan seems to speak ambiguously, sometimes classing Kharawars and Cheroos together, sometimes treating of them as separate. While mentioning the Cheroos as nearly extinct in the plains, he speaks of them as still existing in numbers in the high country within the hills. In the accounts of the latter country, on the other hand, I find no mention of either Cheroos or Bhurs under those names. Farther inquiry seems necessary. Our use of Roman letters applied to native names is very uncertain, and if we could suppose the C in Cheroo to be pronounced hard as in Cole, Cheroo would become Kheroo, and Kheroo would be not very different from the Khara of Kharawar (the 'war' is a mere termination), while Khara might again be connected with the name of the Kolarian Khorewahs already mentioned, and with the *Koors*, equally Kolarian, to be subsequently noticed. Again, the Bhurs are more commonly known as 'Rajbhurs;' may not Rajhbur have been corrupted into 'Rajwar?'

The present dominant position of the Kharwars in a considerable country would seem much to tally with the idea of their representing the tribes once so famous. Both the Rajas of Singrowlee and Jush-

pore are Kharwars, however they may claim an origin from Rajpoot foundlings, and they are the people who most affect what Col. Dalton calls 'refining into Rajpoots.' Although many of them may have achieved a good deal of improvement in their blood and appearance, they are not originally a handsome race, for Col. Dalton expressly tells us that in the more remote parts, the Kharwars of Palamow, and especially the Bhogtahs, are very ugly and ill-favoured. Like the other aborigines, they have no proper caste and eat anything.

I leave, for separate notice, a very numerous tribe all along the borders of Bengal, Orissa, and part of Bahar, called Bhuyas, whose connection with the races above described is not clear.

In this region of India, it only remains to mention one more Aboriginal tribe, called Kaurs, found in the extreme west of the Chota-Nagpore Agency about Korea, Oodeypore, and the adjoining parts of the territory of Nagpore proper, the Pergunnah of Korbah of Chatteesgurh. They are described as a very industrious thriving people, considerably advanced in civilisation. They now affect Hindoo traditions, pretend to be descended from the defeated remnants of the Kooroos who fought the Pandavas, worship Siva and speak Hindee, but in appearance they are ultra-aboriginal, very black, with broad noses and thick lips, and eat fowls, &c., bury most of their dead, and contemn Bramins; so that their Hindooism is scarcely skin-deep.

From the last mentioned point westward, through a broad tract of country, the plains are occupied by the ordinary Indian Arians, the hills and forests by the Gonds (who here in the centre of India meet the Hindustanees on the North, the Telingas on the South, and the Marattas on the West); and we do not again come to Kolarian Aborigines, till we get in fact to the West of India. There is then a hiatus, as respects the Kolarians, of four or five degrees of longitude, where by the advance of the conquering Gonds they have probably been split asunder. It somewhat singularly happens that the first people of this race whom we come to in the West, bear as nearly as possible the same name as the last we left in the East. The latter were called 'Kaurs.' In the Western Sautpooras, in the hills about Gawalghur near Ellichpore, and thence towards Indore, is a tribe called '*Coour*' or Koor Koos. These people speak an undoubtedly Kolarian language. The name is sufficiently near to *Gour* to cause them to have been

sometimes confounded with their neighbours, the Gonds, but the difference is clear. In the notes with which I have been favoured from Bombay, Major Keatinge mentions them as "a tribe of Gonds calling themselves Koor Koos," but he goes on to distinguish them from the Gonds, mentioning the geographical location of each, and adding that the two tribes keep themselves separate, do not intermix, and that each has a separate language of its own. He does not give particulars of the language, and it is from a paper on which I stumbled in an old number of the Society's Journal, and which does not appear to have been previously much noticed, that I have been able to identify this tribe with precision. Dr. Voysey, writing at Ellichpore so long ago as 1821, also at first calls them Gonds, but he goes on to say that they are also called 'Coours,' and that the Gonds consider themselves a distinct tribe from the Coours and neither eat nor intermarry with them. He then gives a small list of Coour words. This was taken long before Hodgson's vocabularies were published, and the two seem never to have been compared. I have compared Dr. Voysey's list with Hodgson's lists of words of the Kolarian tribes of Lurka Coles, Santals, &c. and find a remarkable coincidence. For instance, take the numerals.

	Coour.	Hodgson's Coles, &c.
1.	Mea, ...	Mi.
2.	Bariah, ...	Barria.
3.	Aphe, ...	Apia.
4.	Aphoon, ...	Apunia.
5.	Munea, ...	Monaya.
6.	Turrume, ...	Turia.
7.	Aya, ...	Iya.
8.	Ilhar, ...	Irlia.
9.	Arhe, ...	Area.
10.	Gyl, ...	Gel.

And again.

	Coour.	Hodgson.
Man,	Hoko,	Ho.
Water,	Da,	Dah.
Fire,	Singhel,	Sengel.
Tree,	Darao,	Daru.

House,	Oah,	Oa.
Mouth,	Ah,	A.
Eye,	Meht,	Met.

In fact, of the first nine of Voysey's words which are also given by Hodgson, seven are identical, a circumstance very remarkable, seeing how far these illiterate tribes are separated from one another. None of the words correspond with the Dravidian synonyms, so there can be no doubt that we have traced the Kolarians so far.

Immediately beyond the Koors, from Asseerghur westwards, we are in the Bombay Presidency.

As I cannot ascertain that Mhars and Mangs and Ramooses now live as entirely separate tribes, I may at once say that, so far as my information goes, the Bombay Aborigines are (for my present purpose) all comprised in the two tribes of Koolees and Bheels. These tribes are scattered over a great portion of the Presidency, and in some parts, the Koolees especially, seem to live as a part of the general population. But the Koolees in part, and the Bheels more generally, are still found in portions of their original seats as distinct tribes, and they both seem to be numerous. Their name, position, and character seem to mark the Koolees as Kolarians. But beyond this, the more precise test of language is unfortunately wanting. I have not been able to find that these tribes have now any aboriginal languages of their own. They are generally said to speak dialects of the civilised languages of the neighbouring countries. In one or two places allusion is made to the existence or supposed existence of a Bheel language in remote jungles, but I have not found any precise indication respecting it.

I was at first inclined to conjecture that the separation into two tribes of Koolee and Bheels, and perhaps the more predatory character of the latter, might point to a division of race; that the Bheels might be Dravidians. I find, however, that the general opinion of those qualified to judge seems to tend to the belief that there is no essential difference between the two tribes. Forbes in his Ras Mala says: "Koolees or Bheels, for though the former would resent the classification, the distinctions between them need not be here ch a " Capt. Probyn says, "I think there is no actual difference ry Koolees and Bheels. Their religion is the same." Mr. Ash

"There is no real difference between Bheels and Koolees; their habits, physiognomy and mode of life are the same, modified by local circumstances." And the Rev. Mr. Dunlop Moore says, "Koolees frequently marry Bheel wives." Other authorities, however, say that they do not intermarry. They both seem to claim a northern and not a southern origin, pointing to the hills of Rajpootana and the north of Goozerat. The Bheels say that they were originally called Kaiyos; Sir John Malcolm says that they are related to the Meenas of Rajpootana, and once ruled in the Jeypore country. Forbes again tells us that the Koolees were originally called Mairs; while in Rajpootana, Col. Tod speaks of Mairs or Meenas as one race.

The Rev. Mr. Dunlop says that, though these tribes speak the same languages as their neighbours, "certain words are universally recognised as peculiar to Koolees as well as Bheels." He only instances one word written in a character which I can read, and that is 'Bhoroo' or 'Bhooroo,' the *head*. As I write, I have turned up the word *head* in Hodgson's vocabularies, and find that the Kols, Santals, Bhumiz and Moondas use the word 'Bu,' 'Buho' or 'Bohu' which seems to be the same word. The Dravidian words for head are entirely different.

It would be in many ways very interesting and important to rescue any remains of aboriginal words or aboriginal dialects of these tribes, and especially to find whether among them can be traced any non-Aryan radicals of the Goozerattee, Maratta, and the Hindee dialects of Rajpootana.

Though probably in the main of the same class and similar origin, the Koolees and Bheels are now quite distinct tribes, and there is this considerable difference that the Koolees have come much more into contact with Aryan blood and civilisation, are in appearance generally much more Hindooised than the others, and consider themselves altogether a higher class. As has been said, both tribes are now much scattered over many parts of the Presidency and in places a good deal intermixed, but their proper locale seems to be as follows. The Koolees are the Aborigines of Goozerat (where they was five in considerable number), and of the hills adjoining that province. The hills east of Goozerat are called 'Kolwan' and seem to be the property of Koolee tribes, just as in the Chota-Nagpore

but somewhat lower in the scale of humanity. I do not know whether these are really sub-divisions of the Bheels or separate tribes. In fact there may be many remnants of tribes in the jungles of Central India yet undescribed. I have now, however, noticed all the aboriginal tribes of the hilly portions of the Indian Peninsula known to me, with the exception only of the Bhooyas of the borders of Bengal.

In the plains, of course, we do not look to find separate aboriginal tribes, and those now classed as 'castes' will be afterwards noticed; but before leaving the subject of Koolees or Kolaries I may mention an assertion of Col. Tod that all the weaver caste throughout Hindustan are of this class, though they now call themselves 'Julahas' or Julahees. I do not know what is the ground for this assertion, but the weavers who have not turned Mahommedans are certainly sometimes or generally known as 'Korees' and considered to be low in the social scale.

There are no aboriginal tribes, of the character which I have been describing, in the Himalayas. The Kolees of the Simla hills and Domes of Kumaon are merely inferior castes living among the general population. Both in Kumaon and Nepal, there seems to be a sort of tradition or popular belief of the existence in some remote forests of a 'Ban-manush' or wild man of the woods, but I cannot find that any one has ever seen one of these creatures, or that his existence is really in any way authenticated. One can hardly say whether the story points to the recent disappearance of the last remnants of an ancient race, or whether it is merely a nursery tale.

It is not then in the Himalayas, but in the forests at their foot, that we must look for some aboriginal tribes. And here I must observe that I think the use of the term Sub-Himalayan by Hodgson, and (following him) by most other authorities, leads to a good deal of misapprehension, from an Indian point of view at least. We are in the habit of considering the Simla hills, Kumaon, and Nepal to be part of the Himalayas (and with good reason too I think), but Hodgson calls everything below the Snowy Range "Sub-Himalayan," and classes as 'Sub-Himalayan' people who live higher than the highest mountaineers in Europe, in the most precipitous mountains, 8,000 or 10,000 feet high; while the people really living under the hills are usually put in another class. I am now about to notice

tribes who have nothing whatever to do with the hills, but live in the forests and what is called the 'Terai,' at the foot. No two climates and locations can be more dissimilar than those of the hills and the Terai, and no races are more distinct in their habits, manners, and aptitudes than the people of the hills and those of the jungle belt below.

It may be generally said that there is no Terai or forest belt northwest of the Seharunpore district and the Dehra Dhoon; but thence eastward this belt stretches along the foot of the hills through Rohilcund, Oude, and the Bengal Frontier, up to Assam. A great part of it belongs to the Nepalese. A very interesting paper by Dr. Stewart on the Boksas, a forest tribe found in western Rohilcund and in part of the forests or Sewalik hills of Dehra Dhoon, was published in the Society's Journal last year. They are entirely confined to the forest tracts, where they enjoy a wonderful immunity from the effects of malaria. They never (says Dr. Stewart) settle more than two years on one spot, but after getting a little out of the soil, move to fresh locations. They are of short stature and spare habit, and in feature certainly Turanian of some sort, with broad faces, depressed noses, prognathous jaws, thick lips, and very scanty beard and moustaches, but in colour apparently not darker than the ordinary Hindoos of the country. They are fond of game and pigs, eat almost anything, have no caste, and are reputed to be very skilful in witchcraft. They have no separate language. They are simple, inoffensive, and good-humoured, but very ignorant and indolent. Their cultivation is very scanty and rude, but they also collect forest produce and wash for gold. They are supposed to be dying out.

I have seen mention of another small and savage tribe in the Rohilcund Terai called "Rawats" or "Rajis;" and passing westward we come to a very important tribe, the 'Tharoos,' who in fact occupy all the Terai from eastern Rohilcund all along the frontiers of Oude and into Goruckpore. They are in many respects very like the Boksas—in physical appearance and manners I should say extremely like—but they are much more industrious, and altogether a larger, more settled, and, one may say, less savage tribe. They, like the Boksas, keep exclusively to the Terai and forest, living where no one else can live. They are shy and timid, but frank and truthful, when you get hold of

them, and are very good cultivators in their own simple way. They are not particularly dark, and, in addition to the ordinary breadth and flatness of face, have a good deal of the Chinese-looking form of eye; so that it is difficult from appearance to say, whether they really belong to the Negrito, or to the Indo-Chinese stock. The fact is that though no two races can be more unlike one another than the slim, black, tangled-haired Negrito, and the stout, fair, lank haired Thibetan, yet when we come to half-breeds, the difference may not be so great. When the colour is softened or heightened, and the size increased or decreased to that of the ordinary Hindoo, and the hair reduced to civilised limits, there is the same appearance of breadth and flatness of face, and these latter characteristics are more apparent at a glance than any distinction between prognathous and pyramidal skulls. It would seem too that the Chinese peculiarity of eye is caused by the broad cheek bone common to both races, and perhaps it may be that while the eye being sunk deeper in the Negro and Negrito, and more covered by a more fleshy form of face its form is not so apparent, in the half-breed it is brought out, and the skin tightened by the high cheek-bone shows the Chinese-looking form of eye. I have noticed some of the Ghatwals on the borders of Bengal and Behar, who looked not unlike Goorkas. Thus then it becomes difficult to distinguish those tribes, on the northern and eastern frontiers, whose blood may be supposed to have become a good deal mixed by long contact with other races, and whose colour may have been softened by the cool, moist and shady climate of the Northern Terai.

I must also say that I think Hodgson has somewhat contributed to mix up the two races in our ideas, for in his enthusiasm to establish a connection between his Tamulians and the eastern races, he scarcely attempts to distinguish them, and classes as Tamulians, Bodos, Dhimals, &c. of whose connection with the Aborigines of the South of India there does not seem to be the slightest evidence in language, and who in appearance are as different as can be.

To return to the 'Tharoos;' as I said their appearance might leave doubt of their origin, and unfortunately they are not known to have any language of their own. Those with whom we have come more immediately in contact (including all those in eastern Rohilcund) certainly now speak Hindee, but the tribe is so large and important, that it

would be, I think, desirable not to give up without farther inquiry the attempt to find a Tharoo language, though it will be more difficult now that, by the transfer of the Oude Terai, the great mass of them, and all those least mixed with Hindustanees, are Nepal subjects.

In other respects the habits and manners of the Boksas and Tharoos certainly point rather to an Indian than a Thibetan origin. I saw something of the Tharoos before they were annexed to Nepal; and their general style suggests a good deal of resemblance to the Santals for instance. Mr. Robert Drummond, who has served both in Pillebheet and in Central India, and who knew the Tharoos well, tells me that in many ways they remind him very much of the Aboriginal tribes of the Central hills. They have the same simple ways and the same religion of Bhoots and familiar spirits. He also mentions a singular circumstance, that on looking over a map of the hill country of Bhaugulpore (now called the Santal Pergunnahs), he was struck by the occurrence of many names which he had supposed to be peculiar to the Tharoos.

The claim of the Boksas to Rajpoot origin is of course ridiculous, but it is clear that all their traditions point to the south and south-west as the country of their origin, not to the northern hills. These tribes have in fact little intercourse with and no known congeners in the hills. The Boksas and Western Tharoos are separated from the Thibetan tribes by a great tract of very difficult country occupied by Arians; and though the Eastern Tharoos are nearer to Nepalese races who show Thibetan blood, it seems hardly probable that inhabitants of the hills should be driven out into the Forest below (of which the hill-men have a great horror); while, that Aboriginal Indians should be driven from the plains to the neighbouring jungles, would be probable enough. I am inclined to think that the Tharoos and Boksas are probably not Thibetan, farther than the accession of refugees and others from Nepal may have introduced a little of that blood. Dr. Stewart suggests the possibility that they may be akin to the Indo-Chinese races who occupy the lowlands near the Berhampooter; but though that may be possible, it seems to be a long way for emigrant tribes to find their way up to the Dehra Dhoon in countries where, for so many hundred miles, there is no trace of their congeners. On the whole, it seems more probable that they are Aboriginal Indians a good deal

diluted. I have not heard of the Tharoos serving as labourers, but if they are akin to the Dhangar Coolees now so much sought after, seeing their immunity against malaria, they would be very valuable to any one who could induce them to emigrate. As yet, however, they are very shy.

From Goruckpore eastward in the Nepal Terai and along the Frontiers of Bengal, I cannot learn that there are any Aboriginal tribes till we come to the neighbourhood of Sikkim and Kooch Behar. Those whom I have asked knew of none, and it is probable that if there were any, Hodgson would have mentioned them. Dr. Campbell of Darjeeling speaks generally of the population of the Nepal Terai as composed of a most varied assemblage of bastard Hindus.

The Kooch Behar people have become so Hinduised, that their original character cannot be distinguished with certainty. They call themselves "Rajbansees," as I think do several Hinduised Aboriginal tribes.

About this parallel we come upon the Meches or Mechis who form the chief population of the forests and Doars at the foot of the Sikkim and Bhootan hills, and a few of whom have recently settled in the extreme eastern portion of the Nepal Terai. I understand that these people are the same as the Bodos of Hodgson, who are of an Indo-Chinese family. I shall rank them and other similar tribes as 'Borderers,' and now only notice them for the purpose of comparison. They are described as very Mongolian or Indo-Chinese in feature, fairer than the Hindus and of a yellow tinge, taller and larger than the Nepalese cultivators, addicted to spirits and to smoking opium. They make small and temporary clearances in the forest and are proof against malaria. In an industrial point of view they are evidently much inferior to the Tharoos.

Dr. Campbell incidentally mentions among the lowland neighbours of the Mechis a tribe inhabiting similar tracts called '*Thawas*' whom I have not seen mentioned elsewhere. They seem (so far as one can gather from the slightest notices) to be more industrious and settled than the Mechis. Dr. Campbell seems to speak of them as a different race. It would be interesting to know whether these Thawas may not possibly be related to the Tharoos.

Also among the neighbours of the Mechis are the Garrows, whose main habitat is the hill country just within the bend of the Berham-

pooter as it sweeps round from Assam into Bengal, the extreme western portion of the range which separates Sylhet, &c. from Assam. More to the east are the Cossya hills, to the west those of the Garrows. While all the tribes of the eastern hills are Indo-Chinese, I am inclined to suspect that the Garrows alone are Indian Aborigines, more or less mixed it may be. They seem to be quite distinct and different from the other tribes of the neighbourhood, and several officers, to whom I have talked, agree in thinking them more in the style of Coles and Bheels than of Indo-Chinese. I have not found any very exact description of them, but gather that they are small and dark, savage and troublesome. That they should belong to the Aboriginal races of India, is *primâ facie* by no means improbable, seeing that their hill country is, as the crow flies, scarcely more than 150 miles distant from that of the Santals and Rajmehalees, as may be seen by a glance at any map. There is a kind of straight between the eastern and western hills through which the Ganges and Berhampooter run before expanding in the broader Delta of Southern Bengal.

The little that is known of the language of the Garrows has not sufficed to connect them with any of the Aboriginal tribes mentioned by me, but it also seems to show that it is radically different from the surrounding Indo-Chinese dialects. It seems especially desirable to know something more of the Garrows and their language.

I have kept to the last the Bhooyas or Bhoojans, because they seem to belong to both sides of Bengal, to West Bengal and Orissa on one side, and to Assam on the other. I have not met with any detailed account of their position in Assam, but I imagine that there can be no better authority than Col. Dalton who intimately knows both Provinces, and he, while describing them in the western hills, distinctly states that they were once the dominant race in Assam. It is always necessary to be cautious in dealing with names of this sound, since, as I have already mentioned, 'Bhoomea' means 'man of the soil,' and I believe that the word earth or soil also takes the form Bai. The Bhooyas have no immediate connection (that is looking only to the name) with either the Bhumiz or the Boyars. But Col. Dalton no doubt looks farther than this; and indeed he goes on to notice a considerable connection between Assam and the west both

in races and in language. The Bhooyas in the west seem to be numerous. They appear to be the original occupants of much of the lower country to the south of the Chota-Nagpore plateau, great part of Singbhoom and Bonai, and the borders of Orissa. From a portion of their country they have been partly driven and partly they are dominated over by Coles, themselves probably impelled south and east by pressure from the north and west. They are still very numerous in all the districts and petty states hereabouts, and are found more or less all the way across the lower hill-country to the borders of Behar. Col. Dalton calls them a dark complexioned race, with rather high cheekbones, but not otherwise peculiar. They have no language of their own, but speak Oorya on the Ooriah borders, Bengalee on the borders of Bengal, and Hindee farther north. They are now somewhat Hinduised, but have still priests of their own and traces of an old religion, which seems even down to recent times to have included human sacrifices. Major Tickell speaks of the Aboriginal Bhooians who preceded the Coles in lower Singbhoom as "an inoffensive simple race, but rich in cattle and industrious cultivators." The descriptions of Col. Dalton and Major Tickell seem to suggest a resemblance in appearance to the Ooryahs, among whom high cheek bones seem to prevail with good features and straight hair. The Bhooyas whom I have seen in the hills towards the Bahar border seemed to have a larger dash of the black Aboriginal type. Seeing how far these Bhooyas are spread to the west, I was curious to know whether they might be related to the Buis, a tribe of Telengana and Central India who serve all over the centre, south, and west as palanquin bearers and domestic servants, and from whose name is, I believe, the most authentic derivation of the widespread word '*Boy*' as applied to a dark servant. Travelling from Nagpore towards Jubbulpore I observed that I changed the Buis of Central India for the Kahars of Hindoostan. Col. Dalton did not know whether there was any connection between Bhooyas and Buis. But quite recently, making a trip through a part of the Chota-Nagpore country, I found that the palanquin was carried by Bhooyas there and below the hill country till I got close to Gya, and I ascertained that they had no connection with the Hindoostanee Kahars by whom they were then relieved, but were considered to be a wholly different race. I cannot

help thinking that the Bhooya palanquin bearers of Chota-Nagpore may be the same as the Buis of Nagpore Proper. At any rate it might be worth inquiring. These Bhooyas or Bhooians have been reputed to be the Aborigines of Bengal, and if that be so, it would quite account for their being found both in Orissa in the west and in Assam on the east. The difficulty is that there seem to be no such people now in Bengal, nor have I been able to identify them with any caste under another name. If, however, one travels in a palanquin from the Chota-Nagpore country into Bengal or Orissa, the bearers will be relieved not by Kahars as in Hindoostan, but by Gwallas or cow-keepers. These Gwallas do the work of palanquin-bearing and domestic service in Bengal, functions not performed by Gwallas so far as I know in any other part of India. An Aheer or up-country Gwala would never dream of such work. In fact the Gwallas in Bengal take the place of the Buis or Boys of the centre and south of India. They are now the most numerous Hindoo caste in Bengal and especially in Orissa. As I said, Major Tickell describes the original Bhooians as rich in cattle. May not the Hindoos have adopted them and turned them into Gwallas? I should also however mention that the lowest or sweeper class are called I understand in Bengal "Buimals," but I have not been able to ascertain the derivation of that word.

The Bengalees are certainly in many respects different from any other people of India, and if the Bhooyas are the Aboriginals of a great part of Bengal, we may the more readily believe that they are in fact different from the Coolees and Dravidians who have gone to compose the Hindoostanees and Southerners respectively. Who they are, and where they came from, are questions which open out a wide field of inquiry. Can any Aboriginal language or words spoken by them be traced? may they have any dash of more eastern blood? Is the mode of carrying palanquins rather a Chinese than an Arian fashion?

If we knew something more of the Garrows and the Garrow language, they might possibly supply a link in the history of Bengal.

Another race mentioned by Col. Dalton, as found both in the West and in Assam, are the Kolitas, whose name might suggest some relation to Coolees; but they seem to be now considered rather high

caste and good looking Hindoos, so the name is probably not the same. Is every direction, however, there is room for inquiry.

One word regarding a people in another quarter who have been classed with the Indian Aborigines, the Brahuis of the higher parts of Belochistan near Khelat, &c. These people are set down as allied to the Dravidians upon, I think, the slightest possible evidence, but it is one of those things that, having once got into print, is in the absence of farther information repeated again and again, till it seems an established fact. Dr. Caldwell, in his amiable enthusiasm for his beloved Dravidians, and seeking to establish for them an aristocratic pedigree, without acknowledging obligation to the northern Hindoos, seizes upon the Brahuis as the link to connect them with the more northern nations and goes somewhat into the matter.

The Brahuis are described as a stout, squat, somewhat flat-faced people, fair, with hair and beards often brown if not red. That they have indications of some Turanian element both in feature and speech, may be at once admitted, using the word Turanian in its widest sense; but for the rest anything in greater contrast to the slim black Dravidian Aborigines, it is impossible to imagine. They are very remote from any Dravidian tribe, the nearest being the Gonds. Their language is not supposed to show any affinity to the Kolarians.

On the other hand, in one direction we have not far to seek for an explanation of the Turanian element in the features of the Brahuis. The Hazarehs of the hill country near Ghuznee and Candahar have it in a more marked degree, and are without doubt of Mongolian blood. They seem to be in many ways like the Brahuis, and we are told that at one time they possessed the country on the Khelat side of Candahar, and were nearer than they now are to the Brahuis. That the latter have some of their blood, or may even be a branch of them driven to the hills by Belochees or Hindoos, would seem *primâ facie* the most probable thing in the world. It is then only by the test of language that any Dravidian connection can be assigned to the Brahûis, and in the case of people otherwise so dissimilar and so distant, the linguistic evidence ought to be very strong, to satisfy us. I have been unable to find a paper giving a list of Brahui words said to have been published by this Society, but Dr. Caldwell seems to sum up all the evidence on the subject. He admits that "the Brahui

language, considered as a whole, is derived from the same source as the Punjabee and Scindee" (in which no one ever suspected a Dravidian connection), but he goes on to show that the Brahui has also a Dravidian element in it. Now there are scarcely any two languages in which here and there words of similar meaning and similar sound may not be found, but so far as the vocabulary goes, Dr. Caldwell's list seems to show that he must have been very hard put to it. '*Khaff*,' the ear, and '*pid*,' the belly, seem to me at least as near to the Hindoostanee '*kan*' and '*pet*' as to the Dravidian '*kadu*' and '*pir*' or '*bir*.' '*Kat*,' a bedstead is, I think, distinctly a Hindee or Punjabee word. '*Dir*,' water, seems to me as near to the Kolarian '*dak*' as to the Dravidian '*nir*.' '*Ae*' or '*ayi*,' a mother or nurse, and '*pussie*,' a cat, are words of world-wide use.

So also the pronoun '*ni*' or '*nim*,' thou or you, appears in some shape in every dialect not purely Arian, from Australia to northern Siberia and from Japan to Finland. I really cannot find above 6 or 8 words which Dr. Caldwell shows to be especially like Dravidian words, and to make out these, he picks and chooses from every one of the different Dravidian dialects and accepts some rather distant resemblances as '*pak*' to go, Tamil '*pogu*.' This much seems to me to prove nothing whatever.

Again, take his grammatical resemblances. Some seem to be too wide, applying to many other languages, and others too minute. The use of postpositions and the want of comparatives and superlatives in adjectives is equally a coincidence with Hindoostanee and many other languages, neighbours of the Brahui on one side. The expression of gender by separate words and of plurals by postfixes denoting plurality is equally common to many other languages, including the neighbour of the Brahui on the other side, the Persian, *e. g.* '*nar-gow*' a '*male cow*,' and *Aspahan* '*horses*.' The genitive in '*na*' seems just as like to the Hindoostanee and Punjabee '*ka*' or '*da*' as to the Tamilian '*ma*.' The dative-accusative in '*e*' is a familiar Hindoostanee or Punjabee form, thus instead of '*Mujh-ko do*' Give me, it is constantly '*Mujhe do*,' and '*Use maro*' beat him, especially with the Punjabees. So also '*ten*,' said by Dr. Caldwell to mean 'self' in Brahui, seems very like the same syllable used to give precision in Hindoostanee as "*Use-ten do*," which I should translate '*give to him himself*.' At any rate '*ten*' is found nearer at hand than the Dravidian '*tan*.'

The copulative '*u*' 'and,' most people would think palpable Persian, and not go all the way to the Canarese for it.

It comes then in my view to this that the only real appearance of analogy to the Dravidian class of languages in particular (as distinguished from the body of Turanian languages in general) is reduced to two numerals. In Brahui neither 'one' nor 'four' and upwards in the least correspond with Dravidian numerals, but the two numbers 'two' and 'three' as given by Dr. Caldwell do seem similar. He gives the Brahui two, '*irat*' and three, '*musit*' or '*muoit*' which bear comparison with the Dravidian two, '*eradu*,' '*irandu*,' '*randu*,' '*ranu*' and three, '*muru*' '*mudu*,' '*mundu*,' '*munnar*,' '*munu*.'

The Brahui one '*asit*' seems very like the Pehlevi '*achat*,' and the Brahui *irat* may come from the Pehlevi '*tarein*' two, the Caucasian '*iera*' and the Georgian '*ori*.' If so the 'three' would be the only tie to the Dravidians left, and that is not very close. The ground of induction seems insufficient to connect such dissimilar people. My impression is, that if, instead of saying that the Brahui language is mainly Punjabee with a Dravidian element, Dr. Caldwell had said that it is mainly Arian (Indo-Persic) with a Turanian element, that would have been more correct. At any rate in so important a matter fuller inquiry is necessary.

THE MODERN INDIANS.

I commence with the Bramins.

It is well-known that the Bramins as Priests are a necessary part of every Hindu society, and as Priests they are to be found wherever there are Hindus. In that character then it would be unnecessary to my purpose more particularly to trace them, for with their religious sects and tenets I do not deal. I shall only trace them for Ethnological purposes through the countries in which they form an important part of the general secular population. In fact, far from being restricted to the character of Priests, they are one of the most numerous castes in India, and probably that which follows the greatest variety of avocations. On the whole I should say that they are less prejudiced than any other of those whom I call full-blown or High Hindus. At any rate, whether it be that their character as keepers and expounders of the Law gives them greater licence, or that their intellect

is more varied and their necessities greater, they do in various places and under various circumstances turn their hands to very many odd jobs as it were. Throughout Hindustan they have almost entirely lost that function of Clerks and Bureaucrats of the community which they still retain to a great extent in other parts of India; and it will be as members of the ordinary agricultural populations that I shall most deal with them.

Beginning from the north, we first meet with the Bramins in that quarter to which all their traditions point, within the hills north of the Punjab. The first Indians encountered by a traveller from Central Asia would be these Bramins of this extreme North-West corner, occupying both the valley of Kashmir and the hills immediately to the west and south-west of it.

Kashmir is a Bramin country. The lower classes have long been converted to Mahommedanism, but they seem to be ethnologically identical with the Bramins, and tradition also asserts that they are of the same race. At the present day no other Hindu caste save the Bramin is known, nor is there any trace (so far as I could find) that there ever was any other in the country. The Bramin population is numerous, but it would seem as if, while the illiterate multitude adopted the religion of the ruling power, the better educated and superior class maintained their own tenets; and at this day the Bramins (or Pandits, as they are usually called) form quite a sort of aristocracy. They are almost all educated and exceedingly clever, and so, being to a great degree above manual labour, they are an excessive and somewhat oppressive Bureaucracy, which not only has ruled Kashmir under every successive government, but sends out colonies to seek a livelihood throughout Northern India. The Kashmir Bramins are quite High-Arian in the type of their features, very fair and handsome, with high chiselled features, and no trace of intermixture of the blood of any lower race. It may be partly race and partly occupation, but they have certainly a greater refinement and regularity of feature than the Affghans and others of a rougher type; with, however, a less manly-looking physique and a colour less ruddy and more inclining to a somewhat sallow fairness. The high nose, slightly aquiline, but by no means what we call Jewish or Nut-cracker, is a common type. Raise a little the brow of a Greek

statue, and give the nose a small turn at the bony point in front of the bridge (so as to break the straightness of line), you have then the model type of this part of India, to be found both in the living men and in the statues dug up in the Peshawar valley. There are also a good many straight noses, and some varieties as in all places, but much less departure from an ordinary handsome standard than in most countries. The figure of the ordinary working Kashmeeree is strong and athletic. But none of them are martial, and the Bramins are in this respect no exception. They rule by the brain and the pen, and not by the sword. It is this character that has gained them the favour of so many rulers of a different faith. Kashmere long belonged to the Cabul kingdom, but it was never in any degree colonised by Affghans, and is singularly free from any modern intermixture of foreign races. The fact seems to be that the valley never belonged to the Affghan nation, but was always retained as a Crown Appanage of the kings, who were very jealous of admitting into it subjects whom they might find it difficult to turn out again, and much preferred to govern through the Pandits. Others have to a great extent followed the same policy.

From a Hindu point of view, the Kashmir Bramins do not rank well. As they are Priests to no one but themselves, they are necessarily much more secular than Bramins who among other Hindus claim to be a priestly class, while they eat meat and are altogether loose in their observances, to an extent which makes them very far short of the modern Hindu standard. They are in fact not recognised among the modern Divisions of Indian Bramins, belonging neither to the 5 Gours nor to the 5 Dravidas, but forming a class apart. I have alluded to their attempt to claim the blood of all the Bramins higher in the sacerdotal scale, and suggested that it is more probable that the latter have sprung from and (in their sense) improved upon the Kashmeerees. In fact, the founder of the latter (Kashiyupa who drained the lake, colonised the valley, gave his name to Kashgar and Kashmere and to the people originally called Kashas or Kassias,) is still recognised by the Bramins and Hindus as the first of the seven Rishis, and even far away down on the west coast of India, the Bramins in general still trace their descent to Kashiyupa. I shall afterwards notice the name Kash as Khas occurring again and again in other parts of India, in a way which requires explanation.

The Kashmeeree Pandits are known all over Northern India as a very clever and energetic race of office-seekers. As a body they excel in acuteness the same number of any other race with whom they come in contact. Probably they are in no respect inferior to the Maratta Bramins, but they have not in Hindustan the same advantage as the latter have had in their own country among inferior races. The Kashmeerees, as foreigners among energetic races, have a much harder struggle, and though they get a good share of good things, they are nowhere dominant, nor have they usually risen to such high stations as many Maratta Bramins. The most conspicuous man whom I recollect was Raja Denonath, Ranjeet Sing's Financier and in some respects Chief Minister. Although the Kashmeerees seldom find their way as far as Calcutta, it is somewhat singular that in Bengal the first native to attain very high office is a man of this race, viz., Shamboonath Pandit, Judge of the High Court. Almost all the secular Pandits use the Persian character freely; they are perfectly versatile, and, serving abroad, will mount a horse, gird on a sword, and assume at a push a semi-military air.

The Kashmir language is separate and distinct, and the dress, manners, and fashions of the Kashmeerees mark them as in every way a distinct people. Of the language we only know that it contains a very large proportion of Sanscrit. The Institutions of the people have nothing of the democratic character.

In the hills also, between Kashmir and the Punjab, Bramins occupy the van (or perhaps we should call it the rear) of the Indian race to the west, though they have abandoned their Hindoo religion and become partly Mahommedans and partly Sikhs. They are in habits, language, and manners quite different from the Kashmeerees, and seem now to belong to a different nation. Their language is a dialect of the Punjabee (a very Pracrit tongue and certainly not borrowed from any Mahommedan race), while they are good soldiers and altogether more Punjabees than Kashmeerees. Beyond the Jhelum, the hill frontier is occupied by a tribe called Bambas, now Mahommedans, but originally Bramins; while on this side the Jhelum the hills are shared with other races by a numerous tribe of Bramin-Sikhs. The position of these men is curious. They became Sikhs long before the extension of Sikh power to those regions, and in a

much more complete sense than most modern Sikhs, abandoning all pretence of Hindoo religion and adopting to the full the Sikh reformer's tenets. Indeed they were converted during Mahommedan rule, and when 'Sikh' was really a religious rather than a political name. The fact probably is, that they found the country [illegible] by [illegible] Bramins, but did not care to become Mahommedans, so accepted the alternative of becoming Sikhs, and so free from the trammels of caste. These men are very useful soldiers and servants, especially under Sikh rule. A good many of them have been introduced into Kashmir as a sort of military colonists, partly by a Hindu governor under the Affghans, and partly by the Sikh rulers; but they remain quite apart from the Kashmir Bramins. One of the best native officers in the Punjab force, who is himself of this class, told me that the *Bambas* are without doubt Bramins under a corrupted name. He says that to this day the Sikh Bramins and Bambas exchange cakes on the occasion of certain ceremonies (births, funerals, &c. I think), and that there is no doubt that they are of the same stock. I believe that it certainly is so. It seems to be a common practice in India to give to tribes who have departed from the faith or mixed the blood of their ancestors, names derived from their original tribal names. Thus half-civilised Bheels are called '*Bheelalahs*;' Mahommedan Rajpoots are called "Rangars;" a tribe of bastard Bramins to be afterwards noticed (in Benares and Bahar) 'Bamuns' or 'Babhans.'

The Bramins of the frontier hills are, I think, even handsomer than the Kashmeerees. To my view, the people in general of those hills are the handsomest of the human race.

Descending from the Himalayas, there are some Bramins near the foot of the hills. Except a few priests, I do not think that they are found beyond the Indus, but they are, I understand, pretty numerous in part of the Rawal Pindee district. South of the Salt Range, in the plains, they are well nigh overwhelmed by the strong flow of Rajpoots and Jats (advancing, as I believe, at a later period and from another direction). The Bramins either never occupied the plains of the Punjab to the south-west, or they have been driven from that country. Even nearer the hills they are not exceedingly numerous. But still in that fertile and pleasant strip under the hills we have, among other races, villages of agricultural Bramins in the districts of Sealkot,

Goordaspore &c., in the valleys of the broken country between Hoshecarpore and Kangra, and in parts of Umballa district and the adjoining Simla hills; and thus we, as it were, mark the trail of the Bramin race in its progress southwards from the hills of Kashmir to the banks of the sacred Saroostee or Saraswatee and the famous field of the Gulcheter at Tanessur close to the Grand Trunk Road, some thirty miles south of Umballa.

Here also the Bramin population in the country is not specially numerous. Other races have swept over the scene. But lower down the course of the Saraswatee, where it may be traced through the now somewhat desolate countries of Marwar and Jessulmere, the Bramins are still numerous. Where the low and comparatively moist tracts, in which the river once ran, still admit of cultivation, the Saraswatee Bramins are found very industrious and good cultivators, who claim to have occupied the country before Jats and Rajpoots became dominant. *There* is found (at Pokhar) the only temple in India still dedicated to the worship of Brama the Father. The town of 'Palli' seems to be a Bramin centre, and thence come a race of mercantile Bramins called 'Palliwals.'

Sir John Malcolm also mentions the Marwarree or Saraswatee Bramins as forming a considerable proportion of the most industrious cultivators in Malwa. And following the Saraswatee down to the Indus, we find that (some southern immigrants excepted) they are also the Bramins of Scinde, but said to be much looked down on by more orthodox southerners as eaters of meat and altogether little advanced Bramins.

The settlement on the banks of the Saraswatee is a well-known stage of Hindu history. Here the Bramins came in contact with other races, castes were recognised, and early Hinduism became literary and historical. But the extreme caste and religious system, the full-blown High-Hinduism of the Gangetic Bramins, was not yet. The descendants of those who continued to dwell on the Saraswatee seem to have much kept to the tenets of their forefathers. They are separate from the Kashmeerees and have a place among the recognised divisions of Indian Bramins, but their more advanced brethren give them the lowest place in the orthodox scale, and in their native country they chiefly shine by those simple and agricultural virtues in which their remote ancestors also probably excelled.

It is a curious problem, that lost river, the Saraswatee. The evident river-traces all the way down to the Indus, ancient Hindu history, and the universal traditions of the people of those regions, all go to make it as certain as any historical fact can be, that the Saraswatee was once a fine river, and that the countries through which it flowed (now for the most part desert and barren) were once well-watered and green. No mere diminution in the amount of rainfall, caused by denudations or the like, could have occasioned such as change. The outer range of the Himalaya runs all the way from the Sutlej to the Jumna without a break, and the tributaries of the Saraswatee receive but the outer drainage of the slope a few miles wide. No doubling or trebling of the rainfall could make any of these considerable perennial streams; nothing in fact short of a change of elevation of the ridges to the extent of several thousand feet would render possible any outlet in this quarter of the drainage of the interior of the Himalayas. The Saraswatee itself is now not a stream at all, but an absolutely dry bed, which is only filled by surface flooding in the height of the rains. The high embankments on the present Grand Trunk Road, on the Umballa side of Thanessur or Peeplee, mark the levels, and show the hollow where a great river once flowed. I have long had a theory that, in truth, the stream now called the Jumna once flowed in this channel. The present channel of the Saraswatee points upwards to the point where the Jumna issues from the hills, and ends in a confused drainage within 2 or 3 miles of that almost natural channel in which the Western Jumna Canal (running more like a river than a canal) carries the Jumna water in a course which eventually leads it lower down into the very bed of the Saraswatee. The Jumna at its first issue from the hills runs in a course which points directly towards the Saraswatee and the lower Indus, and the moment you cross, to the west, the high bank (which is accumulated along the course of most rivers), the whole of the drainage of the country is to the Saraswatee and not to the Jumna. In fact the bed of the Jumna is higher than that of the Saraswatee. Sir P. Cautley was anxious, by a change of the Jumna Canal, to carry it directly into the Saraswatee channel, and I believe that to divert the whole river would be a work within easy reach of modern engineering. May it not then be that nature caused a change

the other way, that the stream now called the Jumna then belonged to the Saraswatee, but that those hill torrents from the Sewalik, bringing down masses of sand and earth, raised between them and the main stream a sort of James and Mary which eventually caused the latter to break away to the south-east? If the stream moved, most of the Hindus would probably move forward too and find themselves in the Gangetic valley.

The Saraswatee Bramins are also called (in the south at least) "Kashastalee" a name which seems still to mark the time when they were considered to be of Kashmeeree or Kasha origin. In fact there seem to be several stages in the history of Braminism. The oldest of the race may be the people of the upper hills who date from a time altogether prior to Hinduism. The Kashmeerees were a civilised and literary Braminical people not yet fully Hindu. The Saraswatee Bramins (those Kasha settlers in the plains of India) were the earliest and most simple and pure Hindus of Vedic faith, that faith being now worked out and developed; those of the Ganges and the rest of India are in various phases the types of modern Hinduism.

From the Gulcheter down to Dehli and in the country about Dehli, Bramin villages are scattered about, but the Bramins cannot be said to constitute a very large proportion of the agricultural population. Wherever they are found in this country, they are capital cultivators, quiet, industrious, intelligent; there is no better population, and the women work as well as the men. It was remarked by the fugitives from Dehli at the time of the mutiny, that whenever they came to a Goojar village, they were always plundered; whenever they came to a Bramin village, they were always kindly treated; while at any other village their treatment was uncertain. These Bramins too are, I should think, descendants of the Saraswatee Bramins. Some of the less pure agricultural Bramins of these parts are called 'Tugas' or 'Gour Tugas.' South of Dehli, in the Jyepore country, Bramins seem to be numerous, but I have not been able to ascertain if they are of the same branch. In the Seharunpore district too there are a good many Bramins of secular occupations, besides the priests of Hardwar.

Sir H. Elliott has remarked on the difficulty of accounting for the fact that all the Dehli country is occupied by 'Gour' Bramins. They can hardly, he thinks, have come from Gour in Bengal, from which

they are separated by great tribes of Kanoujeas and others, and their own traditions point to Harriana as their original country. I would suggest the following explanation. The principal tributary of the Saraswatee is the 'Guggur' or 'Ghargar' which now gives its name to the main channel where it passes through the Harriana district. May not the name of 'Gour,' borne by these Bramins of Harriana, be a mere abbreviation of 'Guggur' or Ghargar? May not the Gour Bramins be simply Bramins of the Guggur or Lower Saraswatee?

Generally speaking I think it may be said that in the western parts of the present N. W. Provinces, in the Rohilcund, Meerut and Agra Divisions and in Western Oude, the Bramin population is not specially numerous. They are scattered about everywhere here and there, both as cultivators and in other capacities, but I know no large body of them. I don't know that they follow much any profession involving manual labour, except cultivation and almost any kind of service; unskilled labour as Coolees or spade labourers, they may undertake when pressed, but I do not think that they are artisans. There are a few considerable Bramin bankers in Hindustan, or at least one great house, but that trade is not generally in their hands.

Farther east, in the Lower Doab, Eastern Oude, and the adjoining districts, is the great country of the modern Hindustanee Bramins. Kanouj, the ancient head-quarters of the race, is on the old Ganges 50 or 60 miles above Cawnpore. It is now an insignificant place, and the mass of the Bramin population lies to the east of it. In the districts of Cawnpore and Futtehpore I believe that the Bramin cultivators far exceed in number any other class; in Cawnpore alone there are some 250,000 of them. It is much the same immediately on the other side of the Ganges, in the adjoining parts of Oude. The country of which this is the centre may then more than any other be considered especially that in which the Bramins are now settled as a people. And in the far distant country in which also they are very numerous, the Western Coast of Southern India, the Bramins claim to be colonists from the same region, saying that Paras Ram led them from Calpee (the great Ferry of the Jumna opposite Cawnpore) and causing the sea to recede, settled them under the Western Ghats. The Lower Doab is well-known all over Central and Southern India as the "Unter-bed."

Whether from the example of the Rajpoots, or for other reasons, these Bramins of the Unterbed and Oude have taken largely to the profession of arms, not usually much followed by them in other parts of the country; and beyond their own boundaries in their Military character they are reputed the most overbearing and disagreeable of their race. Yet I fancy that it is rather their profession than their natural character, which has attached to them this bad name. Numerous as they were in the Sepoy Army and foully as that Army behaved, I cannot find that the Bramins were really by any means worse than others; some of the most Bramin Regiments stood the best. And at home they seem to be quiet and peaceable enough. The Bramin district of Cawnpore pays, I think, a higher revenue rate than any other in India, except the peculiar Delta of the Cauvery about Tanjore. Numerous as the Bramins are in this part of the country and apt as soldiers, they have not been the dominant race. I do not know much of the history of the Cawnpore district, but I have never heard of Bramin rule; and certainly over the river, in Oude, the rule is with the Rajpoots, not with the Bramins. All the really old Talookdars are Rajpoots, as are the Rajas of Bundlecund and Baghelcund beyond the Jumna.

I am not sure what is the extent of the Bramin population in Bundlecund. In the Banda District I think that they are common, and certainly in 'Baghelcund,' or Rewah, they are very numerous; but whether the same martial race, I do not know, for there they condescend to very menial services and groom most of the horses on the Jubbulpore road.

In the proper Bramin country, I think that some of them affect the Rajpoot prejudice against actually holding the plough, but even there they perform every other agricultural labour. Agricultural and military as they are, they rejoice in the classic names of Dobee, Tewaree, and Choubee, that is men of two Veds, of three Veds, of four Veds, and are considered to be very high caste. Between the Ganges and the Gogra, as we recede from the Ganges, the population becomes more Rajpoot than Bramin, but there are many Bramins about 'Ajoodia,' the old 'Oadh.' Beyond the Gogra again is a numerous Bramin population of a different tribe from the martial Bramins of the Ganges, humbler, and not soldiers. Thence to the

north of the Gogra and Ganges all the way into Tirhoot there are, I believe, many Bramins. South of the Gogra and thence across the Ganges, into the Arrah District (Bojpore), runs the Rajpoot dominions. But about Benares, and still more in the greater part of Bahar, the dominion is held by a numerous class of bastard Bramins called 'Bamans' or 'Bhabans,' to which belong both the Raja of Benares and almost all the great landholders of Bahar. There seems to be no doubt that this class is formed by an intermixture of Bramins with some inferior caste. They live in strong and pugnacious brotherhoods, and are in character much more like Rajpoots than Bramins. The main country of the Bramins may then be described to be that part of Hindustan (between the Vyndyas on one side and the Himalayas on the other), from the longitude of Kanouj and Lucknow to near the frontiers of Bengal, with a large segment of more especially Rajpoot country (stretching from Lucknow to Bojpore) cut out of the centre of this tract.

The Hindustanee Bramins are all strict Hindus of the modern type. They are generally good sized and on the whole well-looking men, not I think particularly fair among the higher castes, but seldom so dark as the lower. Their features are good, but by no means generally of the peculiar High-Arian and sub-aquiline type. In fact the breed has here lost some of the purity of its blood, and the features are very much as in Europe. I think I have noticed among many of the Hindustanee Bramins a good deal of the open, blunt, bullet-headed, and as it were anti-aquiline style of countenance; not so handsome as more High-Arian features, but still pleasant enough. I do not think that in appearance they have any decided superiority over the higher castes of Hindustanees in general, though the higher castes have some general advantages over the inferior castes. By far the greater number of them are quite illiterate and have nothing of the clerkly character about them. The priests and Pandits are learned enough in their way, but they have never taken to the use of the Persian character. I doubt whether Hindustanee Bramins are as a body much more clever that several other classes; if they had been, they would have held their own better in spite of Mahommedan rule, as they have done in several other parts of India. As it is, they have scarcely any share of high office and very little literate service.

Besides serving as soldiers, they may be found among the lower hangers-on of courts, jails, &c., as process servers, guards over prisoners, and so on, but little in anything higher. As I have said, they turn their hands to many miscellaneous occupations not peculiar to any one else, and of course occasionally rise.

Sir H. Elliott calls the bastard Bramins of Benares and Bahar *Bhonhars*' and seems to consider them a branch of the Sarwarea or Transgogra Bramins. Again he speaks of them (quoting from the 'Harivansa') as Military Bramins descendants of *Kasya Princes*, and here he seems to connect the term *Kasya* with *Kashee*, the Hindoo name for Benares. I do not know the derivation of Kashee, or whether it is connected with Kashupya.

Bramins are numerous in Kumaon and Gurwhal. The great tribe of those Provinces are however "Khassias" who now claim to be Rajpoots, but whose title to that character is more than doubtful. Education is, I think, more general here than in the plains, and the Nagaree or ordinary Sanscrit character is always used. Again the Goorkhas, the dominant tribe in Nepal, are properly called 'Khas,' whence Gor-khas. They are certainly for the most part of Arian and Hindoo origin, and pretend to be Rajpoots; but, according to Mr. Hodgson, they are really bastard Bramins, the offspring of a cross between Bramin immigrants and the people of the hills. Both the Khassias of Kumaon and the Khas of Nepal assert that they are comparatively recent immigrants from the plains, but this is probably in a great degree connected with their claim to the blue blood of the Rajpoots of the plains. The latter by no means acknowledge the connection. The circumstance that a bastard Bramin race is dominant in the plains immediately under the Central parts of Nepal gives much colour to Mr. Hodgson's account of a similar race in the hills. May it not be that the Rajpoots have never got so far east in the hills, and that the hill country was occupied by pre-Rajpoot Bramins? May it be that the names Kashee, Khassia, and Khas, point to a time when the Bramins were known as Khasas or Kashmeerees, just as English colonists are known as Anglo-Saxons?

Mr. B. Colvin, long Deputy Commissioner of Almorah, tells me a curious circumstance, viz. that in Kumaon, although the hill dialect is in the main Hindee, it has some curious grammatical affinities to

the Bengalee, both in some of the popular terminations, in the verb 'to be,' and in other particulars. I had before learned that there was a peculiarity of this kind in the Hindee spoken in the high country immediately south of Bahar, but there I supposed it to be a mere intermixture of the not distant Bengalee. The existence, however, of Bengalee affinities in the patois of Kumaon would seem to suggest the question whether these are not the remains of a form of Arian speech older that the modern Hindee, spoken perhaps before Rajpoots and Jats came on the scene, and then driven forward to Bengal in one direction, into the hills in another. I have not myself any acquaintance with Bengalee, but it would be interesting to enquire if it has any affinities with the older forms of speech in Kashmir and the north-western hills, or again with the Maratta and western dialects.

To get an idea of the Bengalee formation, I asked a friend the other day a single word, the pronoun 'he' and the genitive 'of him,' which he gave me '*Se*' and '*Taha*' or '*Tah*.' At this present writing, by way of experiment, I have just turned up these same words in Mr. Edgeworth's small Kashmir Grammar and find 'he,' '*Su* ;' 'of him' '*Teh*.' The '*Se*' is a very old Arian form, found in the Kaffir hills, which disappears in Hindee and reappears in Bengalee; but the genitive '*Teh*' in Cashmiree, '*Tah*' in Bengalee, seems a singular and hardly accidental coincidence.

To return, this brings me to the Bengalee Bramins. They all assert a northern origin as a historical fact, and I believe that there is no doubt of it. Still their nationality is altogether Bengalee, and as the Bengalees differ from all other Indians, these Bramins also differ much in language, dress, habits, and general style from the Hindustanee Bramins.

In appearance they are certainly fairer, larger, and altogether Aryans of a higher type than the mass of the Bengalees. There is much more difference, I think, between Bramins and the mass in Bengal than in Hindustan. Some of them are fine looking men both in size and feature. They regain here too, some (though not all) of the aristocratic and bureaucratic position which they have lost in Hindustan. They have little competition from Rajpoots and rough northern tribes, and might have it pretty much their own way,

were it not that they are hard-pushed by the clerkly caste of Kaits who also are numerous in Bengal. As it is, the Bramins have a large share of the landed property, the public offices, the educated professions, and some mercantile and banking business. They are very numerous. In the entire absence of statistics and detailed information in Bengal, the only source of ethnological information which I can find is in the jail statistics. These show that about 9 per cent. of the total number of Hindu prisoners are Bramins. We may suppose that the Bramins of Bengal proper come to jail less frequently than the inferior classes, and this return certainly seems to prove that the Bramin population must be very large. I do not understand that anywhere in Bengal they form the mass of the population, or that they are often found in the lowest ranks of agriculturists and labourers. They are rather more or less an aristocratic class, and though following a variety of callings and to some extent cultivating the land, will not ordinarily put their hand to the plough, and affect as far as possible the position of superiors. They are altogether unwarlike and somewhat effeminate in their habits.

In Eastern Bengal Mahommedans prevail, and some Bramins are supposed not to like to cross the Berhampooter, hence in that quarter they seem not to be very numerous. In Orissa I believe they are very many, and I see it stated in the Gazetteer of Southern India that in the Oorya portion of the Ganjam District many of the Oorya Bramins both obtain their livelihood as cultivators and traders, and follow the occupations of brickmakers, bricklayers, &c.

The result of education shows the Bramins of Bengal to be most acute and intellectually capable. But they do not appear to have the practical energy of the mercantile and some other classes, nor the political and administrative success of Maratta and Kashmeeree Bramins. In native times I do not remember to have heard of Bengalee Bramins in great places, unless we except Nandcomar who attained so unfortunate an eminence. In these days I believe that intellectual eminence is often combined with much high principle among the educated Bengalees, and I hope that both may bear practical fruit.

Going to the other side of India, in Goozerat the Bramins appear to be numerous, but I have not yet visited that Province, and have not exactly ascertained their position and avocations. Forbes does

not seem to speak of them as forming any large portion of the cultivating classes. They trace their descent from Kashyupa, and are divided into a large number of tribes and sub-divisions. In a secular capacity they seem to have a good share of office (although there also they encounter an energetic writer-caste) and also to trade. The Jains of Western India have Bramins among them, and these would seem to be for the most part Goozerat men.

Next to Goozerat comes the Maratta country, extending from Damaun to the neighbourhood of Goa, and from Bombay to Nagpore and the Wyuganga. The Maratta Bramins are the most famous and successful of their race. That their fortune is due to their talent and energy, is shown by their success beyond their own bounds, in fact throughout Southern and Central India. But in their own country and among their own people, they are also favoured by circumstances. The lower caste men of the pen, who have ousted the Bramins in some countries of the north and more than rivalled them in others, are not found in the Maratta social system (those now found in the Bombay country are Goozerattees, and Bombay itself is in a mercantile sense very much a Goozerattee city). The mass of the Maratta people are of a comparatively humble class, without the pride and jealousy of Bramins shown by Rajpoots and Jats. Hence wherever there is a Maratta people or Maratta rule, Maratta Bramins are the brains and directing power. At first they contented themselves with the highest administrative offices under Maratta rulers, but later, as is well known, the Peshwa and other Bramins usurped the supreme power itself, assumed the command of armies, and openly ruled the confederacy. In truth, so miscellaneous, and so loosely held together by any other tie, were Maratta confederacies and armies, that these Bramins may be considered to be the real source of the power and fame of the Marattas as rulers in India. They were the heads of a body of which others were but the hands guided by them. Even to the present day in many States and places beyond their own limits, they have the chief power.

In fact perhaps no race, certainly no Indian race, has ever shown greater administrative talent and acuteness. The native country of the Maratta Bramins is chiefly to the west, and especially the Concan, south of Bombay, the hilly strip near the Western Coast.

It might be conjectured that centuries of Mahommedan rule might have caused the retreat of the Bramins from the more open plains to these regions; but I do not know that there is historical ground for this supposition, and think it more likely that under any rule they would hold their own and circumvent even foreign rulers. Their personal appearance would lead one rather to suppose that they came from the North-West. Many of them are very fair, and I think that there is among them a much greater tendency to the common occurrence of a somewhat aquiline, or what I call sub-aquiline type of feature than among Hindustanee Bramins. A very marked feature, not uncommonly met with, seems to be a light greyish kind of eye. Altogether, I cannot suppose these Bramins to be a branch of the race which, after occupying Hindustan, extended southwards. I cannot imagine how they could in the south, as it were, in some degree have returned towards an earlier type, instead of step by step becoming darker and more Indian-like. It is undoubtedly the case and is a subject of common remark, that all along the West Coast of India the people are much fairer than in the interior, even though most of the interior country above the Ghats is considerably elevated. Some have accounted for this by saying that colour does not altogether depend on the thermometer, that the inhabitants of the more umbrageous Coast are less exposed to an unclouded sun and dry atmosphere than the people of the bare and treeless plains of the Deccan, and that thus the difference of colour is to be accounted for. I will not say that this cause is wholly without effect, but I think it quite insufficient to account for the whole difference. The Bengalees in a moist atmosphere and amid a luxurious vegetation are generally dark. The blackest of the Aboriginal tribes live in the densest forest country in a moist malarious climate. Even on this very Western Coast I find the Aboriginal Helots of Malabar described as being "of the deepest black." We must look then to some other cause modifying the complexion of many tribes on the West Coast, and that I take to be immigration by sea. That there has been much such immigration, is not only probable, but a historical fact. All along the southern portion of the West Coast, a large part of the population is notoriously to a great degree of foreign blood. The Moplahs are to a great extent Arabs, the 'Teers' or 'Teermen' are also

said to be immigrants (as their very name indicates), and there are many Jews and Christians, though the latter I believe have not much trace of Western blood. All along the Bombay Coast also, from Goa to Kurrachee, are the descendants of Persian, Arab, Portuguese, and other Western immigrants. Hence I did not think it by any means absurd when an educated Bramin of Poonah suggested to me as a theory, that the Bramins owed the light eyes and light complexion noticed among them to an intermixture of Western blood. The Bramins would be less liable, however, to casual and recent intermixture than other races, and I incline rather to the theory that these Bramins of this part of the Coast may have more directly come from the original seats of the race by the route of the Saraswatee and the Indus, and thence perhaps by sea, without passing through Hindustan and Central India and there suffering any infiltration of Aboriginal blood. I have already traced the Bramins down the Saraswatee. Is it not probable enough that in very early days, when they were pressed by Rajpoots and Jats, they may have colonised the Konkan, reduced to subjection the rude Aborigines, and transmitted to descendants features preserved from great deterioration by caste rules, and forms only somewhat deteriorated in size and robustness by a southern climate and the absence of manual labour? If such an immigration took place so early as I suppose, it might well happen that, in long contact with southern elements and southern creeds, the colonists in the Maratta country would separate themselves from the old Saraswatee Bramins and become a separate division.

I have seen some allusions to Konkan Bramins as distinguished from Maratta Bramins, but have not been able to make out the exact distinction. Certainly Maratta Bramins are altogether the dominant race in great part of the Konkan. But it appears that there is a strip to the south, extending beyond the district usually known as the Konkan to some way beyond Goa, in which a mixed language called Konkanee is spoken. In this Konkan there are some Bramins still called 'Kashastala or Saraswatee' and from the Konkan some of them have penetrated into the north-western part of the Mysore country, where they are traders and in public employment, and described as very clever but greatly looked down upon by southern Bramins who profess to be much more rigid in their rules. In the

towns of the North Canarese Coast, the Hindu traders are said to be chiefly "Konkanee Bramins who trade and keep shops."

In the Maratta Konkan the Bramins are at the head of the agricultural community. Most of the '*Kotes*' or village zemindars who rule over and claim the proprietary right in each village are of this caste. I have not been able to ascertain what proportion of the actual cultivators are of the same class. For the rest, office of every kind, including the village and pergunnah accountantships all over the country, and every service of the head and the pen, seem to be their great resources. They are not military, nor generally in any way men of the sword, though, as I have said, they have in their prosperity taken the command of Maratta Armies. Nor do they seem to have any great commercial proclivities. Among the various races who push to so great a point mercantile enterprise in Bombay I cannot find that the Bramins have any great share. Under our Government they have almost a monopoly of office in Western India.

Adjoining the Maratta country on the east is the Telinga or Telagoo country, very little of which I have visited and of the castes and population of which I have been able to learn less than of any other part of India. This at least, however, I find that here also the Bramins, though not so famous nor, I apprehend, so clever as those of Maharashtra, are numerous and powerful. The Telinga people are described as generally illiterate and as (unlike their Tamil neighbours) leaving literature and science to the Bramins; so that the latter would seem in Telingana, free from the competition of a writer caste, to have in their hands all the secular business of a clerkly character and a good deal more besides. I have not ascertained what proportion of the population they there form, and whether many of them are actual cultivators; but in more than one place I find it stated that many of the Zemindars are Bramins, and in Rajamundry the more respectable inhabitants of the Town are said to be chiefly Bramins.

I can only trust that this meagre account of the Telagoo Bramins will be supplemented by some one better qualified to describe them. Towards Madras I gather that there are some learned Gwallas called Yadavas and Telagoo Chetties (perhaps a merchant class, but I am not sure), who must a good deal interfere with the Bramins. They

do not seem to be very conspicuous in Madras itself, which, though in the Tamil country, is not far from the Telagoo frontier.

In the Canarese country (comprising Canara, Mysore and parts of the Bombay Southern Districts and adjoining Nizam's country) the Bramins are not rivalled by a specific writer class, and have a large share of literate office, very generally (it appears) occupying that of Shanbogue or village accountant, besides many higher offices. But a very large proportion of the Canarese people are of the ultra-Sivite or Lingayet sect, who altogether ignore Bramins in their sacerdotal character; and there are energetic mercantile and other classes. The rule of the Marattas in one quarter, and of the Mahommedans in another was also unfavorable to the power of the Canarese Bramins, and thus they are by no means dominant. Maratta Bramins, Mahommedans, East Indians and others have a large share of the higher offices and occupations.

In the North Western part of the Canarese country, in the district of North Canara, in the high and hilly country above and about the ghats, and the adjoining parts of Mysore, there is a large population of Bramin cultivators who are on all hands represented as exceedingly industrious, thriving, and in every way good. Most of these people are called 'Haiga' Bramins, and they seem to be of pure race and of no bastard or doubtful caste. They especially affect the cultivation of the betel-nut, and both own and cultivate the land over a large extent of country. In the Canara District they constitute one of the most numerous castes, being given by a census taken some years ago as 147,924, to 146,309 Banters (corresponding to Nairs), and 151,491 of the inferior class called Billawars. In the Nagar district of Mysore they are also numerous, and they are there described as "very fair, with large eyes and aquiline noses," a description which would seem to imply for them a derivation from an uncorrupted and little intermixed northern source. They are stated not to be very literary or highly educated, being more devoted to agriculture.

In South Canara and what is called the Talava country, there are again many Bramins who do much cultivation, and on the whole West Coast, down to the extreme South of India, the country is said to have been extensively colonised by the Bramin colony led from Calpee by Parasram, who caused the sea to retire for their convenience.

In the centre of this tract, in Malabar, the Bramins, owing to political circumstances and hostile rule, have been to a great extent driven away, but they are very numerous in Travancore and Cochin; and in the Palghaut valley (a little inland, where the break takes place in the line of the ghats) the Bramins seem to be very numerous as cultivators, and are industrious and good in that capacity. The principal class of Bramins on the South Coast are called Namberees, and they have some very peculiar customs. They affect, however, much of the sacerdotal character, and seem to be very influential in Travancore and Cochin. Throughout the South Western Coast, however, wherever the Nairs and allied tribes are or have been politically dominant or are now numerous, the Bramins have by no means a monopoly of office, even among Hindus; for the Nairs themselves are frequently educated and hold very many public offices.

The Namberee Bramins are described as very like the Nairs and General Hindu population of the South Coast, but as not unfrequently fairer.

It remains to notice the Tamil country. There also the Bramins are numerous, but it appears that throughout the extreme South, they again lose that literary predominance, or almost monopoly, which they enjoy in the Maratta and other countries in the middle zone of India as well as in the extreme North. I have mentioned that the Nairs of the Malayala and Tahva country by no means resign the pen to the Bramins; and so also it appears that throughout the Tamil country offshoots of the dominant tribes, under the names of Modelliars, Pillays, &c., do much of the clerkly work, and the Bramins have not generally the office of village accountant and collector—the possession of which is the greatest test of predominance in that respect. I gather that the Lingamite sect is less numerous in the Tamil than in the Canarese country, and consequently the Bramins are in a sacerdotal point of view more important. They also push their fortunes in many secular ways. They rent much land, but will not hold the plough, and are extensively employed in the public offices as churkaras (messengers or process servers) and in such like capacities, also as keepers of choultrees and in many other occupations. With reference to what I have said of them as renters rather than cultivators, I should add that, though the Palghat country is included

in Malabar, it appears that most of the cultivating Bramins there are of Tamil extraction. Many of them condescend to officiate as astrologers and religious guides to the very lowest and scarcely Hindu castes of Southern India.

Briefly I would thus recapitulate the position of the Bramins in the principal Provinces of India.

In Kashmir, they are altogether dominant by the brain and pen; but are not military.

In the Punjab, Scinde, and countries about the Saraswatee, Bramins are superseded by other races, and are only found here and there in the eastern part of this tract as industrious cultivators claiming to be the ancient occupants of the country.

In Hindustan, Bramins have altogether lost literate predominance (with the exception of some immigrant Cashmeerees), and also political predominance, except something retained by quasi-Bramins of mixed caste in the extreme east of this country. But they constitute a large section of the population of Hindustan, especially of the eastern half, and a large proportion of the cultivators, soldiers, &c.

In Bengal and Orissa, Bramins form a large portion of the Hindu population, occupy to a great extent an aristocratic position, and have a large share in the superior rights in land, in offices, and in the literate professions; but are at the same time quite rivalled by Kaists.

In the Maratta country, Bramins are altogether dominant in literate work, and have the largest share of political power.

In the Telinga country, Bramins are in possession of most of the literate work, and apparently of a good deal of office, land, &c., but my information is very imperfect.

In the South of India, Bramins have but a moderate share of the literate work; but on the West Coast, they have a large share of the land and form a large proportion of the best cultivating population; while in the east of this country they seem to be not dominant and are rivalled by several other tribes, though here also they are numerous and employed in many capacities, secular as well as sacerdotal.

The Jats.

On the general scheme of tracing the Arian races from the North-West, I take the Jats before the Rajpoots. These Jats are in fact by far the most perfect specimen of the democratic and more properly Indo-Germanic races, whom I believe to have appeared in India later than the early Braminical Hindus, and who, while Hindu in much of their speech, laws, and manners, have also some peculiarities and institutions, and perhaps some grammatical forms of speech not to be traced in the earlier Braminical writings. These tribes, now constituting over a great part of India an upper and dominant stratum of society, have given to a great degree their own tone and colour to many Provinces. In great part of Jat-land the Jats are not only the upper stratum, but the great body and mass of the free people; and hence we have among them their original institutions in the greatest purity, little modified by modern Braminical Laws, or by those necessities of Military and Feudal organisation which so much alter the institutions of a free people, when they become dominant conquerors over other races greatly superior in number.

There is some variation in the pronunciation of the word 'Jat,' it being sometimes (chiefly in the west country) pronounced so short that it may be written 'Jut;' sometimes (in much of the Punjab) variably used, and sometimes (chiefly in the east) pronounced very long as 'Jāt' and even occasionally written by early English authors 'Jaut.' And the present religion, dress, &c. of the race also differing in different regions (they are Mussulmans in the west, Sikhs in great part of the Punjab, and in some sense Hindus in the east), some people have supposed Mahommedan Jats of Scinde to be radically different from Hindu Jauts of Bhurtpore, and the wide extent and populousness of this great race is not very generally known. In fact, however, any apparent differences in the extreme of the type disappear, when we trace them as one great continuous population throughout the whole tract, and find that the one extreme gradually and imperceptibly merges into the other.

To prevent future doubts, I will, however, add that there may possibly be small local western tribes of similar name, distinct from the great Jat nation. It seems that on some parts of the frontier Jats are

known as a somewhat pastoral and light-fingered tribe; and Burton in his 'Scinde' speaks of a tribe of Beloochis bearing the name; also says that it is the name of a wandering tribe found about Candahar, Herat, Meshed, &c., and that in all the Western parts of Central Asia, the term is used as synonymous with thief and scoundrel. These gentry may be offshoots of our Jats thrown by circumstances on the resources of their mother-wit, or they may be some other tribe; but at any rate they are in no way a type of the great agricultural nation whose habitat I am about to describe, and about whose oneness and complete ethnological nationality there can be, I think, no doubt whatever.

In all the east of Beloochistan, about the routes by which the most open and constant communications between India and the countries to the west are maintained, in the Provinces marked in the maps as 'Sewestan' and 'Cutch Gandava,' Jats form a large, probably the largest portion of the agricultural population, and claim to be the original owners of the soil. In fact the Beloochis are there but a later wave and upper stratum. The Persian Tajiks are the original agricultural class of all the west of Affghanistan and Beloochistan; then there is a tribe apparently somewhat mixed, called 'Dehwars,' found about Candahar and thereabouts. The Jats are not found in Affghanistan, but in Beloochistan they succeed the Tajiks and Dehwars, as we go east by the Bolan and routes thereabouts. Here then they are not confined to the plains, but occupy the hilly country.

Descending into the plains, we find the Jats spread to the right and left along the Indus and its tributaries, occupying upper Scinde on one side and the Punjab on the other. But it is particularly to be remarked that in the Punjab they are not found in any numbers above the Salt Range, and they are wholly unknown in the Himalaya. In fact, to the north they are altogether excluded from the hilly country, a circumstance which seems to me conclusively to show that they did not enter India by that extreme northern route. The hills to the north seem on the contrary to be a barrier by which the flood of Jats was checked.

In all Upper Scinde the Jats are still the prevailing population, and their language is the language of the country. It is moreover matter of history that they were once the aristocracy of that land, though

latterly other races have dominated and the higher classes among the Jats have lost somewhat of their position. In the south and west of the Punjab too they have long been subject to Mahommedan rulers, but latterly as Sikhs they became rulers of the whole Punjab and of the country beyond as far as the upper Jumna, in all which territories they are still in every way the dominant population. Over great tracts of this country, I should say that three villages out of four are Jat, and that in each Jat village the Jats constitute perhaps two-thirds of the entire population, the remainder being low caste Helots, with a few traders, artisans, &c.

The Juts of the Indus seem on the map to be separated from the Jauts of Bhurtpore and Agra by the whole breadth of Rajpootana, but the fact is that the ordinary geographical nomenclature gives rise to much misconception on the subject. By far the greater part of what we call Rajpootana is, ethnologically speaking, much more a Jat than a Rajpoot country. The great seat of Rajpoot population and ancient power and glory is on the Ganges, and it is said that since the Mahommedans conquered them there, the chief Rajpoot houses have as it were doubled back on the comparatively unfruitful countries which now bear their name, but where, notwithstanding, the most numerous section of the population is Jat. Col. Tod expressly tells us that northern Rajpootana was partitioned into small Jat republics, before the Rajpoots were driven back from Ajoodea and the Ganges. It is clear then that the Jats extend continuously east from the Indus over Rajpootana. They do not seem to have occupied (or at least do not now occupy) lower Scinde, nor are they found in Goozerat, although in the history of the latter country mention is made of incursions of Jat horsemen on the frontier in conjunction with Katties. Their line of settlement lies farther north. They may have arrived on the Saraswatee, before its banks lost their moisture, and if so, their passage to the east would be comparatively easy. Throughout the more open parts of Rajpootana they share the soil with the Aboriginal or semi-Aboriginal Meenas, the remains of the Bramin population, and the dominant Rajpoots; the Jats having, I gather, the largest share of the cultivation. The southern and more hilly parts of Rajpootana (where Mhairs, Meenas, and Bheels so much hold their own,) are not Jat, but in Malwa again they are numerous, and seem to share that Province with Rajpoots and Koonbees.

To the north, in the north-eastern Punjab and Cis-Sutlej districts, as we get near the hills, I think there are evident indications that the Jat population has been advancing on what has once been a proper Rajpoot country, after having perhaps been, before that, a Bramin country. It is not clear whether the Bhattees of Bhatteana were originally Rajpoots or really are Yuti or Jats. But from Bhatteana northwards, Rajpoot villages are scattered about in considerable numbers among the Jats, and there are traces of more extensive Rajpoot possessions. The Rajpoots seem to be here undergoing gradual submersion.* But in the extreme north of the Baree and adjoining Doabs of the Punjab (the Baree is that Doab in which Lahore and Umritsir are situated) there is still a strip immediately [illegible] the hills, which may be classed with the adjoining hill country as still mainly Rajpoot. To the west, advancing through Rajpootana, we come to the Jats of Bhurtpore and Dholpore, famous in history. Gwalior was a Jat fortress belonging, I think, to the Dholpore [illegible]. They do not go much further south in this direction. From this point they may be said to occupy the banks of the Jumna all the way north to the hills. The Dehli territory is principally a Jat country, and from Agra upwards the flood of that race has passed the river in considerable numbers, and forms a large part of the population of the Upper Doab in the districts of Allighur, Meerut, and Mozuffernugger. They are just known over the Ganges in the Moradabad district, but they cannot be said to have crossed that river in any numbers.

To define then the Jat country; take as a basis the country on both sides of the Indus from Lat. 26° or 27° up to the Salt Range; from the extremities of this base draw two lines nearly at right angles to the river and inclining south, so as to reach Lat. 23° or 24° in Malwa, and Lat. 30° on the Jumna, thus including Upper Scinde, Marwar, and part of Malwa on one side, and Lahore, Umritsir, and Umballa on the other; then connect the two eastern points by a line which shall include Dholpore, Agra, Allighur, and Meerut. Within all that ambit the Jat race ethnologically predominates, excepting only the hills of Mewar and the neighbourhood, still held by Aboriginal tribes.

The Jats of Beloochistan are described, from an Afighan or Candahar point of view, as fine athletic men with handsome features, but rather dark.

In Upper Scinde, up the course of the Indus, and in the south-western Punjab, they are now for the most part Mahommedans, and in that character seem to be somewhat inferior to their unconverted and perhaps purer brethren; the more so as they have been long subject to foreign rule. The language spoken along the line of the Indus and throughout Upper Scinde is there known as the "Jatee Gul" or Jat language, but is in fact identical with that which we call Punjabee. The Punjabee may, in fact, properly be called the Jat language; to the Jats the dialect seems especially to belong, and by them chiefly it is spoken. Advancing eastwards into the Punjab and Rajpootana, we find Hindu and Mahommedan Jats much mixed; it often happens that one-half of a village or one branch of a family is Mahommedan, and the other Hindu. Further east, Mahommedan Jats become rarer and rarer, and both about Lahore and all that part of the Punjab and along the line of the Upper Sutlej and Jumna the great mass remain unconverted. In the Punjab they all take the name of 'Sing,' and dress somewhat differently from ordinary Hindu Jats, but for the most part they only become formally Sikhs, when they take service, and that change makes little difference in their laws and social relations. The Jats of Dehli, Bhurtpore, &c. are a very fine race. They still bear the old Hindu names of 'Mull' and such like, and are not all 'Sings.' In Rajpootana the Jats are probably a good deal intermixed by contact with Meenas, &c., and they have now been long subject to an alien rule. One does not there hear much of them otherwise than as quiet and submissive cultivators.

The Jat Sings of the Punjab and the Upper Sutlej may probably be taken as the best representative type of the race. They are a remarkably fine variety of man—tall, large, well-featured, with very plentiful and long beards, fine teeth, and a very pleasant open expression of countenance. I am told that in the Punjab Regiments, which select from several of the finest races in the world, the Sikhs are upon the whole the largest men, although they are not so stout-limbed or in certain respects quite so robust as the Affghan Pathans. Perhaps the larger population to choose from may have something to do with the superior size, but I should say that on an average they are taller than Pathans, with the upper part of the body especially well developed. In pluck and Military qualities they excel the fairer and

in some degree more beautiful non-Pathan races of the northern hills. Altogether then they are not excelled by any race in Asia.

There is among them a large proportion of High-Arian feature, but there is much more variety and not so universal a high-nosed type as among the men of the frontier hills. Compared to northern races they are dark, but in every other respect they are, take them all in all, a very remarkably fine handsome people.

They are as energetic in the arts of peace as in those of war. There are no better cultivators; hard-working and thrifty, they let little land lie waste, and pay their revenue punctually. They have this great advantage too that among them a woman is almost as good as a man, works as well and makes herself as generally useful. They are not literary, they leave that, with proper mercantile business, to the Khatrees (to be afterwards noticed). But many men and some women can read and write in their own rough way, and as waggoners they not unfrequently carry their grain and other goods to distant markets on their own account.

They have an excessive craving after fixed ownership in the soil, and are essentially agriculturists. They seldom undertake a gardening style of cultivation, and prefer broad high lands to more cramped though moister locations. Where the country is more fitted for cattle, they breed them largely, and both ordinary carts and large mercantile waggons are generally plentiful in the Jat countries. Camels too they sometimes breed. But still, in India the Jats have never anything of the pastoral, roving, Gypsy-like character.

I have alluded to the democratic institutions of the Jats, institutions to which we do not find allusions in the books of the Bramins. Yet it is certain that such institutions prevailed in the North of India as early as the time of Alexander the Great. The Greek accounts are distinct on the point. They represent the institutions as in fact extremely democratic, and add that the Indians ascribed their free constitution to Bacchus, by whom they were led into the country. I mentioned Col. Tod's testimony to the former existence of Jat republics in great part of what is now Rajpootana. I know of only one recognised republican State which came down to our day, that of 'Phool' or 'Maraj,' from which sprung the chiefs who founded the States of Patteealah, Nabah, Jheend, &c. The old terri-

tory of the Phoolkeean race was recognised, and treated, among the Protected Sikh States, as a regular republic. But I fear that, with many less creditable institutions, it has now been brought under the general rule of British dominion.

However, States apart, every Jat village is on a small scale a democratic republic. As respects property, there is neither that common tribal right which we find among the wilder Arabs, Turcomans, and New Zealanders, nor that complete joint family which figures so largely in the Hindu-Law of the Braminical sages. Every man has his share of the cultivated land, separate and divided. It may be that a father and sons cultivate in common, but entire commensality seldom goes farther. The union in a joint village community is rather the political union of the Commune, so well known in Europe, than a common enjoyment of property. The village site, the waste lands and grazing grounds, and it may be one or two other things belong to the commune, and the members of the commune have in these rights of common. For all the purposes of cultivation, the remainder of the land is in every way separate individual property. And the government of the commune is no patriarched rule, but simply representative government. A Communal Council or Punchayet rules by right of representation. For the rest, the laws of these people are of Arian, Indo-Germanic, and to some extent of the more liberal Hindu type. Marriage is a sacred and irrevocable bond, though remarriage of widows is permitted; and alliances are restricted by the bonds of caste. The hereditary succession and general hereditary character of everything, which usually attends this system of caste and exclusive marriage, prevails among the Jats. Property is equally divided among sons. Daughters get nothing but that which may be given to them at the time of marriage. All the Jats are divided into many Gentes and Tribes, after the universal fashion of the peoples of this stock, and the usual fashion is to marry into another Gens.

In that portion of the Protected Sikh Territories which Sikhs from the Lahore country had occupied as conquerors, there was a perfect feudal system. The chief of a tribe, as General, had a large appanage; smaller chiefs owed him allegiance and service for their smaller domains, and under-holders under them again (all holding on a permanent hereditary tenure), till we come to the tenure of a single

horseman. These latter again have come to be divided under the operation of the rules of inheritance. But this system, it will be observed, is only adopted abroad for purposes of foreign domination.

Beyond the caste system common to them with most Indo-Germans, the Jats have very little of the ceremonial strictness of Hindu caste. In Punjabee Regiments, they mess freely like Europeans, and have their comfortable two or three meals a day.

The Jats sometimes claim to have been originally Rajpoots, and it is so stated in some of the written accounts; but that is only one of the many stories of the kind prompted by a desire to stand high in the Hindu scale, and its futility is illustrated by a counter-story told by some of the Mahommedan Jats, viz. that they are descended from one of the companions of the prophet. That the Jats and Rajpoots and their congeners are branches of one great stock, I have no doubt. It may be possible that the Rajpoots are Jats who have advanced farther into Hindustan, have there more intermingled with Hindu races, have become more high and strict Hindus, and achieved earlier power and glory. But that the Jats are Rajpoots who have receded from a higher Hindu position, is a theory for which there is not the least support, and which is contradicted by every feature in the present position of the now rapidly progressing Jats.

The suggestion that Rajpoots may be Jats more highly developed in a Hindu point of view, would make the latter the earliest and most primitive, though at the same time perhaps the purest of the race; just as I have supposed the Bramins of Cashmere and the Frontier hills to be Hindus of an earlier stage of Braminical development. But I am more inclined to suppose the Jats to be later immigrants from Central or Western Asia. The character of the northern hills is such that immigration from thence could only gradually filtrate into the plains; but by the passes of the Bolan, great immigrations are possible. Looking at the area of Jat occupation, it is just that which we might suppose to be covered by the steady flow of a large flood of population issuing from the Bolan, about Lat. 28° or 30°, as from a funnel, and thence spreading over the plains and pushing away before it other populations. The Rajpoots, again, when I come to treat of them, will be found to be ranged in a kind of horse shoe form round the outer edge of the Jat area, the mass of them occu-

pying the richer valley of the Ganges. My conjecture is that the Rajpoots are an earlier wave from the same source, and who came in by the same route, who have farther advanced and have been more completely Hinduised, while the Jats have come in behind them.

The Jat or Punjabee language is but a dialect, bearing somewhat the same relation to the Hindee of the Rajpoots and other Hindustanees that Lowland Scotch bears to English. In its main grammatical and essential features it is not widely different. There are certainly in it many words which sound strange to a European only superficially acquainted with the common Hindustanee, and it would be very interesting to examine all these words and ascertain whether any and what foreign elements can be found. But I may state broadly that by far the greater number of these words are really of plain Sanscrit origin, and very many of them are quite familiar to those well acquainted with the purer Hindee dialects. I have been surprised to find how Sanscrit are most of the words which (little linguist that I am) I had supposed to be peculiarly Punjabee. Indeed the Rev. Mr. Trump broadly states the Jat language to be one of the most Pracrit of Indian Vernaculars, and so it clearly is. There remains the old question which concerns it equally with the Hindee, whether the grammar can be derived from the Sanscrit. It seems very improbable that so great a mass of people as the Jats should have lost all traces of a separate language, if they ever had one. If so, it may surely be recognised in some Punjabee words. For the rest, the only doubt seems to be whether the Jats and Rajpoots, speaking an Indo-Germanic tongue allied to the Sanscrit, may have brought with them the grammar which now distinguishes the Punjabee and Hindee; or whether the Bramins, when they spread wide over Hindustan and mixed among a large Aboriginal population, adopted some Aboriginal grammar, and fitted into it their own vocabulary, making a language which Jats and Rajpoots also have received in India; or whether in fact all these tribes have derived a common tongue by direct Pracrit descent from the Sanscrit.

The Rajpoots.

I have already made so many allusions to the Rajpoots, that I have half anticipated my description of them. The best proof that they

are not a part of the original Hindu system, but rather something engrafted upon it, is (I think) to be found in the difficulty of defining what is and what is not a Rajpoot. I have already shown, in noticing many tribes, that it is almost impossible to say where the Rajpoots begin and where they end. I shall now, however, confine myself as far as possible to the tribes who are generally acknowledged to be real Rajpoots of blue blood.

They can scarcely be said to have any broad general tribal name like that of the Jats. It is hardly contended that they are really the old Kshatryas of the early Braminical accounts; and though, in a military point of view, they have occupied and more than occupied the place assigned to the Kshatryas, still their numbers, their position and the existence among them of the institutions shared with them by the Jats and unknown to the old Hindoo Shasters (in them we find no trace of democracy) would all go to show that the Rajpoots are another race. In fact the days of the Kshatryas were those of the earliest Hindu annals, many hundred years before Christ, while the Rajpoots may be considered to have been the immediate predecessors of the Mahommedans in the rule of Hindustan. Except then in an affected way and with direct reference to the old Sanscrit Nomenclature, the Rajpoots are not usually called 'Kshatryas,' while the name Rajpoot also is by no means universal among them, and merely means 'Son of a Raja' or 'Royal.' In some parts of the country they usually call themselves 'Thakoors,' a word which also means Chiefs or Nobles.

They are more frequently known by the names of their tribes as 'Chouhans,' 'Soorujbansees,' 'Bais,' 'Rahtores,' 'Baghels' (or Waghels') or the like, but the practice of marrying into another tribe makes all these high-caste tribes identical for ethnological purposes. I shall continue, then, to call them Rajpoots.

They are chiefly known to Europeans in their military character and as feudal conquerors. But in reality, in their own villages in the plains of the Ganges, they are simple agriculturalists of a constitution very much like that of the Jats, only less pure and complete. The fact is that the Rajpoots have had their day, and are now a down-going race. Partly the furnishing of armies and feudal hosts has exhausted the material and corrupted the simplicity of their ori-

ginal villages; partly infanticide and other causes tend to diminish their numbers; the result of all which is, that over great tracts of country we find them rather a minority trying to maintain a failing rule over a scarcely subject majority, than forming full-democratic bodies of free Rajpoots. Still, in some parts of the country the agricultural Rajpoot villages are strong and numerous; the land is divided among them, every Rajpoot is free and equal, and the commune is administered on democratic principles. Wherever this is so, their institutions are like those of the Jats. Although they have never cared much for Bramins, they have, unlike the Jats, the ceremonies and superstitions of Hindu caste. They cook once a day with great fuss and form, almost every man for himself after the most approved Hindustanee fashion, and are very particular about caste-marks, &c. &c. Their widows may not remarry, and it is their excessive point of honour to marry their daughters to none but men of the best tribes (a feeling allied to our chivalry no doubt) that renders the daughters such a burden to them, and makes female infanticide unfortunately so common among them. Their wives again are shut up after the Mahommedan fashion, and are lost for agricultural labour. Altogether Rajpoot females are a very unsatisfactory institution, and this goes far to weigh down and give a comparatively bad name to men who who are often industrious enough.

Like the Jats, the Rajpoots are not found in any numbers to the North of the Salt Range, nor are they in any of the hill country west of the Jhelum.* If they ever occupied the Western Punjab, they have been driven forward by the Jats, and they are now only found about the Salt Range itself, where a small tribe called *Jhanjhooas* (now Mahommedans) represents a Rajpoot race that seems to have been once great in those parts. But in the North-Eastern Punjab near the hills, the Rajpoot population is (as I have already noticed) more numerous, and the Himalayas of the Jummoo and Kangra districts are occupied by Hindu Rajpoots who are there altogether the dominant race. I do not know if the highest Rajpoots to the south east

* It was somewhere suggested that the Gadoons or Jadoons just over the Indus, where that river issues from the Himalayas near Torbela, are Rajpoots, but that seems to be a mere conjecture, founded on a fancied resemblance to the name of a Rajpoot tribe. There is not the least doubt that the Gadoons are pure Pushtoo-speaking Pathans.

would admit the equality, but the Kangra and Jummoo Rajas and their clans affect among themselves to be of very blue blood indeed, and they are certainly very fine handsome men. The Kangra Rajpoots in particular are very fair and handsome and High-Arian looking. I fancy that in all these hills, for a considerable distance to the east, there is a great deal of Kashmeeree or rather old Kasha blood. The women of the hills are in deserved repute and much sought after in the plains. The Kangra Rajas have endless genealogies, but I think that their clansmen are somewhat effeminate looking and not very first rate soldiers. The men of the Jummoo country, the immediate clansmen and subjects of the Maharaja of Cashmere, (and who also occupy the west of the Kangra district), commonly called Dogras, are not spoken of with so much Hindoo respect, and are not so pretty and be-jewelled looking as the Kangra men, but they are much more robust and brave. In the Punjab force, no men are preferred to them as soldiers; they are quiet, staunch, steady and reliable, without the disagreeable Hindustanee airs of the old Sepoy Rajpoots. The Rajpoot population of these hills must be very considerable. East of the Sutlej, in the Simla hills, many of the Rajas and their followers are Rajpoots, but most of the agriculturalists are of another caste called Kanaits.

A large proportion of the Rajpoots scattered about the Eastern Punjab, Cis-Sutlej territory, and Dehli districts are now Mahommedans, as are occasional Rajpoot villages all over Hindustan and a good many Rajpoot Rajas, this being no doubt the result of the favour shown to the Rajpoots by the Mogul Emperors; but east of Dehli conversion is quite the exception, by far the greater number are staunch Hindus.

In the Gangetic valley the body of the Rajpoot population may be said to lie next to the Jats to the east, in the middle Doab, Rohilcund, and Oude; and still farther east the country is shared with a Bramin population. Before Rohilcund (given as a jagheer to Rohillas) acquired its present name, it was known as the Rajpoot Province of Katerh, and to the present day in all lower Rohilcund the Rajpoot communities, (they are there called Thakoors) are strong and numerous. They are also numerous in Western Oude, but for what reason I know not, neither the Rohilcund men nor those of

Western Oude entered the Sepoy Army in large numbers. In the Central Doab, in the districts of Mynpooree, Futtehgurh, Etawah, &c. Rajpoots are numerous, and a good many of them served in the army. The Raja of Mynpooree is, I think, one of the highest of the famous Chouhan clan. The lower Doab is, as I have before noticed, more a Bramin country; but Eastern Oude, especially most of the broad tract between the Gogra and the Ganges, is the home of the great Rajpoot population which supplied so large a proportion of the Sepoy Army. At home these Rajpoots are by no means a loose military class, but a purely agricultural population. The prejudice against the particular act of holding the plough which so many of them affect, is reduced to the narrowest possible limits, and many ex-Sepoys may now be seen grubbing up weeds, raising water by manual labour, and performing all the lowest agricultural functions. Baiswara, the country of the Bais Rajpoots, lying almost parallel to the Bramin country of the lower Doab, is a famous nursery of Sepoys. In all this part of the country, so far as there still subsist ancient superior rights in the land, they belong to the heads of Rajpoot clans.

Some of the inferior clansmen hold subordinate tenures and village proprietorships, but the great mass of the Rajpoots of Oude are now reduced to the position of mere ryots, in which capacity they are much intermixed with Bramins. Many of the superior rights have passed away to modern men.

Passing to the east of Oude, Rajpoots are pretty numerous in Azimghur and Ghazeepore, but, as I have already mentioned, in the surrounding districts and those farther to east, the chief Rajas and landholders are the bastard Bramins or 'Bhamuns' whose clansmen abound in Behar. In the Arrah district only (in the east) in the small Doab between the Soane and the Ganges, the Rajpoots are strong and numerous. Their leader was the famous rebel landholder, Koer Sing, and they supplied to the Native Army the numerous class known as '*Bhojpore*' Sepoys.

This is almost the limit of Rajpoot ethnological occupation to the east, but turning round to the south-west, the Raja of Rewah is chief of the Baghel Rajpoots (whence his country is called Baghelcund), and has no doubt a numerous following of his clansmen, though Aborigines on one side and Bramins on another are also numerous in

his territory. The Boondeelas of Bundlecund are not, I believe, considered to be very pure Rajpoots; they have probably suffered some intermixture, but they are notoriously bold and martial, form a dominant aristocracy, and used to be very troublesome to us. I do not know the proportion of Rajpoot population in Scindia's territories to the west, but believe that it is numerous. In Malwa, Rajpoots of the Rahtore, Chouhan, Sesodya and other clans form a large proportion of the population, and all the surrounding hilly country which is not held by pure Aborigines seems to have been from very old times in the possession of Rajpoot or semi-Rajpoot chiefs. The Mewar or Oodeypore Rajpoots, occupying a strong and elevated country in the west, claim to be the most ancient of the race; and I have seen it stated that some of the western Rajpoots are comparatively fair, with light or grey eyes. If so, that would seem to indicate that they reached their present location by a direct route from the west, and not by doubling back from the Ganges, as is supposed to have been the case in northern Rajpootana.

In the history of Guzerat the Rajpoots are very famous, and many of them seem to have been of the same high-caste tribes whose blood is reputed the best in the east, the Waghels, for instance, being (it appears) the same as the Baghels. They are evidently still numerous, but I have not been able to ascertain what proportion of the population they form, and to what extent they take part in the actual cultivation. Forbes does not speak of them as if they were among the most numerous cultivators.

In Kathywar, Rajpoots seem to be numerous, and from the practice of infanticide we may suppose that they consider themselves high-caste, but I cannot exactly make out whether the Kathis are counted as Rajpoots, or whether the many petty chiefs of Kathywar are principally Kathis or proper Rajpoots. The Kathis seem to have been undoubtedly immigrants from the west and at one time neighbours and allies of Jats.

In Lower Scinde there are undoubted traces of ancient Rajpoot rule, and the Summa Rajpoots ruled more recently under the Mahommedan emperors. Farther west, in Beloochistan, there seem to be traces of Hindu rule of a character more orthodox than that of the Jats, but whether the Rajpoots ever had dominion there, I am unable to say.

Looking back, it will be seen that (as I before said would be the case) I have traced the Rajpoots all round the edge of the more compact mass of the Jat population;—from the Salt Range through the Northern Punjab and adjoining hills to Rohilcund, Oude and the Centre Doab; thence by Bundlecund through Scindia's territory, Malwa, Mewar, Guzerat and Kattywar into Lower Scinde.

There remains in the centre of this circuit the greater part of Rajpootana which I have described as ethnologically more Jat than Rajpoot, though the Rajpoots now rule, after doubling back from the Ganges. They form a numerous and dominant aristocracy, organised on the feudal principles necessary to domination.

Though a full and complete Rajpoot village mainly inhabited by Rajpoots is democratic in its constitution, I have never heard of a Rajpoot Republic on a larger scale; and whether it be from long habits of domination by means of a feudal system, from the imbibing of a Hindu spirit, or from their original genius, they seem to be more than the Jats given to suffer the rule of Rajas and Chiefs. In Rajpootana, however, the chief seems generally to be but a chief, and not a despotic ruler. Numerous fiefs are held by subordinate chiefs, who are again surrounded by Military followers holding many petty jagheers and grants of land on a hereditary service tenure. It may well be supposed that under such circumstances, when the British peace-preserving power is at all relaxed, the authority of the chiefs is very apt to collapse. They never could hold their own against the Marattas. But still, as a quasi-chivalrous aristocracy, with their bards, and genealogies, and military get-up, and contests about the possession of high-caste young ladies, they make a very pretty picture.

The normal Rajpoot, however, to my view is, as I have said, the cultivator of the Gangetic valley, where, at the eastern extremity of the horse-shoe which I have described, they spread out in a broad region into a large population. Physically I do not know any striking features which broadly distinguish the Gangetic Rajpoot from his neighbour the Gangetic Bramin. In a Sepoy Regiment, setting aside caste marks, &c., I doubt whether they could be distinguished. They are both in fact the type of the higher class of the modern Hindustanee population. Both are tall men, though in the native army Commanding Officers went in too much for height, and many

of the unpadded recruits looked at first rather lanky. The modern Rajpoots are quite as Hindu as, and a good deal more prejudiced than, the Bramins. In their own villages they are pleasant good fellows enough, but as Sepoys they were a disagreeable overbearing set, and, so far as I can gather, were upon the whole about the worst class in the mutiny.

As agriculturalists their style of cultivation, &c., is much the same as that of the Jats, although very greatly inferior. They are very fond of land, and do not affect the finer garden cultivation but the broad farming style of agriculture. They also keep cattle when the country is fitted for it, and are very fond of laying their hands on other people's cattle when they have the chance,—a weakness from which the Jats also are not altogether free.

They are as a rule wholly un-literary, and very much confine themselves to the two professions of agriculture and arms.

The Rajpoots everywhere speak dialects of the ordinary Hindee. I am not aware that any traces of any other language have ever been found among them.

The Koonbees or Koormees.

To the south of the Rajpoots and Jats, the country is mainly occupied by the class above mentioned. In all the central and eastern parts of the N. W. Provinces, or in fact of Hindustan generally, the Koormees are scattered about in considerable numbers as a well-known and very industrious class of quiet cultivators. They own villages of their own, and are also more widely spread in detached families or groups of families. They affect the finer garden style of cultivation much more than Jats and Rajpoots, and like the Jats are assisted by industrious women.

As I shall afterwards notice, the Koonbees seem to be nearly connected with the Mallies, whose name we apply to the whole profession of gardeners.

The name is variously written, Koormee or Coormee, Kunabi, Kunbee or Koonbee, and there is no doubt that the terms are synonymous.

In Hindustan the Koormees do not go much beyond their own agricultural calling, but they are not absolutely unknown as Sepoys,

and they have occasionally, though rarely, risen to higher posts, especially one somewhat notorious family in Oude. In fact, in the Gangetic valley the Koormees, though much appreciated as cultivators, are somewhat looked down upon by the higher castes as mere humble tillers of the soil. If we proceed south from the Lower Doab, towards the Jubbulpore and Saugor territories, Koormees become more numerous, and there are hereabouts a good many 'Lodhas,' a tribe apparently cognate to Koormees, and who are also pretty well known in the North West Provinces. They seem in this part of the Central Provinces to have at one time occupied a very considerable position. Thence westwards, on both sides of the Nerbudda, and still farther west to the north of the Nerbudda in parts of Malwa, that is in fact throughout the southern borders of Hindustan, Hindee-speaking Koormees are very numerous. In most of this country they are the chief cultivating class. In Malwa they meet the Jats and share with them the character of the most respectable and industrious cultivators. In Rajpootana there is a cultivating class called 'Pittuls' who are supposed to be Koormees under another name.

Farther west in Guzerat the Koonbees form the main body of the best cultivating population. They seem to be in the main the owners of the land, and though quiet and unpretending, are said to be still sturdy and independent and altogether a fine agricultural people.

Throughout the whole of the Maratta country, the Koonbees are the main agricultural and landholding tribe. Here also they generally are quiet simple agriculturalists, but the Maratta Koonbees do not seem to be so energetic and good in this way as their northern congeners. They have lived long under much oppression and subject to great disadvantages. In the Nagpore country, Berar and Candeish, however, they are now a sufficiently industrious and easily managed population. To the south, where they meet the Canarese in the Deccan, every one is agreed that the latter are decidedly superior in industry and agricultural energy.

I have seen an allusion to Telinga Koonbees in the north-eastern portion of the Nizam's territory, in the country down the Godavery below the limits of the Maratta tongue, but whether these are really Telingas of this caste, or whether the word is only used to express Telinga cultivators, I am not sure.

In Hindustan the Koormees, as a lower class, are on an average darker and less good looking than Bramins and Rajpoots, but still they are quite Arian in their features, institutions, and manners. So they are in the Maratta country; indeed the Marattas are still known to the people of the south as 'Aryas,' but they have probably towards the south a larger intermixture of Aboriginal blood, and it is notorious that the Marattas are small men compared to the northern tribes.

The constitution of the Koonbees seems to be less democratic than that of Jats and Rajpoots. In the Maratta country (and indeed in the countries to the north of that also) the villages are for the most part ruled by hereditary patels or headmen without much trace of representation, so far as I could learn, and individual property in land has been in many parts subject to many changes and vicissitudes.

Nothing puzzled me more than this, viz. to understand whence came the great Maratta Military element. In the Punjab one can easily understand the sources of Sikh power; every peasant looks fit to be a soldier. But the great mass of the Maratta Koonbees look like nothing of the kind, and are the quietest and most obedient of humble and unwarlike cultivators. On inquiry I gathered that in fact throughout by far the greater part of the Maratta-speaking country, all through Nagpore, Berar, and the Northern Bombay districts, the agricultural Koonbees furnish very few soldiers, nor ever did furnish many. Although the Koonbee element was the foundation of the Maratta power, though Sevajee and some of his chiefs were Koonbees, it appears that these people came almost exclusively from a comparatively small district near Sattara, a hilly region where, as I judge, the Koonbees are very much mixed with numerous aboriginal and semi-aboriginal tribes of Mhars and others, and where, losing with the intermixture many of their agricultural virtues, they acquired more of the qualities of predatory soldiers. It is notorious that Sevajee relied principally on his '*Mawallees*' of the Western Ghats, who were apparently little better than non-descript predatory tribes. In their best days, it does not appear that the Marattas were ever Koonbees to the same extent and in the same sense that the Sikhs were Jats. In fact the Maratta confederacy was more a political than a personal union. Many of the oldest chiefs were not Koonbees. Holkar was of the shepherd, and the Guickwar was of the cow-herd caste. All these

as well as the Koonbees were quite illiterate, and would have done little without the directing power of the Bramins. When they were farther advanced, the Maratta forces seem to have been mere mercenary armies, a congregation of every loose fortune-seeker of every race and class, Mahommedans included, with a nucleus of the population of Sattara and Poonah, from which the proper Maratta chiefs had sprung.

Take them all in all, I think that the Koonbees must be considered one of the most important as well as one of the most useful and most easily governed tribes in India. A great territory is in the main theirs, extending from about 23° or 24° to about 16° Lat., and from the western frontiers of Guzerat to the countries watered by the Wyngunga and the Middle Godavery, and the upper streams of the Nerbudda.

Other Agricultural Tribes.

I have traced the Jats, Rajpoots, and Koonbees as the three chief territorial tribes peculiar to Northern India. I must now go back to notice other landowning tribes intermixed with them.

I shall take first the farming tribes, apt in the use of arms and of a constitution similar to the Jats and Rajpoots; these are principally found in the Punjab. Second, the tribes more or less pastoral in their proclivities, though now almost universally settled in agricultural communities. Third, the fine-farming or gardening tribes.

I have noticed how much the Salt Range seems to be the northern limit of both Jats and Rajpoots. The people north of this range are a great puzzle. They are those who seem to me the finest and handsomest in India, perhaps in the world. They are all now Mahommedans, but are wholly Indian in their language, habits, manners, and constitutions. There can, I think, be no doubt of that; the line between them and their Pathan neighbours is very distinctly drawn, the languages especially being totally different. Knowing the Pathans so well, any relationship with them is never suggested; a Pathan is with them a Pathan, and a man of another tribe is not a Pathan. But they have fanciful Mussulman genealogies, the Dhoonds and Tanaolees from the Caliph Abbas, the Kurrals from Alexander the Great, the Awans from Roostam and the Gukkurs from some other Persian hero.

There are a large number of petty tribes, very like one another, but

known by their own tribal names only; they have no common appellation. On the one hand much in their features, &c. would seem to show that they have kindred with the Kashmeerees or with the pre-Hindu congeners of the earlier Indians found in the hills farther west; on the other hand, their language and character, dress, and the architecture of their houses would indicate that they are nearly allied to the Punjabees. The language is altogether Punjabee. In these respects they wholly differ from Kashmeerees. Jats and Rajpoots are so well known that one would think that if they belonged to those tribes, they would say so. As it is, the only tribe which admits a Hindustanee origin, is that which seems to have the least claim to it, the Dilazaks, the predecessors of the present Pathan tribes in the Peshawar valley, and who seem to have themselves so considerable an infusion of Pathan blood that it has been doubted whether they are not earlier Pathans.

The Swattees too, the people driven out of Swat by the Euzofzyes, though in the main of the blood which supplied the early Indians, must be considered pre-Hindus, and have now a considerable Pathan intermixture.

The Gukkurs were the rulers of the Rawal Pindee district in comparatively modern times. They might possibly be foreign conquerors, but if so, it would seem singular that they should have completely lost their language, and so entirely assimilated to those around them. In appearance I do not think Gukkurs could be distinguished from Awans. Both are very large fine men, but not exceedingly fair, inhabiting as they do a dry, bare, rather low country, hot in summer. The Awans are the most numerous of these frontier tribes, and the best; there is no finer people in India. They are settled in large agricultural communities in the 'Chuch' plain, immediately facing the Peshawur valley on this side the Indus, and are also found in smaller bodies somewhat to the east, in the Jhelum, Guzerat, and Sealkot districts. They are good soldiers as well as good cultivators, and might be taken for the best class of Jats.

The Dhoonds and Tanaolees are to the north in the outer range of the Himalaya and about the Indus near Torbela. I have not been in the Tanaolee country, but the Dhoonds seemed to me to be the handsomest among handsome tribes. It is to be remarked, however, that

in the country far towards the frontier in this direction, the people who are the fairest and handsomest, are not considered the most plucky and trustworthy; the blood of Cashmere and Swat does not seem altogether to tend to these latter qualities. I cannot attempt to trace the minor tribes of Alpials, &c. &c. &c. Both the Awans of the lower lands and the Dhoonds, &c. of the higher lands seem to have democratic village constitutions.

Till we know something of the language of the tribes of the hills west of Cashmere, it would not be safe to speculate on the origin of the people of this corner of India. If the language of the hills is nearly allied to the Hindee and the Punjabee, we may suppose that these are Indianised tribes from the same source. If on the other hand the hill tribes speak a tongue of an earlier Arian form, then we must look to people of the blood of the Jats and Rajpoots for the introduction of the Hindee form of speech both here and in the rest of Hindustan. Looking to the want of any proper tribal name of the Rajpoots, it might be that before they became famous in Hindu story, some of them occupying the Punjab surmounted the Salt Range and mixing with some aboriginal Caucasians, formed the present tribes. Nowhere is there room for more interesting inquiry than in this direction.

Passing farther down in the Punjab I only remember one class of the character that I am now describing, the Doghurs, a Mahommedan tribe found near the Sutlej, fine, good-looking, high-featured men, but not very reliable and rather given to cattle-lifting. I do not know their origin.

Beyond the Sutlej again I have mentioned the Bhattees of Bhateeana, whose origin is also obscure. But they are certainly one of the very finest and handsomest tribes in India.

In the Simla hills, most of the land is held by a local tribe called Kanaits. They are inferior in position to Rajpoots, more perhaps of the level of Koormees and Lodhas, but they are often educated, and men of this class are generally ministers to the Rajpoot chiefs. In certain places there is a partial and local practice of polyandry among them, but it is not the general custom of the tribe. All those who are not (in the upper hills) in contact with Tartars are quite Arian, though not very large; the women *very* nice-looking.

It will also, I think, be proper to mention the Indian Pathans, before I leave my present class of Fighting-Farmers.

I do not now touch on the proper Pushtoo-speaking Pathans. I do not reckon them as Indian, and all the Pathans beyond the Indus, as well as a few on this side (in the north of the Hazareh District and west of that of Rawal Pindee), are Pushtoo-speakers. The Pathans are the only Central-Asiatic people who have in comparatively modern times colonised to a considerable extent in India. They have never come in large bodies, nor occupied any large tracts at any one spot, but Affghanistan has always been as it were the base of operations of all the successive Mahommedan Empires in India; and from that base Pathans have immigrated in the service or under the protection of Mahommedan rulers, and have settled themselves here and there at many places throughout Northern India and even in some places in Southern India. They are not nearly so much mere Urban fortune-seekers as other Mahommedans, but are generally settled in villages, in many of which they own and cultivate the soil, and in some of which they form large brotherhoods, approaching those of Jats and Rajpoots. Their constitution and modes of government also seem to me to be in these villages very similar. They have been generally a favoured class who have had in places a good deal of jagheer and rent-free land, and still look a good deal to service, but many of them pay their rent or revenue by honest cultivation like any one else. Indian society is a wonderful solvent and absorbent; every one who long lives in it, becomes Indianised; and so all the Pathan colonists, even those whose immigrations are matter of recent history, are essentially Indian, not Affghan. Among Indians, they have very marked characteristics, but their nationality is changed, and the Pathans from the Frontier, who came down in the mutiny times, utterly refused to acknowledge the proudest Indian Pathans as having anything in common with themselves, and chopped off their heads with the utmost non-chalance. In many respects, however, the Indian Pathans are a very great improvement on the wilder Pathans of the Frontier. They are very much more civilised and educated. In India, in fact, the Pathans are quite an aristocratic class. Notwithstanding the wide door to corruption of blood opened by the Mahommedan laws of marriage, they are still a very handsome people;

a large proportion of them are in a respectable well-to-do position, and many of them are very well educated. After all a well-educated Mahommedan has much more in common with us than most Hindus, and comes much nearer our idea of a gentleman. It may be, too, that these Pathans retain some little trace of that non-Indian character which makes us readily become familiar with Affghans. Altogether I have no hesitation in saying that (putting the Punjab apart), among Hindustanees, the Pathans are by far the best class with whom we come in contact. They have always been very numerous in our Irregular Cavalry and also had a large share in our Civil Service. I shall be sorry, if, partly on account of the more insinuating and it may be in some respects sharper character of subservient Hindus, and partly from the difficulty of imposing our education on those who have already an education of their own, these and other Mahommedans are gradually extruded from the public service.

Pathan settlements are dotted here and there about the Punjab, but they are not very numerous. In Hindustan they are more so. They are found about Dehli, and are very numerous in the Upper Doab and Rohilcund, though it must not be supposed that the latter is really a Rohilla country; it is only a Rohilla jagheer, and the Pathans, though positively numerous, are relatively but a small minority of the population. It may be mentioned that the term 'Rohilla' does not signify any particular tribe, but is applied in India to Pathans generally, meaning apparently "mountaineer." The Rohilcund and Dehli Provinces are the chief nurseries of Pathan soldiers, &c., but all over Hindustan, and indeed all over India, Pathan Principalities and Jagheers, Pathan settlements, and Pathan families are found here and there.

It will be well here to dispose of the other Mahommedan settlers, that is, Mahommedans who do not own or cannot be traced to a Hindu origin. With the exception of the Pathans, their origin is, in fact, generally obscure and doubtless very mixed.

The name of Mogul is assumed by but few, and whatever the word may originally have been, it must be understood that it does not now in India in any degree mean 'Mongol.' There is no ethnological trace of Mongol immigration into India. Even the leaders who inherited Mongol claims had, in fact, changed their blood in passing

through Persian and Afghan peoples. And on the Frontier, the term Mogul is now applied to Persian-speakers, as distinguished from Pushtoo-speaking Pathans. Most people will there tell you that 'Mogul' means a Persian, but it is really a somewhat wider designation. In Cabul, the Mahommedan population is simply divided into Pathans and Moguls (or non-Pathans), the latter being chiefly composed of Persian Kazzilbashes and the like. So then in the armies and followings of the Emperors of Dehli, Foreigners were divided into Pathans and Moguls; but while the Pathan settlers are many, the Moguls are, as I have said, very few.

In small Mahommedan countries there are numerous people claiming to be descendants of the prophet after the easy Mahommedan form of descent. Indian Syuds are generally mere loose waifs of low degree among the Urban population; but here and there we have considerable settlements of Syuds holding villages or jagheers, and where these occur, they generally claim and maintain a good deal of dignity and propriety, and are a superior and well educated, if sometimes somewhat bigoted, class.

It is generally said that a 'Sheik' means only a Mahommedan who is neither Pathan, Mogul, nor Syud. There are, however, a good many respectable landholders, and some village communities who bear the name of Sheiks; for instance, the old proprietors of Lucknow, when it was but a village, were Sheiks. It is impossible to trace the origin of these people, much less that of the loose Urban Mahommedan population. But I think it may be said that, generally speaking, the Mahommedans retain among them considerable traces of north-western origin. Dress and manners may have something to do with it, and there are of course many exceptions, but on an average they are fairer and show fewer marks of aboriginal intermixture than the Hindus. High-Arian features are not unfrequently to be seen among them. Even among those who do not directly claim to belong to Pathan and other tribes of the North-West, one often sees handsome faces, features, and beards, such as would make good 'wise men of the east,' or the very best of our oriental imaginings. It is impossible to attribute to these features, in Northern, Central and Eastern India, a Semitic origin (on the South Western borders it is another matter), and I attribute them to the hilly countries of the North-Western Arians.

Of the races which I call in some respect pastoral, I will take first

THE GOOJARS.

They have been long known to us as cultivators of predatory proclivities in the country about Dehli, and after 50 years of enforced peace and quietness, they distinguished themselves by breaking out into wholesale plunder all over that district within a few hours of the out-break of the mutiny, just as if the present generation had been accustomed to it all their lives. However, we must take a wider survey, for the Goojars are a far extending people, numerous in the Punjab and on the Northern Frontier. In fact, they now extend farther to the North-West than any other Indian people. I understand that they are still numerous in Swat and the adjacent hills, and they are said to have been the original inhabitants and owners of part of the Hazareh District, on this side the Indus, before they were in great degree dispossessed by the Swattees, themselves pushed forward by the Affghans. In the hills about Kashmere the Goojars are very numerous; and there more than anywhere else they have an actual pastoral character, being apparently somewhat vagrant in their habits, and at one season receiving the cattle of the Kashmeerees to graze, while at another they bring their own down for sale. Perhaps these are the Goojars who were dispossessed of their homes in Hazareh. It is supposed that in the event of any disturbance in Kashmere, they might visit the valley for other than pastoral purposes.

Descending into the plains of the Punjab, we find the Goojars about Goojerat and the country thereabouts in very much better repute than elsewhere, in fact they are there said to be among the best cultivators. They are very numerous, settled in prosperous communities, and give, it appears, their name to the town and thence to the district of Goojerat. There might be some question whether the word is not the Persian one, '*Goozerat*,' *i. e.* 'Fords' or 'Ferries,' in allusion to the ferries over several rivers thereabouts, but I understand that it is really Goojerat from Goojar. And there are frequent names in the Punjab derived from the same source. In fact, Goojars are very much mixed with Jats in all the northern, if not in all the Jat country, and form a considerable proportion of the population. About Dehli they are, as I have said, very numerous, and they are so in the Meerut and Seharanpore Districts of the Doab. They are numerous

in all Northern Rajpootana, and extend into Malwa and the adjoining parts of Central India.* They there extend as far east as Bundlecund, where one of the chiefs is a Goojar. But in the other direction they do not approach Goozerat, and, so far as I can learn have never been known there. I believe that the Bombay 'Goozerat' is a name derived from some other source. Its proper form is said to be *Gurjarat*, derived from '*Gurjar*' Princes. I do not know the derivation of this last term, but there are *Gurjat* Chiefs in the Cuttack and Southern Nagpore territories, where there are no Goojars. I fancy, however, that I have heard it said (though I cannot now trace the source), that a similarity of names can be traced between places in Goozerat and in the Punjab Goojerat. If that be really so, it would open up an interesting inquiry. To prevent mistake, I should here notice that in the Bombay Presidency the word 'Goozar' is used, not to signify a Goojar in the northern sense, but merely an inhabitant of Goozerat, as thus 'Goozar Bramins,' 'Goozar Banians.'

The Goojars are generally a fair good looking people, especially towards the frontier, and have no aboriginal traces about them. Those located to the east trace their origin from the west. All, I think, to the north of Dehli are now Mahommedans; but those to the east and south of that place are sometimes half-Mahommedans, sometimes a sort of Hindus, though of so lax a character that I believe they are hardly admitted within the pale, and are considered to be in some degree a sect apart. They are sometimes said by the natives to have a language of their own; at least so I was told in the Punjab. It may not improbably be that this is only the patois of one province carried by them into another, but it would be interesting to inquire whether they may possibly have among themselves some sort of Gypsy tongue. Their most proper calling seems to be the keeping of cattle and buffaloes, not sheep; but they do not generally exercise this as a mere caste profession among the general population. They

* The last Nagpore Prince is stated to have been a *Goojar* adopted into the family, the son of 'Nane Goojar,' but I apprehend that there must be some mistake, as the Nagpore family were, I believe, Maratta Koonbees, of the same race as the Sattara family. Either 'Goojar' must be here a mere name or title of the individual, or the allusion must be to some supposed indiscretion of a lady of the family.

are usually settled in separate villages of their own, and in the absence of pastoral and predatory opportunities are cultivators, like other tribes, though in most places indifferent ones.

I shall here just mention 'Mewattees,' not because I am prepared to class them as 'Pastorals,' but because they are very frequently classed with Goojars, as "Goojars and Mewattees," with reference to their plundering propensities. In fact, although I have always been familiar with Mewattees as a very thieving tribe of cultivators found here and there along the south-western borders of the North West Provinces, I have not been able to make out what they really are. They seem to come from the Central country, from somewhere in Rajpootana or Central India, and their name might seem to indicate a connection with Mewar. I have seen mention of 'Mewassees,' hill chiefs, in those parts, but don't know if they are connected with the Mewattees. In fact, the Alwar country near Dehli seems to have been of late called 'Mewat.' Mewattees are mentioned as common in Malwa in the characters of irregular soldiers and depredators. They extend farther east than the Goojars. I think the villages razed to the ground in the station of Allahabad, for their predatory activity in the mutiny, were those of Mewattees. My impression is that they are mostly Mahommedans and not bad looking, but in truth I know and can find very little about them.

The Goojars are succeeded as cattle-keepers to the east and south by the 'Aheers,' who seem to be the pastoral element of the Rajpoot and Bramin countries, as the Goojars are of the Jat countries. Aheers and Goojars are sometimes spoken of as if connected, but that I believe is an error arising from mere coincidence of profession. Meeting as they do in the country east and south of Dehli, they keep entirely apart (in a social point of view), and are universally recognised as entirely separate and distinct castes, with no connection whatever. The Aheers are not a very strict sect of Hindus in the modern sense, and their widows re-marry, but still they are decided Hindus of the respectable position which their charge of the sacred animal demands. In the strictest days of caste there were a good many Aheers in the Sepoy army. They are good and upper-class-looking Hindustanees. Like the Goojars, they are not a mere cow-keeping caste, but have many independent villages, and in some parts of the

country are in considerable tracts almost the principal landholding class. Under these circumstances they are very fair agriculturalists, only a little given to cattle-lifting, when opportunity offers. Besides the Aheer villages, families of the caste are much spread about the country as cultivators and herdsmen. 'Ghosees' also, common as buffaloe-keepers, are said to be related to the Aheers; they are, I think, Aheers converted to Mahommedanism. Except in the country occupied by Jats and Goojars, Aheers are found all over Hindustan, but do not generally extend east into Bengal. There are many of them just between the proper Jat and the Rajpoot country about the Ganges, to the east of Meerut and Allyghur, and on the other side in part of Rohilcund, and they seem to extend into the south-east of Rajpootana and of the Dehli territory, and are found about the Jumna near Muttra, and in many places farther east. In the Benares and Behar Divisions there are also many of them.

Thence through Central India I am not prepared to say what proportion of the population are Aheers, but they were certainly very famous in old time on the Southern frontiers of Hindustan, in Guzerat, and in the Maratta country. The famous Fort of Asseerghur derives its name from *Asa Aheer*, a noted leader of this tribe, and Aheers are still, I believe, found in those parts. They are said to have been once powerful in Goozerat and to be still numerous in Kattywar. That western country is stated in fact to have been formerly called 'Abhira' or the country of the Aheers. And thence southwards, it seems probable that Aheers were one of the principal Hindu races who along with the Bramins conquered and colonised Southern India. Bramins and Herdsmen are said to have been the first conquerors, and the Aheers may probably be the progenitors of the cowherd castes who are still numerous in the Southern Districts. One can only suppose Goozerat to have been a Goojar country, by assuming Goojars and Aheers to have been originally identical, which at any rate would require that we should go back a very long way. The subject is, however, worthy of inquiry.

Besides the Aheers known in the Maratta Districts, there seems to be in the south of that country and also in the Canarese country a quiet respectable class of cultivators called 'Dhangurs.' The word is translated 'Shepherds,' but I have also seen it stated that the

Dhangurs and Aheers are nearly the same. It would be well to know more on the point.

In Hindustan sheep and goat herds, 'Gaderias,' form a separate and very inferior caste and profession. They have no villages of their own, but tend sheep in the villages in which they reside.

In Bengal Proper and Orissa, the Aheers are succeeded by the Gwallas, whom I have already incidentally noticed as very different in their style, manners and occupations. 'Gwalla' is not a tribal name, but merely means a cowkeeper (from the old Sanscritic word, *go*, a cow), so that the name does not necessarily imply any tribal connection with the Gwallas of the south and elsewhere. The Gwallas (as I have before noticed) are, with their congeners the 'Satgopes,' by far the most numerous Hindu caste in Bengal; and as Bengal is not much of a grazing country, they constitute a large proportion of the cultivators, besides carrying palanquins, acting as domestic servants, and following some other avocations. In the jail returns they are about 13 per cent. of the non-Mahommedans, that is, of Hindus and Aborigines of all sorts taken together; and as Aheers prevail in Behar, it is probable that in Bengal and Orissa the Gwallas amount to fully 20 per cent.

There are no democratic villages in Bengal; indeed village communities in the proper sense, with anything like a municipal constitution of any kind, can hardly be said to exist; the Province is in that respect peculiar. Consequently it is unnecessary to add that the Gwallas are not in regular communities. They are scattered about the country. I believe that they have frequently acquired rights in the land and attained to respectable positions. They seem to be a quiet, decent set of people.

I am not well versed in the manners and customs of the Bengallees, and there seems to be a great want of information on the subject, which I trust may be supplied.

I have before hazarded a conjecture whether the Bengallee Gwallas may not have been formed on the basis of the Aboriginal Bhooyas.

Of the fine cultivators or gardeners, the most important are—

THE MALLIES,

to whom I have alluded as apparently allied to the Koormees, and who are not only the humble gardeners to whom Europeans ordinarily

apply the name (as to a profession), but a considerable and far extended people. On the Frontier, above the Salt Range and extending up into Peshawar, there is a considerable class of 'Mulleals' who are I believe Mallies (though like most of the people of those parts now Mahommedans), and who are very industrious cultivators and gardeners.

Throughout the plains of the Punjab, there is again a very important and numerous class who seem to be allied to the above, called Raees or Raeens. These people have generally villages of their own, or hold divisions of villages on equal terms with Jats and others, and under a similar constitution. They chiefly affect the best lands and finer cultivation, where they pay a high revenue and are much appreciated by native governments; for they are probably, on the whole, the best cultivators in the Province. They are not martial, but are generally (like almost all Punjabee Mahommedans) fair and good-looking men. They are all, so far as I know, Mahommedans, which may account for their bearing a different name from their Hindu congeners, if congeners they be. So far as I am aware, they are not known by this name beyond the Punjab.

A little farther east, long before we come to the Koormees, we meet with Hindu Mallies. I know that between Umballa and Dehli, in the Khytul country (one by nature very little suited for gardening operations), there are a good many Mallie villages. In the North West Provinces I do not think that they are much known as independent landholders, but as gardeners they are scattered about. I find mention made of them as common about Ajmere and on the Southern frontier of Hindustan. Beyond Jubbulpore they are common, mixed with the Koormees. Thence going onwards to the Maratta country, in Nagpore also they share the country with the Koonbees, and are the class next in importance to these latter. In fact, in all this part of Central India, (the southern limits of Hindustan and the Maratta country), Koormees and Mallies seemed to be classed together. The Patels, I learned, were either Koonbees or Mallies, and they often divided the same villages. The two classes (I was told by the Patels of the Nagpore country) will eat together, but do not intermarry. In this latitude both Mallees and Koormees extend far to the east. I find mention of the former in Orissa, and of the latter in Maunbhoom and other districts of Chota-Nagpore.

The Lodhas I have already mentioned as connected with and of the same character as the Koonbees, though they are strictly speaking distinct from them.

The remaining classes of Northern India, whose proper profession is cultivation or gardening, have not generally, to my knowledge, villages of their own. There are, however, scattered through most villages in Hindustan many industrious Kachees and Koerees and Morows (tobacco cultivators) and Kumbohs, and some (though not many) who have no other caste name than that of 'Kisan' or cultivator. The farther we go down in the scale, the greater seems to be the infusion of aboriginal blood, the shorter is the stature, the darker the skin, and the more low-Arian the features; but in none of these decent castes of Hindustan do the features or the complexion and hair assume at all an aboriginal type.

In Bengal the names of castes are different, and *there* very many of the cultivators, the majority I believe in all Eastern Bengal, are Mahommedans, whose original caste and ethnological history I am at present unable to discover. Among Hindus, the most numerous castes after Gwallas, Bramins, and Kaists, are Bagdees (who are I am told of an inferior and aboriginal type), and a decent class of cultivators called Kyburtos. I am as yet altogether puzzled about the ethnology of the mass of Bengal ryots. Most of them, though dark, look Arian, but some are *very* dark, and have a decided tendency to a thickness of lip, and to some features either Aboriginal or Indo-Chinese. I am half inclined to think that there are two types among them. Some of them seem to have a great tendency to curly hair, and to a cast of features which I should be disposed to attribute to the influence of the black woolly-headed Aborigines, who may have stretched across from the Rajmahal to the Garrow hills. Others, especially the Ooryahs, with the Bhooyas of those parts and some of the Bengalees, seem rather to have straight hair with high cheek bones and complexions not very dark, which might suggest an Indo-Chinese element stretching from Burmah across the Soonderbuns. But I have acknowledged that I do not understand Bengal, and I hope that others will throw more light on it.

The inferior Helot classes, who generally, all over Northern India, cultivate to a considerable extent, either on their own account, or as the servants of others, I leave for another division of my subject.

It must, however, be understood that a good deal of cultivation, in most parts of the country, is carried on by miscellaneous cultivators of a great variety of classes, who by caste properly belong to other professions. Cultivation is the one profession which is open to all alike, and is occasionally followed by almost all. In a great part of Hindustan in particular, wherever Rajpoots and Bramins are comparatively few, and Koerees and Kachees are not numerous, there is in the present state of cultivation a large space not occupied by the classes which I have enumerated, and lists of tenant cultivators of these tracts present a very great variety. It is the same in Bengal. The caste of '*Telees*' are supposed to be properly oil-manufacturers, but whether (seeing the large growth of oilseeds) they were also in their origin oil-growers, or whether their multiplication is accidental, they certainly in many parts of the country form an important and respectable section of the agricultural community. Many of them are found both in Hindustan and in the Bombay Presidency, and in Bengal and Orissa they are particularly numerous and well-to-do. In Bengal the Tantees or weavers are also a prosperous class, and own a good deal of land.

The Chumars or leather workers form a large proportion of the population of Hindustan, and are both labourers and cultivators, but they may perhaps better be put among the inferior labouring classes.

For the rest the list of cultivating artisans and others would be endless. They must be classed under their own professions.

The Mercantille Classes.

First under this head, I will put—

The Khatrees.

Trade is their main occupation, but in fact they have broader and more distinguished functions. Besides monopolising the trade of the Punjab and the greater part of Affghanistan, and doing a good deal beyond those limits, they are in the Punjab the chief civil administrators, and have almost all literate work in their hands. So far as the Sikhs have a priesthood, they are moreover the priests or gooroos of the Sikhs; both Nanuk and Govind were, and the Sodees and Bedees of the present day are, Khatrees. Thus then

they are in fact in the Punjab, so far as a more energetic race will permit them, all that the Maratta Bramins are in the Maratta country, besides engrossing the trade which the Maratta Bramins have not. They are not usually military in their character, but are quite capable of using the sword when necessary. Dewan Sawan Mull, Governor of Mooltan (and his notorious successor Moolraj), and very many of Runjeet Sing's chief functionaries were Khatrees. Even under Mahommedan rulers in the west, they have risen to high administrative posts; there is record of a Khatree Dewan of Badakshan or Koondooz, and I believe of a Khatree Governor of Peshawar under the Affghans. The Emperor Akbar's famous minister, Todar Mull, was a Khatree; and (though I was not before aware of it) a relative of that man of undoubted energy, the great Commissariat Contractor of Agra, Jotee Pershad, lately informed me that he also is a Khatree. Altogether there can be no doubt that these Khatrees are one of the most acute, energetic, and remarkable races in India, though in fact (except locally in the Punjab) they are not much known to Europeans. They are, either on account of their name confounded with Rajpoots (by those who only see the name), or more frequently, on account of their mercantile profession, are confounded with the Bunneahs or Banians, with whom socially (as matter of tribe and caste) they have no connection whatever. The Khatrees are staunch Hindus, and it is somewhat singular that, while giving a religion and priests to the Sikhs, they themselves are comparatively seldom Sikhs. And though, judged by a modern Hindu standard, they can hardly penetrate as they do into Central Asia with much regard for caste, they show their staunchness by never succumbing to the Mahommedan faith, where all the Indians around them have done so. I scarcely think that there are such people as Mahommedan Khatrees in latitudes where Jats, Rajpoots, and others are all Mahommedan; and even in Affghanistan they seem to maintain their faith intact. The Khatrees are a very fine, fair, handsome race. And as may be gathered from what I have already said, they are very generally educated. There is a large subordinate class of Khatrees, somewhat lower, but of equal mercantile energy, called Rors or Roras. The proper Khatrees of higher grade will often deny all connection with them, or at least only admit that they have some sort of bastard kindred with Khatrees,

but I think there can be no doubt that they are ethnologically the same, and they are certainly mixed up with Khatrees in their avocations. I shall treat the whole kindred as generically Khatrees. Though the Rors have not usually risen to such high posts, at least one of Runjeet Sing's ministers was of this class.

Speaking of the Khatrees then thus broadly, they have, as I have said, the whole trade of the Punjab and of most of Affghanistan. No village can get on without the Khatree who keeps the accounts, does the banking business, and buys and sells the grain. They seem too to get on with the people better than most traders and usurers of this kind. Of course, like all people so situated, they are often a good deal abused, but in a Punjabee village I think that the Khatree is generally rather a popular character and on friendly terms with his clients; at any rate they appreciate the necessity for him, and are by no means anxious to get rid of him. In Affghanistan, among a rough and alien people, notwithstanding occasional exceptions, the Khatrees are as a rule confined to the position of humble dealers, shop-keepers and money-lenders; but in that capacity the Pathans seem to look on them as a kind of valuable animal, and a Pathan will steal another man's Khatree, not only for the sake of ransom (as is frequently done on the Peshawar and Hazarah frontier), but also as he might steal a milch-cow, or as Jews might, I dare say, be carried off in the middle ages, with a view to render them profitable.

I do not know the exact limits of Khatree occupation to the west, but certainly in all eastern Affghanistan they seem to be just as much a part of the established community as they are in the Punjab. They find their way far into Central Asia, but the farther they get, the more depressed and humiliating is their position. In Turkistan, Vambery speaks of them with great contempt as yellow-faced Hindus of a cowardly and sneaking character. Under Turcoman rule, they could hardly be otherwise. They have even found their way to St. Petersburgh and made money there. They are in fact the only Hindus known in Central Asia.

In the Punjab they are so numerous that they cannot all be rich and mercantile, and many of them hold land, cultivate, take service, and follow various avocations. But I do not think that there is in the plains such a thing as a Khatree village or Khatree community,

such as I have described to be the social form of other castes. They are always mixed among other classes.

It is somewhat singular that the Khatrees, so important in Affghanistan, and who also push so far into Central Asia, are altogether excluded from Bramin Kashmere; they are not found there at all. In point of acuteness, I fancy it is an instance of 'two of a trade.' In the hills, however, the 'Kukkas' on the east bank of the Jhelum are said to have been originally Khatrees, (they are a curiously handsome race); and in the interior of the Kangra hills there is an interesting race of fine patriarchal-looking shepherds called 'Gaddees,' most of whom are Khatrees. There are some Bramins among them, and some of low caste, but the great majority are Khatrees, and their story is that they are the remnant of the former rulers of the plains of the Punjab, driven to the hills by conquering invaders. They are a very pleasant, frank, simple people, quite apart from their present neighbours, and a great puzzle. Khatree traders are numerous in Dehli, are found in Agra, Lucknow and Patna, and are well known in the Burra Bazar of Calcutta (though there they are principally connected with Punjab firms). But as soon as they pass east from the limits of the Punjab, they get into the mercantile field of the Bunneeahs, who are quite their equals in mere mercantile ability where little physical courage is required, and in the Bunneeah country the Khatree merchants are mere exceptions in large towns.

In Behar there seems to be a considerable agricultural class called Kshatrees, Chatrees, or Khatrees, who are distinct from and considered to be somewhat lower in rank than Rajpoots. They seem somewhat to affect a Military character, sometimes serve, I believe, as soldiers, and are well known as '*Darwans*' and the like in Calcutta. Buchanan seems to have been inclined to suppose that they are really Khatrees from the west, but I have not yet been able to ascertain whether they are in truth of the same caste as the mercantile Khatrees.

I do not know the exact limits of the Khatrees to the south. I have not visited Mooltan which is a great mercantile centre of the race, and cannot accurately distinguish between Khatree and Bunneeah sects called by their sub-tribal names. The term 'Mooltanees' seems to be applied to several trading sects in different parts of Central India, &c., some apparently wandering Pathan traders, and some,

I suspect, of some Khatree sect. The Khatrees do not seem as a rule to reach the western Coast; the Guzerat and Cutch traders appear to be Bunneeahs (or Banians) not Khatrees, and in the Bombay market I cannot find that they have any considerable place. In Scinde, however, I find (in Captain Burton's book) an account of a race of "pretended Khsatryas who are really Banians of the Nanuk-Shahi (Sikh) faith," and who trade and have a large share of public offices. These are evidently Khatrees. I had supposed the Lohanee merchants to be Pathans coming under much the same category as the "Povindeahs," but again Captain Burton makes mention of the "Lohanos, a Mooltanee caste of Banians," a robust and good-looking race who trade with Central Asia, and also with the Arabian Coast, who form a very large proportion of the Government servants in Scinde, and who also do some agriculture and labour. I cannot at this moment ascertain whether these Lohanos are really Banians or Khatrees, probably I think the latter. Palgrave again mentions among the Indian traders of the Arabian Coast, as distinguished from Banians, people whom he calls 'Loothians' or Loodianah men. I take it that these must be Khatrees, unless indeed they may possibly be Kashmeree shawl merchants. Loodianah is a large and thriving town of mercantile Khatrees, with a numerous colony of Kashmeree shawl-weavers.

The Khatrees claim to be the descendants of the old Kshatryas, and I am inclined to think that they really have the best claim to that honour. With all their enterprise, it is difficult to imagine them so completely domiciled in Affghanistan, among so alien a people, if they are entirely foreigners in that country. It is well known that the Pathans themselves have advanced into the North Eastern portion of the country which we call Affghanistan, within comparatively recent and historical times; and although the upper valleys of the Indian Caucasus have probably all along been held by pre-Hindu tribes, there seems to be little doubt that the lower valleys of the Cabul country were once Hindu. To this day the peaks of the 'Sufed Koh' between Jalalabad and Cabul bear the palpably Hindu names of "Seeta Ram" and such like.

The old Sanscrit books make the Bramins and Khsatryas to have remotely sprung from a common origin. May it not be that in early

Aryan days the Bramins of Kashmere may first have become literary and civilised, and ruled on the Saraswatee by peaceful arts, after the fashion of the earliest Egyptians before the art of war was invented, (See M. Renan's abstract of recent Egyptian inquiries); and that later a cognate tribe of Khatrees of the Cabul country, rougher and more warlike, may have come down upon them like the Shepherd Kings, and assumed the rule of the Military caste of early Hindu history? That warlike conquerors of one age should become astute money-dealers of another, is but the ordinary course of history—Jews, Greeks, Lombards and others are instances in point, and perhaps when the New Zealanders rule in England, the English may be known as the Khatrees of those parts.

The Bunneahs, Banians, Banees, or Wanees.

No race is more important in India than the Banees. What I have described the Khatrees to be in a mercantile point of view in the Punjab, that the Banees are in the whole of Hindustan and Western India. No village can get on without them. Unlike the Khatrees, they are for the most part confined to their proper mercantile business. A few of them are found in Government offices and such service, more properly the domain of the Kaists, but these are only rare exceptions. They have also under our system acquired by purchase large rights in the land, and take farms of more, but this is in fact with them a mere mercantile operation; they do not cultivate the land, but make the most of the rents payable by the ryots, and the ejected proprietors reproachfully term the British Government "Bunneah ka Raj" or the shopkeepers' rule. Bunneahs may cultivate a few fields, like any one else, or even reduced individuals may earn their livelihood as ryots or labourers, but so far as I know, a proper Bunneah village is nowhere to be found.

There is no doubt that in their own way the Banees are a people of wonderful energy and enterprise, and it is their energy that gives tone and sinew in a commercial, and to a great degree an industrial [illegible] to the greater part of India. Without the Banee to supply the [illegible]s of wa[illegible]ittle would be done. Their function permeates every [illegible]peration of every village. In all the great cities of Hindustan, they are found in a position commanding much respect as Bankers and

Merchants, and they are also most daring speculators, as is well known in the markets of Bombay and Calcutta. Indeed they often carry the rage for speculation to the point of gambling. In respect of physical courage, however, the case is quite different. Both their habits and their religious ideas make the use of a sword a thing unknown to them, and they have no affectation of personal manliness.

If the Banees are not generally very tall or strong, they are not much the contrary, and they are generally very fair. For this latter feature their indoor avocations may in part account, but that alone is not, I think, sufficient. When one gets peeps of the faces of their women on the occasion of great religious gatherings and the like, they seem to be fair beyond almost any other Hindustanee caste. The men, though flabby and un-muscular looking, are, I think, to an unprejudiced eye often by no means bad looking. They have, however, none of the high-Arian sharpness of feature, but rather a sleek comely pudding-faced kind of countenance, something like those old Egyptian faces which are said to come nearest to the Hindu type. They are, I think, generally reputed more grasping than I have described the Khatrees to be; are more often accused of being hard on those in their power, and exercising a severe tyranny of the purse. But even in their case I believe that this is a good deal exaggerated, and that many of those who abuse them most, can least get on without them. Possessed as they are of so much capital and energy, there can be no doubt that, from an industrial point of view, the acquisition by them, from indolent and unprovident proprietors, of a good deal of the land is beneficial, when it becomes their absolute property. They, almost alone among superior landholders, perform something of the industrial functions of landlords, and they know too well the value of ryots, altogether to expend and sell up those in whom they have a permanent interest. There is to be set, on the other side, the political weakness resulting from the existence of large numbers of strong-armed pre-owners still, as they think, natural proprietors, side by side with new owners who in a difficulty will not fight. Still, if the Bunneahs will not fight, they may perhaps pay others to fight for them. It is only when they are set to 'exploiter' the ryot in a speculative way, as mere temporary lessees and middlemen under the great superior Zemindars, that they are often a great curse.

The great seat of the Bunneahs seems to be in the west, and most of them point to a western origin, or rather, speaking from a Hindustanee point of view, I should say south-western, not to the Punjab, but to Rajpootana and the Bombay country. There are a great many sub-divisions among them, and my impression is that the different divisions do not intermarry as do those of Jats and Rajpoots. There may therefore be ethnological distinctions among them, but I do not know that it is so. The most famous of them are the Marwarees; and that is the name of the country, and not of the sect, intimating their habitat in Rajpootana. The red-turbaned gentlemen so conspicuous in the Calcutta Opium marts and Bombay share-markets are generally Marwarees. In Hindustan the highest class of Bunneahs are called 'Aggerwals,' and there are several other sects. The Bunneahs professing the Jain religion are called Srawaks, and under that name they seem to have been famous in very old times, even in parts of Central India which are now comparatively barbarous. In Hindustan, Hindu Boras are a sect of money-lenders and traders and, I imagine, Bunneahs. I believe the name is the same as that of the Mahommedan 'Boras' of the Bombay side; but the latter, with some peculiar Mahommedan tenets, have probably got some traces of transmarine blood, and I shall reserve them for the category of 'Borderers.' Towards the south of Hindustan I have heard of a sect of inferior Bunneahs called 'Jashwals' who, unlike the race generally, are lax Hindus and even permit their widows to remarry.

So far as I can make out, the proper Banees are not thoroughly and completely domiciled in Bengal proper, and to the want of that element (or of anything equal to it) I attribute the absence of enterprise and practical achievement, which seems to be remarkable among the Bengallee, notwithstanding the great value acquired by the land under the permanent settlement, and the accumulation of wealth during a hundred years of peace. In Calcutta most of the considerable trade and banking business and all the Hindu speculation is done by up-country Marwarees and other Bunneahs, not by Bengallees. In the Bengal districts, though a good many Banee colonists are settled in towns and considerable places, the money-lending and shopkeeping business seems to be in great part in the hands of a variety of other classes. Bramins do, I believe, a good deal of money-lending, and the

goldsmith class are also Bankers in Bengal. Then there is a class of *Sahoos*, whose proper profession is spirit-distilling and vending, but who have a large share of the general trading business. The common 'Modees' or grain-sellers, instead of being almost universally Banees as in Hindustan; are, I understand, of various castes, and there are separate spice-sellers, oil-sellers, &c. If there are not so many enterprising Banees to make the most of the land, there is at any rate this advantage that, I believe, the ryots are now not nearly so much rack-rented in Bengal as they are in Behar and other parts of Hindustan, where the lands of great landholders are almost invariably farmed to speculators.

In Goozerat, Forbes describes the Wanees as very universal and very grasping. But at any rate the traders of the Coast of Goozerat and Cutch are very enterprising. The Banian of those parts is an important institution all over the coasts of Arabia and Africa on the opposite side of the Ocean. And in Bombay, Premchand and other Banees have made their names famous. In the Maratta country, the higher trade and banking seems to be done by Marwarees, the village business by local Wanees. Farther south, in the Canarese country, the classes of trading proclivities called, 'Banijagas' seem to be very numerous, but as the name is derived from the Sanscrit 'Banij' a trader, I cannot be quite sure that the northern and southern traders are related by blood. Inquiry is necessary on this point.

Almost all the Banees are strict Hindus, that is, strict in their own form of the faith; for in some sense Jains and such like may be said not to be proper Hindus. In Hindustan, though there are a good many Jains, the great majority are proper Hindus. They may be considered to be in religion very high Hindus, and carry to a great extreme respect for animal life. This tenet, I think, connects them with the western Jains and others, the foundation of whose faith is really the doctrine of metempsychosis and the transmission of souls from one creature to another. The Banees are, I think, really the most sincerely religious among the Hindus, and much attached to their tenets. Among many other Hindu classes, religion is little better than form. In the west country, Jain tenets very much prevail at the present day among all the Banee classes, and seem to have

had a very ancient hold upon them. In the south, the Banijagas are, it appears, now chiefly Lingamites and, as such, scarcely Braminical Hindus. But at one time the Jain form quite prevailed among them. In fact, in all the west and southwest the Jain religion appears to have been at one time predominant. The Jains seem to assert that the Rajpoots were once of their faith. The Pali language and character would seem especially to belong them.

What then is the origin of the Banees? That is a very puzzling question. I cannot account for them in any historical way, but the speculation which has occurred to my mind is, whether they may not originally have been immigrants by sea from the west who brought with them the Phallus or Lingam, and those ideas of a continually self-reproducing procreative power which took shape in the worship of Siva, and eventually gave birth to Buddhism and to Jainism, and which finally, meeting and amalgamating with the Braminical faith, produced modern Hinduism. If this be so, we might suppose that the Banees had done much to civilise the Central and South of India, before the Bramins got so far. But, as I have said, this is mere speculation; much farther inquiry is necessary.

Among the mercantile classes of the north (as well as of the south) should be classed the well-known Banjaras or wandering grain merchants, men of great energy and usefulness in their day. Though they carry on their trade all over the country, they have in some places fixed homes. On the borders of Rohilcund, towards the Terai, they have in fact considerable settlements, are considerable landed proprietors and altogether important people.

I now come to the Writer classes:—

The Kaits or Kayasts.

Important as this caste now is, I am totally at a loss to imagine how or why it came into existence. In old Hindu times, with a great Bramin class occupying something the position which Bramins now hold among the Marattas (by no means confined to sacerdotal duties, but performing all literate functions), one can see no room for a separate Writer class. If the Rajpoots, coming in as conquerors, wished to put aside the Bramins, they would probably have found Khatrees and Banees ready to assist them. The Mahommedans, we know, had

always among them a large educated class of their own, so much so that in the early days of our rule in Upper India most of our public servants were Mahommedans. Yet somehow there has sprung up this special Writer class, which among Hindus has not only rivalled the Bramins, but in Hindustan may be said to have almost wholly ousted them from secular literate work, and under our Government is rapidly ousting the Mahommedans also.

Very sharp and clever these Kaits certainly are. They are looked on by Hindus as rather a low caste, and their appearance is not aristocratic. Most of them are decidedly dark, generally spare thin men, and, I should say, on the average short, with often sharp weasel-like features, small and quite low-Arian. They are somewhat lax in their ways, given to drink, and on their great annual festival, when they worship the pen, it is rather the correct thing than otherwise to have a good debauch.

They have generally the office of Patwaree, or village accountant; and of high office, having always had a good share, they are getting more and more a monopoly. They are, in fact, first-rate men of business, and without pride ready to adapt themselves to our ways, they have become almost indispensable to us. They have acquired much landed property, some by honest means, some by dishonest means, when very loose practices prevailed in our courts. And of course, with dignity and wealth the respect with which they are regarded from day to day increases. What I have said of loose ways, is only applicable to the lower and more common members of the sect. It is only fair to acknowledge that there are now many high officers and worthy proprietors of this class, whose respectability is great and conduct unimpeachable. I never remember to have heard a conjecture as to the origin of the Kaits. They are never found in separate villages, but are scattered about rather as a separate profession than a separate race. There are a good many illiterate men among them who earn their bread as they best can; but most of them are educated. I should not say that they anywhere in Hindustan form a very large population. One may suppose that when the Bramins got indolent, this class grew up as a sort of low-caste clerks to the Bramins, who ruled by supplanting their masters. But whence did they get their talent? Some of the Aboriginal races seem to have activity and bodily energy, but none of them mental talent.

In Bengal the Kaits occupy a higher relative position and are very numerous. It is related as a historical fact that they accompanied the Bramins into Bengal from the North-West, and indeed it would seem as if the Hindustanee colonists in Bengal had been almost exclusively Bramins and Kaits; there are scarcely any other castes of well authenticated Arian descent, while a large proportion of the inhabitants show some aboriginal traces. In Bengal then the Kaits seem to rank next or nearly next to the Bramins, and form an aristocratic class. According to the Jail Returns, they are 7 per cent. of the Hindus incarcerated in Bengal, Behar and Orissa, and in the general population they are probably in still larger proportion. They have extensive proprietary rights in the land, and also, I believe, cultivate a good deal. Of the ministerial places in the public offices they have the larger share. In the educational institutions and higher professions of Calcutta, they are, I believe, quite equal to the Bramins, all qualities taken together, though some detailed information of the capacities of different classes, as shewn by the educational tests, would be very interesting. Among the native pleaders of the High Court, most of the ablest men are either Bramins or Kaits; perhaps the ablest of all, at this moment, is a Kait.

Not knowing where else to put them, I shall here mention a caste who are, so far as I know, peculiar to Bengal, the Boidyas or physicians. They are not very numerous, are, I believe, often learned and respectable men, and rank high among Hindus, but in truth I do not know very much about them. It would be interesting to know more.

The Kaits extend west all through Hindustan, are numerous in Malwa and are found in Goozerat. But in this latter Province we come upon either another caste of the same kind, or a branch of the same bearing a different name, and called—

Purbhoos or Purvoes

who are very conspicuous in that part of India and in the town of Bombay, where they do most of the work of clerks. I cannot make out whether Kaits and Purbhoos are in the main the same or different. Of two well informed native gentleman whose opinions have been sent me, one seems to think that they are mere sub-divisions of an original writer class, another, that they are different. Those whom I saw in Bombay seemed to me different in appearance as well as

very different in dress from the Hindustanee Kaits; they are, I should say, generally fairer and better looking. I should much like to know more about them.

The Artisans.

For ethnological purposes it would be useless to go through the long lists of professional castes, as they cannot, so far I know, be distinguished as representing races, but are merely the modern Hindu social division into professions. It will nearly suffice to say that in Northern India almost every possible profession has its separate caste, and that there is no grouping of them together, either into right hand and left hand, or into such groups as the Punchalas of the south. Nothing of the kind is known; Carpenters, Blacksmiths, Goldsmiths, Bricklayers, Potters; Barbers, Confectioners, Washermen, Spirit-sellers, and very many others, have all their own separate castes, and they eat and marry within those castes. Some are more and some less strict Hindus. All are of a low-Arian type, and I am not prepared to suggest any ethnological differences, except that they are better looking in the Punjab, and less so to the east and south. I doubt, whether substantial differences can be found till we get lower, to tribes exhibiting more decided aboriginal traces. Most professions bear different names in Bengal from those in Hindustan. I do not know much of these classes in Goozerat and the Maratta country.

The Hindustanee Kahars or Palkee-bearers are a considerable class, and are strong hard-working men, rather good looking than otherwise. They stand well among Hindus, whose water-carriers they are, and who will therefore generally drink from their hands. They are also fishermen and cultivate a good deal. They have by caste nothing whatever to do with cow-keeping, though they may own cows, like other people. I believe that they are quite distinct both from Bengal Gwallas and from south country Buis or Booes. They are found in parts of the Punjab as well as in all Hindustan, but not in the west of the Punjab.

The Inferior and Helot Classes.

Finally I come to the inferior labouring classes, the Helots and out-castes, among whom, if anywhere, the aboriginal blood should show itself in a marked way.

Castes originating in a difference of races, it may be pretty safely assumed that Helot races represent conquered peoples; but it sometimes happens that the form remains when all substantial difference has disappeared, just as in fossils we have the form although in fact the substance is stone like that which surrounds it. In the hills of the extreme north, where we have the high-Arian race in its purest and most unalloyed state, even the form of a Helot caste is wanting; which is just what we might expect in a country where the Arians themselves are the aborigines. There are no out-caste Pariahs. In Kashmere a tribe called Wattals are said to be low, but they appear to be rather immoral than ethnologically low, a gypsy kind of tribe which supplies dancing girls and prostitutes. The women are notoriously among the handsomest in the valley, so they are not at all Helots such as I mean. In all these hills, the "Chooras" of the plains are altogether wanting.

In the plains of the Punjab there is a thorough Helot tribe. The arrangement of castes is there generally more simple than elsewhere, and a single low caste tribe are both the ordinary labourers who do all the inferior Coolee work, and at the same time the out-caste scavengers of the community. They are in fact all considered to be of the lowest sweeper caste, and are called 'Chooras.' As in most democratic communities there has generally been under the freemen a Helot class (the Helots of Greece, the Slaves of Rome, the Negroes of South and the Irish of North America), so also every Jat village has its Helot quarter, where the low caste people, fewer, but still considerable in number, reside. They sometimes cultivate on their own account, but more generally act as labourers, and do all that is done by the Chamars in Hindustan. When a traveller of rank arrives at a village in Hindustan, the Chamars are called out to carry his baggage; the Chooras in the Punjab.

These Punjabee Helots are in fact fine powerful men and tolerably good looking. They were well-known under native governments as good soldiers, fit to be expended on desperate enterprises. The early Sikh reformers, preaching their doctrines of equality, tried to bring these men within the pale, but with very partial success, though a few were admitted to a respectable position as Sikhs. They were only occasionally used as soldiers by chiefs who were hard-pressed.

It has been reserved for us to enlist them in regular regiments, and to try to raise them to a good position. Like most low-placed men, they look low, when in low case performing low offices; but that they are well grown and powerful, is always clear. I had recently an opportunity of looking at them carefully, in a body drawn up on Regimental Parade, and looked especially with the view of seeing whether I could detect any ethnological peculiarity. I was quite satisfied that nothing of the sort is to be found. There may not be so large a proportion of good looking men as among the higher castes, but as a body they are fine Arians, not very materially inferior to the other people of the country. The only physical peculiarity that I have noticed among people of this class in the Punjab is, that a large proportion of them have only one eye. I apprehend, however, that this is not an ethnological peculiarity, but the result of inferior labour in a dry and dusty country, as may be seen in Egypt.

In Scinde also the low caste people are mentioned as large men of Punjabee origin and speaking the Jatee language. They are there called 'Bale Shahe' or Royal, a term also I believe applied to the sweepers in some other parts of India, and which may seem ironical, but may possibly be founded on some traditions of their former rule.

In the Punjab, in addition to the functions which I have mentioned, the Chooras are generally the village watchmen; and it may be observed that this office is all over India very generally held by the representatives of the oldest races, especially when they possess any fighting capacities. It may be supposed that when conquerors came in, they would find the headmen of the conquered races best acquainted with the localities, and most capable of dealing with those of their brethren who had taken to the jungles. I should always be inclined to look to the watchmen for ancient ethnological traces. The same races who do the watching also often do the thieving, and the Punjab Chooras have done a good deal of theft and robbery and some thuggee. What may be the origin of these Punjabee Helots, I must leave to conjecture. Either they may represent an old aboriginal tribe, whose features have been wholly absorbed by infiltration and intermixture, and who have left no ethnological traces but a dark tinge in the colour of the Punjabees and Affghans of the lower hills, or they may be early Arian inhabitants, conquered and enslaved by subsequent tribes of Bramins, Khatrees, Rajpoots, and Jats.

At any rate it may generally be said, that the whole population of the Punjab, both high and low, is above the average Arian type.

I have before mentioned that the lower class of cultivators and labourers in the Simla hills are called "Kolees." I have not noticed among them any marked aboriginal features.

I have alluded to the Chamars as the labourers of Hindustan, but *there* the functions of the Punjabee Helots are divided; the Chamars are the labourers (besides their own proper profession of curing skins), and the out-caste sweepers are an entirely separate and lower class. I have never quite made out whether the Chamars are considered to be properly Hindus. They are not considered absolutely offensive to the touch like the unclean out-castes, but their name is commonly used to signify a low man, and the greatest insult commonly proposed is to beat a man by the hands of Chamars.

They used to be sworn in a court by a peculiar Gooroo of their own, not by the ordinary name of God; and the sweepers again had a different Gooroo. They really are the modern Sudras of Hindu society, and no Hindustanee village could get on without them. Like others, they do not appear to advantage when engaged in menial offices, but to judge them fairly we should take them clean and decently fed and dressed. Most of our Hindustanee Syces are of this caste, and any one in Northern India may among them satisfy himself of their general style. It seems to me that they are a good specimen of the lower grade of the low-Arian type. An ancient proverb, quoted by Sir H. Elliott, speaks of a black Bramin and a fair Chamar as perversities to be avoided. In these days I think many Bramins may be found darker than many Chamars; but as a rule and on an average the Chamars are very decidedly dark, also rather small, though active and well knit. In features they are as it were quite the opposite of the high-Arian; there is a want of prominence, a simplicity as it were of feature; but still they do not I think show anything whatever that can really be called aboriginal. Judged by a European standard, and colour and size apart, I think that their features are quite as good as the average of Europeans of inferior degree.

The Chamars have never been soldiers, though I believe that we have enlisted some of them since the mutiny; nor have they generally

held the office of watchman; that is more frequently held by the unclean out-castes. In their own trade as leatherworkers and shoemakers, they are clever intelligent men, and they are the same as Syces and sometimes Coachmen, and as Coolees and hired labourers. In some parts of the country, a good deal of the cultivation is in their hands; but I have not heard of their acquiring considerable landed rights or rising high in the world, except in Chateesgurh in the Central Provinces, where I understand that a colony of Chamars of a reformed faith have come to occupy quite an aristocratic position.

The Chamars generally are apt to be somewhat foul feeders; the lower people of the race habitually eat the dead cattle which they skin. They are also a good deal given to drink, when they can afford it.

The unclean outcastes are generally by no means numerous in Hindustan, and are for the most part confined to their own proper functions. There are various sub-divisions of them, and they are somewhat indiscriminately known by various names, Bhangees, Mehters, &c. General Briggs, in an ingenious paper, tracing the names of provinces to aboriginal tribes, makes the Bhangees the Aborigines of Bengal, but the term is a Hindustanee one, not Bengalee. The term 'Dome' is somewhat generally applied to these people, or if specially, I should say that their particular function is more particularly connected with dead dogs. It would appear, however, that in the north of Hindustan under the Himalayas, the Domes were once a considerable tribe, and in the Kumaon hills, they are still a numerous Helot section of the population, being in fact the only inferior class, and assuming the functions of artizans as well as those of ordinary labourers.

They are there described as very black, with curly hair, and altogether very aboriginal in appearance. I had not myself noticed this, but when I knew Kumaon I had not much taken up ethnology. In the plains where races have been longer and more mixed, and where, as I have said, the lowest caste are few in numbers, they do not, I think, exhibit aboriginal features. The fact is that so small a class has been recruited by people turned out of other classes, to a degree which has quite obliterated their original type. There are now many decidedly good-looking people among them, and their women often take up with men of other caste. On the average, I should say, that they are now decidedly better looking than the quiet decent Chamars.

The result is that, in my view, in Hindustan, after 3,000 or longer years of juxta-position, the Arian element has quite prevailed in feature over the aboriginal type, and the population, take them all in all, are in this particular about as Arian as Europeans, but dark in skin and usually smaller.

It is on the authority of one of the most learned native members of the society that I have alluded to the *Bagdees*, one of the most numerous non-Mussulman castes of Bengal, as aboriginal, but I have no particular description of them; and though I have observed the much greater frequency of aboriginal feature in Bengal, I am not sufficiently acquainted with the people to distinguish the special personal characteristics of the different inferior classes. The Bagdees seem to be cultivators, fishermen, watchmen, and dacoits. On the borders of Bengal and Behar, the work of labourers is done by Rajwars, Bhooyas and other aboriginal tribes whom I have noticed. The unclean tribes seems to be very various, and to have among them a system of castes more particular than that of many Bramins. I was lately obliged to dismiss the lowest servant in my establishment, an excellent man, because he respectfully but firmly declined to wash the cat, as impossible under the rules of his caste.

In the Prison Returns there is a large entry under the head of 'Chandals,' the orthodox low caste name, and others appear under the titles of 'Dosads,' 'Harees,' 'Bhoomallees,' &c. Altogether they must be numerous in Bengal. There is in the list a considerable caste of 'Mooshers,' but I cannot find what they are.

I consider that in Bengal there is still a very great field for ethnological exploration.

In the plains of Goozerat, the Kolees seem to fill the place of the inferior grade in the social scale, as labourers and lower cultivators, being there rather members of the ordinary community that a separate aboriginal tribe. The unclean outcastes are there called Dhers and Olganas.

In the Maratta country, the 'Mhars' seem to perform the functions of 'Begars' (forced bearers of burdens), watchmen, and Helots generally, much as the Punjab Helots do among the Jats. There is also a low caste of Mhangs. The lowest unclean caste are called 'Dhers' there too, but I have also seen it asserted that the 'Mhars' are really the

same as the "Dhers." There is a low caste called "Parwarees" in the country below the Ghats. They are found in the Bombay army. They, also, seem to be much the same as Mhars. Everything seems to point to the reasonable expectation, that if we could but trace the matter back far enough, the Goozerattee language would be found to be the tongue of the Rajpoots and Koormees with an infusion derived from the Koolees, and the Maratta that of the Koormees and Mallies with a considerable infusion derived from the aboriginal Mhars. I have not any good description of the personal appearance of the modern Mhars. The Ramooses of the south of the Bombay country, seem to have been a bold robber caste, now settled down to cultivation. They came apparently from the Telagoo country and are not aboriginal to the Maratta districts.

Besides the settled lower classes, there are also in the north some tribes of a character which is apparently more common in the south; people who are a kind of half-tamed huntsmen, watchmen, and thieves, doing little regular labour. In all Oude and in some of the neighbouring districts to the east, there prevails a very peculiar tribe called "Pasees" who almost monopolise the office of village watchmen and who are in their way extremely good active men. They are also huntsmen and thieve extensively, also to some degree cultivate and labour. On the whole they are superior to most of these tribes.

Then there are several wandering tribes of Bhoureahs, Sansees, Harnees, Koonjars, Dhanuks, and others who go about on pretext of trapping vermin and the like, and are great robbers. There are also everywhere the gypsy 'Nuts' or 'Sirkie-bashes' (dwellers under reed-mats), but Gypsies are too well-known all over the world to need farther specification here.

The Tribes of the South.

I have already avowed my ignorance of the Telinga country, and without a good knowledge of the races there existing, it would be impossible to trace the Aryan tribes in their progress from North to South—for I find that a very large proportion of the tribes farther South refer to Andria, the Telinga country, as a former stage in their southward progress. That country seems in fact to have been a great nursery of the southern tribes. Whether "Andria" is another form of

"Ariana" I am unable to say. The change, on the southern frontier of the Maratta country, to a Canarese population seems to be abrupt, and there are few traces of progress of the tribes southwards at that point. I am inclined to think that the aborigines held out in the hilly country about Sattara and Poonah till a more recent date, and that the Arian immigration into the south principally occurred by a route farther to the east through the Telinga country, which may possibly have been then more extensive than it now is. In this I put aside the question of maritime immigration from the west.

The Telinga country seems, from some source, to have been civilised at a very early date, and there appears to be reason to believe that a good deal of the country about Warangal and thence eastwards towards the sea, was in a better state than that into which it has since fallen. Much of the ancient Telinga country is said to have been taken from the Koles who (in the sense in which I have used the word) are not now adjacent—the Gonds intervening—and the country was it seems anciently called "Kalinga" which may be another form of Coolie-land. The old Telingas seem to have been a maritime people, and it was probably they who carried Hindu ideas and perhaps some Hindu blood into the Eastern Isles. To this day the Hindus of the Eastern Coast are called "Klings" on the opposite side of the Bay and in the Islands, a name evidently derived from Kalinga or Kalinga. It is then much to be hoped that we may obtain some better knowledge of the Telinga country.

The Bainjagas, who are very important in the Canarese country, are stated to be comparatively humble in the Telinga country and reduced to the condition of cultivators and labourers, while the mercantile business is in the hands of Comtees or Comatiyas, claiming to be a race of pure Arian Vaisyas. The dominant classes are others of Arian character, whom I shall presently mention so far as I know them. All this would seem to indicate that if the Banees, being according to my speculation western immigrants, ever reached the Telinga country as Srawaks or Lingamites, or with some earliest forms of that type of faith, they have since been reduced and humbled by Northern Arians.

The principal people of whom I find mention in the Telinga country are Aylmas or Velmas, said to be "the Rajpoots of the

South," and apparently somewhat like them in character, a dominant agricultural tribe of military proclivities. But of the nature of their settlements I have no information. Another similar tribe are mentioned as "Ratsawars."

Another fine tribe called Reddies and found in the Northern Canarese country, are also stated to be a Telinga tribe, but of their location in the latter country I have no particulars.

The original Telinga "Andras" seem to have come from the North West by the valleys of the Godavery and Wyngunga. The better classes of them would seem to be taller, fairer, and better looking than most of the southerners. The "common Telinga peasantry" are described as people of spare form and dark complexion, with little spirit or enterprise, but it is added that they do well in the Madras Army. I cannot make out what are the common castes of these people.

'Naik,' a word known in the native army and elsewhere, is in some sense a Telinga, but more properly I believe an aboriginal word. There are I think some people called Naiks towards the Eastern Ghats, but in most places 'Naik' is the title of a headman. The Telinga villages, I find it stated, are not compact and fort-looking like those of Northern India and the Maratta country, but loose and detached, which would seem to be rather an approach to the very loose Bengal form. There are a good many Gonds in the North East, but the common low tribes are 'Dhers' and 'Beders' who have their 'Helots' quarter in each village.

The Telinga palanquin-bearers are widely spread over the south and are, I imagine, the Buis of whom I have before made mention. The bearers who ply at Madras itself and on the East Coast seem to come from Ganjam and the Northern Circars, which also furnish many of the so-called "Coolee" emigrants to the Mauritius.

The Canarese country is a remarkable instance of the way in which names are transposed in India. The Canarese name is given to everything that is not Canarese, and to nothing that is. What is called in Bombay the "Southern Maratta country," because the Marattas conquered it (the districts of Dharwar and Belgaum and the country about Beejapore) is for the most part ethnologically Canarese, while the Canara districts on the West Coast (though there is some Canarese intermixture and they were once ruled by a Canarese

dynasty) are principally inhabited by races alien to the Canarese, more akin to the Marattas in the extreme north, and akin to the Malayala people in the south. About and under the Ghats, the Marattas and Northern Bramins run farther south than they do on the plains of the Deccan.

On the other side of the Peninsula, the Carnatic, wholly Non-Canarese, will always be called the Carnatic, because a dynasty seated in the Canarese country once had authority there.

The real Canarese country is, the southern part of the Bombay Presidency, part of the adjoining Nizam's territory, part of Bellary, and nearly the whole of Mysore. The Canarese can scarcely be said to be Hindus, the Lingamite sect so much prevails, and those Lingamites so entirely ignore Bramins, and so completely make their Lingam worship a separate faith. Most of the people are called 'Lingamites' or 'Sibahtagars,' a name which conceals various castes and races; for it is only a religious designation, and Lingamites are of many castes. So far as I can gather, the chief people of the Canarese country are the Banijagas who both trade and hold land, and are very numerous.

In the north of this country the Reddies, whom I have already mentioned, are described as a fine handsome powerful race, capital cultivators, living together in large villages, and raising much cotton, which with other produce they often export as well as grow. They pay their revenue well, but are jealous of interference in their village concerns, and somewhat litigious. This is an old account, and it seems very like what might be said of Jats. I do not know what is the present condition of these communities. The widows of the Reddies remarry. They are much superior to their southern Maratta neighbours in an industrial and personal point of view.

Farther south the chief castes of Hindu cultivators are 'Wokuls' or 'Ooculagas,' said to be called by the Mahommedans 'Koonbees,' and whom the Abbe Dubois considers to be in essentials the same as or similar to the Tamul Vellallers, though they will not eat or marry together. Whatever they may originally have been, they are evidently now a different caste from both Koonbees and Vellallers. I have few particulars regarding their character, but they seem to be on the whole good cultivators. The headmen of Canarese villages are called

'Gaudas,' and under native governments not unfrequently farmed the rents. There also seems to have been the village communal system in some degree, but in most places not democratic. The Wokuls are indifferent soldiers, but serve as Militia. They eat flesh freely and are not a strict class. There are, it seems, a number of sub-divisions among them. One of the chief are called Gungacara, but whether that indicates a northern origin, I can't say. In truth Wokul seems to be a very wide word. A considerable proportion of the cultivators, in several parts of this country, seem to be settled and reclaimed aborigines, sturdy "Beders" and "Malawa" or "hillmen," and there are a class allied to the Billiaru and Teermen of the Western Coast.

The low Helot outcastes are numerous and called "*Hollayers.*" Some of this caste seem to be still aboriginal in the Western Ghats, they are mentioned as coming down to the Coast nearly or quite naked; but most of them are agricultural labourers and serfs. They are said to correspond to the "Dhers" to the north and to the Palli or Pallers to the south. "Halaya" means ancient, and the word Hollayer perhaps only means "the ancient race." The Gollars, Golavadu or Gwallas seem to be few, but the "Dhangars," mentioned as connected with Aheers, extend a good way south, and there is a large class of the aboriginal shepherds the "Carambers." There are Banjaras called also "Lambadi," and I believe also "Warali" or "Katode Warali," but I am not sure whether these last are not a kind of Gypsies found also in the Bombay country.

The Buis and Bustars are palanquin-bearers, fishermen, ferrymen and distillers.

The old Canarese dynasties and most of the people were at one time Jain, but those of that faith are now few, they have returned to the worship of Siva and the Lingam, which seems to be their ancient faith. This former Jain profession seems to be, however, a link of connection with the Banees farther North.

My impression, in passing through the country, has been that the Canarese as a body are fairer and better looking than most of their southern neighbours; and as the tribes of a northern character seem to prevail among them less than in the Tamil and Telagoo country, it may be a question whether their features are influenced by an infusion from the west. It seems that the ancient name of the Canarese

people and language is "Arabee," but I have been unable to trace the origin or derivation of that name. There are some vague traditions of former Arab conquest in those parts, but I have not been able to connect them with the Canarese name. The language is certainly, like the other languages of the South of India, Dravidian with Sanscrit super-imposed, but it is an undoubted fact (as we shall see when we come to the Western Coast) that a succession of immigrations has occurred there, and one of them seems to a considerable extent to have flowed over into the Canarese country. Perhaps still more ancient immigrations may have flowed farther, and it might be well worth while minutely to inquire whether any Himyaritic or Egyptian importations can be traced in the Canarese tongue.

In the Tamul country there is little suspicion of Western blood. The dominant tribe is of a very decided Northern character, while the mass of the lower classes is probably more aboriginal than in any other part of India. Consequently most of the Tamul people are small and black, and there seem to be among them frequent traces of aboriginal features.

The superior agricultural class, owning and cultivating most of the land and in possession of many chiefships, &c. are the "Vellallers," a people of whom their own traditions of immigration from the North, coupled with their laws and institutions, leave in my mind no doubt that they belong to the class of later democratic tribes. Much has been done to dissolve the old communal system, but the early descriptions of Vellaller villages, their apportionment of the lands and mode of self-government are exactly such as would describe a Jat village of the present day.

The term Vellaller, like the Canarese Wokul, seems to be used to express a cultivator of the soil, in fact may be translated zemindar or cultivator, just as "Jat" is synonymous with zemindar in the Punjab. Whether the Vellallers are directly connected with the Velmas of the Telagoo country or with the Bellalla Rajas (who, ruling in the Canarese country, carried their arms into the south), I am unable to say. They appear to burn their dead, but are Hindus of the looser sort in their religious observances, and in their rules respecting marriage, &c. Like most of these tribes, they do not ordinarily marry more than one wife, unless the first fails to bring

children. They have apparently some Poojarees of their own caste, but also to some degree accept Bramins as priests. Some of them are educated, or at least some sections of them are quite literate.

Of this sort I have mentioned the Modelliars, who are distinctly stated to be a branch of them, but I am not quite sure whether it actually is so as regards the Pillays. The Vellallers are the principal tribe among the Tamul population in the north of Ceylon. The whole race seems to be an industrious good people.

The cowherds in the Tamul country are it appears called "Idayan," and I have alluded to the learned branch of the cowherd race called Yadavas. I have not been able to ascertain who are the merchant class among the Tamul people, whether Modelliars, Pillays, &c. or whether there are any Banijagas.

The artisans in the south generally seem to be classed in groups, one caste comprising several different handicrafts, the principal of which is that of the Panchalas or Pancham-Bandams, comprising carpenters, blacksmiths, coppersmiths, masons and another which has escaped me.

The principal low caste tribes are the Palli or Pallers, and the Pariahs, who, though somewhat similar in name, are quite distinct and in fact seem to be a good deal opposed to one another one (the Pallers;) forming the lowest grade of what are called the right hand castes, the other (the Pariahs) holding the same place among the left hand castes. Then there are the robber castes, Kallars and Marawars. I have been unable to make out accurately whether these are the same or different, whether Marawar is the name of the tribe and Kallar only means robber, or whether there are two tribes. However predatory their disposition, they are not all now robbers, but seem to form a considerable portion of the settled inhabitants of the extreme south of the Peninsula. In one place I find the Marawars described as very aboriginal in feature, and in that respect giving much ground for the belief that they are descended from the monkeys who assisted in the conquest of Ceylon, while in another place they are said to be well made and featured and of a martial disposition. Probably they vary very much, accordingly as they are more or less crossed with Arians. The Tondimans people are, it appears, mostly Kallars. There seems to be a great resemblance between the position of the

Ramooses of the southern parts of the Bombay territory, the better Beders of the centre of the Peninsula, and the Kallars and Marawars of the south. All are of a sturdy, semi-military, predatory character. They have generally, in times of trouble, acquired considerable position, and their chiefs have risen to be Polygars. Evidently they are superior to the simpler aborigines. The Ramooses are described as ill-favoured, but not altogether different in appearance from the ordinary population. They have many customs which seem to indicate some connection with the northern democratic tribes (see full particulars in the Madras Literary Journal), and have the Rajpoot-like traditions of the Sacred Horse, &c. It is in such tribes that I think an infusion of Yavana blood may well be suspected.

The Pallers are probably related to the Puliars of the Pulney hills, but as settled inhabitants they seem to be decent cultivators of low degree. They are very numerous, and seem chiefly to cultivate kitchen gardens and small farms. They bury their dead, and have Poojarees of their own caste, eat animal food when they can get it, and drink freely. Like most non-Arian tribes, they appear to practice polygamy when they can afford it.

The Pariahs are well known, their name having become proverbial. *They* also seem to be numerous, and somewhat lower in degree than the Pallers, being under native rule a sort of serfs, and living in serf quarters attached to the Vellaller villages. I think that traces of the thick lip and something of the prognathous jaws of their ancestors may sometimes be traced in those whom we see in service. Yet they are certainly very intelligent good servants. It appears that they are sometimes educated, and that there have even been Pariah authors. Perhaps their masters sometimes found them intelligent, and had them educated.

A strong mark that even yet Hindu ideas and manners have not fully taken hold of the extreme south, is this that *there*, as it appears, even some pretty decent and respectable castes bury, instead of burning their dead.

The division into right hand and left hand castes, which prevails all over Southern India is very extraordinary and unexplained. They are sometimes violent factions, and yet, for anything that we are told, there is as little occasion for the feeling as for the feud between the

three-year-olds and four-year-olds in Ireland. The Canarese Banijagas seem to be the chief of the right hand castes, with the lower cultivating classes of Hollayers and Kallars under them—while the better classes connected with the land appear to be the left hand, with the Pariah serfs under them. The Abbé Dubois seems rather to reverse this arrangement as respects right and left, but the more recent statements are probably the better. The artisans seem to be divided. I think that the subject deserves farther inquiry. Possibly these factions may represent two different streams of civilisation and domination meeting in the south.

The old dominant tribe of the South Western Coast are the Nairs, who seem long to have dominated that country from the Western Ghats. These Nairs are the chief people of Malabar and Travancore, and the Bunts, who occupy a similar position in Canara, are cognate to them, as are the Coorgs above them. They are chiefly notorious for the singular custom of polyandry, and the consequent order of succession through females. Polyandry is not now universally practised (though not uncommon), but the rule of succession through females is at this day the actual unvarying law of this people. They are a good-sized well-featured race, but rather dark, especially compared to the other inhabitants of this Coast. They are not only soldiers and landholders, but are also often educated, and are then considered to be remarkably good accountants. I have mentioned the prevalence of Bramins in this part of India. They seem to get on very well with the Nairs, and share the land with them. Indeed, it is said, that the Nair women are not always satisfied with their own polyandrical arrangements, and that a good deal of Bramin blood has been infused into the Nair aristocracy by the channel of female descent.

There seem to be a considerable number of the Agrestic slaves of Malabar, the black aboriginal Chermars, to whom, as well as to the Nagadies (if possible still lower), I have already alluded. The remaining important sections of the population of this part of India I shall soon come to, but with regard to the effect of immigration upon them, I shall class them under the head of Borderers.

The system of village communities does not prevail on this Western Coast. The land is there considered to be the private property, in full right, of private landholders who hold separately, more after a modern

European fashion. It is also a general observation that in all hilly and broken countries (such as are the Western Ghats and their spurs on either side) village communities are neither required, nor can be easily formed. In the midst of great plain countries, the cultivation of a community is concentrated within fixed and not distant limits, and concentration of habitation is required for defence. In hilly countries, the occasional spaces fit for cultivation are occupied by petty scattered hamlets and individual habitations.

I have never heard any attempt to account for the singular polyandry of the Nairs. My impression, however, is that polyandry is only a step in advance of the custom which is well-known as existing both among the old Jews and among almost all those modern Hindu tribes which permit remarriage, as well as among some other races, viz., that the wife of one brother passes on his decease to the next brother. Among the Jats, the men strenuously assert this right, and the women generally as strenuously deny it; but as we do not enforce it, it has never been decided which is in the right. At any rate it is always asserted. Now when the woman is recognised to be family property, and when moreover the Hindu and older than Hindu doctrine of joint family property is brought to bear on the matter, it seems to require but a little pressure and a little philosophy to convert a successive holding into a joint contemporaneous holding; especially when childless elder brothers are getting old, and younger brothers are rising up who may supply the want. In an early state of society, we know that in war the women are always carried off as the prize of the victors; consequently, as the fortune of war varies, tribes must often be left with a deficiency of women to an inconvenient degree, which the polyandrical arrangement among brothers (already possessed of contingent remainders in the same woman) obviates. This result seems to have followed among some of the Scythian tribes, and there is a tendency to the same thing among some of the Arian tribes of the Himalayas. In this last case, the cause assigned often is, that the women being good-looking and much prized in the plains, fathers have great temptations to make advantageous matches for their daughters (to sell them, rude people say), and women become scarce in the hills.

We may suppose that the Nairs were perhaps a tribe who had

pushed far ahead of their base of operations, possibly their baggage and most of their women had been cut off, and being left with a scant supply of wives in their new settlements, they may have adopted the present arrangement. Yet it seems one which has little to recommend it to permanence. The extraordinary thing then is, that it appears that in some parts of the Malabar Coast, parts of other tribes have actually to some degree borrowed the practice from the Nairs. There can be nothing about the country unfavourable to the propagation of women. Any cause tending to female infanticide would also tend to polyandry, but this has not been assigned as the reason in Malabar.

In the Canara districts, the Jains are still numerous, many of the Bants, &c. being of this sect, and it appears that this country (known also as the Tulu or Tulava country) was formerly a great stronghold of the Jains and ruled by Jain Rajas.

THE BORDERERS.

The Teermen or Islanders of the South West Coast.

On the Malabar Coast there is a numerous class called Teers or Teermen. They are generally a fair good-looking race, but considered to be of very low caste. Caste ideas are there carried to an extreme unknown in Hindustan, where, with the exception of the unclean scavenger caste, mere contiguity and general intercourse is not supposed to affect caste, and all classes mix freely together. In Malabar and Travancore, the Nairs do not pretend to be more than Soodras, but they make out the Teers and Shanars (who are much the same) to be so infinitely below them, that they must get out of the way when a Nair calls out to announce his approach in the public road. And yet the Teers are by no means a low and degraded caste; on the contrary they are, as I said, a good-looking, and they are also a thriving prosperous people, who are largely educated in the Government schools, obtain much public and private service, are acquiring land, and are in every way well-to-do.

They have (it seemed to me in Malabar) not the least aboriginal trace, but are fairer and in appearance more refined looking than the Nairs. The Shanar women of this class are those about whose liberty to cover themselves a disturbance was made in the Travancore

country by the classes who considered them too low for this decent practice. All the Teer and Shanar people are said to be by caste or profession palm-growers or toddy-drawers, in allusion to the principal product of their native regions. 'Teer' it seems means 'Island' and the Teermen are generally understood to be Islanders or immigrants by sea. Their relationship to the Maldivians is spoken of, but that is a petty group, and the only people to whom it is clear that they are related are the Singhalese. I am not acquainted with Singhalese ethnology, but the Singhalese whom I have seen seemed, I think, to be a fine-featured straight-haired people with no dash of the Indian Aborigines and like the Teers, only somewhat darker and somewhat different in dress, &c. Caldwell speaks of the Teers as being a reflex of the previous Hindoo emigration to Ceylon. Yet if all the accounts be correct, it is difficult to suppose all the congeners of the Teers to have come from Ceylon. Not only are the Teers very numerous in Malabar, where they form a great proportion of the population, but all the Shanars farther south are stated to be of the same race, as are the Billiarn (said to mean 'Bow men'), the lower race in Canara, and a considerable number of people related to the latter who are found in Mysore, and there called Halaya Paika or old Paiks. Some of these people are, however, I believe much darker and less good looking than the proper Teers. The latter are also said to have contributed to form the Moplahs. If so large a population has immigrated, it must have been a long time ago. I said I think that there can be little doubt of their relationship to the Singhalese. It would seem from the published accounts, that the Singhalese are not Dravidian in language and manners, but derive the main portions of their language and religion, and perhaps of their civilisation, from Bengal and Magadha. That they received their present Buddhism from Magadha, and much of their language from a Sanscritic source, there can, I believe, be no doubt. But here also Western elements may be mixed with the other, and very careful inquiry is necessary.

It would be curious if it proved that, as it were in the three extremities of India, in Cashmere in the north protected by mountains, Bengal in the east protected by the marshes of the Ganges and Berhampootra, and parts of Ceylon and Malabar on the south protected by distance and water, there remain three remnants of the

older and softer Indian civilisation, not swept over by the democratic tribes of the north-west, and still retaining considerable points of resemblance among themselves.

The Southern Christians.

I have not been able to find any precise ethnological description of the Christians of the Southern Coast, but so far as I can learn, they are principally Shanars.

The Moplahs.

I believe that the notoriety of certain events has led most people at a distance to suppose the Moplahs to be a small sect of religious fanatics on the West Coast. Nothing can be a greater mistake. They are a large, most energetic, and most prosperous people; in some industrial respects perhaps the best population to be found anywhere in India. In point of numbers alone they are very considerable. In a large portion of the Malabar country, they form full half the population, and in the Malabar district their total number by census is not far short of half a million. They are also numerous in Canara and very numerous in Travancore. The Lubbays of the Tinnevelly Coasts seem to be as nearly as possible the same race. It is evident then that they are numerous enough to form a small kingdom, and in point of wealth and individual comfort and prosperity they certainly exceed any similar number of any other race in India. I confidently assert that no one can see the comfortable, neat, superior two-storied houses and homesteads of the Moplahs of the West Coast, without feeling that he has come upon a people non-Indian in their vigour, progressiveness, and whole style. One hardly feels oneself in India. There is no doubt that the Moplahs have a very large share of Arab blood. I have not been able to ascertain particulars of the date of their immigration, nor of the parts of Arabia from which, and the tribes from among whom they come, which latter points would be important now that Mr. Palgrave has led us to distinguish among Arab and quasi-Arabs; but the general native belief, which is probably correct, is that the Moplahs are a cross between Arabs and Teermen. The result is a fine, stout, manly, good-looking race. Their religion and much of their energy and manners

are Arab, but at all events they are Arabs of an industrious money-getting stamp. They have most of the trade of the Coast in their hands, and they are rapidly acquiring a larger and larger share in the land, not only inferior rights by settlement and lease, but also superior rights by purchase and mortgage. As respects their religious fanaticism, I believe it will generally be found that fanaticism is most frequently used as an instrument of political warfare, and that in the most sincere it is but a symptom of political discontent. In spite of Mr. Palgrave, I think that when Arabs beyond their own country are Mahommedans, they are pretty zealous, especially when they find themselves confronted with unbelievers. Probably the Moplahs are as good Mahommedans as are usually found, and in time of political discontent there is no lack of religious leaders from Arabia; but in fact I understand that it is perfectly clear to those acquainted with the matter that the Moplah outrages of which we have heard so much, are really political, or perhaps I should rather say social, outbursts of a few individuals among an energetic people, directed not against the British Government or Christian rule, but against Hindu landlords. The land question is at the bottom of it all. It is the old story of an inferior race with the law in their favour, and a more energetic race who wish to progress somewhat more rapidly than a conservative law allows. The more serious attacks on European officers have been made on them, not because they are Christians, but because they have not taken a view sufficiently favourable to the Moplahs in questions between them and the Hindu landlords.

They are a sturdy and independent as well as an intelligent and educated race, and though they make, I believe, capital public servants when they enter our service, they do not much seek it, and circumstances seem to have rendered them somewhat apart and over-independent. There is perhaps less intercourse and friendly feeling than is desirable between the governors and the governed. Still the Moplahs are an ethnological fact, and a strong and rapidly progressing fact; we can't get rid of them, and we must try to guide their energy in the right direction. After all, their outbreaks have been those of a very few individuals, and have only been serious on account of their extreme pluck and energy, with which only European soldiers can cope.

MIXED AND IMMIGRANT RACES ON THE BOMBAY COAST.

The Mahommedan Borahs, with equal mercantile energy, are a pleasant contrast to the Moplahs in their quiet demeanour and ready acceptance of British rule. They seem to be of the sect of Ismaleahs or Assassins, who are supposed to hold murder among their tenets; but the Borahs are very mild, peaceable, shop-keeping assassins indeed. I believe that the name is that of the Hindu mercantile Borahs, but there is an evident infusion of immigrant blood, which probably came in together with their religion. It is probable that they are a cross between immigrants from the Persian Gulf and Hindu Borahs. Whether called Gulf-Arabs or Persians, the population of the countries at the Northern end of the Gulf is evidently more Persian than Arab, and *there* also seems to be a chief seat of the Ismaleah sect. The Borahs seem to some extent to cultivate and hold land, but their proper avocation is trade; and a most useful and prosperous race they are. They are very numerous in Bombay, and thence west and north-west; they have a large proportion of the trade of Western India, and form an important class in all the large towns up to about the centre of India. Boorhanpore is, I believe, the "city of the Borahs" to which they attach peculiar importance, and where they desire to lay their bones; and they are found in Ellichpore, Nagpore, Indore, Nusseerabad, and many other places in those directions. They are generally a fair good looking people, and deal largely in all sorts of Europe and foreign goods.

The Parsees are so well-known that I need say little of them. They must form altogether a considerable population in the west of India, comprising many humble members in service, &c. as well as merchants. They are, I think, in feature, in the main, of a high-Arian type, somewhat intermixed perhaps after a very long residence in India, and somewhat blunted and thickened as compared to the sharper and more chiselled northern faces; but still there is generally the prominence of feature which we might expect from an extraction originally Persian.

I believe that there are some black Jews on the Western Coast, but the comparatively recent Jew settlers somewhat numerous about Bombay, and who form a considerable community in Calcutta, are one

of the most striking and, I think I may say, handsome of all races. A remarkably showy oriental dress, setting off a complexion almost European, no doubt goes for something; but still the people themselves are very remarkable. Far from the dingy old-clo' looking complexion which we are apt to associate with European Jews, their complexion is the most bright and transparent looking to be seen anywhere, and the blood seems quite to over-master the faint tinge of olive in their skins. The features are large and prominent, almost to excess, and their forms tall and goodly. I believe that these people are all connected with the Persian Gulf, and that they derive their blood from thence. After Mr. Palgrave's description of the true Arab physique, one may well believe that their traits are really rather Persian than Semitic.

The Scindees.

I have already noticed the people of Upper Scinde. The people and language properly called 'Scindee' are almost confined to the lower part of the Province, and I have reserved them to be classed among the Borderers, because they are not altogether an extension of any of the Indian Arians of whom I have treated, but a composite race largely influenced by other elements. The Arabs seem to have conquered Scinde some centuries before India at large was overrun by Mahomedans of other races; and at this day there is both much Arabic in the Scindee language, and probably a good deal of Arab blood in the Scindee people. There is also probably some Persian, some Hindu, and perhaps some aboriginal Koolee blood. In short both the people and the language are altogether composite. The amalgamation does not seem to have had the good industrial result shown in the Moplahs and Borahs. The Scindees are described as well grown and robust, but dark in skin, debased in morals, and idle. The Delta and the country of the Lower Indus seem to be very ill and insufficiently cultivated; and the people are given to hunting, fishing, and pastoral pursuits quite as much as to cultivation.

The Belochees.

I have not alluded to the Belochees as an element in making up the Scindees, because it would seem as if the Belochees themselves were a

composite people, made up of the blood of Persians and Arabs, and I don't know what besides. However, if that is so, it is not now a mere mixture, but a chemical union of the elements thrown together, and the Belochees, if their language is composite, are still now a people of distinct traits and nationality. They acquired, as is well-known, at a comparatively recent time the dominion of Scinde, and they are pretty well-known as settlers in the North-West of India, say to about as far as Dehli; but they have there none of the dignity and station of the Pathan settlers. I dare say there are decent cultivators among them; but they are more often camel-drivers and such like, and they have not a good name, being generally supposed to have considerable robber and cut-throat proclivities. I don't think they have any villages of their own; they are generally only scattered about in the capacities which I have mentioned. They are fine powerful men, but rather dark. Those whom I have seen of the families of the Ameers of Scinde are fair and good looking, but even in Belochistan I believe it may be said of the Belochees generally, that they are a good deal darker than the Pathans. They are similarly arranged in tribes, and are similarly predatory upon the border; but I understand that they are a good deal less democratic in their constitution, and more amenable to the authority of their chiefs than the Pathans. This too may make them preferable as mercenary soldiers. It is somewhat curious that, while in the west of India Arabs are entertained in that capacity, on the Coasts of Arabia itself and of Africa, Belochees are the people so employed by the chiefs. They are in fact the Swiss of those parts.

I have alluded before to the Brahooes, and as I believe that they are not known as residents within Indian limits, I need not recur to them.

The Afghans or Pathans.

I have included the Indian Pathans among modern Indian tribes, and have sometimes called the Pathans proper "Afghans," to distinguish them, and in deference to English habit. But among the people themselves, the name Afghan is hardly known.

Physically these people are among the very finest on the earth. And they have a pleasant, frank, simple, unaffected way, that makes

a man at once feel, when he gets among them, that he is out of India. A European will really more amalgamate with a Pathan in a week than with a thorough Indian in seven years.

The Pathans are decidedly high-Arian in feature; and if their features are less universally very high and chiselled than those seen in the northern hills, they have on the other hand more of a broad, robust, ruddly, manly look, and the people are in fact a hardier and bolder people. About Cabul they are fair, but some of the tribes in the lower and hotter hills and valleys adjoining India have somewhat dark skins. Rough, simple, and frank as these people generally look, they are in fact by no means simple. I believe that some of the more isolated tribes, Wazeerees, &c., have more simple virtue, but the great majority of the Afghans, partly probably by nature and more in consequence of long dealing with many nations (holding as they do the portals of India), have the reputation of being a very astute, intriguing, ambitious, avaricious, and crafty people. Great allowance must, however, be made for their situation and temptations. One cannot but feel that so energetic and fine a race, living in a country so poor, but the highway of so many nations, must of necessity learn to live a good deal on their neighbours. I am told by officers on the frontier, that in point of bold unblushing lying, a Hindu is a mere child to a Pathan. I suppose this habit comes from long living by their wits. The character of faithfulness, however, is in the main injurious to the Pathans. They are distrusted as mercenaries. It is felt that if they are always ready to do any work when it is made worth their while, they are also people of a calculating disposition, who are very likely to turn, when the advantages preponderate in favour of another policy; as the Persians found to their cost in the last century, when they too much availed themselves of the services of the Afghans. At present they are very popular in our native army, and certainly make capital soldiers. But they are fickle and uncertain, and seldom serve long without a break. A man gets a message to say that it is absolutely necessary that he should come home and murder his uncle, and off he goes with or without leave. They come back, however. It is a thing to be understood that the Ameer of Cabul pretends to no authority whatever over the Eastern Afghan tribes. They are avowedly politically quite independent,

while in one sense, without our attempting to interfere in their internal affairs (that they will not permit for an instant), they are becoming more and more our military retainers. A very large number of them pass though our service, and a steady income is derived from it.

The Pathans south and south-west of Peshawar are pure and rough, but the Eusofzies and tribes to the north seem to differ considerably in character. In fact, as I have before mentioned, the Pathans are comparatively recent conquerors and colonists of the northern hills and valleys. They have there mixed much with people of an Indian type, pre-Hindu it may be, but probably the ancestors of Hindus. These people have not the Hindu caste which, for the most part, prevents amalgamation on the part of the Khatrees, and I think there can be little doubt that their blood has much influenced the character of the Eusofzye clans. The purer Afghans are extremely illiterate, and the very opposite of bigots in matters of religion. The Eusofzies are perhaps all the fairer and handsomer for the intermixture of blood; they are also more civilised in their manners and much more literary. And they have imbibed very much of that veneration, that religious capacity, which distinguishes the oldest Indian branch of Arians. Mahomedans as they are, they really seem to have some religious zeal, and they are very much priest-ridden. In fact the Akhoond of Swat and other priests have, to some extent, induced the tribes to submit to a certain and partial religious government, if it can be called by that name. The priests seem to have considerable grants of land, and at any rate succeed in levying a regular tithe from the landholders and cultivators, whose differences they settle as far as they can. It is among these people that discontented Mahomedan immigrants from Hindustan have found some sort of shelter. It should be understood that intermixture has not destroyed the military qualities of the Eusofzies themselves. With an inferior population at home to cultivate their fields, they are amongst the most notable Pathan soldiers who have pushed their fortunes in India.

The proper Afghan constitution is democratic in the extreme, much so that any sort of government on a large scale is almost impossible, and the Ameer's authority is confined to a few open valleys (for the most part cultivated by inferior races) and to a very uncertain

feudal chiefship over the western clans. They have their regular system of democratic representation and self-government by the assemblies of Jeergahs and Oolooses; but like most rude people so situated, no man's nationality goes beyond his own clan (just as in civilised Greece, it did not go beyond his own city), and within the clan order is very insufficiently maintained. Afghan individuality in very irrepressible.

A considerable population of proper Pathans are now our subjects in the districts of Peshawar and Kohat, and it would be very interesting to examine critically, how far their constitution is really different from that of the Jats and other democratic Indian tribes. It is generally said that as a people they are very different, and non-Indians must be very different from Indians. The language too shows that, Arian though they be, the Pathans are a branch separated by a wide interval. But still I have not been able to discover by cursory inquiry that their constitution is other than that of the more democratic Indo-Germans. I rather incline to think that they are probably of the same stock as the Jats and other tribes, but of a common ancestry, long anterior to the entrance of the latter into India. It may be that while some tribes poured into India, others have been gradually working their way though the hills, dispossessing the Khatrees and Khasas and more aboriginal Caucasians who held what is now modern Afghanistan.

The Aboriginal Arians of the Indian Caucasus.

I have lately called attention to our ignorance of these most interesting people, probably the remains of the pre-Hindu ancestors of the earliest Hindus. Of the Kaffirs of the most inaccessible portions of the range, between the Kashgar river and Bameean, we have heard a great deal, but learned almost nothing. They are thought to be related to Europeans, because they sit on chairs and drink wine copiously. They must be a sturdy race, to have maintained their independence so long. All the other tribes seem to be more or less Mahomedans. There are the "Neemchahs" or half breeds on the southern slope of the Caucasus, between the Afghans and the higher peaks, speaking a language with a strong affinity to the Indian tongues, and which also seems to present some curious affinities to

the Latin. In the lower country near the debouchure of the Kashgar river, the people speak a mixed language called "Laghmanee." In the upper valley of that river, the name Kashgar seems to mark the trace of early Khasas.

The ancient language of Swat seems to have disappeared, and the country is now Pathan, with a subject race of aboriginal blood, that is pure Arian aborigines. But farther north, in the valleys of the Ghilghit river, running into the Indus from the West, we have an Arian people speaking a language of their own, which is cognate to the tongue of the tribes east of the Indus in and about the country called "Chilas." Some of these latter are independent and scarcely known, but most of this country, and also Ghilgit, is now subject to the Maharajah of Cashmere. The "Dards" seem to be among these tribes.

It may be asserted of all these Caucasian tribes (excepting the Kaffirs of whom we know so little) that, while they are physically as handsome and fine as possible, they are not so democratic and sturdy in independence as the Afghans. We know very well what an undertaking it is to subdue, still more to rule, an Afghan tribe in their own country. But the Afghans have certainly subdued many of these Caucasians. The Maharajah of Cashmere has conquered and governs many more. Those in contact with our own frontier are quiet and not troublesome. And in Kashgar it is understood that the people submit to their rulers, in a way which Afghans will never suffer. Altogether it may be assumed that this race is less independent (though it may be more intellectual) than the democratic races; more amenable to Rajas and Priests, and altogether just such a people as we might expect to give birth to Khasas and early Braminical Hindus. Living in countries most favourable to the Vine they seem to be generally given to the use of wine. Whether the use of chairs extends beyond Kaffiristan I cannot say. We have in fact everything to learn about these people and their languages.

The Northern Borderers of mixed Tartar or Thibetan blood.

The Mongolians and Arians seem to cross well. Most of the tribes falling under this heading are physically vigorous and industriously energetic.

I have before alluded to the Hazarahs beyond Cabul and Ghuznee, who come down to Peshawar and the Punjab for labour. This name "Hazarah" has no connection with that of the Cis-Indus district so called from a town of that name. These Hazarahs are Persian in speech, Sheeah in religion, and decidedly Mongol in feature, characteristics, which would seem to tally with the story of their having been a body of slaves in the train of some Mahomedan conqueror; but whether this is really historical, I cannot say. They are very independent and industrious, decidedly a good race.

The people of Ghilgit are the farthest Arians of the country whence the Indus flows. To the north the people are of Turkish race, and in the valley of the Indus above the junction with the Ghilgit river are the Bultees of Iskardo, &c. The language of the Bultees is decidedly Thibetan, and their features show a large proportion of the blood of that race. Some of it may be, as they say, that of Alexander, for anything I know to the contrary; but we should hardly have heard of it, if they had not been Mahomedans. They are Sheeahs, as are several tribes in those higher countries, a circumstance which has not been explained. They seem to be a good, stout, quiet race. The Maharajah of Cashmere (who rules the country) has enlisted many of them into his service, apparently with advantage.

In the upper valleys of the Sutlej, in Spiti, Kanawer, &c. there are mixed races exhibiting much Thibetan blood, and apparently more Buddhist than Hindu in religion. A very Thibetan-looking colony used to be settled at Mahasoo just beyond Simla, and people of that race did much of the heavier work, carrying wood on their backs. They are powerful, ruddy-looking people, and as entirely unlike Indians as anything one can imagine. The women especially are remarkably fine females in an industrial sense; but in other respects, whatever they may be from a Turanian point of view, they are not likely to be dangerous to the Arian visitors to the sanatarium.

From this point for many hundred miles to the east, all the passes, the very crests and centres of the passes through the snowy range, are occupied by a peculiar tribe who almost monopolise the trade across, principally carried on upon the backs of sheep. They also cultivate some land. They are known as the "Bhooteas," but that is so wide a word (in fact identical with Thibetan) that it is little guide to us.

I believe that there are some very curious tribes in valleys near and immediately beyond the snows, but I have not the means of specifying them.

As respects the Himalayas generally, the following may, I think, be said. From Cashmere eastwards, all the easily accessible portions of the Himalayas are occupied by perfectly Arian Hindus, as far as the eastern border of Kumaon and the Kalee river, separating that Province from the Nepal dominions; the Thibetans being here confined to the valleys about and beyond the snow. Throughout the whole length of Nepal again people of Thibetan blood have partially flooded over into the Nepal country, have there met and intermixed with other races, and have formed mixed tribes who appear to be generally (the proper Goorkhas perhaps excepted) more Thibetan than Indian in physiognomy and speech, but are or affect to be more Indian than Thibetan in religion and manners, doubtless under the influence of the dominant "Khas." East of Nepal, in Sikkim and Bhootan, Thibetans are altegether dominant, and the Hindu element almost disappears. The soldiers whom we erroneously call 'real Goorkhas' are mostly of the Gurang and Magar tribes of western Nepal. Their features are ultra-Mongolian, but they are small, whereas the Thibetans are generally large. Of their pluck and energy there can be no doubt. At the Simla Government School, the children from a Goorkha Regiment were found at least to equal, in fact rather to beat the Hindus. They themselves affect to be Hindus, and stoutly deny being Buddhists, though they are free from most disagreeable Hindu prejudices. The Newars, the cultivating peasantry of the valley of Nepal, are stated to have Thibetan looking features, with a fair and ruddly complexion. Both their language and that of the Gurangs and Magars seem to be in the main Thibetan, at least in the fundamental numerals, pronouns, &c. Still more is it so as regards the languages of the tribes farther east, Kerantis, Murmis, and others, of whom I know little.

The Lepchas of Sikkim and Lopas of Bhootan are unmitigated Buddhist Thibetans. There seem to be several tribes of "Rong," "Khampas" or Kambas, and Limboos, who come from different parts of Thibet, and there are some differences of language. The Lepcha tribes are described as a dirty, good-natured people, in character said

to be something like the Mongols from beyond the Chinese wall, as described in recent accounts. The Lopas, &c. of Bhootan seem to be more difficult to deal with. Farther east are, I believe, still wilder Thibetan tribes. All these people are idle, but very powerful; and when they do work, they carry enormous loads, both men and women. They are said to carry up to Darjeeling as much as 250 lbs. in a single load. And at some of the Hill Stations on the Eastern Frontiers of Bengal, I understand it is the fashion that a European visitor is carried up the hill in a basket on the back of an old woman.

The people of the Eastern Frontier.

The people of the very lowest hills of Bhootan and of all the low country at their foot are of another race, the Meches or Mechis (before alluded to in marking the boundaries of the Indian Aborigines), who are apparently the same as Hodgson's "Bodo." They are, it appears, now quite ascertained by their language to be Indo-Chinese of the Lohitic or Burmese branch of the Turanian family, a connexion which their physiognomy confirms. They seem to be a good-sized, fair, but rather yellow-looking people. They are described as rude in their agriculture (using the hoe, not the plough), and erratic in their habits, but good-natured and tolerably industrious. They profess a kind of debased Hinduism, but are very omnivorous in their habits. The Dimals are a smaller but somewhat similar tribe, speaking a language which in some degree differs.

Passing over the Garrow and Cossya Hills to Cachar, the Cachar people again are of the same race as the Mechis. So, it would appear (so far as I can gather), are the Nagas, Abors, and some other tribes in the hills bordering on Assam. There are aboriginal tribes of Tipperah and Munneepore, but of their ethnology I am not informed. In the Cossya hills are an isolated body of people of the Taic or Siamese race. Of this race were the Ahoms who once ruled Assam, as are, it appears, the Khamtis and some other tribes of the more distant hills of that Province; also the Shan tribes of the Burmese interior. The Karens are, I rather think, Lohitic. It is evident, however, that on this Eastern Frontier I have got into a vast ethnological region, with which I have no personal acquaintance, and with which I cannot deal farther than to point out the vast field for

inquiry, and to suggest how great a service any one would render, who would briefly classify and describe these tribes. There are endless distinct tribes, even the names of which I do not attempt to give.

POSTSCRIPT.

When this paper had nearly passed through the Press, Colonel Dalton's paper on the Kols (to the want of which I have alluded) was received in the office of the Society, and it will be printed along with this. I have only had an opportunity of hastily glancing at it, but have seen enough to be sure that it will admirably fill up just what was wanting in regard to our knowledge of the aboriginal tribes, and will be read with extreme interest. The two papers, thus published together, having been written without concert, may be found to express or assume different opinions on some points; but I hope that the general result of Colonel Dalton's paper will tend rather to confirm than to contradict most of that which I have written. In regard to the general Negrito character of the Dravidian tribes he fully bears me out. At the same time he seems to point to a considerable difference in the type of the Moondahs, Hos, Sontals, and others speaking the language which I have called Kolarian. He seems in some degree to support Major Tickell's account of the superior physical qualities of the Hos, but he also tells us that other tribes of this race are much more degraded and less good looking. In fact, the principal tribes of the race, the Moondahs and Sontals, are now extremely well known, and it is patent to all that they are among the ugliest of mankind. The Sontals are a proverb for a combination of simple good nature and ugliness. Still, I quite admit that most of these people are less black and Negrito-looking than the Savage Dravidian tribes. I think I have already suggested, and I am inclined to repeat, that they look in some respects more like Hottentots than Negroes. It is very much to be desired that a more complete study of their language should in some degree break through the complete isolation which has been hitherto attributed to it. It seems to have no affinity to the more Eastern tongues so far as has yet been discovered.

I have been struck by those parts of Colonel Dalton's description, which would seem to show, among the more civilised of these tribes, some institutions akin to those of the modern Hindoos. Not only does it appear that the Kolarian tribes burn their dead, but also I notice that the systematic division of their tribes is very similar to that which I have described among the Hindoos, and especially that they have the peculiar rule which forbids intermarriage among people of the same tribe, and imposes on every man the necessity of taking his wife from another tribe. The question will be, whether the practices common to Kolarians and Hindoos are borrowed by Kolarians from Hindoos, or by Hindoos from Kolarians. Many interesting subjects of inquiry may be opened out.

Colonel Dalton's account of the tenacity with which some of the tribes cling to their ancient rights in the soil, seems somewhat at variance with the information which I had noted respecting their ready emigration. That many of them do emigrate, is certain; but perhaps my information has reference to the Dravidians and less settled tribes,

Colonel Dalton in one place speaks of the Kolarian Hos as more dignified and more like North American Indians, and the Dravidian Oraons as more like light-hearted Negroes; but in other places he seems rather to confirm my suggestion that the Kolarian Sontals and Moondahs are an especially light-hearted race, and the Dravidians less so; the Dravidian Oraons having, he says, learned their songs and dances from the Moondahs and other Kolarians among whom they have settled. Certainly the flat and broad-faced Sontals and Moondahs seem to bear no resemblance to the North American style of feature.

Colonel Dalton more than confirms what I have said in regard to the increase of numbers of the Kolarian tribes of the Chota-Nagpore division. He tells us that, notwithstanding their tendency to drink, they increase rapidly. He evidently takes a most favourable view of them, and I think it impossible to doubt that we have in these tribes, in a healthy and accessible country in the immediate vicinity of the Capital of India, a people whom it behoves us to cherish and utilise—a people comparatively free from the peculiar vices of the modern Indians, simple, truthful and ready to receive our religion and the

impress of our manners—possessed moreover of much industrial energy, laboriousness, and ductibility. To make such a people thoroughly our own—to render the central and healthy plateau occupied by them a completely Christian and Anglicised country, would be (higher considerations apart) a very great source of strength and comfort to the English in India. I think that every effort should be made in this direction.

Colonel Dalton has sent with his paper a grammar of the Oraon language by the Rev. Mr. Batsch. This is a Dravidian tongue. The Rev. Mr. Phillips has published a grammar and introduction to the Sontal language, but he has put it in the Bengallee character, somewhat unfortunately, as I think—for although I have not advocated the Romanising of the written vernacular languages, I should prefer to give to the Kolarian tribes, hitherto entirely without a written character, our own Roman letters, rather than those of the foreign and hated Bengallee. Since then Mr. Phillips's work is not available for my present purpose, I propose to re-publish, for comparison with Mr. Batsch's Oraon grammar, the brief grammar of the Kolarian "Ho" language, published by Major. Tickell in an old number of the Society's Journal. I hope then, by placing, as appendices to the present publication, vocabularies of test words both Arian and Aboriginal (including in the latter both Dravidian, Kolarian and Indo-Chinese dialects), and the sketches of Dravidian and Kolarian grammar, to supply the rough elements for a comparison of all the dialects of India. And I trust that if a beginning is thus made, we may hereafter obtain much information, more full, ample, and complete.

The "Kols" of Chota-Nagpore.—*By Lt.-Col.* E. T. Dalton, *Commissioner of Chota-Nagpore.*

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The country called Chota (or properly Chuttia) Nagpore is the eastern portion of the extensive plateau of Central India on which are the sources of the Koel, the Soobunreka, the Damoodah and other less known Indian rivers. It extends into Sirgoojah and forms what is called the Oopur Ghat or highland of Juspore, and it is connected by a continuous chain of hills with the Vindhyan and Kymore ranges, from which flow affluents of the Ganges, and with the highlands of Omerkuntuck on which are the sources of the Nurbudda. That the population of this watershed is found to be, for the most part, a heterogeneous collection of non-Arian tribes, is in itself a fair proof that these tribes were at one time the inhabitants of the plains who, driven from their original sites at different periods by Braminical invaders, gradually fell back, following converging lines of rivers in their retreat, till from different directions, nations, some bearing marks of common origin though separated for ages, others bearing no trace of such affinity, met at the sources of the streams, and formed new nationalities in the secure asylum they found there.

The plateau averages more than 2,000 feet above the sea level; it is on all sides somewhat difficult of access, and it is owing to the security thus given, that the primitive tribes, still found on it, retained for ages so much of their independence and idiosyncracy. After overcoming the difficulties of the approach, these first settlers must have rejoiced at finding they had not merely reached the summit of a range of hills, but had ascended to a new country, well suited to their wants and out of reach of their enemies; and here they made their final stand.

They found a genial climate at this elevation and a well-wooded undulating country, divided and diversified by interior ranges of hills uplifting the fertilizing streams, or breaking out in rocky excrescences, sometimes in vast semi-globular masses of granite, like sunken domes of gigantic temples, sometimes in huge fragments piled in most fan-

tastic forms, viewed with awe by the new settlers as the dwelling places of the local gods.

The total area of the plateau thus occupied is about 7,000 square miles, and the present population may be estimated at a million; more than half of whom are of the race best known to us by the name of "Kol."

This word is one of the epithets of abuse applied by the Bramini-cal races to the aborigines of the country who opposed their early settlement, and it has adhered to the primitive inhabitants of Chota Nagpore for ages. It includes many tribes; the people of this province to whom it is generally applied, are either Moondah or Oraon; and though these races are now found in many parts of the country occupying the same villages, cultivating the same fields, celebrating together the same festivals, and enjoying the same amusements, they are of totally distinct origin and cannot intermarry without loss of caste.

The received tradition is, that the Moondahs first occupied the country, and had been long settled there, when the Oraons made their appearance. The Moondahs believe themselves to be autochthonous, or at all events declare that they are all descended from one man and woman, who were produced or established themselves, at a place called Satyomba, which is revered by the whole tribe as the cradle of the race.

Satyomba is the name of a pergunnah on the edge of the plateau overlooking the valley of the Damoodah. It is not improbable that the Moondah race had previously occupied a position on that river, and that, in departing from it, the division took place which separated them from their brethren the Sonthals. The Sonthals, unquestionably a branch of the same people, have to this day a veneration for the Damoodah, and call it their *sea*; and the ashes of their dead are always preserved till they have the opportunity of disposing of them by throwing them into that stream or burying them near its banks. The Sonthals, remaining in the plains, had easy access to the river and retained their veneration for it. The Moondahs, settling on the highlands, were less faithful to it, but from its name they might claim it as their own; for, though Damoodur has been adopted as one of the sacred names of "Krishno," does not Dah-Moondah in their own language mean "the water of the Moondah?"

We find the Moondah settlements chiefly in the eastern and southern parts of Chota-Nagpore, the Oraons predominating in the western; and this strengthens the hypothesis that the Moondahs ascended from the eastern side of the plateau.

The intimate connection between the Sonthals, the Bhoomij and the Chota-Nagpore Moondah tribes has long been known. I have pointed out their affinity with the Korewahs of Sirgoojah and Juspoor, and have given some account of that wild clan.* I have now to add to the list the "*Kheriahs*," another aboriginal tribe settled on the plateau of Chota-Nagpore, and the "*Juangas*" of the Cuttack tributary mehals, whose women are so conservative in their notions, that they still adhere to the fashion in dress first introduced by mother Eve and wear nothing but leaves. I had often met with individuals and families of the Kheriah tribe, living in mixed communities, but from contact with other races they had lost much of their individuality, and I found it difficult to place them.

This year, I happened to come upon some of their principal settlements in pergunnah Bussiah, on the southern borders of the portion of the plateau occupied by the Moondahs, and collected round me the elders of the tribe. These settlements all lie near the Koel, one of the streams from the watershed of Chota-Nagpore, which, after its union with the Sunkh in Gangpore, becomes the Bramni and terminates its career at Point Palmyras.

The Kheriahs venerate the Koel as the Sonthals the Damoodah. They were in all probability once settled on its banks in the lowlands, and clinging to it in their retreat and adopting the place of refuge that it led to, regard it still as communicating with their fatherland, and with this idea the urns containing the ashes of their dead are dashed into a rock-broken rapid of the river, so that their contents may be rapidly borne away by the current to mingle with the ashes of their forefathers.

They say their first settlement was Porá, a village on the Koel, and that there were no Moondahs in the country, at least in that part of it, when their ancestors first came there. There is sufficient resemblance between the Kheriahs and Moondahs in language and customs

* As. Soc. Journal, Vol. XXXIV. p. 1.

and appearance, to make us certain of their consanguinity, and at the same time sufficient divergence to lead to the inference that the relationship is a remote one, and that the two branches of the family had been long separated when they met again on the banks of the Koel. These points of resemblance and divergence I will describe, when treating of the manners and customs of the race generally.

The Juangas or Puttoons (leaf-clad) are noticed in a paper by Mr. E. A. Samuells.* They are found in the Cuttack tributary mehals of Keonjur, Pal Lehra, Dhekenal and Hindole. They are thus isolated from all other branches of the Moondah family, and have not themselves the least notion of their connection with them; but their language, a specimen of which is given in the table appended, shews they are of the same race, and that their nearest kinsmen are the Kheriahs, a fragment of the tribe left behind when the remainder ascended the valley of the Koel. The Hos of Singbhoom have a tradition that they once wore leaves only, and not long ago threatened to revert to them, unless cloth-sellers lowered their prices!

The Bhoomij form the majority of the population in all the estates of the Manbhoom district to the south of the Kassae river. As they approach the confines of Chota-Nagpore, they appear to be called indiscriminately Moondahs or Bhoomij, and they intermarry. More to the east the Bhoomij have become Hindooized, or rather Bengaleeized, to a great extent, and many of them have acquired considerable estates, like the Mankees of Chota-Nagpore, and positions of influence as "Sirdar Ghatwalls," the hereditary custodians of the passes.

The characteristics of the tribe that they most tenaciously cling to, are the national dances and songs. The Bhoomij appear to have been the first to colonise the large pergunnah called Dhulbhoom or Ghatsillah, attached to the Singbhoom district. The Rajah or Zemindar is, in all probability, himself a Bhoomij by race, though (without thereby improving his pedigree, so far as I can see) he endeavours to conceal his extraction under one of those hazy traditions that Bramins always have ready for families in want of them. His ancestor, according to their version, was a washerman, a Dhoby who

* As. Soc. Journal, Vol. XXV. p. 295, 1856.

saved the goddess Kali when, as Runkini, she ran away from Pochete. Discredit has attached to the Bhoomij and Sonthal in consequence of the human sacrifices offered at this shrine of Runkini, but the whole establishment and ritual are essentially Braminical. The Bhoomij and Sonthal races personally do not much care for the blood-thirsty goddess. The Bhoomij is the branch of the Moondah race that has spread farthest in an eastern direction. Bhoomij are to be found in Mohurbhunj and Keonjur, though perhaps not so much at home there as in Dhulbhoom.

The Sonthals are now chiefly massed in the Sonthal Pergunnahs, but they muster strong in Mohurbhunj, and there are several colonies of them in the Singbhoom district. They are an erratic race, and their ancient traditions are lost in the history of their modern migrations; but my idea is that their chief settlements in Bengal were once on the Damoodah river, and that they gave way to the Koormees, an industrious Hindoo race, who now form the bulk of the population in that part of Manbhoom.

In a southerly direction the next tribe of "Dasyus" that we come across are the Khunds, but I am unable to trace any point of resemblance between them and the Moondah, either in their religion with its morbid superstitions and horrible human sacrifices, or in their language.

To trace the further ramifications of the Moondahs we must proceed west, not south, and take up the link in the hills and highest table-lands of Sirgoojah and Juspore, where we find the wildest of the race in the Korewahs. I have given a brief note on them in the paper above quoted, and have only to add that the Korewahs are quite unaware of the connectionship between themselves and the Kols. They do not acknowledge, and do not see, that the languages are almost identical. This would not, I conceive, have been the case if the Korewahs had broken off from their Satyomba kinsfolk.

The Korewahs are another branch of the family, and the history of their migrations is no doubt an independent one. It is probable that they were forced back into the hills they now occupy by the Gooands, as a Hindooized clan of that people became the dominant race in the plains of Sirgoojah. Moreover, as pointed out by Mr. G. Campbell, at a late meeting of the Society, we have in

this Journal* a brief notice of a tribe called "Coour Gooand," and a vocabulary which proves them to be not Gooand at all, but another branch of the great family we are describing, occupying the Gavilghur range of hills near Ellichpore. Dr. Latham mentions in connection with them another tribe which he calls Chunah, but I have no further information about them. If the investigation is carried out, we shall, no doubt, find connecting links in the intervening ranges of hills.

Thus we have in the Coours of Ellichpoor, the Korewahs of Sirgoojah and Juspore, the Moondahs and the Kheriahs of Chota-Nagpore, the Hos of Singbhoom, the Bhoomij of Manbhoom and Dhulbhoom, and the Sonthals of Manbhoom, Singbhoom, Cuttack, tributary mehals, Hazareebagh and the Sonthal Pergunnahs (the author of the introduction to the Sonthal language, the Rev. J. Phillips, adds "Nâkâles and Kodas," I do not know where they are to be found,) a kindred people sufficiently numerous, if united, to form a nation of several millions of souls. They were, in all probability, one of the tribes that were most persistent in their hostility to the Arian invaders, and thus earned for themselves the epithets of "worshippers of *mad* gods," "haters of Bramins," "ferocious lookers," "inhuman," "flesh-eaters," "devourers of life," "possessed of magical powers," "changing their shape at will."† To this day, the Arians settled in Chota-Nagpore and Singbhoom firmly believe that the Moondahs have powers as wizards and witches, and can transform themselves into tigers and other beasts of prey, with the view of devouring their enemies, and that they can witch away the lives of man and beast. It is to the wildest and most savage of the tribe that such powers are generally ascribed; and amongst the Kols themselves the belief in the magic powers of their brethren is so strong, that I have heard converts to Christianity assert they were first induced to turn to our religion, because sorcery had apparently no power over those who were baptized! The upper classes of the Moondahs, those who aspire to be Zemindars, have assumed the "*poita*" and taken to Bramins and Kali, but the mass of the people adore their "mad gods" still, after their own primitive fashion. The great propitiatory sacrifices to the local deities or devils are carousals

* As. Soc. Journal, Vol. XIII. p. 19. † See Muir's Sanscrit texts.

at which they eat, drink, sing, dance and make love, but though the austere "munis" of old must have stood aghast at such wild ebullitions of devotion, it is a fact that whilst the mass of the Kols have not taken to the worship of any Hindoo idols, the Hindoos settled in the province think it expedient to propitiate the gods of the Kols. It is gratifying that the darkness in which this primitive and interesting people have so long dwelt, is now being dispelled by a brighter light: that their paganism is at length yielding to the gentle influence of Christian teaching; that there is abroad amongst them a widespread feeling that a change is necessary, a change more perfect than can be typified by the adoption of a "*poita*."

As the Moondahs first settled at Satyomba spread over the country, they formed themselves into communities called Purhas, or the country was divided into Purhas, each consisting of twelve or more villages under a chief. They do not appear in their earlier days to have acknowledged any chief, superior to the head of the Purha; the ordinary business of the community was conducted by him, and on extraordinary occasions, the Purha chiefs met and took counsel together.

Vestiges of this ancient system are still met with in many parts of the country. Though ignored as geographical or fiscal or territorial divisions, the Purhas still exist in the eyes of the people, and they still have chiefs whom they call Rajahs, men of influence and weight, who preside when a meeting is called to adjudicate regarding breaches of social observances, and who take the lead on the great hunting expeditions and national festivals.

It is said that the Moondahs were in a very wild state, occupying but a small portion of the plateau, when the Oraons, driven from the Rhotas hills, swarmed into the country, and sought and obtained permission to occupy it jointly with the Moondahs. Both Moondahs and Oraons declare there was on this occasion no fighting. The former were glad to obtain assistance in reclaiming the country they had adopted, and the Oraons are said to have come with large herds of cattle and implements of husbandry previously unknown to the Moondahs.

It is probable that the Moondahs of those days were not more advanced than are to this day their brethren, the hill Korewahs of Sirgoojah, a tribe that know not the use of the plough: but they

were great hunters, and could sing and dance and make merry. The Oraon youth and maidens speedily acquired the songs and the steps, and this I doubt not aided greatly the harmonious blending of the two peoples.

There are no ancient temples or other antiquities on the plateau of Chota-Nagpore to indicate that the early Braminical races or Buddhists ever obtained a footing there; there is no tradition even of the "Munis" having sought retreats amongst its rocks or by its waterfalls for their devotional exercises. We find such monuments in Sirgoojah to the very foot of the western face of the plateau; and, as I have recently described in a paper devoted to the antiquities of Manbhoom, we find numerous remains of Arian colonization close to its southern and eastern approaches, but none on the plateau itself. Left to themselves, the Kols increased and multiplied, and lived a happy arcadian sort of life under their republican form of government for many centuries; but it is said that a wily Bramin at last obtained a footing amongst them, and an important change in the form of government was the result.

The Rajah of the Purha of which Satyomba was the head quarters, was a Moondah named Madura. His occupation of the supposed cradle of the race gave him precedence in the confederate councils; and a child of his house, reared in it if not born there, was, through his influence and by the advice of a Bramin he had taken into his service, elected supreme chief over the whole confederacy; but as it would not suit the noble family, his descendants, to have it supposed that their ancestor was one of the despised race called Kol, they have adopted the following legend as their origin:—

"When Jonmajoya, Rajah of Hustinapoor, attempted the destruction of the Nags or Serpent race, one of them, Poondorik, assumed the form of a Brahmin and went to the house of a Bramin at Benares to study the 'shasters.' The Benares Bramin, pleased with the intelligence and grace of his pupil, gave him his only daughter 'Parbutee' to be his wife. Poondorik and his wife, Parbutee, together visited Juggernath, and on their return, passing through this country, then called 'Jharkhund,' the forest land, she was seized with the pains of labour near Satyomba, and gave birth to a child and died.

"Madura's Bramin happening to pass, bearing an image of the sun worshipped by the Moondahs, saw the child sleeping and protected by a snake with expanded hood. This snake was Poondorik, relapsed into his original form. He addressed the Bramin, told his own story and the story of the child's birth, declared that the babe was destined to be a great Rajah, and that his name was to be Funimatuk Roy, 'the snake hood crowned,' a worshipper of the sun, whose image the Bramin bore, and the Bramin was to be the family priest. The snake then vanished. The child was taken to Madura's house and adopted and brought up with his own son, a boy of much the same age. When Funimatuk Roy was twelve years of age, Madura convened the Purha chiefs, and it is said the neighbouring Rajahs, including the Rajah of Sirgoojah and the Dytya Rajah, and suggested that one of the two lads should be selected as the Rajah of Nagpore. The lads were subjected to an examination, when it was found that the snake boy had already acquired all the accomplishments necessary for his destined position, whilst the other was a mere rustic. It was then (according to the annals of the Nagbunsee family) ruled, that Funimatuk Roy and his heirs for ever should be the Rajahs, and that the Moondah's child and his descendants should bear burdens, and thus all who claim to hold lands as descendants of the Moondahs and Oroans that first cleared them, are bound, when called on, to bear the burdens imposed on them by the Rajah and his assigns!"

It is frankly admitted in the annals I quote from, that a difficulty arose regarding Funimatuk's birth, when he sought in marriage the daughter of the Sikurbhoom (or Pochete) Rajah. The Sikurbhoom family priest was sent to examine the certificates of birth and found none: but Rajah Matuck Roy prayed for the intercession of his *ophidian* parent; he had calmly contemplated his position and put it to his father, that if the Sikurbhoom priest was not satisfied, a Moondah or an Oroan girl should become Queen of Nagpore. This was not to be thought of. So the Nag once more entered an appearance, satisfied the Bramin by a relation of wonders, and since then the Nagbunsis have always intermarried with the best Rajpoot families. It is particularly noted that at Funimatuk Roy's wedding-feast the Oroans and Moondahs all got drunk and began to fight, and the Rajah of Nagpore and Madura had to obtain the assistance of his guests, the

Rajah of Sirgoojah and the Dytya Rajah, to separate them. The Dytya Rajah was, I presume, the Rajah of Patkoom, as that family bear the surname of Adytya to this day.

The marriage was celebrated at Satyomba, and there the first Rajah resided in a mud fort. The fourth in descent from Funimatuk moved his court to Chuttia, where we have the remains of a fort with masonry walls and some stone temples ascribed to him. Subsequently Doisa was chosen as the seat of Government, and here are some fine buildings, shewing that the family were improving in art and in civilization, when they moved there. This site also has been abandoned, and the present Rajah lives in a very mean house at Palkote.

The sway of the Rajah of Chota-Nagpore does not, in early times, appear to have extended beyond the plateau or fringe of hills which divide it from the plains, but the Moondahs overran those limits and formed colonies in what are now called the five pergunnahs—Silli, Tamar, Barundah, Rabey and Boondoo—which did not acknowledge the Rajah-elect of Satyomba. In time, each of these pergunnahs elected a Rajah of its own, who (their descendants declare) were each of a divine or miraculous birth, like Funimatuk Roy; and on the strength of it they all call themselves Chuttrees and wear the cord. They intermarry amongst themselves or with the petty Rajahs of Manbhoom who are of similar origin; so their claim to be Chuttrees, or at all events Hindoos of respectable caste, is not disputed. According to their own tradition, the Rajahs of the five pergunnahs first forfeited their independence by submitting to pay tribute to the Rajah of Cuttack. Eventually, however, they were subjugated by the Maharajah of Chota-Nagpore, and submitted to pay tribute to and accept the "Tilluck" or symbol of investiture from him. The Moondahs comprise about two-thirds of the population of the five pergunnahs, and all who are not Moondahs are settlers of no very ancient date.

In the northern and western parts of Chota-Nagpore, the authority of the old Moondah or Oraon chiefs has been almost effaced by the middlemen who have been introduced by the Zemindars as more profitable farmers, or by the Bramins, Rajpoots and others to whom, for religious or secular services, grants have been made by the Maharajah and members of his family holding under him. In many instances, the Kols have been entirely dispossessed of the lands their

ancestors brought under cultivation, and ryots from other parts of India, more subservient to the wishes of the farmers, have been introduced. In some villages the peasant proprietory right of the aborigines has been entirely extinguished, and the few of that class that remain are found in the position of farm labourers.

In the southern parts of Chota-Nagpore the Moondah chiefs, there as in Singbhoom called Mankees, have managed to retain their position, first, by resisting in open arms all attempts to encroach upon it, and lastly, by a settlement suggested and brought about by the officers of the British Government and concluded with the Maharajah shortly after the Kol disturbances in A. D. 1833.

These Mankees have each under them about as many villages as formerly were included in a "Purha," and they pay a quit rent to the Maharajah as a commutation of the service and tribute in kind formerly paid to him as Lord Paramount, and they collect this and a little more as the contribution for their own support from the heads of villages, who again collect according to ancient custom at fixed rates from the villagers. There is fixity of tenure throughout, from the Maharajah to the cultivator, notwithstanding the intervention of the Mankee, the village Moondah, or Mohto. This is no doubt a living exemplification of the relation that, in older times, subsisted between the cultivator of the soil and his chief in most parts of India.

In the Hoor Lurka Kols of Singbhoom we have a people who, till recently, had no notion of what it was to pay rent to any one, or even to give pecuniary support to their chiefs. They had their Mankees and Moondahs, but no one exercised any right arising from a title in the land except the cultivators. We have a very interesting description of the Hos, their country and their languages, by Colonel Tickell,* and to this, before proceeding further with my memoir, I will add a brief sketch of their history.

The Singbhoom district is of a singular interest to the ethnologist. That portion of it called the Colehan, the Ho-desum or country proper of the Hos, is a series of fair and fertile plains, broken, divided and surrounded by hills; about 60 miles in length from north to south, and from 35 to 60 in breadth from east to west. It has to the south and south east the tributary estates, Mohurbhun, Keonjur, Bonai

* As. Soc. Journal, Vol. IX. pp. 783, 997, 1063.

and Gangpore, inhabited by Ooriah-speaking Hindoos, to the east and north the Bengalee pergunnah of Dhulbhoom and district of Manbhoom, and north and north-east the Hindee district of Lohardaggah, and it is occupied by a race totally distinct by descent, custom, religion and language from any of the three. A people on whose smiling country covetous eyes have often been directed, but into which no one ever attempted with impunity to intrude.

It is impossible to say when the Hos first entered Singbhoom; but as we find that the Chota-Nagpore Moondahs more and more assimilate to the Hos, as we approach Singbhoom from Chota-Nagpore, we may safely infer that the Hos came originally from that country; and this is their own tradition. They appear to have brought with them and retained their system of confederate government by Purhas, but in Singbhoom the word now used to express it, is Pirhi or Peer. Thus the Colehan is divided into Pirhis, each under a Mankee as chief of the Pirhi, and each village having its Moondah as headman.

According to their own tradition, the Hos displaced a nation of Jains settled in the eastern parts of Singbhoom, some remains of whom are still extant, and a nation of Bhuyahs from the western and southern parts, driving them out of, and appropriating to their own exclusive use, the richest part of the country. From these early times, probably more than 2,000 years ago, they have proudly held the country they acquired; and, in my humble opinion, they have a right to say they never submitted to rulers of an alien race, till they were forced to do so by the power of the British Empire.

At the commencement of the present century, Singbhoom was only known to the British Government as a country under the rule of certain Rajpoot chiefs, all of one family, whose independence, when we first occupied the Orissa Provinces, Lord Wellesley promised to respect. After the final cession of all the surrounding districts in 1819 these chiefs, occupying a territory that embraces the Colehan, voluntarily submitted to the British Government, and immediately sought the assistance of that Government in reducing the "Hos" to submission, asserting that the Hos were their subjects then in rebellion; but they admitted that for fifty years they had exercised no authority over them, and I find no proof that the Hos had at any former period ever submitted to them. It is not pretended that they were conquered,

but supremacy was claimed by the Rajpoot Rajahs over the Ho tribes next to them, thus dividing the country and the people amongst four Rajpoot chiefs, the Rajahs of Mohurbhunj and Porahat, Koer of Seraikilla, and Thakoor of Khursowan.

It is true that the chiefs of Singbhoom, ancestors of the Rajahs of Porahat, Seraikilla and Thakoor of Khursowan, obtained great influence over their wild neighbours. They were gradually induced to believe tales which gave to the founder of this family a miraculous birth in their country, and they accorded to him divine honors, whilst they repudiated the idea of his being their temporal chief. The oldest surviving member of the Porahat family tells me that no regular tribute was ever received from the Colehan, but they were treated and employed rather as friendly allies than as subjects, and at certain seasons presents of trifling value were received from them and presents given in return.

When a division of the estate of the Singhoom chief occurred, the brothers each took, with the share assigned to him, a share in the good-will of the Hos. Thus the Seraikilla and Khursowan families claimed the allegiance of the tribes nearest to them. The claim of the Mohurbhunj Rajah sprang up as the Kols extended their cultivation, till it touched or ran over his boundary. But it is admitted that all recorded attempts of the Rajpoot chiefs to subdue them had been finally defeated.

On the last occasion, the great grandfather of the present Maharajah of Chota-Nagpore, at the head of 20,000 of his own men co-operating with the forces of the Singbhoom Rajpoot chiefs, entered the Colehan. The Hos allowed him to do this; they then fell on his army in masses, and, routing it with immense slaughter, ignominiously expelled him, pursuing him into his own territory, and severely retaliating on the border villages of the Maharajah and his allies.

It was no doubt in retaliation for these attacks on their independence that the Hos now became, as they were found to be when first brought to our notice (in 1819-20), the scourge of the inhabitants of the more civilized parts of Singbhoom and of all the surrounding districts. They shewed no mercy to the Braminical inhabitants of the villages they attacked and pillaged. A long line of Bramin villages on the Bramin river in Gangpoor was laid waste by them and has remained

depopulated ever since. No traveller ever ventured to pass through their country. No Bramin, Rajpoot or other Hindoo caste, or Mussalman was suffered to reside in it.

In 1820, the Agent Governor-General, Major Roughsedge, entered the Colehan at the head of a force consisting of a battalion of infantry, with cavalry and artillery. He was surprised to find the wild race, of whom he had heard such disparaging accounts, in possession of an open undulating and richly cultivated country, studded with villages in groves of magnificent tamarind and mango trees, abounding in unusual indications of rural wealth. He was allowed to enter on this scene unmolested, but the slaughter of some of his camp-followers, who had incautiously strayed into one of the villages, demonstrated the hostility of the people, and an attempt to capture the murderers brought about the first collision between the Hos and our troops. A party of cavalry, sent to the offending village, was met in the open field by 300 warriors, who undauntedly advanced to meet the charge, rushed between the ranks of the horsemen, hacking especially at the horses with their formidable battle-axes, and shewing no disposition to yield or to turn, till half their number had been sabred or shot. In the village where the murder was committed, was found a reserve of 60 men who fought desperately and were all killed! The same evening another body of Lurkahs* attacked the rear of the column and cut off a convoy of supplies. It became necessary to act with vigour, [illegible] the old Hos of the present day describe the retaliation that now [illegible] upon them as dreadfully severe. Eventually some intercepted mails were restored uninjured, as a token of submission, and the Lurka chiefs in the vicinity entered into engagements to acknowledge and pay tribute to the Rajah of Singbhoom.†

Major Roughsedge met with further opposition in his progress towards Sumbulpoor through the Southern Peers: he had in fact to fight his way out of the country; and on his leaving it a war broke out between the Kols who had submitted, and those who had not. One hundred Hindustanee burkundazes under a Soobadar were sent by the Agent to the support of the Rajah and his Lurka allies, [illegible] this for a time gave them the advantage; but the Soobadar havi[illegible]

* "Laraka," the fighters, a common name for the Hos.
† Major Roughsedge's dispatches.

been induced to enter the Colehan to assist in levying a contribution, was attacked, and he and the *whole of the party cut up!*

In 1821 a large force was employed to reduce the Lurkas to submission, and after a month's hostilities, the leaders, encouraged by a proclamation surrendered and entered into engagement, binding themselves to subjection to the British Government, and agreeing to pay to the chiefs at the rate of 8 annas for each plough. It was now noticed that the Lurkas evinced a perfect willingness to be guided and ruled by British officers, and the utmost repugnance to the authority arrogated over them by the Singbhoom chiefs; and it would have saved much blood, expense and trouble, if this feeling had at the time been taken advantage of. Made over to the chiefs, they soon again became restive and reverted to their old practices of resistance and pillage. The circle of depredations gradually increased, till it had included Dhulbhoom, devastated Bamunghatee, and extended to some parts of Chota-Nagpore. The chiefs under whom the Lurkas had been placed could not control them, and for some five years, from 1830 to 1836 the Hos, maintained this hostile attitude.

In consequence of this unsatisfactory state of affairs, a proposal made by Captain Wilkinson in August 1836, to employ a force and thoroughly subdue the Lurkas, and then to take the whole tribe under direct management of British officers, was favourably received by Government and promptly acted on. Two Regiments of Infantry and two Brigades of guns entered Singbhoom in November 1836, and operations were immediately commenced against the refractory Peers; and by February following all the Mankees and Moondahs had submitted and bound themselves by fresh engagements to obey and pay revenue to the British Government, and no longer to follow the orders of the chiefs to whom they had previously been required to submit. Six hundred and twenty-two villages, with a population estimated at 90,000 souls, of whom more than three-fourths are Hos, were thus brought and have since remained under the immediate control of the British Government. Since then, the population and area of cultivation have immensely increased, and the people are now peaceful, prosperous and happy. From the region round about the station, Chybassah, 170 miles due west from Calcutta, the waste lands have entirely disappeared. Colonies of Hindus may now be

found settled in the heart of the Colehan, occupying villages apart from the Hos, but without demur placing themselves under the Ho Mankees of Peers. For their own system of government is, as far as possible, preserved, and the Mankees are officers of police as well as the tuhsildars or rent-collectors of their circles. One great change is now being peaceably introduced, the old system of assessment on ploughs is under process of commutation to a light assessment on the land.

This is undoubtedly the nucleus of the Moondah nation, the most compact, the purest, most powerful and most interesting division of the whole race, and in appearance decidedly the best looking. In their erect carriage and fine manly bearing, the Hos look like a people that have maintained and are proud of their independence. Many have features of sufficiently good cast to entitle them to rank as Arians; high noses, large but well formed mouths, beautiful teeth, and the facial angle as good as in the Hindu races. The figures both of male and female freely displayed by the extreme scantiness of the national costume are often models of beauty; but this description applies only to the people of the highly cultivated part of the country who have seldom been subjected to severe privation and who generally fare right well. The inhabitants of the imperfectly reclaimed hill forests are more savage-looking, but they seldom deteriorate to the almost simian physiognomy that the Oraons are found with under similar circumstances. When the face of the Moondah varies from the Arian or Caucasian type, it appears to me rather to merge into the Mongolian than the Negro. High cheek bones, small openings for the eyes, having in some rare instances a tendency to the peculiar oblique set of the Mongolian, and flattish faces without much beard or whisker. They are of average stature, and in colour vary from brown to tawny yellow.

II.—The Oraons.

The Oraons have a tradition that they were once settled in Guzerat. They were expelled from that part of India, and, retreating east, made a stand at fort Kalinjur where they fought the "Loorik Sowrik" of "Pan[illegible] pipri," were defeated, and, retreating still east, settled on the Rhotas hills. Here they say, they remained unmolested till attacked and

driven from the hills by the Mahomedans in the reign of the emperor Akbar, but as they aver this occurred fifty-two generations ago, there is an anachronism somewhere. I think they were settled in Chota Nagpore centuries before the days of Akbar, but it is probable that some of the clan remained in the Rhotas hills until the Mahomedans constructed their fortress there.

The accounts of ancient Guzerat faintly confirm the Oraon tradition. I find from Thornton's Gazetteer that there is a race settled there from remote antiquity who are called Coolies; but there is nothing in the name, which, as I observed before, appears to have been applied very generally to the aborigines by the Arians, and the account given of the Coolies does not lead me to suppose they are of the Oraon family. There is, however, a short description of what appears to be a remnant of a tribe, which would answer perfectly for the Oraons,—"A small, active, well built race, engaged to some extent in cultivation, but by choice deriving their subsistence, as far as possible, from the chase, fishing, or the collecting of wild fruits and the marketable produce of the jungles for sale. Their peculiar pursuits, little relished or shared in by the rest of the community, caused them to be viewed with dislike and dread, and the reputation of possessing great powers in sorcery subjects them to much cruel treatment."

Every word of the above description applies to the Oraon tribe, and the name given to this remnant of a people viz. "Dunjas," is an Oraon word not unlike the term Dhangurh, so commonly applied to the Oraons in the countries to which they emigrate for work.

The names traditionally handed down amongst the Oraons, as Loorik Sowrik, allude probably to some tribe of Sravacks or Sowoks or Jains, and the Palipipri might refer to the Palithana mountains, the Jain temples on which are amongst the most interesting architectural works in India. The etymology of the word Oraon, I have not been able to trace satisfactorily, but it may have been applied to the tribe in consequence of their migratory habits. They call themselves "Khoonkir."

Between the language of the Oraons and the language of the Moondahs and their cognates, I can trace no similarity either in pronunciation, formation, construction or general character. With pretty copious vocabularies before me, I can find no analogues, and

whilst the language of the Moondahs is soft and sonorous, that of the Oraons is guttural and harsh. Doctor Latham, in his descriptive ethnology, has noticed the near connection of the Oraon, Rájmahal hill and Tamul languages, and especially observes on the similarity of the personal pronouns.

English.	*Rajmahal.*	*Oraon.*	*Tamul, &c*
I	En	En	naan, En.
Thou	Nin	Nin	Nin
He, she, it	Ath	As	Ata
We	Nim	Em	Nam
Ye	Nina	Nim	Nim
They	Awar	Ar	Awar.

Out of a vocabulary of about 24 Oraon and Tamul words, I find the following analogues.

English.	*Tamul.*	*Tuda.*	*Oraon.*
Man	Al	Al	Al
Eye	Kam	Kan	Khan
Tooth	Pal	Paroh	Pulla

But I find in the language now spoken by the Oraons, words of Sanscrit origin not in common use, as "*puph*," flower, "*amb*," water, "*kesh*," hair, indicative of their having occupied some country in common with people speaking a Sanscrit or Prakrit dialect.

The annexed notes on the language with which I have been favoured by the Rev. Frederic Batsch, senior Missionary at Ranchee, will, I hope, throw some light on the subject. The resemblance between the Oraon and Tamul language does not invalidate their own migratory traditions, for it is not more marked than the relation between the Tamul and the language of the Gonds and others.

Their physical peculiarities are as different from those of the Moondah as are their linguistic characteristics. The Oraons must be regarded as a very small race, not short and squat like some of the Indo-Chinese stock, but a well proportioned small race. The young men and women have light graceful figures and are as active as monkies. Their complexions are, as a rule, of the darkest; but if we take as our type those who dwell in mixed communities, we find great variety in feature and colour. If we take those who, living in isolated positions, may be supposed to offer us the purest blood, we find them

generally dark and ill-favoured. They have wide mouths, thick lips and projecting maxillary processes, nostrils wide apart, and no elevation of nose to speak of, and low though not in general very receding foreheads. I have seen amongst them heads that in the woolly crispness of the hair completed the similitude of the Oraons to the Negro. It may be said that the class I am describing have degenerated in feature from living a wilder and more savage life than others of their clan; but I do not find this degeneracy of feature amongst the Jushpore Korewahs, who are to the Moondahs of Chota-Nagpore what the Jushpore Oraons are to the Oraons of the same district.* I found the Korewahs mostly short of stature, but with well knit muscular frames, complexion brown not black, sharp bright deep set eyes, noses not deficient in prominency, somewhat high cheek bones, but without notable maxillary protuberances. In the more civilized parts of the province, both Oraons and Moondahs improve in appearance. The former indeed still retain their somewhat diminutive appearance, but in complexion they are fairer, in features softer, some even good looking, and the youthful amongst them all pleasing from their usual happy contented expression and imperturbable good humour.

Driven from the Rhotas hills, the Oraons, according to their own tradition, separated into two great divisions. One of these, moving east, found a final resting-place in the Rájmahal hills; the other, going south, sought refuge in the Palamow hills, and wandered from valley to valley in those ranges, till they found themselves in Burway, a hill-locked estate in Chota-Nagpore proper. From thence they occupied the highlands of Jushpore and formed the settlements in the vicinity of Lohardugga, on the Chota-Nagpore plateau, where they still constitute the bulk of the population. The Satyomba Moondahs had not effected settlements so far to the west.

The identity of the language spoken by the Rájmahal hill people (not the Sonthals) and that of the Oraons is full and sufficient confirmation of the tradition of their common origin, and of the division of the tribe spoken of above; but a comparison of the customs of the Rájmahal hill people, who being isolated must have retained those they brought with them to the hills, with the customs of the Oraons, demonstrates that the latter are derived from the Moondahs.

* Asiatic Society's Journal, Vol. XXXIV. p. 15.

Referring to Col. Walter Sherwill's account of the Rájmahal hill people,* I find, in regard to marriage, that it is customary for the young couple to sleep together on the same bed before marriage. The Oraons would consider this a very indecorous proceeding, though a public recognition that the young couple have slept together after the marriage is with the Oraons an important sequel to the ceremony. In the Rájmahal hills, says Col. Sherwill, the dead are buried. The Rig Veda and Ramayun tell us that this was the custom of the Dusyas, but the Moondahs and their cognates all burn their dead, and the Oraons follow their example.

The Rájmahal hill men swear on salt, the Oraons have a veneration for salt, but swear on *dub* grass,† *huldee* and rice.

The Oraons know nothing of Bedo Gosain, the invisible spirit adored by the Rájmahalies. Their supreme deity is the sun under the title of Dhurmo, but as that and the Rájmahalee term are both of Sanscrit origin, it evinces that neither race have in their own language any word for the Deity.

Lastly, the hill man is described as less cheerful than the Sonthal, less industrious, and as not joining in the dances that the people of the Moondah stock are so devoted to. In Chota-Nagpore the Oraons are more lively than the Moondahs, quite as industrious, and the most enthusiastic and nimble-footed of the dancers.

The two races, Moondah and Oraon, must have been for ages the only colonists of the plateau; it is singular that they have no tradition of any dispute having arisen between them. Affecting jealously to guard against admixture of the races by sexual intercourse, they in other respects lived as one people, the Oraon conforming more to the customs of the Moondah than the Moondahs to the Oraon, and in many instances adopting the Moondah language and losing their own.

In villages east of Ranchee, though inhabited wholly by Oraons, the Moondah, not Oraon, is the language spoken; but the Moondah language is not much known in the vicinity of Lohardaggah or in Jushpore.

The village systems of the two people became almost identical in form. The village priest, called the Pahan, is probably an Oraon institution, as, I think, amongst the Moondahs the principle is that the head of the family is priest; but the Moondahs of Chota-Nagpore

* Asiatic Society's Journal, Vol. XX. p. 544. † Agrostis linearis.

adopted it, and in their villages, as well as in those of the Oraons, there is always a Pahan. The village system now existing is such as it became after many encroachments by the Rajah and the middlemen introduced by him. Still as bearing the impress of a very primitive form of government, it is worth describing, and in doing so, I will make use of a very elaborate report on the subject written by Doctor Davidson in 1839.

The actual descendants of the men who formed the villages are called Bhuinhurs. They are a privileged class, who hold their lands at low fixed rates or rent-free, but they are bound to do service to the chief or his representative. The head of the Bhuinhurs is called the Moondah, and is generally the representative of the old Moondah chief of the village. He presides when meetings are held to settle disputes about social customs; and all demands for service on the Bhuinhurs by the proprietor or farmer are made through him. He holds his lands as Bhuinhurree, and has no other emolument.

The Mahto, though second in point of rank, is the most important functionary in the village. He has the assessment and settlement of all lands not held by the hereditary cultivators; collects all dues and rents, and is responsible for them to the farmer or proprietor. He holds for his services one *powa* of land rent-free, and in some villages gets a fee of one or two pice annually from each ryot. The office is not hereditary.

The Pahan is the village priest. He is a Moondah or Oraon by caste, but all observances for propitiating the village gods or devils are performed by him. No Bramins are permitted to interfere. The office of Pahan is generally hereditary, but is not necessarily so. He has under his charge the land called "Dalikhatari," and from the proceeds of this land, he has to support himself and to provide the rice and rice-beer required for the great festivals.

The Bhandari assists in the collection of rents, summoning ryots who have to do work or whose attendance is required by the Zemindar or farmer, and in looking after the collections made in kind. He has an allowance of one *powa* of land, and gets from each ryot one *kerai* or bundle of each crop as it is cut.

There is a Gorait for each village, and a Kotewar for one or more villages. The former is the messenger of the Zemindar or his representative, the latter is the Police officer.

The villagers maintain a blacksmith and a Gowala or herd; the latter takes care of all the village cattle, and is supposed to be responsible if any are stolen. They each get a maund of dhan for every plough and three *kerais*, bundles, of other crops.

According to the tradition of the Kols, the Rajah is entitled to the rent of only half of the land in each village. The remainder is Bhuinhurree, or rent-free under some other denomination, but in most villages rent is now taken on from two-thirds to three-fourths of the land. The land is thus divided:—

I. Rughus—the land that pays rent to the owner or his representative.

II. Bhetketta, a certain portion of the Rughus which each ryot, not a Bhuinhur, is allowed to cultivate free of rent, but for which he has to perform various services to the landlord or farmer.

III. The land allotted to the Mahto, the Pahan and the Bhundari.

IV. Munghus—the land at the disposal of the landlord or his agent or the farmer of the village. For the cultivation of this land, the holder of the village can make any arrangement that he pleases.

V. Bhuinhurree is the land held rent free by the descendants of the founder of the village, who are, however, bound to render certain services to the Rajah or his representative.

VI. Bhootketta—the land, the produce of which is appropriated to the expense of the great village poojas and festivals; a portion of this called "Dalikhatari" is assigned to the Pahan for the ordinary annual poojas, and the proceeds of the remainder are reserved for the triennial sacrifices and extraordinary occasions.

The rent is assessed on the wet land only. The cultivator is entitled to upland in proportion to the wet land for which he pays. If he cultivates more, the custom is for a payment in kind called Muswur, to be made when the crop is harvested.

The Bhuinhurs cling most tenaciously to their Bhuinhurree lands. Insurrections have followed attempts to disturb these tenures, and even now such attempts are sure to lead to serious affrays. The Kol insurrection of 1833 was, without doubt, mainly caused by the encroachments of alien farmers and sub-proprietors on the rights of the descendants of the old settlers. The first burst of the outbreak was a pretty broad hint, a general conflagration of the houses of alien farmers

and sub-proprietors, and the massacre of all that the incensed Kols could find.

The Kols of Chota-Nagpore, generally a good-tempered, mild, inoffensive race, become wild with excitement on this question, and nothing can reconcile them to a decree or order which in any way infringes on what they consider their proprietary right. According to their theory, dispossession for generations can no more annul their right in the land than it can extinguish the ties of blood. The courts will not always accept this doctrine, and the Kols cannot regard as equitable any decision that excludes it.

An Oraon family lives very promiscuously in a small, indifferently constructed and untidy looking hut, and their village often consists of a street or court of such huts. In all that relates to their inner domestic life, they are less susceptible of improvement than the other tribes. They have no gardens or orchards attached to individual houses, but the groves of fruit-trees that they plant outside the village form a beautiful feature in the scenery of Chota-Nagpore, and they have generally, in and about the village, some fine trees which are common property. In every Oraon village of old standing there is a house called the "Doomcoorcea" (Bachelor's Hall), in which all unmarried men and boys of the tribe are obliged to sleep. Any one absenting himself and spending the night elsewhere in the village is fined. In this building the flags, musical instruments, yaks' tails, dancing equipments and other property used at the festivals are kept. They have a regular system of fagging in the Doomcoorcea. The small boys have to shampoo the limbs of their luxurious masters, and obey all orders of the elders, who also systematically bully them to make them, it is alleged, hardy. In some villages the unmarried girls have a house to themselves, an old woman being appointed as Duenna to look after them. She is always armed with a stick to keep the boys off. A circular space, in front of the Doomcoorea, is kept clear as the village dancing ground. It is generally sheltered by fine old trees, and seats are placed all round for spectators or tired dancers.

The Doomcoorcea is never used by boys of the Moondah tribe. It is an institution quite unknown to the Hos, but the Moondahs and Hos build themselves houses in which all the family can be decently accommo-

dated. Their houses are more isolated, occupy much more space and are in appearance much more civilized than those of the Oraons, with verandahs, well raised plinths and separate apartments for the married and single members of the family. Every Moondah village has its dancing place, though it has no Doomcoorcea. The best Korewah villages consist of about forty houses built round a large square, in the centre of which is the dancing arena; but as the Korewahs are nomads, changing their abodes every second or third year, their villages may be regarded as mere standing camps. The Kheriahs build substantial comfortable houses like the Hos. It is curious they have the same word "O" for a house and the sky. The Moondah word "Ora" is, like the Turkoman "Ova," a house or tent. The flags kept in the Oraon Doomcoorcea appear to be an Oraon institution. Every village or group of villages, probably the head quarters of each "Parha," has its peculiar flag, and we have actually had cases in courts praying for injunction against villages charged with having assumed flags that did not belong to them!

I will now proceed to review the customs of the Moondahs and Oraons together, taking care to note all points of divergence that are known to me.

After the birth of a child, the mother has to undergo purification, and on the same day that this ceremony takes place, which is simply a process of ablution, the child is named. Elderly females or matrons, friends and relations assemble for this purpose, and a vessel containing water is placed in the midst, and as the name first selected is pronounced, one of the women drops a grain of rice into the water. If the grain of rice sinks, that name is discarded, and the experiment is repeated with the second name on the list, and so on till, as the name is pronounced, the grain floats. (The Garrows of the eastern frontier have a similar method for divining the name of the spirit they ought to invoke on particular occasions.) If the name of some friend is chosen, it is considered as establishing a tie between the child and his namesake, resembling that which subsists between a Christian child and his godfather. The person whose name is selected is always called Saki or Sakhi, a word of Sanscrit origin meaning friend, so that in "nam Saki" we have in meaning and sound our word namesake. The following are some names of girls, Jambi, Jima, Jingi, Turki,

Sulgi,* Pongla, Madhi, Makoo, Roomeea Saggi, Dinli, Natri, Akli, Bangi, Julli, and the Hindoo names of the days of the week are very commonly given. The following are the names of boys—Rumsi, Birsa, Somra, Daharoo, Singra, Satri, Dubroo, Doolkoo, Didoo, Runka, Biggoo. But they have adopted many foreign names, and the names of British officers they have known and esteemed, are thus preserved amongst the Hos of Singbhoom, and may be handed down from generation to generation. Thus "Major" and "Captain" have become common names in the Colehan, originally taken from Major Roughsedge, the first British officer they ever saw, and Captain Wilkinson (now Col. Wilkinson) whom they regard as their greatest benefactor. Doctor, Tickell, &c. are also common. Girls, when three or four years of age, receive their mark of caste. Three lines tattooed on the forehead and two on each temple, four dots on the chin and one on the nose. It does not appear to be connected with any religious custom, nor is it applied with any ceremony, and as neither the Moondahs nor the Oraons have any particular term for it in their own language, it is probable that they adopted it from the Sudhs or Hindoos. Some Moondah girls of Chota-Nagpore have different marks. Those of Singbhoom have adopted the arrow, appropriately enough, as the national weapon of their lords and masters.

The Kheriahs and Juangas, though isolated from the Moondahs and Oraons, have the same triple and double marks on the forehead and temples. The Oraon boys are marked, when children, on the arms by rather a severe process of puncturation, which they consider it manly to endure. The only reason I have heard assigned for this custom is, that through it even the naked dead may have a distinguishing mark.

When a girl approaches maturity, it is incumbent on her to bind up her hair, and from that period of her life she is restricted to food prepared by her own people. As a child with her hair loose, she is permitted to partake of whatever is edible, no matter by whom prepared. Young men enjoy this liberty of appetite till they marry. They then, to use their own expression, put salt in their flesh, and must not partake of food prepared by aliens. The Oraons have a veneration for salt, and they are not absolutely prohibited from partaking of

* A common name and also the name of a goddess, and the name, I see, of one of the young ladies from the Andaman Islands.

plain rice cooked by others, provided they are left to salt it themselves. The salt, it would appear, thus applied, removes the "Taboo," and makes *fas* what is otherwise *nefas*.

As a rule, marriages are not contracted till both the bride and bridegroom are of mature age. It is sometimes left to the parents to select wives for their sons, but the young people have ample opportunities for studying each others characters, love-making and following the bent of their own inclinations; and it very often happens, that plans concocted by the parents are frustrated by the children.

In Chota-Nagpore, amongst the agricultural classes, and in Singbhoom amongst all classes of Kols, the girls have all a price fixed upon them, and this the lover or his friends must arrange to pay, before the parents of the bride will give their consent. In Singbhoom, the price is so high, especially for young ladies of good family, that marriage is frequently put off till late in life; and girls valued not so much for their charms and accomplishments as for their pedigree, often grow grey as maidens in the house of their fathers. Singbhoom is perhaps the only place in India in which old maids are found; they have plenty of them there. But though urged to change this practice by all who take an interest in them, the old Mankees of Singbhoom are inflexible, not only in demanding a high price for their girls, but in insisting that it shall be paid, according to ancient custom, chiefly in cattle. A Mankee of the old school will not take less than forty head of cattle for his daughter; but the eyes of the rising generation are opened to the absurdity of the practice, and some of us may live to see it changed.

In consequence of this custom, the grown up boys and girls are quite a separate institution in every Kol village; there is very little restraint on their intercourse, they form a very pleasant society of their own, from which the old people sensibly keep aloof. If a flirtation is known to have gone too far, the matter is generally settled by the young man being made to pay the price for the girl and marry her.

In Chota-Nagpore the daughter of a Mankee was, some years ago, valued at about 36 Rs, but they are gradually adopting the custom of the Hindoos in regard to their marriages, and giving up the objectionable practice of putting a price on them. The price paid by

the common people ranges from 10 to 12 rupees. These disagreeable preliminaries having been arranged, the bridegroom and a large party of his friends of both sexes enter with much singing and dancing and sham fighting the village of the bride, where they meet the bride's party and are hospitably entertained.

The bride and bridegroom are now well anointed with turmeric, and bathed, and then taken and wedded, not to each other, but to two trees! The bride to a Mowa tree, the bridegroom to a Mango. They are made to touch the tree with "*seendoor*," (red lead), and then to clasp it in their arms. On returning, they are placed standing face to face, the girl on a curry stone over a ploughshare supported on sheaves of corn or grass. The bridegroom stands ungallantly treading on his bride's toes, and in this position touches her forehead with the red lead; she touches his forehead in the same manner. The bride's maids then, after some preliminary splashing and sprinkling, pour a jar of water over the head of each: this necessitates a change of raiment, and apparently concludes the ceremony, as the young couple going inside to change, do not appear again till the cock-crowing announces the dawn or its approach. At the first crow the bride's maids, who with the young men have been merrily keeping it up all night with the song and dance, burst into the nuptial chamber and bring forth the blushing bride and her bashful lord; and then they all go down to the river or to a tank to bathe, and parties of boys and girls form sides under the leadership of the bride and bridegroom, and pelt each other with clods of earth. The bridegroom next takes a water vessel and conceals it in the stream or water for the bride to find. She then conceals it from him, and when he has found it, she takes it up filled with water and places it on her head. She lifts her arm to support the pitcher, and the bridegroom, standing behind her with his bow strung, and the hand that grasps it lightly resting on her shoulder, discharges an arrow from the pretty loophole thus formed into the path before her. The girl walks on to where the arrow falls, and with head erect and still bearing the pitcher of water, she picks up with her foot, takes it into her hand, and restores it to her husband with a graceful obeisance. She thus shews that she can adroitly perform her domestic duties and knows her duty to her lord and master, whilst he, on his part, in discharging an arrow to clear

her path of an imaginary foe, indicates that he is prepared to perform his duty as her guide and protector through life.

In the Oraon marriages, many of these symbolical ceremonies are omitted, and the important one of exchanging the "*sindoor*" is differently performed. The bridegroom stands behind his bride with his toes on her heels, and stretches over her head to touch her forehead with the powder. She touches his forehead by reaching back over his shoulder. The cold bath completes the ceremony, they go to their own apartment to change their clothes, and do not emerge till morning.

The price paid for a girl in cows is called "*Sukmur*" by the Kheriah tribe. They have no word for marriage in their own language, and the only ceremony used appears to be little more than a sort of public recognition of the cohabitation. They have learned to call this "*biha*," but they admitted to me that this public recognition was often dispensed with.

It takes place in this wise. After the settlement of the usual preliminaries, the bride is brought to the village of her intended bridegroom by her own people and their friends, and they halt and bivouac in the village grove. The bridegroom and his friends join them in the grove where they all regale themselves and dance, and during these nuptial dances the bride and bridegroom are each borne on the hips of one of their dancing friends; they are not allowed to put their feet to the ground. Thus wildly dancing, they proceed into the village, and the bride and bridegroom are taken to the latter's house and anointed with oil; they are then brought outside, and the ceremony of touching each other's forehead with the "*sindoor*" is performed, followed by the splashing and sousing which becomes a general romp. Then the young couple are left to themselves till morning. The bride's maids arouse them as the cock crows, and after the public ablution of garments and their wearers the party breaks up.

The gestures of the dancers on these occasions, and the songs, all bear more directly than delicately on what is evidently considered as the main object of the festivities.

In Singbhoom, marriages, notwithstanding the lateness at which they take place are generally arranged by the parents, but their wishes are not unfrequently anticipated by love matches. In the various journeyings to and fro that are found necessary when a match

is being arranged, omens are carefully observed, and the match is broken off, if they are unfavourable. At the actual marriage there is much feasting and dancing, but little ceremony. The turning point of the affair is, when the bride and bridegroom mix and drink off some of the beer they have each been helped to; the boy pours some of the beer given to him into the girl's cup, she pours from her cup into the boy's cup, and they drink and thus become of the same "*keeli*" or clan, for the Hos, Moondahs and Oraons are all divided into families under this name, and may not take to wife a girl of their own *keeli*.

This division of the primitive races into something having a semblance to caste, will be found in the North Eastern Frontier as well as in this province. The Garrows, for instance, are divided into what are called "maharis," and a man may not marry a girl of his own mahari.

It is obvious that the custom does not spring from any such notion of caste as are found amongst the Hindoos, and that it is not one which these races have adopted from the Hindoos, because with a Hindoo, caste is destroyed by a marriage *out* of it. It is equally opposed to the custom of the Jews, whose daughters (at least if heiresses) were obliged to take husbands of their own tribe.*

In Singbhoom the bride and bridegroom do not touch each other with "*sindoor*", as is the custom in Chota-Nagpore. The Oraons and Moondahs may have adopted the custom from the Hindoos, and the primitive practice of the race is probably as it is found amongst the more isolated Hos.

A very singular scene may sometimes be noticed in the markets of Singbhoom. A young man suddenly makes a pounce on a girl and carries her off bodily, his friends covering the retreat (like a group from the picture of the rape of the Sabines). This is generally a summary method of surmounting the obstacles that cruel parents may have placed in the lovers' path; but though it is sometimes done in anticipation of the favourable inclination of the girl herself, and in spite of her struggles and tears, no disinterested person interferes, and the Hos, late companions of the abducted maiden, often applaud the exploit.

The Ho husband has to pay a high price for his wife, and it is

* Numbers xxxvi. 6.

certain that he highly appreciates her. Although he is not known to have for her any more endearing epithet than "my old woman," yet by no civilized race are wives treated with more consideration than by the untutored Ho. The whole of the domestic arrangements are under her exclusive management. She is consulted on all occasions, and I know one or two husbands whom I am almost inclined to regard as henpecked. The Kols seldom take a second wife during the lifetime of the first, but I know instances of their having done so. The wife always cooks for her husband, and when the dinner is ready, they sit down and eat it together like Christians; but the Oraons have followed the Hindoo custom of making the woman eat the leavings of her lord.

It is customary with all these tribes to pay particular attention to omens, when any of them set out to arrange the preliminaries of a marriage. The Hos who are more under the influence of this superstition than their cognates or than the Oraons, have a long list of deterrent signs, which have been described by Tickell in his paper above quoted. I subjoin the most noticeable of those that are observed by the Oraons.

1. On leaving the house "to win a bride", they look out for omens. If a cow calls and the calf responds, it is good. If there is no response, the wooing is postponed or abandoned.

2. If they find a dead mouse on the road, they must stop and make a diagnosis. If ants and flies have possessed themselves of the carcass, it is good, they go on. If the insects appear to have shunned it (which is not very likely to happen), they go back.

3. It is not good to meet oxen or buffaloes with their horns crossed, or to see a hawk strike a bird, or to come upon women washing clothes. It is good to see people burying a dead body, and to find on their road a cow giving milk to her calf.

4. If they see a man cutting a tree, and the tree falls before they can get past it, it is very bad. If they pass before it falls, it is all right. A certain bird heard on the left gives a note of joy; if heard on the right, he is a harbinger of woe.

5. If, on approaching the village of the girl, they come on women with water-pots full, it is a happy omen. If they meet a party with empty water-pots, it is a bad one.

The Nagpore Kols, whether of the Moondah or Oraon tribe, and all the cognates of the Moondahs that I know of, are passionately fond of dancing, and with them dancing is as much an accomplishment as it is with the civilized nations of Europe. They have a great variety of dances, and in each different steps and figures are used, of great intricacy, but they are performed with a neatness and precision that can only be acquired by great practice. Little children are hardly on their legs, before they begin to learn their dancing steps; and the result of this early training is that, however difficult the step, the limbs of the performers move as if they belonged to one body. They have musical voices and a great variety of simple melodies. It is a fact that, when we raised a corps of Kols, their early practice in keeping step and time greatly facilitated the operations of drill; and the Missionaries have availed themselves of the musical talents and taste of the Kol converts to produce congregational singing that would be a credit to an English country church.

The dances are seen to the greatest advantage at the great periodical festivals called "Jatras." They are at appointed places and seasons, and when the day comes, all take a holiday and proceed to the spot in their best array. The girls, on these occasions, put on their best dress, generally a white "*saree*" with a broad red border. They tastefully arrange flowers in their hair and plumes of the long breast feathers of the paddy-bird. The young men wear Turkey red turbans, and add a snow white cloth to their usually scanty garb, and also adorn themselves with flowers and peacock's feathers. As parties from the different villages come near the trysting place, they may be observed finishing their toilettes in the open fields; when all is ready, the groups form, and their approach from different sides, with their banners and yak's tails waving, horns and symbols sounding, marshalled into alternate ranks of lads and lasses all keeping perfect step and dress, with the gay head-dresses of the girls and the numerous brass ornaments of the boys glittering in the sun, forms a very lively and pleasing picture. They enter the grove where the meeting is held in jaunty dashing style, wheeling and countermarching and forming lines, circles and columns with grace and precision. The dance with these movements is called "khurriah," and they are held all months of the year, a series of them following each other at

short intervals at different places all over the country, and the attendance, at some that I have seen, could not be under 5,000 people, all enjoying themselves.

When they enter the grove, the different groups join and dance the khurriah together, forming one vast dancing procession. Then each takes its own place and plants its flag and dances round it till near sunset, when all go dancing home. This is followed by a carouse in the village, after which the dance is often continued at the "*akrah*" all night.

At each of these "Jattras," a kind of fair is held, and fairings and refreshments are to be had in abundance. The young men can treat their partners with sweetmeats and do so. As already observed, there is a place in every village called "*akrah*" set apart for dancing and ceremonies. This is a circular arena with a post in the centre, and around it are benches for the spectators or for the dancers when wearied, the whole being generally shaded by fine old tamarind, the most beautiful of village trees.

The season dances in the village open with the *kurrum* in July, at the commencement of the planting season. There is a movement in this dance called "*hojar*" when the girls suddenly kneel and pat the ground in time to the music, as if caressing and coaxing it to be productive. On the day appointed for the ceremony, the boys and girls go in procession to the *kurrum* tree, cut and bring back to the village some branches, which are planted in the *akrah*. An old man with a liberal allowance of beer is placed to watch these, whilst the young people refresh themselves. They all, old and young, then assemble in the *akrah*, and one of the elders harangues them, and after giving them much good advice, concludes by directing them to commence the dance. The songs sung on this occasion are in Hindee, and contain allusions to the flooded state of the rivers and fields. They also sing an ode to the Satyomba Rajah. The *kurrum* is kept by the Soodh or Hindoo population as well as by the Kols.

After harvest of the earlier crop of the planted rice, in November, the "*matha*" is danced by the boys and girls in the village. The girls, moving in a semicircle and clasping each others hands, dance with a very lively step and bowing motion of the body to the men who sing and play to them. The girls have another dance at the

season called "*angua*," because it is danced in front of the house instead of the *akrah*; to this and to a feast held on the occasion the young men are not invited.

The "Jadoor" dances commence on the completion of the great harvest of the rice crop, and continue till the commencement of the hot season. This is one of the most characteristic dances, from the peculiar way in which the arms are interwoven and clasped behind the back of the performers.

Then comes the "Sarhool," at the close of the month of Phalgoon or early in March. The Sarhool is the flower of the Saul tree which now blossoms. The boys and girls make garlands of these flowers, weave them in their hair and decorate their houses with them. The dance on this occasion, called the "Baihini," is a very frisky one. The boys and girls dance to each other, clasping hands and pirouetting, so as to cause "*dos-à-dos*" concussions which appear to constitute the best part of the fun. Yet the subject of the song sung at the Sarhool feast is a sad one. A girl who had married out of the village is supposed to return to it in affliction, and to sit weeping at one side of the house, whilst her former associates are revelling at the other. The songs are in the Moondah language.

They have besides different dances for weddings, and a dance called "Jumhir" which is suited to any occasion. The dances above briefly noticed are all more or less connected with some religious ceremony, but this is left to the elders. The young people seem to me to take little interest in that part of the festival, which is, in proportion to the dancing, in importance like the bread to Falstaff's sack. They are always ready for a dance, and night after night in some villages the *akrah* drums collect the youths and maidens after the evening meal, and if you go quietly to the scene, as I have done, you may find that, whilst some are dancing, others are flirting in the most demonstrative manner, seated in detached couples on the benches or on the roots of the great trees, with arms round each others' waists, looking lovingly into each others' faces.

Next to dancing, that which most engrosses the mind of the Kol is the belief in and fear of witchcraft. All disease in men and in cattle is attributed to one of two causes, the wrath of some evil spirit who has to be appeased, or the spell of some witch or sorcerer

who should be destroyed. The fear of punishment and, I may add for some of them, the respect they bear to the orders of their rulers, restrain their hands, and witch murders are now very rare, but a village is soon made too hot to hold one who is supposed to be a witch.

When a belief is entertained that sickness in a family, or mortality amongst cattle, or other misfortune has been brought about by sorcery, a Sokha or witch-finder is employed to find out who has cast the spell. By the Sokhas various methods of divination are employed. One of the most common is the test by the stone and "*poila*." The latter is a large wooden cup shaped like a half cocoanut, used as a measure for grain. It is placed under a flat stone, and becomes a pivot for the stone to turn on. A boy is then placed in a sitting position on the stone, supporting himself by his hands, and the names of all the people in the neighbourhood are slowly pronounced, and as each name is uttered, a few grains of rice are thrown at the boy; when they come to the name of the witch or wizard, the stone turns and the boy rolls off!

There is no necessary collusion between the Sokha and the boy; the motion of the hand throwing the rice produces *coma*, and the Sokha is, I suppose, sufficiently a mesmerist to bring about the required result when he pleases.

The Singbhoom Kols or Hos, left to themselves, not only considered it necessary to put to death a witch thus denounced, but if she had children or other blood relations, they must all perish, as all of the same blood were supposed to be tainted.

In 1857, when, in consequence of the mutinies, Singbhoom was temporarily without officers, the Ho tribes of the southern parts of the district, always the most turbulent, released from a restraint they had never been very patient under, set to work to search out the witches and sorcerers who, it was supposed, from the long spell of protection they had enjoyed, had increased and multiplied to a dangerous extent. In a report on this subject from the district officer, in 1860, it is stated that "the destruction of human life that ensued is too terrible to contemplate; whole families were put an end to. In some instances the destroyers, issuing forth in the dusk and commencing with the denounced wizard and his household, went from house

to house, until before the morning dawn they had succeeded in extinguishing, as they supposed, the whole race." On the suppression of the disturbances, the return of the refractory Hos to order was as sudden and decisive as had been their relapse into barbarism. The survivors of the families who had suffered at once emerged with confidence from their hiding-places, and of the cases of witchcraft-murder, thus or otherwise brought to notice, the perpetrators were in almost every instance prosecuted to conviction.

It was melancholy to have to condemn men who themselves artlessly detailed every incident of the crime with which they were charged. The work of retribution was a sad task, but it was rigorously carried out, and we have not since then had a single case of witchcraft murder in the Colehan. That the belief in the existence of witches and sorcerers is consequently extirpated, cannot be hoped. Nothing but their conversion from paganism could effect this. I am convinced that in most instances the prisoners, who in their examinations detailed the most marvellous effects of imputed sorcery, were sincere believers in all that they narrated.

One of them, named Mora, saw his wife killed by a tiger, which he followed till it led him to the house of a man named Poosa whom he knew. He told Poosa's relations what had occurred, declaring to them that Poosa had, in the form of a tiger, killed and eaten his wife. The relatives appealed to, did not for a moment discredit the charge. They said they were aware that Poosa did possess the imputed power of metamorphosis. They brought him out and, delivering him bound to his accuser, stood by whilst Mora deliberately put him to death.

In explanation of their having so acted, they deposed that Poosa had one night devoured an entire goat and roared like a tiger, whilst he was eating it; and on another occasion he informed his friends he had a longing to eat a particular bullock, and that very night that very bullock was killed and devoured by a tiger!

From their having lived so long together, it is not surprising that we should find the religious ceremonies of the Oraon and Moondah almost identical. The Oraons have adopted the religion of the Moondah, but they retain some features of their original faith which indicate that it was in many essential points different from that to which they have conformed.

I have already observed that the Pahan or village priest is in all probability an Oraon institution. The Rajmahali have a similar functionary called 'Demam,' who foretells events, offers sacrifices, regulates feasts and exorcises devils. In the Ho and Moondah villages, all priestly functions may be performed by the head of the family, or, if the occasion be one in which the village generally is concerned, by any elder of the requisite knowledge and experience. They worship the sun, "Singbonga," as the supreme being, the creator, the preserver; and a number of secondary gods, all invisible; material idol worship they have none. The paganism of the Ho and Moondah in all essential features is shamanistic.

The Oraons, in addition to the Pahan whose business it is to offer sacrifices for the benefit of the community, have recourse to a person called "Ojha" whom they consult regarding the proper spirit to be invoked and the nature of the sacrifice that is required of them, and whose functions appear to me to bear a strong resemblance to those of the medicine man of the African tribes. The Oraons have wooden images or stones to represent the village and domestic spirits that they worship. Thus a carved post in the centre of their dancing arena represents the tutelary deity of the village, "Daroo;" and they have objects of some kind to represent their domestic gods, *penates*.

They never build a house, or select a new site for a village or even a new threshing-floor, without consulting the ojha and omens. When a new house is ready for the reception of its owners, an ojha is called, and he takes earth from the hearth and charcoal, and mixing them together, marks on the floor a magic circle. In the centre of this he places an egg, and on the egg a split twig of the Bel tree. The egg is then roasted and eaten by the people who are to occupy the house. This is followed by a great feast and dancing—a regular house-warming—on the top of the house an image of a fish is hung to avert the evil eye. These peculiarities in the paganism of the Oraon, and only practised by Moondahs who live in the same village with them, appear to me to savour thoroughly of feticism: before affirming this positively, it would be advisable to examine more minutely the customs of the Rajmahal hill tribes; but the elephant gods, depicted by W. Sherwill as seen in their villages, are very fetish in appearance.*

* Vide Journal, Asiatic Society Bengal, No. VII. 1851, page 553.

The Moondahs, without applying to an ojha or medicine-man, consult auguries in choosing the site of a house, with prayer to Singbonga. A small quantity of rice is placed in holes made at the four corners of the selected site, where it is left all night; and if found undisturbed in the morning, the site is good. The same process is gone through in selecting a new site for a village. Prayer is offered to Singbonga twice, first, that the test applied may truly indicate if the site be good or bad; secondly, for a blessing on the chosen site.

It is the fashion to call the religion of the Kols 'devil worship,' but this is not strictly correct; for although the minor deities may be mostly of a malevolent nature and therefore devils who have to be propitiated, still Singbonga is worshipped as a beneficent god. This worship of the sun as the supreme deity is the foundation of the religion of the Oraons as well as the Moondahs. By the former he is invoked as Dharmi, the holy one. He is the creator and the preserver, and with reference to his purity, white animals are offered to him by his votaries. He is not regarded as the author of sickness or calamity; but he may be appealed to to avert it, and this appeal is often made, when the sacrifices to the minor deities have been unproductive.

But besides these occasional sacrifices, all Moondahs who hold to the faith of their ancestors, are especially bound to make a certain number of offerings to Singbonga during their tenure of the position of head of the family. He may take his own time about them, but he will not be happy in his mind till he completes his complement and clears the account. I obtained this information from the Kheriahs, and on speaking about it to some ancient Pahans and Moondah elders, was told that it undoubtedly is the orthodox practice, but it has been neglected. The sacrifices are five in number: 1st, fowls; 2nd, a pig; 3rd, a white goat; 4th, a ram; 5th, a buffalo; and they must be offered in the open plain in front of an ant hill, or with an ant hill as an altar. Sacrifices to other gods are generally offered in the "Saerna,"* the sacred grove of Sal trees, the remnant of the primeval forest left for the spirits when the settlement was first made.

The names and attributes of the inferior deities are nearly the same amongst the Hos in Singbhoom, the Moondahs and Oraons in Chota-

* Or 'Saran,' 'Charan.'

Nagpore, and amongst the Sonthals 'passim.' Marang Booroo and Pongla his wife; Desaoolli, Jaer Boori, Eekin Bonga, Boora Bonga, Charee Desoolli and Dara are invoked in Chota-Nagpore.

The Sonthals have Marang Booroo, also Maniko his brother and Jaer his sister. Tickell's paper in Vol. IX, part 2nd of this Journal gives the Singbhoom gods and their attributes. They too have Marang Booroo and Pongala, Desaoolli and Jaer Boori or Jaer Era and others. In cases of sickness the Ho, after ascertaining by augury which of the gods should be propitiated, will go on offering sacrifices till the patient recovers or his live stock is entirely exhausted.

Next to Singbonga I am inclined to place the deity that is adored as "Marang Booroo." Booroo means mountain, but every mountain has its spirit, and the word is therefore used to mean god or spirit* also. Marang Booroo is the great spirit or great mountain. Not far from the village of Lodmah in Chota-Nagpore one of the most conspicuous hills on the plateau is called Marang Booroo, and here the great spirit is supposed to dwell. It is worshipped by the Sonthals, the Bhoomij, the Hos, the Moondahs and the Oraons. The two latter make pilgrimages to it. The Hos have some vague notion of its situation; the more distant members of the family canonize some hill more conveniently situated.

The Marang Booroo is especially venerated as the lord of rain. Before the rains the women go to the top of the hill, under the leadership of the wives of the Pahans, with drums, which are on this occasion only played on by young ladies, and with offerings of milk and leaves of the Bel tree. On the top of the hill there is a flat mass of rock on which they deposit their offerings.

The wives of the Pahans now kneel down, and with hair loosened invoke the deity, beseeching him to give their crops seasonable rain. They shake their heads violently as they reiterate this prayer, till they work themselves into a phrensy, and the movement becomes involuntary. They go on thus wildly gesticulating, till a "little cloud like a man's hand" is seen. Then they arise, take up the drums, and dance the Kurrun on the rock, till Marang Booroo's response to their prayer is heard in the distant rumbling of thunder, and they go home rejoicing.

* Thus they have for their altars groves and high places like the idolatrous Jews.

They must go "fasting to the mount," and stay there till "there is a sound of abundance of rain," when they get them down to eat and drink. My informant tells me it always comes before evening. We must conclude that the old women are wonderfully clever at taking a 'forecast,' and do not commence the fast till they sniff the rain.

All the villagers living in the vicinity of the hill make offerings of goats, whenever they think it desirable to propitiate this spirit; but he is not invoked in cases of sickness, unless the ojha declares it necessary. Sometimes bullocks are offered.

The next in importance in Chota-Nagpore appears to be the spirit Dara, whom the Oraons and Moondahs living with them adore in the form of a carved post stuck up where the great *jatras* are held, or in the village dancing place. Dara appears to be a god of rather bacchanalian characteristics, worshipped amidst much revelling and wassail. A sacrifice to him of fowls is followed by a feast in his honour, at which all the elders drink themselves into a state of sottish drunkenness, whilst the young people dance and make love; and next day comes the *jatra* which all the country attend.

The Penates are generally called the "old folks." They are in fact the *manes* of the votaries' ancestors; votive offerings are made to them when their descendants go on a journey, and they are generally the first that are propitiated when there is sickness in the family. By the Singbhoom Kols, the *manes* of the ancestors of the principal lady of the house are also honoured. The offerings to them are made on the path by which she was brought home as a bride. Desaoolli and Jaeroolli are propitiated for harvests and for cattle, Chandoo Seekur, the same probably as the Chanala of the Hos, for children.

The Pahan has to solemnize regularly the following festivals. The Hurihur, at the commencement of the planting season. Every one then plants a branch of the Belowa in his field and each contributes a fowl, a pitcher of beer and a handful of rice to the feast. The sacrifice is offered to Desaoolli, Jaer Boori and others, in the Saerna.

During the Sarhool—when the Sal tree blossoms—the sacrifice of a goat and fowls is offered in the Saerna by the Pahan to the *manes* of the founders of the village and to Dara. The introduction of the Sal blossom, in memory of the forest that was cleared when the village was formed, is very appropriate. At the khurria Poojah, when the rice is

harvested, the sacrifice is offered and the feast takes place on the Pahan's threshing floor.

Dalikattari: every second year a fowl, every third year a ram, every fourth year a buffalo. To provide what is required for this feast, the Pahan holds the Dalikattaree land.

I have already alluded to the division of the Moondahs and their cognates into "Keelles" or clans. Many of the Oraon clans and some of the Moondah in Chota-Nagpore are called after animals, and they must not kill or eat what they are named after.

Thus the Moondah "Enidhi" and the Oraon "Minjrar" or Eel tribe will not kill or eat that fish. The Hawk, Crow, Heron tribes will not kill or eat those birds. Livingstone, quoted in Latham,* tells us that the sub-tribes of the Bitshaunas (or Bechuanas) are similarly named after certain animals, and a tribe never eats the animal from which it is named, using the term, "*ila*," hate or dread, in reference to killing it.

The above curious coincidence tempts me to give a few more details regarding the Oraon clans.

The "Tirki"—have an objection to animals whose eyes are not yet open, and their own offspring are never shewn till they are wide awake.

The "Ekkar"—will not touch the head of a tortoise.

The "Katchoor"—object to water in which an elephant has been bathed.

The "Amdiar"—will not eat the foam of the river.

The "Kujrar"—will not eat the oil of the Kujri tree, or sit in its shade.

The "Tiga"—will not eat the monkey.

The Ho chiefs could give me no signification for the names in which their families rejoice. The following are the most aristocratic, the Boorioolli, the Poorthi, Sincoi, Baipoi, Soondee, Bandri.

I do not know of any people who are more careful in regard to the disposal of their dead than are the tribes of whom I am treating, especially the Singbhoom Kols and best classes of the Moondahs.

On the death of a Ho or Moondah, a very substantial coffin is constructed and placed on faggots of firewood. The body, carefully

* Latham's Ethnology, Vol. II. p. 160.

washed and anointed with oil and turmeric, is reverently laid in the coffin, and all the clothes and ornaments used by the deceased are placed with it, and also any money that he had about him when he died. Then the lid of the coffin is put on and faggots piled above and around it, and the whole is burned. The cremation takes place in front of the deceased's house. Next morning water is thrown on the ashes and search made for the bones; all the larger fragments are carefully preserved, the remainder, with the ashes, are buried then and there. The selected bones are placed in a vessel and hung up in the house in a place where they may be continually viewed by the widow or mother. Thus they remain till the very extensive arrangements necessary for the final disposal are effected. A large monumental stone has to be selected, and it is sometimes so large that the men of several villages are employed to move it. It is brought to the family burial place, which with the Hos is close to their houses, and with the Oraons generally separated from the village by a stream. A deep round hole is dug beside the stone, and when all is ready, a procession is formed consisting of one old woman carrying the bones on a decorated bamboo tray, one or two men with deep sounding wooden drums, and half a dozen young girls, those in the front rank carrying empty and partly broken pitchers, and brass vessels. The procession moves with a solemn ghostly gliding step, in time to the deep sounding drum. The old woman carries the tray on her head, but at regular intervals she slowly lowers it, and as she does so, the girls gently lower and mournfully reverse the pitchers and brass vessels, to shew that they are empty.

In this manner the remains are taken to the house of every friend and relative of the deceased, within a circle of a few miles, and to every house in the village, and as it approaches, the inmates come out and mourn, as they call to mind all the good qualities of the deceased. The bones are thus conveyed also to all his favourite haunts, to the fields he cultivated, to the grove he planted, to the threshing-floor where he worked, and to the *akrah* where he made merry. When this part of the ceremony is completed, the procession returns to the village and moves in circles round the grave, gradually approaching its goal: at last it stops, and a quantity of rice and other food, cooked and uncooked, is now cast into the hole. The bones are then put into a

new earthen vessel and deposited on the rice, and the hole is filled in and covered with the large slab which effectually closes it against desecration.

The collection of these massive grave stones under the fine old tamarind trees is a remarkable feature in Kol villages, and almost an indelible one, for they are found in many places where Kols have not existed for centuries. Besides the grave stones, monumental stones are set up outside the village to the memory of men of note. They are fixed in an earthen plinth, on which, shaded by the pillar, the ghost is supposed to sit. The Kheriahs have collections of these monuments in the little enclosure round their houses, and offerings and libations are constantly made to them.

The funeral ceremonies above described are of a composite order, mingling with the Hindoo custom of cremation, what was in all probability their original mode of burial; but a very profound reverence for the dead pervades them all. I think it is very probable that the Kols originally disposed of their dead differently. The coffin, though put together on the faggots that are to consume it, has projections as if to facilitate transport. Omit the burning and substitute burial, and we have the careful disposal and subsequent adoration of the dead that is practised by the Chinese; but the burning of the body and the long retention of the ashes in a portable form may have been adopted at a time when the tribe could not be certain of continued residence in one place.

Tickell has given at length the Ho legend of the origin of the human race. It is supremely absurd, and very few of the present generation know anything or care anything about it. I have always found such legends changeable and untrustworthy. With no written record to give them permanence, they are altered either to suit new conditions or the fancy of the reciter. Thus though the Kols have known the English for little more than half a century, they assign to them a most honourable place in their genesis. The Assam Abors and Garrows do just the same.

I do not think that the present generation of Kols have any notion of a heaven or a hell that may not be traced to Brahminical or Christian teaching. The old idea is that the souls of the dead become "*bhoots*," spirits, but no thought of reward or punishment is connected with the

change. When a Ho swears, the oath has no reference whatever to a future state. He prays, that if he speak not the truth he may be afflicted in this world with the loss of all, health, wealth, wife, children; that he may sow without reaping and finally may be devoured by a tiger; but he swears not by any hope of happiness beyond the grave. He has in his primitive state no such hope, and I believe that most Indian aborigines, though they may have some vague ideas of continuous existence, will be found equally devoid of original notions in regard to the Judgment to come.

It may be said that the funeral ceremonies I have described, indicate clearly a belief in resurrection, else why should food, clothes and money be burned with the body or buried with the ashes? The Kols have given me the same explanation of this that I once before received from the Chulikutta Mishmees in Upper Assam, who have no notion of any existence beyond the grave. They do not wish to benefit by the loss of their friend, which they would do if they were to appropriate any article belonging to him: they therefore give with him all his personalties, all property that he and he alone used and benefited by; but this does not apply to the stock of the farm and household property that all profit by, or even to new cloth, for that might have been procured for any member of the family. It often happens that a respectable 'Ho' has goods of this nature, that he abstains from using even once, because if once used, the article will be destroyed at his death.

The Moondah Oraon races are passionately fond of field sports, and are so successful that large and small game soon disappear from the vicinity of considerable settlements; and they fear not to make a new settlement, consisting only of a few huts, in the jungles most infested by wild beasts. Every year at the commencement of the hot season, they form great hunting parties which are well described in Tickell's memoir. They are also greatly addicted to cock-fighting. They have periodical meets at assigned places where hundreds of fighting cocks are collected. Cruel steel spurs are used, and the combat is always *à l'outrance*, the victims becoming the property of the owners of the victorious birds. This is, I think, the only stake. They are fond of fishing too, and some of them are very expert in spearing large fish.

The arms of the Kols are to this day what they were in the days of "*Rama*"—the bow and arrow and battle-axe. The bow is simply a piece of bamboo, and the string is of the same material. The war arrows have large broad blades doubly and trebly barbed, but they make them of all shapes: poison they do not use. They commence practice with the bow and arrow at the earliest age. In Singbhoom boys three and four years old and upwards, when herding cattle or otherwise engaged, have always their bow, and blunt and sharp arrows; the former for practice, the latter to bring down birds when they have a chance.

In the villages of Chota-Nagpore where the Oraon and Moondah are mixed up together, the difference of character between the two races is not much marked; but if we compare the Singbhoom Hos or Chota-Nagpore Mankees and the Oraons, we see strong contrasts. The Oraon has the lively happy disposition of the Negro. He is fond of gaiety, decorating rather than clothing his person, and whether toiling or playing, is always cheerful.

The Ho or Moondah has more the dignity and reserve of the North American Indian, at least when he is sober. He appears to less advantage when he is drunk, and he is not unfrequently in that state. At all festivals and ceremonies, deep potations of the rice-beer called "*celey*" are freely indulged in by both sexes. Inspirited by this beverage, the young men and girls dance together all day and half the night; but the dances are perfectly correct, and whenever these meetings have led to improprieties, it is always attributed to a too free indulgence in *celey*. As a rule, the men are reserved and highly decorous in their treatment of the women; and the girls, though totally free from the prudery that secludes altogether or averts the head of a Hindoo or Mahommedan maiden when seen by a man, have a modest demeanour, combined with frank open manners and womanly grace.

It is said by some, that at the seasons of their great festivals amongst themselves, breaches of chastity are of frequent occurrence; but the mere freedom of intercourse allowed to the sexes is likely to be viewed with unmerited prejudice and misconstrued by their neighbours of different race who place such restrictions upon it, and I believe that this may give rise to false imputations of impropriety. It is, at

all events, a fact that illegitimate births are rare. Out of her own tribe, a Ho girl is hardly ever known to go astray, though from the freedom allowed to her and, for a tropical climate, the ripe age at which she is likely to be sought in marriage, she must have to pass through many temptations.

The Hos are acutely sensitive under abusive language that at all reflects upon them, and may be and often are driven to commit suicide by an angry word. If a woman appears mortified by anything that has been said, it is unsafe to let her go away till she is soothed. The men are almost as sensitive as the women, and you cannot offend them more than by doubting their word. It has often seemed to me that the more a statement tells against themselves, the more certain they are to tell the exact truth about it. It frequently happens that a man is himself the first person to bring to notice that he has committed a crime; he tells all about it, and deliberately gives himself up to be dealt with according to law.

The Oraon is, I think, less truthful, he is more given to vagabondising, and wandering over the face of the earth in search of employment; he soon loses all the freshness of his character. He returns after an absence of years, unimproved in appearance, more given to drink and self-indulgence, less genial and truthful than before, with a bag of money that is soon improvidently spent. Those who have never left their own country have far more pleasing manners and dispositions, than those who return to it after years spent in other parts of India or beyond the seas. The fact is, they are not an improvable people. They are best seen in their wild state.

There is no more pleasing trait amongst all these tribes than their kindly affectionate manner one towards another. I never saw girls quarrelling, and never heard them abuse each other. They are the most unspiteful of their sex, and the men never coarsely abuse and seldom speak harshly of the women. This is remarkable on this side of India where you seldom pass through a bazar without hearing women screeching indecent abuse at each other across the street, whilst the men look on. A Kol girl's vocabulary is as free from bad language of this kind as a Bengalee's is full of it.

The young Oraons of both sexes are intensely fond of decorating their persons with beads and brass ornaments. These they entirely

discard on embracing Christianity, and the converts may be always recognised by the total absence of all such adornment. The converts do not join in the dances, or festivals, and must not even be seen as spectators, when they are going on. They appear indeed to lose all relish for their old amusements, and shrink with horror at the idea of resuming their discarded ornaments. And as Christianity is rapidly spreading amongst them, and in all probability will continue to spread more and more rapidly every year, it is quite possible that in the course of a few generations, the most marked characteristics of the races I am describing, will have been effaced for ever. It is marvellous with what firmness old prejudices are abandoned, old customs discarded, and even tastes changed, when they become Christians; and there is now a wide-spread feeling amongst the Kols themselves, that this change will inevitably come upon them all.

The Moondah-Oraon are a rapidly increasing people. We may form some calculation as to the rate of increase by the statistics of the Mission. In 1864, the baptised converts numbered 5,923, and in that year there were 195 births to 80 deaths. In 1865 there were 7,828 baptized Christians, and the births during the year were 309 to 86 deaths. The number of professing Christians is probably double the number registered as baptized. I subjoin in a tabular form brief vocabularies of the Moondahs and their cognates, referring to Tickell's memoir for a full notice of the language. I annex notes on the Oraon language with which I have been kindly favoured by the Reverend Frederic Batsch.

APPENDICES.

APPENDIX A.

List of words and phrases to be noted and used as test words for the discovery of the radical affinities of languages, and for easy comparison.

Numerals.	One to ten.	Twenty.	Fifty.	Hundred.
Pronouns. I.	Of me.	Mine.		
We.	Of us.	Our.		
Thou.	Of thee.	Thine.		
You.	Of you.	Your.		
He.	Of him.	His.		
They.	Of them.	Their.		

Hand.	Father.	Sun.
Foot.	Mother.	Moon.
Nose.	Brother.	Star.
Eye.	Sister.	Fire.
Mouth.	Man.	Water.
Tooth.	Woman.	House.
Ear.	Wife.	Horse.
Hair.	Child.	Cow.
Head.	Son.	Dog.
Tongue.	Daughter.	Cat.
Belly.	Slave.	Cock.
Back.	Cultivator.	Duck.
Iron.	Shepherd.	Ass.
Gold.	God.	Camel.
Silver.	Devil.	Bird.

Go.	Come.	Die.
Eat.	Beat.	Give.
Sit.	Stand.	Run.

Up	down	before
near	far	behind
who	what	why
and	but	if
yes	no	alas.

A Father.	Two Fathers.	Fathers.
Of a father.		Of fathers.
To a father.		To fathers.
From a father.		From fathers.

A daughter.	Two daughters.	Daughters.
Of a daughter.		Of daughters.
To a daughter.		To daughters.
From a daughter.		From daughters.

A good man.	Two good men.	Good men.
Of a good man.		Of good men.
To a good man.		To good men.
From a good man.		From good men.

A good woman.	Good women.
A bad boy.	A bad girl.

good	better	best
high	higher	highest

a horse	a mare	horses	mares
a bull	a cow	bulls	cows
a dog	a bitch	dogs	bitches
a he-goat	a female goat	...	goats
a male deer	a female deer	...	deer.

I am	Thou art	He is.
We are	You are	They are.
I was	Thou wast	He was.
We were	You were	They were.

Be.	To be.	Being.	Having been.
I may be.	I shall be.		I should be.

Beat.	To beat. Beating.	Having beaten.
I beat.	Thou beatest.	He beats.
We beat.	You beat.	They beat.
I am beating.	I was beating.	I had beaten.
I may beat.	I shall beat.	I should beat.
I am beaten.	I was beaten.	I shall be beaten.
I go.	Thou goest.	He goes.
I went.	Thou wentest.	He went.
Go.	Going.	Gone.

What is your name?
How old is this horse?
How far is it from here to Kashmir?
How many sons are there in your father's house?
I have walked a long way to-day.
The son of my uncle is married to her sister.
In the house is the saddle of the white horse.
Put the saddle upon his back.
I have beaten his son with many stripes.
He is grazing cattle on the top of the hill.
He is sitting on a horse under that tree.
His brother is taller than his sister.
The price of that is two rupees and a half.
My father lives in that small house.
Give this rupee to him.
Take those rupees from him.
Beat him well and bind him with ropes.
Draw water from the well.
Walk before me.
Whose boy comes behind you?
From whom did you buy that?
From a shop-keeper of the village.

APPENDIX B.

Comparative Table of Aboriginal words.

English.	Dravidian.		Kolarian.		Indo-Chinese.		
	Tamul.	Gond, Oraon & Rajmehalee.	Hos or Singbhoom Kols.	Sontals.	Thibetan.	Bodo or Mechi.	Khamti (Siamese.)
One	onru	undi	mi	mia	chik	che	niong
Two	irandu	ranu	bara	baria	nyis	ne	song
Three	munru	munu	apia	pia	sum	tham	sam
Four	nalu	nalu	apania	ponia	zhi	bré	si
Five	angu	saighan	moya	monaya	gna	ba	pa
Six	aru	sarong	turia	turüi	thu	do	pok
Seven	ezhu	yetu	iya	iair	dun	chin	tet
Eight	ettu	anamur	irlia	iral	gyé	ye	pet
Nine	oubadu	...	area	ărĕ	guh	küha	kan
Ten	pata	pada	gelea	gel	chuh	te	sip
I	nan	enan or en	aing	ing	gna	ang	kaü
Thou	ni	nien	am	amg	khe	nang	maü
He	avan	asan or atti	ini	üni	khü	bi	man

We	nam	em or nam	allege	...	gnango	jong	han
You	nin	asü or nina	inkoghi	...	khengo	nang	maü-su
They	avar	asabar or awar	anko	...	khongo	bi	man-ku
Mine	enadu	onghi	iyan	ingrea	gna-yi	ang-ni	kaü
Thine	imadu	ningki	amma	ami	khe-yi	nang-ni	maü
His	avanadu	ona	ini	ünea	kho-yi	bi-ni	man
Our	namadu	emki or mabai	allea	allea	gnango-yi	jong-ni	...
Your	umdu	usghi or nimki	appea	appe	khengo-yi	nang-charni	...
Their	avaradu	ona	enkoa	ankure	khongo-yi	bi-charni	...
Hand	kai	kaik	thi	tihi	sang	akhai	mü
Foot	adi	dappi or kev	katu	kata	kango	yupha	tin
Eye	kan	kank	met	med	mik	mogon	ta
Mouth	vayi	bai	á	mocha	kha	khoügü	sop
Tooth	pal	palk	datha	datha	so	hathai	khiü
Ear	kadu	kheb or kavi	latur	lutur	sa or amcho	khoma	hü
Hair	mayir	robung or chütti	up	up	kin or pra	khanai	pe
Head	talei	tala or kuk	bu	bohu	go	khoro	ho
Father	tandei	wawoo	apang	baba	pha	bipha	po
Mother	tayi or ayi	aval or aya	eang	iyo	ama	bima	me
Man	alsa	allu or malê	ho	horh	mi	hiwa	kun

Comparative Table of Aboriginal words,—(Continued.)

English.	Dravidian.		Kolarian.		Indo-Chinese.		
	Tamul.	Gond, Oraon & Rajmehalee.	Hos or Singbhoom Kols.	Sontals.	Thibetan.	Bodo or Mechi.	Khamti (Siamese.)
Sun	pakalon	dharmi or ber	singi	singi	nisina	shan	wan
Moon	tingal	bilpe	chandu	chundo	dawa	nokabir	lun
Star	vanmin	suku or binka	epil	ipil	kurma	hatot	naü
Fire	nirappu	kis or chik	sengel	sengil	ma	wat	fai
Water	nir	ver	dah	dha	chu	doi	nam
Earth	nilam	kekhat	oti	ot	sa	ha	languim
House	manei	roon or erpa	oa	ora	nang	noü	häu
Horse	kudirei	kondand	sadam	sadham	ta	korai	mää
Dog	nayi	nai	seta	seta	khyi or ayo	ahoi or ma	mă
Cat	pussei or punei	birka	bilai	pusi	byala or süni	moügi	miaü
Fish	min	min	haku	hai	gna	na	pa
Cow	pasu or avu	üdi or oi	gundi	üri	ba	masha	ngo

APPENDIX C.

Comparative Table of Northern and Arian Words.

English.	Sanscrit.	Persian.	Turkish	Hindee.	Panjabee.
One	éka	ék	bir	ék	ek, eko
Two	dwi	do	iki	do	do
Three	tri	seh	üch	tray or tin	teen
Four	chatur	chahar	dürt	char	char
Five	panchan	panj	besh	panch	panj
Six	shash	shas	altië	cheh	chi
Seven	sapta	haft	yeddi	sat	sút
Eight	ashtan	hast	sekkiz	ath	uth
Nine	navan	nah	dokküz	nava, or nau	nou
Ten	dashan	deh	own	das	das
Twenty	vingsati	best	yirmi	bis, or koree	vee, koree
Fifty	panchásat	punjah	elli	puchas.	punjah
Hundred	sata	súd	yüz	sow	sow
I	aham	man	ben	main	muen
Of me	mama or me	i-man	benin	mujhka	mujhda
Mine	madiya	man or Am	-m,-in	merá	mera

Comparative Table of Northern and Arian Words,—(Continued.)

English.	Sanscrit.	Persian.	Turkish.	Hindee.	Panjabee.
We	vayam	ma	biz	ham	assi
Of us	asmakam, nah	i-ma	bizim	hamka	assi da
Our	asmadiya	ma or an	miz, imiz	hamara	sada
Thou	twan	to	sen	tu	too
Of thee	tava, te	i-to	senin	tujhka	tugh-da
thine	twadiya, távaka	to or at	-n, in	tera	tera
You	yuyam	shuma	siz	toom	tassi
of you	yusmákam, vah	i-shuma	sizne	toom ka	tasi da
Your	yusmadiya	shuma	niz, iniz	toomara	tohda
He	sa	an or oe	ol	wuh	o'
of him	tadiya	i-an	anün	uska	o' da
his	tasya	ash or oe	i, si	us-ka	oéda
They	te	aishan	aular	wè	oèe
of them	tesam	i-aishan	aularüm	un-ka	ohee da
their	tadiya	aishan or shan	larü, leri	un-ka	ohee da

Hand	hasta	dast	el	hat	hūth
Foot	pada	pay	ayak	pair, paon	pyr
Nose	násiká	beenee	bürün	năk	nuk
Eye	Chaxû, netra	chashm	güz	ānkh	ukh, neta
Mouth	mukha	dehan	aghuz	mooh	mook
Tooth	danta	dandan	deesh	dānt	dund
Ear	karna	gosh	kúlák	kān	kan
Hair	kesh, bála	moo	múi	bal	wal, kes
Head	sirah, mastaka	sir	bash	sir, kulla	sir, kulla
Tongue	jihwá	zabán	deel	jib	jeebe, zuban
Father	pitá	pedr	bábá	peeta, bap	bap, pita
Mother	mátá	mádr	ama	ma	ma, umma
Brother	bhrátá	brádr	kárdásh	bhai	bhao
Sister	swashá	hamshira	küz kárdásh	bahin	bhyn
Man	mánusha, jana	mardăm	mard	manoos, admee	monookh, admee
Woman	stri	zun	karü	aurut	teemee, stree
Wife	bháryá	zöuja	karü	joroo	bohoo
Child	santána	farzund	chojük	bal, chokra	baluk
Son	putra	pesr	oghül	pootra, beta	putra
Daughter	duhitá, kanyá	dokhtr	küz	pootree, betee	putree

Comparative Table of Northern and Arian Words,—(Continued.)

English.	Sanscrit.	Persian.	Turkish.	Hindee.	Panjabee.
Sun	sûrya	aftab	ghünesh	suraj	sooraj
Moon	chandra	mah	ay	chand	chand
Star	naxatra, táraka	sitara	yildiz	tara	tara
Fire	agni	atash	átash	ag	ăg
Water	ápa, jala	áb	soo	jul, panee	jul, panee
Earth	prithwi, mrittika	zameen	toprak	prithwi, matee	bhomeen
Wood	gahan, káshtha	chob	ágáj	lakrí, kath	kath
House	griha	khana	ev	ghur	ghur
Horse	ghotaka, aswa	asp	át	ghoṛa	ghoḍa
Cow	gábhi, go	gão	inek	gai	gou, goru
Dog	kukkura, swan	sug	küpek	kootha	kootha
Cat	biḍála	gurbah	kedi	billee	billee
Fish	matsya	mahi	balük	muchee	muchee, mas
Of a father	pitûh	i-pedr	bábánün	pitee ka	peethe da
To a father	pitaram	ba-pedr, pedr-ra	bábáyah	pithee ko	peethe nu
From a father	pitûh	az pedr	bábádan	pithee se	peethe, te

Two fathers	pitarau	do-pedran	iki bábá	do pithee	do peethe
Bad father	dushta pitá	pedr bad	.....	bud pitha	bad peetha
Fathers	pitarah	padran	.....	pithe	peethe
Good man	saj-jana	ek mardum khoob	ayü mard	acha admee, bhala manus	changa manuk
Two good men	saj-janau	do marduman khoob	iki ayü mard	do bhale manus	do change manuk
Good men	saj-janáh	marduman khoob	ayü mardlar	bhale manus	changé manuk
Good	sat	khoob	ayü	achha, suth	changa
Better	sat-tara	khoobtar	daha ayü	aur achha	
Best	sat-tama	khoobtareen	au ayü	subse achha	oodumee
I am	asmi, bhavámi	man hastam	olürüm	main hoon	main hon
Thou art	asi, bhavasi	tu hasti	olürsum	tu hai	tu hai
He is	asti, bhavati	oe hast	olür	wuh hai	o' hai
We are	smah, bhavámah	ma hasteem	olürüz	hum hain	assi hain
You are	stha, bhavatha	shuma hasted	olüsünüz	toom hain	tussi hain
They are	santi, bhavanti	anan hastand	olürlar	wee hain	oee hain
I was	ásam, abhavam	man boodam	olürdüm	main tha	main tha
Thou wast	ásih, abhavah	tu boodee	olürdün	tu the	tu the
He was	ásit, abhavat	oe bood	olürdú	wuh the	o' the
We were	ásma, abhaváma	ma boodeem	olürdak	hum the	assi the
You were	ásta, abhavata	shuma booded	olürdünúz	toom the	tassi the
They were	ásan, abhavun	anau boodand	olürdülar	we the	oee the

Comparative Table of Northern and Arian Words,—(Continued.)

English.	Sanscrit.	Persian	Turkish.	Hindee.	Panjabee.
Be	bhava	bash	ol	ho	ho
To be	bhavitum	boodan	olmak	hona	hona
Having been	bhutwá	boodah	olmüsh	hokar, hoke	hoke
I shall be	bhavishyami	man khaham bood	olajagüm	hoga	hoga
I should be	abhavishyám	man khaham bood	olsüm	honga	honga
I beat	aham hanmi	man zadam	wurüm	main maron	main maren
Thou beatest	twam hansi	tu zadee	wursüm	tu mare	tu mare
He beats	sa hanti	oe zad	wurür	wuh mare	o' mare
We beat	vayam hanma	ma zudeem	wurürüz	hum maren	assi maren
You beat	yuyam hatha	shuma zaded	wurürsünüz	toom maren	tassi maren
They beat	te ghnanti	anan zadand	wurürlar	we maren	oee maren
Beat	jahi	be-zan	wur	mar	mar
To beat	hantum	zadan	wurmak	marna	marna
Having beaten	hatwá	zadah boodah	wurmüsh	markar	markee
I did beat	aham jaghána	man zad boodam	wurürdüm	marahon	marahon
I shall beat	aham hanishyámi	man khaham zad	wurajagüm	maronga	maronga

Comparative Table of Arian Words,—(Continued.)

English.	Pushtoo.	Aboriginal Caucasian.	Cashmeree.	Khas of Nepal.	Singalese.
One	you	ach	akh	ék	ekai
Two	dwá	du	zuh	dwi	dekai
Three	dare	tre	trae	tin	thunai
Four	salor	tsadda	tsoar	chár	hatherai
Five	punz	punts	pánts	pánch	pahai
Six	sh'paj	su	sheh	chhah	hiai
Seven	avo	sut	sat	sát	hathai
Eight	atha	ast	aait	áth	atai
Nine	nah	nu	noun	nou	namai
Ten	las	dos	dah	das	dhahayai
Twenty	schil	biis	wuh	bis	vissai
Fifty	pinzust	du-isa-dos	pantsah	pachás	panahai
Hundred	sil	pune	hat	sai	sēyaí
I	zu	ei	boh	man	mamey
Of me	zma	ima	müne	meró	magey
Mine	zma	ima	meum	.....	magey
We	manga	ima	ass	hami hera	matey
Of us	zmuj	imṇa	sone	hami heruko	apey
Ours	zmuj	imṇa	meüm	.....	apey

Comparative Table of Arian Words,—(Continued.)

English.	Pushtoo.	Aboriginal Caucasian.	Cashmeree.	Khas of Nepal.	Singalese.
Thou	ta	tu	tsu	toṉ, taṉ	thamoosay
Of thee	da ta	tua	choan	tero	thamoosaygey
Thine	sta	tua	theum	.....	thamoosaygey
You	taso	vi	tsuhu	timi heru	umbe
Of you	da taso	ya	tahoond	timi heruko	umbegey
Your	staso	ya	tuhaindi	.....	umbegey
He	hagha	sega	su	ú	āya
Of him	da hagha	sêga	taha	ùskò	āyagey
His	da hagha	sêga	tamsand	.....	āyagey
They	hago	sige	tum	úní heru	awan
Of them	da hago	sigā	tila or tunun	uni heruko	awänegey
Their	da hago	sigā	tuhand	.....	awanegey
Hand	las	das	atha	háth	hathey
Foot	.....	kur	kor, padu	gṓrá	paya, kakoole
Nose	paza	nasuri	nast	náka	naháye
Eye	stirgha	ānsi	nag, anch	aṉkha	áha
Mouth	.....	asi	aás, kiat	mukha	kate
Tooth	.....	dont	dand	dáṉt	dhathe

Ear	ghwaj	karna	kan	kan	kane
Hair	zooli	dru	mast, wal	raon	kes, tssakaya
Head	.....	sa	kálla	tau, tou	oloowe
Tongue	.....	.....	jian	.....	dhewe
Father	plár	dai	maul	bábá	appa, thatha
Mother	mor	arau	maij	amma	amma
Brother	uror	bla	boi	doju	tya
Sister	khor	sus	benjí	bahini	nanyee
Man	sarrae	mats	mohnyn	manis	miniya
Woman	khadza	istri	zanana, bya	swasní	ganee
Wife	mandinah	.....	bya	jo'i	ishteree
Child	balak	.....	shur, nechu	.....	lamaya
Son	dzoe	sagga	nechu	chóra	pootha
Daughter	jmai	su	kori	chóri	.....
Sun	.....	.....	saria	surj	surya, ouwa
Moon	spazma	.....	zun	chánd	handhe
Star	storò	.....	tarukh	tárá	istharookawe
Fire	or	ana	agan, nār	ago	gindhere
Water	oba	abu	tresh	pani	wathoore
Earth	.....	boom	zameen	prithwi, mati	polawa

Comparative Table of Arian Words,—(Continued.)

English.	Pushtoo.	Aboriginal Caucasian.	Cashmeree.	Khas of Nepal.	Singalese.
Wood	owani	dau	agar	káth	
House	kor	ama	gar, car	ghar	gadhere
Horse	ás	guru	gür	ghora	aspeya
Cow	ghwa	ga	goop	gai	gona
Dog	spaí	kuri	hoon	kukar	balla
Cat	pūshee	bisas	broar	biralo	ballelee
Fish	.....	.....	gad	machha	matsya, maloo
Oí a father	da plara	dai-wa or dā	malu sand	bábá ko	thathagey
To a father	plara ta	dai-e	malis	bábá lai	thathalí
From a father	la plara	dai-da	malinishī	.....	thathageng
Two fathers	dwa plaruna	du dai	zu mail	dwi baba	thathadhenna
Fathers	plaruna	dai	mail	bábá heru	thathagey
Bad father	nakar plar	abaru daí	yech maul	naniko bábá	narake thattha
A good man	khah sarrae	mats maista	ek rut mohuyn	ek niko manis	hondhe mineya
Two good men	dwa khaha sarri	du mats maista	zu ruch mohnivi	dwi niko manis heru	hondhe minissu-dhenna
Good men	khaha sarri	mats maista	ruch mohnivi	niko manis heru	hondhe minissu

Good	khah	maista	rut or jan	niko	hondhe
Better	der khah	.....	yats rut		
Best	tol khah	.....	sitah rut		
I am	zu yaim	ei sum	boh chus		
Thou art	ta ye	tu sis	tsa chuk		
He is	hagha dhè	sega se	su chu		
We are	munga yoo	ima simis	áass ché		
You are	taso yast	vee sik	tohi chewak		
They are	hagha deè	sege sin	tim ché		
I was	zu woom	ei su	boh asus		
Thou wast	ta we	tu suus	tsu asuk		
He was	hagha woo	sega se	su aus		
We were	manga wôô	ima sumis	áass ais		
You were	taso wêê	vee sus	tohi asawa		
They were	hagha wôô	sige sin	tim assis		
Be	aos	sales	sta-as		
To be	aosdal	.....	asan	honee	
Having been	.....	.....	asmut-asas		
I shall be	zu bah yáim	ei salam	boh yats asan		
I should be					

Comparative Table of Arian Words,—(Continued.)

English.	Pushtoo.	Aboriginal Caucasian.	Cashmeree.	Khas of Nepal.	Singalese.
I beat	zu wajam	ei veeyansam	boh layan chus	.....	mamey ghahanown
Thou beatest	ta wajè	tu veeyansis	tsu layan chuk		
He beats	hagha wajé	siga veeyansi	su layan chu		
We beat	munga wajó	.....	aass layan che		
You beat	taso wajo	.....	tohi layan chewak		
They beat	hagha wajeè	.....	tim layan ché		
Beat	waj	veeyans	layan or maron	.....	gahapan
To beat	wajdal	.....	layan	.....	gahande
Having beat	wajhalee	.....	asmat layan		
I did beat	zu wajdam	ei veeyansa	boh layan asus	.....	mumey gahanwa
I shall beat	zu bah wájam	ei veeyansalam	boh yats layan	.....	mumey gahanowa

Comparative Table of Arian Words,—(Continued.)

English.	Bengalee.	Ooryah.	Maharatta.	Guzeratee.
One	ek	eko	ek	ek
Two	dui	doo-i	don	be
Three	tin	tini	ten	tran, ton
Four	chár	chari	chár	chár
Five	pánch	pancho	páṇch	paṇch
Six	chhay	chho	sahá	chhã
Seven	sát	shato	sát	sát
Eight	át	atho	át	át
Nine	nay	no-o	nou	nou
Ten	das	dosho	dãhá	dãs
Twenty	bish, kuri	kore-e	vis	bis
Fifty	panchás	ponchaso	pännás	pachás
Hundred	sata	shoye	sämbhär	sou
I	ámi	ambhay	mi	hún̤
Of me	ámár, mor	ambhor	májhe	márún̤
Mine	mama, madiya	ambhor	májhe	márún

English.	Bengalee.	Oorya.	Maharatta.	Guzratee.
We	ámrá	ambkoo	amhi	apre, hămon
Of us	ámáder, moder	ambha mankoo	ápăs-che, ápás	aprúṇ
Ours	,,	ambha manunkoo	amhálokáche	aprúṇ
Thou	tumi	toombhay	tomhi	túṇ
Of thee	tomar, tor	toombhar	tujhe	thárú
Thine	taba, twadiya	toombhar	tujhe, tomche	thárú
You	tomrá	toombho man	tomhi lok	tome
Of you	tomáder, toder	toombho manko	tomhá lokáche	tomárú
Your	jushmadiya	toombho manunkoo	tumche, tomhâ lokâche	tomárú
He	tini, se	tahar	to	te
Of him	tár, táhár	tankor	tyáchá	tenu
His	tadiya	tankor	tyáchá	tenu
They	tárá, táhárá	samanay	tyálokáchá	teo
Of them	táder, táháder	tahankor	tyálokási	teonu
Their	tadiya	tahankor	tyálokáche	teonu
Hand	hát	hato	háth	háth
Foot	pá	goro	pád	păg
Nose	năk	nako	nák	nák

Eye	cḥok	akhi	dăre	áṇkh
Mouth	mukha	mooho	tond	măhrú
Tooth	dānt	danto	dát	dánt
Ear	kān	kano	kán	kán
Hair	chul	balo	kes	bál
Head	máthá	motha	doká, sir	máthu
Tongue	jib	jihba	jíbh	jíbh
Father	báp	bapo	báp	báp
Mother	má	ma	máĭ, áĭ	máh
Brother	bhái	bhai	bháú	bhái
Sister	bon	bhownee	băhin	ben
Man	mánnsh	minipo	mánús	mánús
Woman	máyá, má	maikinya	boiká	strí, boiré
Wife	mág, strí	mipo	boikú	pannelí, boire
Child	santán	chha, pila	săntăli, lekre.	bachchhon
Son	chhelya	poo-o	loyk, putro	dikro
Daughter	máyá	jhiyo	lyek.	dikró
Sun	surja	soorjyo	súriyo.	súraj
Moon	chánd	chando	chăndră	chánd
Star	tárá	tora	lakshtră	tárá

Comparative Table of Arian Words,—(Continued.)

English.	Bengalee.	Oorya.	Maharatta.	Guzratee.
Fire	águn	nian	agni, bistu	ágni, ág
Water	jal	paní	páni	páni
Earth	mãtí, bhuí	proothwee	prithwí, zamin	mitté, zãmín
Wood	kát	katho	lãkre, lákúr	lãkroṇ
House	ghar	ghur	ghãr, wáṛá	ghár
Horse	ghoṛa	gorha	ghorá	ghoro
Cow	goru	gai	gáí	gáí
Dog	kukur	kootha	kutrá	kutro
Cat	biṛãl	birarhee	mánjer	belárí
Fish	mách	machhee	mássá	mãchhlí
Of a father	báper	bapur	bápá che	bápnú
To a father	bápke	bapungko	bápás	bápne
From a father	báper thaiṇ	bapungko tharo	bápá pásúṇ	báp pásethi
Two fathers	dni báp	doee bapo	don báp	be bãp
Fathers	bápera	bapwanay	bahu báp	bápã
Bad father	manda báp	manda bap	wáet báp	khãráb báp

A good man	ek bhála lok	eka bhala loko	ek changle mánús	ek sáro mánús
Two good men	dui bhála lok	dwi bhala loko	don changle mánúsă	be sáru mánúsă
Good men	bhála lokera	bhala loko monay	changlé mánúsă	sáru mánúsă
Good	bhála	bhala	chángle	sáru
Better	uttamatara	bhala roo bhalo	te apekshá chángle, or te áhúm chánge	bodháre sáru
Best	uttamottama	utkrista	bahut chángle	sonthé sáru, bodáthé [sáru
I am	ámi áchi	ambhay hŏoon	mi áhe	hún chháún
Thou art	tumi ácha	tombhay hooo	tú áhas or tomhi áhet	túṉ chhe
He is	tini áchen	say hooonti	to áhe	te chhe
We are	ámrá áchi	ambhay manay hoo	amhilok áhot	hamon chheyó
You are	tomrá ácha	toombhy manay hooo	tumhilok áhót	tomen chho
They are	tárá áchen	say manay hooon	tya lok áhet	teo chhe
I was	ámi chhilám	ambhay hooi the	me hoto	húṉ hoto
Thou wast	tumi chhilá	toombhay hooi thelu	tu hotásh	toṉ hoto
He was	tini chhilen	say hoi thela	to hotá	te hoto
We were	ámrá chhilám	ambhay maney hoitheloo	amhilok hoto	hămon hotá
You were	tomrá chhilá	toombhay manay hoithela	tumhilok hotá	tomeṉ hotá
They were	tárá chhilen	say manay hoithela	tyalok hote	teo hotá
Be	hao	hooo	honá	houṉ, thobon
To be	haite	ho-ba	honáche	thowáne
Having been	haiyá, haile	ho-oo	jhále	thayúṉ hotoṉ

Comparative Table of Arian Words,—(Continued.)

English.	Bengalee.	Oorya.	Maharatta.	Guzratee.
I shall be	ámi haibo	ambhay haybon	mi eyên	hún thowás
I should be	ámi haitám	.....	mi álăch	măne tháú joiă
I beat	ámi mári	ambhay maree	mi márta he	hún márúchhoṉ
Thou beatest	tumi máro	toombhay maro	tu máritos	ton márechhe
He beats	tini máren	say maronti	to márito	te márechhe
We beat	ámrá mári	ambhay manay marie	amhilok márito	hămon máiechhyé
You beat	tomrá máro	toombhay manay maro	tumhi márá	tomeṉ márochho
They beat	tárá máren	say manay maroonte	telok márle	teo márechhe
Beat	már	mara	már	maroúṉ
To beat	márite	mariba	márálá	márwáne
Having beaten	máriyá	maree	márle láhe	márco
I did beat	ámi máriyáchhi	ambhay mareethala	mi márle	me márco
I shall beat	ámi máribo	ambhay marreebo	mi máren	hún máris

APPENDIX D.

Kashmiree Vocabulary and Grammatical Forms.

In consequence of recent discussions in the Society, Mr. L. Bowring, Commissioner of Mysore, was kind enough to let me know that he had many years ago compiled and sent to the Society a Kashmiree Vocabulary. The result has been the discovery of a paper as valuable as the hereditary reputation of the author would lead us to expect, which the Society now loses no time in publishing, and which it has been thought well to put in this place in connection with our Ethnological inquiries. Mr. Bowring's paper gives us a far fuller and better knowledge of the Kashmiree language than anything that we have yet had. The Vocabularies are very full, exact, and well arranged, and the grammatical forms of the verb especially are very fully set forth. It is only necessary (treating the matter ethnologically) to observe that since Persian has been for several hundred years the language of Government, religion and literature in Kashmir, and there has also been a long connection with Hindustan and the Punjab, a vast number of Persian words and phrases, and some Hindustanee and Punjabee expressions have necessarily incorporated themselves in the modern Kashmiree, especially as spoken by the better classes. In fact, that wonderful language Persian infuses itself wherever it comes in contact, and it abounds in Kashmiree just as in the upper class Hindustanee and in fact in Turkish also. Hence a faithful specimen of the Kashmiree of the present day will be found to contain many foreign words. But they are easily distinguishable, still wearing their foreign dress and little adapted to the native forms; and for the most part such words need not be confounded with original native words in such a way as to mislead us regarding the radical affinities of the language.

I have taken the liberty of omitting from Mr. Bowring's vocabularies a few evidently Persian words of a literary, and for the most part compound character, as I thought that these would not serve our present purpose. Some remain as now part of the ordinary vulgar tongue, but looking both to the vocables and to the grammar, I think it will be found that Kashmiree is certainly allied to the Indian languages rather than to the Persian.

Mr. Bowring has, perhaps, in the examples which he has given, put the declension of the noun rather too simply. He has used the uninflected Indian form 'Manush' for man and the Persian word 'Zananah' for woman. He shows, however, that most Kashmiree nouns are inflected to form the plural, and I think it will be found that almost all real Kashmiree nouns are inflected for cases also. Both my own observations and those of Messrs. Edgeworth and Leech, as well as Mr. Bowring's dialogues give the proper Kashmiree form for man 'Mohnyn,' plural 'Mohnivi.' And the following which I take from Leech is, I believe, the true declension of the Kashmiree noun 'Nichu,' a son.

A son, nichu	Sons, nichivi.
Of a son, nichivi-sand	Of sons, nichiven-sand.
To a son, nichivis	To sons, nichiven.
From a son, nichinishi	From sons, nichiven-nishi.

With respect to the variations of the genitive case, Mr. Edgeworth seems to differ from Mr. Bowring, saying that the genitive affix is, like Hindustanee, governed in point of gender by the noun which follows rather than by that which precedes it. So far as I could make out from cursory inquiry on the spot, it seemed to me that in fact the form of this affix is affected by *both* the preceding and the following nouns. Indeed it seems to have the most extraordinary chameleon-like variety of shapes, according to the positions in which the words are placed, and the only conclusion of my inquiries was, that the rules of Kashmiree declension are so complicated, that nothing but careful and scientific study will reduce them to shape.

It may be added that feminines are formed from masculines by inflections, as—

Masculine.	*Feminine.*
Gur, horse.	guir, mare.
Kokur, cock,	kokair, hen.
Tsawal, he goat,	tsavij, she goat.
Batak, drake,	batich, duck.
Kav, male crow,	kavin, female crow.

The language is evidently altogether subject to very many post-inflections, and abounds in affixes and postpositions.

G. Campbell.

Vocàbulary of the Kashmírí Language.—By L. Bowring, *Esq., Commissioner of Mysore.*

The following vocabulary was prepared in Kashmírí in 1851, after comparison with another copy in Urdú.

It may be observed of the Kashmírí that the pronunciation of the letter *ó* is very broad, resembling the *aw* in *awful*, as for instance 'mól,' father, read 'mawl.' The language also affects the compound letter *ts* in lieu of '*ch*,' as 'tsor,' four.

The formation of the plurals of substantives is irregular, but they generally take the affixes '*cha*' and '*chí*.' The genitive of substantives takes its gender from the noun preceding, not from that following as in Urdú.

The particle نے is not used with verbs. The great number of Sanskrit words existing in Kashmírí is evident, but there are many words peculiar to the language. The character is generally written with Persian letters, but a form of Nágrí is also in use.

Substantives.

Air	ákásh	Boat	nau, shikárí
Apple	tsúnt	Brick	sír
Ass	khar	Book	púth
Arm	nar	Buffalo	moesh
Army	fauj	Bread	tsút
Age	bujar	Breast	vachh
Assistance	yári	Badness	yach
Answer	uttar	Beard	dóṛ
Arrow	tír	Bone	adij
Abuse	lēk	Bill	tont
Bird	pak	Breath	sháh
Brother	bóí	Brass	sartal
Boy	lokat	Business	kóm
Branch	lang	Basket	phut, dák
Barley	úshak	Bush	kradzál
Butter	thain	Blood	rath
Blackberry	bar	Bag	thíl
Birth	parsun	Bow	kámán
Bridge	kadul	Blow	chók

Butterfly	didar
Burglary	san
Bee	tilar
Child	bálak
Cucumber	lór
Cherry	glás
Clothes	kapaṛ
City	shahr
Copper	trám
Cow	gáó
Cat	barúr
Camel	únṭh
Chin	hongain
Coat	faran
Ceiling	tálaú
Cotton	kapás
Cheese	cháman
Claim	dáwá
Corner	kón
Colour	rang
Chesnut	búñ
Cedar	deodár
Carrot	gajar
Cloud	abar
Crossbeam	thathar
Chair	sandal
Corpse	mur
Chalk	siap
Candle	soyĕt
Day	dúh
Dew	shabnam
Daughter	kúr
Death	maran
Dog	hún
Deer	loh, rús
Duck	battuk
Dirt	mal
Deceit	bram
Darkness	gath
Dream	supan
Danger	khatar
Drop	phiúr
Dram	henur
Dance	nagmah
Earth	zamín
Elephant	hasth
Egg	thól
Eye	úchh
Ear	kan
Eyebrow	bumah
Evil	yach
Edge	buṭh
East	púr
Elbow	khŏn
Enemy	shitar
Exertion	talásh
Fire	tungul, nártun-[gul
Father	mól, băb
Father-in-law	zámtúr
Fruit	mewah
Flower	pósh
Flour	óṭ
Fowl	kukkur
Fox	patsló
Fish	gáḍ
Frog	niñímondij
Food	bat
Field	khyetí
Foot	khór
Forehead	dek
Fear	bayí
Flesh	shun
Firebasket	kángar
Foreigner	bishahrú

Fraud	dagha
Face	bút
Feather	par
Fever	tap
Fireplace	bukhárí
Friend	mitar
Family	shírbóts
Ferry	ghát
Finger	anguj
Fisher	gáḍhanj
Fist	musht
Funeral-pile	chentá
Flea	pish
Fly	mach
God	dé
Girl	lókat kúr
Grass	gás
Gram	chholá
Garlic	ruhan
Gold	són
Goat	tsáwij, tsáwul
Goose	ans
Grain	anáj
Garden	bágh
Goodness	ján
Greatness	bajar
Grape	dach
Groom	sáis
Game	gindun
Girth	tang
Husband	rún
Hail	ḍóṭ
House	garh, lur
Horse	gúr
Head	kalah
Hair	wál
Heart	vandah
Hand	ath
Height	thazar
Heap	dér, anbár
Hunger	búchí
Health	balan
Hedge	vár
Hoof	padur
Honey	mách
Horn	hiang
Hour	gaṛ
Hemp	bang
Ice	yak
Insect	kím
Iron	shistar
Indian corn	makhai
Interest	súdh
Interference	*kh*alal, toth
Ink	míl
Juice	ras
Jest	thathá
Jackal	shál
Knife	srák
Leaf	barak
Leg	lang
Lip	úth
Length	zechar
Lie	apuz
Life	umar
Light	gásh
Letter	achar, harí
Linseed	alish
Lime	chunah
Liver	jigar
Lock	kului
Load	bár
Log	haṭ
Lizard	haḍzúng

Moon	zún
Mountain	koh, parvat
Mist	vunar
Month	riat
Morning	subah, prabat
Midday	dopáhar
Man	manush, mohnú
Mother	mój
Mushroom	heḍar
Marriage	khándar
Mosque	mashíd
Money	nakd
Mule	kátir
Mouth	ós
Moustache	gónch
Measure	minun
Medicine	dawá
Milk	dódh
Molasses	gor
Manure	páh
Minute	lazá, pal
Market	koṭh
Mat	vagú
Mine	kán
Monkey	vándur
Mortgage	band
Mustard	ásur
Mint	podín
Musquito	mah
Meteorite	trath
Mouse	anmúr
Name	nav
Night	rát
Nephew	bápitar
Niece	bápitar beñí
Nose	nast
Nail	nam
Neck	gardan
Needle	súzan
Nest	ól
Noise	shor, kraknád
Number	ganzrun
Nettle	swái
Net	zál
North	vutar
Onion	parán
Oil	tíl
Oar	kúr, chapá
Oath	drí
Pumpkin	alah
Pear	ṭank
Partridge	tsar
Pearl	mukt
People	lok
Platter	thál
Pain	dód
Price	mŏl
Pair	joṛá
Poplar	farast
Piece	tukṛá
Peg	mekh
Pepper	marach
Pace	púr
Paper	kágh*a*z
Pen	kalam
Pillar	tham
Pillow	vatrun
Pit	khad
Plough	álah
Pole	chób
Power	kowwat
Pocketpicking	thappul
Question	prachun
River	daryá

Rain	rúd
Rains	barsát
Rice	tumal
Raspberry	chanchh
Road	vat
Rat	gagar
Rump	mandul
Roof	báin
Relation	rishta
Rope	raz
Red pepper	martsuwángan
Rind	diyal
Rate	mol
Rein	lákam
Remedy	iláj
Ring	vój
Rose	guláb
Rust	kháí
Sea	samandar
Sun	áítab, saría
Star	tárak
Snow	shín
Son	nichú
Sister	beñí
Son-in-law	heúr
Spring	behár
Summer	rathkól
Stem	múl
Salt	núm
Strawberry	kandachh
Street	dúr, kocha
Stone	kain
Silver	chánd
Sheep	gobh
Snake	sarp
Shoulder	phiúk
Stomach	yaḍ
Smallness	shikaslad
Strength	zór
Shadow	sáyah
Shoe	paizár
Sleep	nindar
Skin	chamu
Sound	áwáz
Seed	beul
Sugar	shakar
Stick	lúr
South	duchan
Shop	ván
Sugarcane	waishakar
Staircase	hér
Saddle	zín
Sorrow	azáb
Sack	gun
Stool	rayat, garusth
Spider	zallur
Species	ḳism
Sand	siak
Saw	lotar
Scale	trak, háyúk
Screw	pech
Sheath	kum
Sheet	chádar
Shield	sipar
Side	ṭarí
Silk	pót
Sleeve	núr
Smoke	duh
Soap	sabun
Spot	dágh
Sting	toph
Scorpion	bich
Steel	ſolád
Straw	gás

Sweat	gumah
Storm	váú
Spoon	choucha
Thunder	gagráí
Tree	kul
Temple	mandir
Teeth	dand
Tongue	jiau
Thigh	rán
Truth	puz
Time	vakt, vél
Throat	hut
Turban	dastár
Thirst	tresh
Tank	taláú
Tea	cháhí
Tail	dumah
Trade	saudágarí
Toe	khórij anguj
Tomato	ruvangan
Turnip	gogaj
Thread	pan
Tent	khema
Table	mez
Taste	maza, swád
Thorn	kanth
Theft	tsúr
Trust	itimád, pats
Uncle	pitar, chácha
Umbrella	tábdán
Udder	than
Urine	mutr
Use	kám
Venom	zahar
Velvet	makhmal
Vein	rag
Vice	páp
Village	gám
Water	áb, poũ
Wind	háwá
Woman	zenánah
Wife	kolai
Winter	vand
Wheat	kanak
Wood	zun
Wrist	mats
Width	khajar
Well	cháh, krúr
Weight	tolún
West	pachum
Washerman	dub
Watermelon	handwand
Wall	dos
Worm	ámkhiúm
Whore	háfiz
Weed	gás
Wager	dau
Wax	móm
Wheel	hagur
Widow	mond
Wing	par
Wire	tár
Wool	wón
Yard	gaj
Year	varíh

Declensions.

Singular.	N.	A man	manush
	G.	Of a man	manush-sund
	Acc.	A man	manush-is
	Ab.	From a man	manush-nishin
Plural.	N.	Men	manash
	G.	Of men	manash-sund
	Acc.	Men	manash-is
	Ab.	From men	manash-nishin
Singular.	N.	A woman	zenání
	G.	Of a woman	zenání-hund
	Acc.	A woman	zenání
	Ab.	From a woman	zenání-nishin
Plural.	N.	Women	zenánah
	G.	Of women	zenánah-hund
	Acc.	Women	zenánah
	Ab.	From women	zenánah-nishin

Examples of Plurals.

Beñí	a sister	Beñícha	sisters
Bói	a brother	Bái	brothers
Mól	a father	Mail	fathers
Mój	a mother	Májí	mothers
Nichu	a son	Nichii	sons
Kul	a tree	Kuil	trees
Barak	a leaf	Barakchi	leaves
Gám	a village	Gámchi	villages
Gás	a grass	Gáscha	grasses
Jánwar	an animal	Jánwarchi	animals

Adjectives.

Active	takṛá	Blind	un
Blunt	mund	Blue	niúl
Boiling	tut, bahar	Black	karhún
Broken	phuṭmuṭ	Bitter	tsok, chok

Bad	yach
Cheap	sug
Clever	gaṭul
Clear	sáí
Coarse	viuṭ
Crooked	hul
Cold	turun
Certain	pats
Deep	sun
Dear	drug
Dark	anigut
Deaf	zúr
Dumb	kul
Dead	múdmud
Double	zuh
Dry	huk
Dirty	malburut
Drunk	muṭ
Easy	ásán
Empty	khálí
Expert	fázil
First	pathiúm
Former	bronṭh
Fat	viuṭ
False	ápuz
Frightened	khochún
Fine	zayul
Full	barít
Fond	ṭóṭh
Good	ján
Great	bód
Glad	khúsh
Greedy	lúlachí
Green	sabz
Generous	dátah
General	ám
High	thud
Hard	dúr
Hungry	buch
Heavy	gubh
Hot	garm, ushan
Ill, bad	yach
Low	past, tsut
Long	dsiút, khul
Little	kam
Less	kehna
Last	brunṭhun
Lame	lung
Leprous	hitrilad
Lazy	sust
Light	lut
Loose	diyul
Left	hul
Lower	tal
Many	sitáh
Mad	dewána
Middle	sum
New	nó
Naked	nathnun
Old	purón, buḍh
Proud	kibar
Putrid	dudriyomut
Poor	gharíb
Quick	tikán
Ready	tayyár
Right	sind
Ripe	papiúmúd
Raw	khám
Small	lúk
Sweet	miúṭ
Stupid	nádan
Straight	siud
Square	chankunjal
Sharp	tej

Slippery	pishul	Weak	liyad
Thirsty	treshut	Well	ján
Thin	lissá	White	safíd
Tight	tang	Wet	tar, udar
Ugly	yach	Young	jawán
Upper	piaṭh		

Declension.

N.	A good man	ján manush	*Singular.*
G.	Of a good man	ján manush-sund	
Acc.	A good man	ján manush-is	
Ab.	From a good man	ján manush-nishin	
N.	Good men	jánchi manash	*Plural.*
G.	Of good men	jánchi manash-sund	
Acc.	Good men	jánchi manash-is	
Ab.	From good men	jánchi manash-nishin	

Comparison.

Good	Ján
Better	Yuts ján
Best.	Sitáh ján

Verbs.

To awake	votun	To Burn	zálun
,, Avoid	bachun	,, Blow	phok diun
,, Ascend	khasun	,, Bury	gárhun
,, Advance	bron khasun	,, Buy	miúl hiún
,, Ask	prutsun	,, Come	iyun
,, Be	sompanun	,, Cut	tsatun
,, Be able	hekkun	,, Call	nádun
,, Bring	ánun	,, Conquer	jítun
,, Begin	lagun	,, Choose	tsárun
,, Bite	tsátun	,, Cover	vatun
,, Believe	patskarun	,, Chew cud	drámun karun
,, Boil	pakinwun	,, Drink	chiun
,, Beg	mangun	,, Die	marun

To Dwell	basun
„ Do	karun
„ Decrease	kamgachun
„ Draw	lamun
„ Drive	patrozun
„ Drown	phatun
„ Expel	kaḍit tsumuṇ
„ Erase	kaḍun
„ Enter	andar atsun
„ End	makoláwun
„ Find	labhun
„ Fight	laḍun
„ Fly	uphún
„ Fall	paṛun
„ Fasten	lágun
„ Forget	mashun
„ Frighten	kotsunáwun
„ Go	gasun
„ Give	diun
„ Gamble	záras gindun
„ Hear	bozun
„ Increase	baḍun
„ Join	melanáwun
„ Kill	márun
„ Know	janun
„ Kick	lat diun
„ Lose	hárun
„ Live	zindásun
„ Leave	chhoṛun
„ Laugh	ásun
„ Learn	hichun
„ Hide	khaditrozun
„ Lift	tolun
„ Leap	khanun
„ Lie	apuz vanun
„ Meet	melun
„ Melt	galun
To Move	alaráwun
„ Open	mussurun
„ Play	gindun
„ Put on	gandun, chháwun
„ Put off	mutsurun, wálun
„ Pain	dod karun
„ Place	tháwun
„ Pass	guzaráwun
„ Plague	dek karun
„ Pour	ḍalun
„ Push	dhakdiun
„ Read	páṛhun
„ Roast	buzun
„ Run away	tsalun
„ Reap	fasl tsatun
„ Reckon	gansrun
„ Recollect	yad karun
„ Return	phir diun
„ Repel	nibar kadun
„ Retire	pat nerun
„ Ride	khasun
„ Rise	vathun
„ Row	vayun
„ Rouse	uzanáwun
„ Run	dáúwun
„ Rub	mathun
„ Stick	lagun
„ Swim	tsátwáyun
„ Swell	hunun
„ Sweep	dún
„ Suckle	cháwun
„ Sing	gewun
„ Spit	taktráwun
„ Sell	kunun
„ Sit	bihun
„ Show	hawidun
„ Send	sozun, ludun

To Strain	chhánun	To Take	hiun
„ Seek	tsáḍun	„ Taste	tsuhun
„ Sow	váwun	„ Teach	hichunáwun
„ Strike	márun	„ Throw	trevitsunun
„ Stand	istádrozun	„ Touch	lágun
„ Seize	ratun	„ Vomit	khai karun
„ Shut	bandh karun	„ Weave	vonun
„ Say	vanun	„ Weigh	tolun
„ See	uchhun	„ Wait	prárun
„ Smell	mushakhiun	„ Wish	yatsun
„ Sleep	shongun	„ Wash	chhalun
„ Speak	vanun		

CONJUGATIONS.

Sompanun, to be.

Present.		*Imperfect.*	
I am	buh chus	I was	buh ósus
Thou art	tsuh chukuh	Thou wast	tsuh ósukuh
He is	suh chuh *or* chó	He was	suh óús
We are	as chih	We were	as óús
Ye are	tahí chiwuh	Ye were	tahí ósuwuh
They are	tim chih	They were	tim óús

Perfect.

I have been	buh ósus osmutun
Thou hast been	tsuh ósukuh osmutun
He has been	suh óús osmutun
We have been	as óús osmutun
Ye have been	tahí ósuwuh osmutun
They have been	tim óús osmutun

Pluperfect.

I had been	buh ósus sompunwatun
Thou hadst been	tsuh ósukuh sompunwatun
He had been	suh óús sompunwatun
We had been	as óús sompunwatun
Ye had been	tahí ósuwuh sompunwatun
They had been	tim óús sompunwatun

Future.

I shall be	buh heksompanit
Thou shalt be	tsuh hekaksompanit
He shall be	suh hekisompanit
We shall be	as hekáúsompanit
Ye shall be	tahí hekiúsompanit
They shall be	tim hekáúsompanit

To be	sompanun
Being	sompanit
Been	sompun

Vanun, to speak.

Present.

I speak or am speaking	buh chus vanán
Thou speakest	tsuh chukuh vanán
He speaks	suh chuh vanán
We speak	as chih vanáú
Ye speak	tahí chiwuh vanáú
They speak	tim chih vanáú

Imperfect.

I spoke	mi vun
Thou spokest	tsuh vanut
He spoke	suh vun
We spoke	as vanwutun
Ye spoke	tahí vanwutun
They spoke	timáú vanwutun

Perfect.

I have spoken	mi chum vanwutun
Thou hast spoken	tsuh chuh vanwutun
He has spoken	tim chá vanwutun
We have spoken	as chá vanwutun
Ye have spoken	tahí chuh vanwutun
They have spoken	timáú chuh vanwutun

Pluperfect.

I had spoken	mi ós vanwutun
Thou hadst spoken	tsuh ósi vanwutun
He had spoken	tim ós vanwutun
We had spoken	as ósus vanwutun
Ye had spoken	tahí ósú vanwutun
They had spoken	timáú ós vanwutun

Future.

I shall speak	buh hek vanit
Thou shalt speak	tsuh hekak vanit
He shall speak	suh hekí vanit
We shall speak	as hekáú vanit
Ye shall speak	tahí hekiú vanit
They shall speak	tim hekáú vanit

Potential.

I may speak	buh vanah
Thou mayest speak	tsuh vanak
He may speak	suh vaní
We may speak	as vanáú
Ye may speak	tahí vaniú
They may speak	tim vanáú

Speak	van
Speaking	vanán
Spoken	vanwutun

Conjugation of the Passive Voice of máRun to strike.

Present.

I am struck	buh gasa márah
Thou art struck	tsuh gasak márah
He is struck	suh gasa márah
We are struck	as chih márah gasán
Ye are struck	tahí chuh márah gasán
They are struck	tim chih márah gasán

Imperfect.

I was struck	buh gós márah
Thou wast struck	tsuh gók márah
He was struck	suh gáú márah
We were struck	as gayé márah
Ye were struck	tahi gáú márah
They were struck	tim gayó márah

Future.

I shall be struck	buh gatsa márah
Thou shalt be struck	tsuh gatsak márah
He shall be struck	suh gatsa márah
We shall be struck	as gatsáú márah
Ye shall be struck	tahí gatsiú márah
They shall be struck	tim gatsáú márah

PRONOUNS.

Personal.

I	buh
Thou	tsuh
He, she	suh
We	asi, mi
Ye	tahí
They	tim, timáú

Possessive.

Mine	miún
Thine	chhón
His	tasun
Our	miún
Your	chhón
Their	tasun

Relative and Interjective.

Who?	kus?
Which?	kyá
Whoever	yus
Whatever	yih
He who	yus

Indicative.

This	ih
That	uh, suh
These	yum
Those	tium

Miscellaneous.

Self	páné
Such	yithúí
All	sárí
Same	sárú
Other	bék
Another	duyum
Any	kánh
Every	yusaká
Own	panun

Declension of Pronouns.

N.	I	buh	N.	We	mi
G.	Of me	miún	G.	Of us	as in singular
Acc.	Me	mi	Acc.	Us	
Ab.	From me	mi nishin	Ab.	From us	
N.	Thou	tsuh	N.	You	tsih
G.	Of thee	chhon	G.	Of you	as in singular
Acc.	Thee	tsih	Acc.	You	
Ab.	From thee	tsih nishin	Ab.	From you	
N.	He	suh	N.	They	tim
G.	Of him	tasun	G.	Of them	as in singular
Acc.	Him	humis	Acc.	Them	
Ab.	To him	humis nishin	Ab.	To them	
N.	This	Ih	N.	These	yum
G.	Of this	yimsun	G.	Of these	yuhund
Acc.	This	yimis	Acc.	These	yiman
Ab.	From this	yimis nishin	Ab.	From these	yiman nishin
N.	That	uh, suh	N.	Those	tium
G.	Of that	yusun	G.	Of those	tinhund
Acc.	That	humis	Acc.	Those	timan
Ab.	From that	humis nishin	Ab.	From those	timan nishin

Myself	buh páné
Of myself	buh pánas

&c.

Adverbs.

Above	piaṭ	Below	tal
Always	dohái	Backwards	pat
Almost	jaljal	Except	siwái
Also	bíyih	Exactly	thík
As	yiut	Enough	thayú
Already	wuini	Far	dúr
Alone	kunui	From	piath, nishin
Altogether	sárí sán	Forwards	brúnt

How	kiut	Still	támat
How much } How many }	kótá	Then	til
		Thus	ithui
Hither	yúr	There	tati
Inside	andar	Thither	hór
Immediately	jhaṭpaṭ	Therefore	imbápat
Near	nakh	Together	sán
Now	vuin	Very	sitáh
Nothing	kechnú	When	yil
No	nah	Where?	kati
Outside	nebar	Why	kyázi
Perhaps	dewuh	Yes	óñ, áú
Quickly	jalpáhan	How	kitpóthin
So	ithui	sA } So }	yithipóthin
Slowly	lut		tithipóthin
Suddenly	yekáyek		

Prepositions.

According	ithuí	In	andar
After	pat	On	piaṭ
Among	mauz	Towards	ṭarí
Before	brúnt	With	satin
Besides	varáí	Without	siwá
For sake of	bápat		

Conjunctions.

And	ta	If	hargáh
Although	hargáh	Either	yá
But	lekin	Or	yá
Because	yudvane		

Interjections.

Alas!	aísús!	Lo!	neh!
Ho!	hatá!	What!	kya!

Cardinal Numbers.

One	ak	Seventeen	saddah
Two	dzuh	Eighteen	aṭhdah
Three	tré	Nineteen	kunuwúh
Four	tsór, chór	Twenty	wúh
Five	páns	Twenty-one*	ekwúh
Six	shah	Thirty	truh
Seven	sat	Forty	chatjí
Eight	áth	Fifty	pansa
Nine	náú	Sixty	sheṭ
Ten	dah	Seventy	satat
Eleven	káh	Eighty	shít
Twelve	báh	Ninety	namat
Thirteen	trowáh	Hundred	hat
Fourteen	chaudah	Two hundred	zahat
Fifteen	pandah	Thousand	dahshat, sás
Sixteen	shurah	Lakh	lach

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*22	dzitówúh	49	unwanzah
23	trawúh	51	ekwanzah
24	cháúwúh	52	dowanzah
25	pántsuh	53	trewanzah
26	shawwúh	54	chauwanzah
27	satowúh	55	panswanzah
28	aṭhowúh	56	shahwanzah
29	untruh	57	satwanzah
31	ektruh	58	aṭhwanzah
32	daitruh	59	unhath
33	tchtruh	61	ekhath
34	chaitruh	62	dohath
35	pánstruh	69	kunsátat
36	shahtruh	71	eksatat
37	sattruh	72	dosatat
38	aṭhtruh	79	kunshít
39	kuntazi	81	ekshít
41	ektazi	89	kunánamat
42	}	91	eknamat
43		99	nanánamat
44			
45	} as above		
46			
47			
48	}		

Ordinal Numbers.

First	godniuk	21st	ekwúhiúm
Second	duyum	22nd	dzitowuhium
Third	treyum	23rd	trawuhium
Fourth	tsurum	24th	cháúwuhium
Fifth	panchum	25th &c.	&c.
Sixth	shayum		
Seventh	satum		
Eighth	aṭhtum		
Ninth	nawum		
Tenth	dahiúm		
Eleventh	káhiúm		

Sentences.

What is your name?	chhón náú kyá chŭh?
What is the name of this village?	yit gámas kyá chŭh náú?
How far is it to Kashmir?	Kashmír támut kótá chŭh dúr?
How many houses are there in this village?	yit gámas kuts garh chuh?
Who is the head man?	mokaddam kus chuh?
What is the time?	kótá chuh dŭh?
Three o-clock.	sihpahar chuh.
Bring that.	uh anun.
Take away this.	ih niun.
What crops are grown here?	yithi kyá fasl chuh sompanín?
Are the pears ripe or unripe?	ṭank chó paminmud ki na khám chuh?
Go away.	gats.
Come here.	vol yúr.
Come quickly.	jald volah.
What does this man want?	ih monhyú kyá chuh mangán.
Ask him.	humis prichú.
I cannot say.	buh chus sasna vanit hekán.
I shall go to-morrow.	buh gats phagá.
It rained yesterday.	rát volun rúd.
It is very hot.	sitáh garm chuh.

The road is good.	vat chuh (*or* chavuh) ján.
The road is bad.	vat do. yaah.
One must ascend that hill.	yit kohas piat baniá khasun.
What is the price of this?	yit kyá chuh kímat?
It is dear.	drug chuh.
It is cheap.	sug chuh.
You ask too much.	tsuh chukuh sitáh mangán.
Are there any manufactures here?	yithi baniá ki tyár karun?
Is cloth woven?	kapar baniá vanun?
What pay do you get?	tsuh kyá chuh talab inelan?
Is the Kardar a good man?	Kárdár chó ján monhyu?
I wish to find out.	buh chus yatsán zi maálúm kar.
Is he able to carry that load?	hekyá uh bór tulit?
My horse is lame.	miun gur lung'chuh.
Can you shoe him?	tsuh hekak yimis guris nál lágit?
What rent do you pay for this shop?	yit vánas kot chukuh diwan kiráya tsuh?
Six rupees a year.	shah rúpí varíhas.
He began to get tired.	suh lug thakne.
They began to fight together.	tim lêg pánawin harhar karani.
Can you read and write?	tsuh hekak likhit, parhit?
A little.	kaṃ kam.
How do you know?	tsuh kitpóthin zának?
In what way will you repair this?	tsuh kitpóthin karan ih durust
In what month is saffron gathered?	kat retas andar chih kongposh
In Kártik.	Kártikas andar. [tsaṭán?
What colour is best?	kyá rang chuh sárikot ján?
If he takes it what will you do?	hargáh ih heki timsritit, tsuh kyá karakadah?
Has he gone before, or is he following?	suh chuh brúnt gomut, kin-pat chuh áwán?
Why are you making such a noise?	tahí kyá zi chúr yút krakanád karán?
Put on this dress and put off that.	ih kaparu mutsar, uh tsun nóil.
I went with him.	buh chus gomut humis satin.
He walks without shoes.	suh chuh paizár siwái pakán.
When he comes tell me.	yili suh yi tili gasi mi khabar.
Is it near or far?	nazdík chó, kinh dúr chuh?

You always delay.	tsuh chukúh dóhí tsér karan.
We are almost ready.	as chih thikán thikán tyár.
I am hungry and thirsty.	buh chus pháké bi treshut.
Don't eat raw apples.	khám tsunt ma khiú.
I have ate enough.	thaiú, khiaú.
Where is my servant?	miun naukar kati chuh?
Is he here or there?	yithi chó, kinh tathi chuh?
It is still raining.	vunyas tányat chuh válán.
Shall you sleep inside or outside?	andar shongak kinh nibar?
This dog is exactly like mine.	yih húm chuh menis húnis hiú.
I have already heard that story.	mi búz suh kissa brúnt.
There is a bridge opposite.	brohun kani chuh kadul.
Do as I say.	yithipóthim buh dapán chus, tithi póthin kariú.
Write accordingly as I do.	menis lekhinas hiú likhiú.
Are you alone?	tsuh chukuh kunezun?
He fell from his horse.	suh piau guri piaṭ visiṭ.
Throw down that blanket.	uh kamal sun bonkun trevit.
Come up here.	yúr khas hiúr.
How far is it from here?	ithi piat kótá chuh dúr?
It is five kos.	páns króh chuh.
My brother and I went home.	ak buh bi miún bói gaye garh.
Either you or he will be punished.	yá tsuh nat humis meliwuh sazá.
Why should I be punished?	mi kyá zi diú sazá.
Because you are a thief.	awé bápat zi tsuh chukuh tsúr.
Unless you have witnesses you will be imprisoned.	hargáh tsuh gawá ashinah, ta kaid sompanak.
This horse is better than that.	ih gur chuh humsiu kotján.
What do you call that basket?	hut fiatis kya chuh vanán?
Don't be frightened.	kots muh.
He ought to have done so.	timis guts ih karun.
Can you swim?	tsuh hekak tsánt vayut?
Listen! show me the road.	hatá? mi háú vat.
You must do it.	tsuh gatsi zarúr karun.
Taste this peach.	ih tsunun gatsi tsuhun.
I cannot find my coat.	miún kurtah chuh nah melán.
Look behind that wall.	hut dewáras pat kani uchhú.

He lost Rs 50 in gambling.	hum hárí záras andar pantsáh rúpí.
I won Rs. 100 „ „	mi ziún „ „ hat „
A snake bit him in the leg.	humis dítsnas sarpan langas tiop.
She laughed much.	humi us sitáh.
We seized 10 thieves.	asi rit dah tsúr.
They all escaped.	timáú tsail sárí.
They shall leave this country.	tim tsalan yihu mulk.
I will punish them.	buh dimak adh timan sazá.
Can you lend me a rupee?	tsuh hekak asi rúpiyahak wozum [dit?
What do you teach these children?	im shiúr kyá chiwak hichanáwan?
Let him come, why do you stop him?	yiu ih kyá zi chuwan raṭan?
I beat him soundly.	mi dint humis sitáh már.
His house has been burnt.	humis lug garhas nár.
He will be buried to-morrow.	phagá ihi daffan karanah.
Choose one of these apples.	yimáú tsuntáú andar tsuhun ak tsun- [ṭánah.
Cover that pan.	hut degchas piaṭ thavin sarposh.
Send me some fruit.	asi mishin ladiu kinh mewah.
He answered me falsely.	tim vunasi mishin apuz jawáb.
Hang up these clothes.	ih kapar tsinun awezán.
What are you doing?	tsuh kyá chukuh karan?
I am cutting corn.	buh chus kanak tsaṭán.
Are these cows chewing the cud?	ih gáú chuh drámun karán?
Go and see.	gatsit vuch.
Feed them with grass.	yim khiáwúk gás.
Give them water to drink.	yim chúviúk tresh.
Has the room been swept?	at kothis duwah kinh nah?
Can this be washed?	ih yiyá chhalanah?
I have two horses.	mi chuh dzuh gur.
He had three wives.	timas ásah tre koleyih.
I shall have plenty.	mi nishin ási ih sitáh.
I rode 10 kos without stopping.	buh gós dahan krohun guris kia lákim varái.
What is to be done?	kyá gatsi karun?
They are drunk.	suh chuh mut.
We are poor.	as chih kangál.
This room is 12 ft. long, 10 ft. wide,	ih koth báh páwah dsut, dah páwah

and 9 ft. high.	khúshadah, bi chuh náú páwah thúd.
He was very lazy.	suh ós sitáh sust.
Give me rather less than one seer.	mi gatsi ak sír akich kih kom diún.
Weigh this ghee.	ih ghiáú tuliun.
How much honey for a rupee?	rúpía kótá chuh mách?
Change this rupee into pice.	yit rupía aniu tiunk.
Is there any batta taken?	kinh chuh hewán rúpía vat?
Give that blind man, that lame man and that leper each an anna.	humis anis ta humis langis ta humis hitriládas, akak áná diú.
Take care how you carry that.	uh chíz gatsi khabardarí san niun.
I shall be very glad.	buh gatsa sitáh khúsh.
All the people came to see.	sárí lok áye uchhini.
Is this the same horse or another?	ih chuh suhí gur kinh bék chuh?
Every man was killed.	pratakáh gáú márah.
His father and mine are cousins.	humsund mól bi miun mól chih pánaion bói bói.
His uncle is rich.	humsund pitar chuh dáúlatmand.
Her mother is poor.	humsanz mój chuh kangál.
Your horse is lame.	chhón gur chuh lung.
My servant is ill.	miún monhyú chuh bemár.
Put this and that together.	ak ih bi ih gachi vátun.
This is my own watch.	ih chuh mi panin gar.
Why was I beaten?	buh kyá zi gós márah?
Shall I be beaten?	buh gatsa márah?
Why should I give you anything?	buh kyá zi dimáí tsuh kih?
You should go quickly.	chhon gatsi jald gatsun.
There are rocks above and below.	koh chuh piaṭ ti tá tal ti.
This language is rather difficult.	ih zabán chuh kentsa mushkil.
With practice it will become easy	ádat satin gatsi ásán.
Never mind, speak every day.	ki parwar chunah duhí van.
Shall I go with or without my horse?	buh gatsah garheth knih nah?
Why do you follow me?	tsuh kyá zi chukuh mi patpat wán?
I want alms.	buh chus bechán.
Perhaps it will rain.	dewah válik.
I was wet through.	buh ós sitáh baranah.

Dry my clothes in the sun.	miún kapar hoknáwú tápas. [phiat.
He and his brother were drowned in the river.	suh bi tasun bói daryávas andar
The maháráját is very kind to artisans.	Maháráját chuh karigaran piat sitáh miharbání karan.
They are never fined.	amis chun zehtí chit iván hinah.
He sent me a good 'ziafat.'	tim laz asi zabar ziáfat.
I laughed and she wept.	mi us ta tim wud. [hund.
This shawl is not worth Rs. 400.	ih doshálah chuh nah tsorhatun
This is not the first time.	ih chuh nah godiniúk dó.
The Government takes half the produce.	sirkár chuh nisf paidaish hewán.
I and you and he will go together.	ak buh bí tsuh bi suh gatsán ikwatén.
You will never come back.	tsuh guk nah biyi zá yór.
The people here are very dirty and poor. [Kashmír?	yithik lók chih sitáh mail talryi chih kangál.
How many boats are there in	Kashmíras andar kotsa náú chih?
About two thousand.	aṭsaṭ chih dósás.
Do they pay any tax?	kinh chih mahsúl diwán?
If he ever do so, beat him.	hargáh suh biyi ithui kare, aũh márun. [wot tárit.
If you can jump over this ditch.	hargáh tsuh hekak yit khandakas
I cannot jump over it.	buh hek nah tarit. [tan?
Can you shoot birds flying?	tsuh hekak wuphun janáwar márl-
Is there any game in these hills?	yit kohas chó kinh shikár?
Yes, a great deal.	áú, sitáh.
Of what kind?	kyá kyá chuh?
There are bears and deer.	hápat chó kinh rús chuh.
How do you know?	tsuh kitpothin zának?
I am a sportsman.	buh chus shikárí.
What do the bears eat?	hápat kyá chih khiawán?
Indian corn, walnuts and fruit.	makhai chih khiáwán, dun chih khiawán, kinh mewah chih khiawán.
Are there any white bears?	kanu chah safíd hápat?
Not here, but there are beyond.	ithi chuh nah, ammá wehin chuh
In what district?	kut pergannahs andar?

On this or on that side of the hill?	kohas ihpár kinh chuh kinh apár kinh chuh?
Beyond it.	apáré.
What kind of fish are there in the river?	daryávas andar kami reng chih gád?
A great many kinds.	sitáhí reng chih.
Do people catch them or not?	low chih gád ratan kinh nah?
Attend to what I am saying.	ih kinh tsuh buh vanánchus, tat piaṭ tháú dhián.
If you do not, you will repent it.	hargah nah karak, adh pashtáwak.
If you do not go, I will beat you.	hargáh nah gasak, adh marut.
Had you done as I told you, this misfortune would not have happened.	yithi póṭhin mi dah piumáú, hárgah tithi póihin karihiu, adh ih hauwinan kánthi balái.
If I were rich, I would repair this house.	hargah buh daulatmand ásah, adh karahah yit kothas marammat.
If he had gone there, he would undoubtedly have been killed.	hargáh suh ór gatsaheh adh bilá-shak gatse suh márah.

APPENDIX E.

Language of Dravidian Aborigines. Notes on the Oraon Language.—By the Rev. F. Batsch.

Nouns.

The language is very defective in nouns. It is evident that the Oraons have lost much of their own language, and that they have made up their losses from the languages of the people amongst whom they have dwelt, chiefly Sanskrit and Hindustani. They have no original religious terms, no abstract ideas, no words for actions of the mind or thoughts.

Gender.

In Oraon there are two genders, the masculine and the feminine, but there are very few nouns of the latter.

Whether the noun is a masculine or feminine is only to be found in the termination of the verb. In the declension, the gender is not or only very seldom expressed.

Declension.

There are all the usages of the Hindi language to be found in the Oraon. The oblique cases are also formed by postpositions.

Note. Pronunciation of the Roman characters as used in writing the Oraon words.

à	like	a	in	father		e	like	e	in	peg
u	„	u	„	rule		o	„	o	„	so
ì	„	i	„	police		ai	„	ai	„	aisle
a	„	a	„	roman		au	„	ow	„	owl
u	„	u	„	full		ch	„	ch	„	church
i	„	i	„	still		ch as in German doch, loch				

SINGULAR.

Nom.	kukos, the boy.
Gen.	kukosgahi, of the boy.
Dat.	kukosge, for to the boy.
Acc.	kukosin, the boy.
Abl.	kukosgusti, from the boy.
Instr. (?)	kukusanti, from or by the boy.
Loc.	kukosnu, on, in, upon the boy.
Agent.	kukosim (?)
Voc.	ana ko, oh boy.

PLURAL.

Nom.	kukor.
Gen.	kukorgahi.
Dat.	kukorge.
Acc.	kukorin.
Abl.	kukurgusti.
Instr.	kukoranti.
Loc.	kukornu.
Voc.	ana koe.

SINGULAR.

Nom.	kukoi, the girl.
Gen.	kukoigahi.
Dat.	kukoige.
Acc.	kukoidin.
Abl.	kukoigusti.
Instr.	kukointi.
Loc.	kuknu.
Agent.	kukoidim.
Voc.	an koi.

PLURAL.

Nom.	kukoier.
Gen.	kukoiergahi, etc.

SINGULAR.

Nom.	chad, the boy.
Gen.	chadasgahi.
Dat.	chadge.
Acc.	chadin, or chadasin.

Abl.	chadgusti.
Instr.	chadanti.
Loc.	chadnu.
Agont.	chadasim.
Loc.	ana chad.

PLURAL.

Nom.	chadar.
Gen.	chadargahi.

etc.

The plural is mostly expressed in the termination of the verb, the noun remaining unaltered in the singular and plural.

NOUNS.

Masculine.		*Feminine.*	
tangdas	son	tangṛi	daughter
kukos	boy	kukoi	girl
belas	king	belṛi	queen
meūt	husband	mukka	woman

NOUNS.

mercha	firmament	chebda	ear
chechal	earth	tatcha	tongue
binko	star	cheka	hand
biṛi	sun	chochal	bone
chando	moon	pall	tooth
pairi	morning	chesar	shoulder
ulla	day	chocha	back
màchà	night	kul	belly
ucha	darkness	umbalcho	liver
āl	man	?	heart
meth	male	?	lungs
mukka	female	cheso	blood
kuku	head	ched	foot
kes, chuti	hair	chosga	leg
chan	eye	angli	finger
kapṛe	forehead	eroch	nail
moy	nose	gurchi	heel
boi	mouth	màka	knee
gale	cheek	bàri	arm

thaṛi	palm of hand	bercha	cat
gunṛi	cow	lakra	tiger
ado	ox	haṛha	wolf
eṛa	goat	tsigalo	jackal
paṭha	lamb	cher	fowl
allah	dog	cokro	cock

PRONOUNS.

En	I	nām	we (both)
nin	thou	em	we (more than two)
ās	he	nim	you
ād	it	ar	they
ād	she		
ne	who		
end	what		

Declension of pronouns.

	Singular.	*Plural.*
Nom.	En, I &c.	Em, we, &c.
Gen.	enghai, of me	emhai.
Dat.	engage	emage
Acc.	engan	eman
Abl.	engusti	emgustim
Instr.	enganti	emanti
Loc.	engnu	emanu or emanum
Agent.	enim	emim
Nom.	nin, thou	nim, you
Gen.	ninghai	nimhai
Dat.	ningāge	nimāge
Acc.	nimin	nimin, nimanun
Abl.	ningusti	nimgustim
Instr.	ninanti	nimanti
Loc.	ninganu	nimganu
Agent.	ninim (?)	nimim (?)

Nom.	ās, he	ar, they
Gen.	āsgahi	ārgahi
Dat.	āsge	ārge
Acc.	āsin	ārin
Abl.	āsgusti	argustim
Instr.	āsanti	aranti
Loc.	āsganu	argnu
Agen.	âsim	arim.

The dual may be formed, but does not really exist,—as

nām .	irab, we both	nim	irib, you both
nām	irbgahi	nim	irbargahi
nām	irbge	nima	irbarge
nām	irbatin	nim	irbarim
nām	irbgusti	nim	iribgusti
nām	irbanti	nim	iribanti
nām	irbnu	nim	iribnu

Postpositions.

gane,	with	chocha,	after
gusti,	from	mechha,	above
gusan,	unto	kuti,	beside
ge,	to, for	hiri,	near
anti,	by, through	kaṭha,	beyond
nu,	upon	gechha,	far
num,	in	meṉya,	up
kīṉya,	beneath	mund,	before

Adjectives.

The adjectives, which are only a few, take no part in the declension.

Nom.	sanni alas, little man
Gen.	sanni alasgahi
Dat.	sani alasge
Acc.	sani alasin
Abl.	sani alasgusti
	etc. etc.
Nom.	sanni mukka, little woman
Gen.	sanni mukkagahi

Dat.	sanni mukkage
Loc.	sanni mukkasin
Abl.	sanni mukkasgusti, etc.

Comparison.

Pos.	sanni, small
Comp.	adinti sanni, smaller
Superl.	ad hurminti sanni, smallest

Pos.	koha, great
Comp.	adinti koha, greater
Superl.	ad hurminti koha, greatest

ADJECTIVES.

pāṉru,	white	gaṛi,	deep
mochāru,	black	oṭṭa,	heavy
cheso,	red	nebba,	light (not heavy)
hariar,	green	marchia,	dirty
pīyar,	yellow	kuri,	hot
dīgha,	long	kurna,	warm
pudda,	short	kiri,	cold
mōṭ,	thick	baríar,	strong
sarhua,	thin	jukki,	little
chaika,	lean	chaiga,	wet
kuba, benko,	crooked	chaika,	dry
		kiṛa,	hungry
ujgo,	straight	didiṛna,	satisfied (full)
mechha,	high	nidi,	empty
phuda,	low	ninka,	full
maldan,	ugly	chandrna,	sleepy
sobhdas, koṛe,	beautiful	ejrna,	watchful
		landi,	slow
beṉs,	good	kitka,	rotten
malbeṉs,	bad	panjka,	ripe
malkoṛe,	ill	chena,	unripe
pachgi,	old	ghutum otaro,	round
joch,	young	tissa,	sour
sanni,	small	phāṛi,	pure
bhircha,	hard		

NUMERALS.

onta,	one
enr,	two
mund,	three
nāch,	four
pantche,	five
soi,	six
sate,	seven
aṭhe,	eight
nawe,	nine
dase,	ten

There are no ordinals.

táṛa, half
onghoṇ thauṇa, once
páṇr enr, twice
páṇr mund, thrice
páṇr nách, four times
etc.

In numbering human beings, these are the following numerals:

ort ālas,	one man
irib ālar,	two men
núb ālar,	three men
naib ālar,	four men
pantche ālar,	five men
etc.	

VERBS.

The auxiliary to be, mannáge.

INDICATIVE MOOD.

Present.

I am &c.

En	ra : adan	rain
nin	ra : aday	ra : adi
ās	ra : adas	ád ray ad raï
em	ra : adam	raim
nim	ra : adar	ra : aday
ār	ra : anar	ar ra : nay

Imperfect.

I was.

En	ra : achkan	ra : achan
nin	ra : achkay	ra : achki
ās	ra : achas	ād ra : acha
em	ra : achkam	
nim	ra : achkar	ra : ach kay
ār	ra : achar	ād ra : achay

Perfect.

I have been.

En	manjkan	be : edan	en	manjkan	be : en
nin	manjkai	be : eday	nin	manjki	be : edi
ās	manjkas	be : edas	ād	manjki	be : i
em	manjkam	be : edam	em	manjkeem	be : em
nim	manjkar	be : edar	nim	manjkay	be : eday
ār	manjkar	be : enar	ad	manjkay	be : enay

Pluperfect.

I had been.

En	manjkan	ra : achkan	en	manjkin	ra : achan
nin	manjkai	ra : achkaij		manjki	ra : achki
ās	manjkas	ra : achas	ad	manjki	ra : acha
em	manjkam	ra : achkam		manjkam	ra : achkam
nim	manjkar	ra : achkar		manjkay	ra : achkay
ār	manjkar	ra : achar		manjkay	ra : achay

Future.

I shall or will be.

En	manon	
nin	manoy	
ās	manos	ad mano
em	manom	
nim	mannor	
ār	mannor	

Future completive.

I shall have been.

En	manj chachon,
nin	manj chachoy
ās	manj chachos
em	manj chachom
nim	manj chachor
ār	manj chachor

Imperative Mood.

En	manon,	let me be.
nin	mana	manai, be thou.
ās	mana	ad mani, let him, etc. be.
em	mannom	
nim	mannor	
ār	mannor	

POTENTIAL MOOD.

Present.

I can be.

En	manna oŋgon,
nin	mana oŋgoi
ās	manna oŋgos
em	manna oŋgom
nim	manna oŋgor
ār	manna oŋgor

Imperfect.

I might, could, &c. be.

En	manna oŋgdon
nin	manna oŋgday
ās	manna oŋgdas
em	manna oŋgdam
nim	manna oŋgdar
āṛ	manna oŋgmar

Perfect.

I may have been.

En	manna ongkan	be : edan
nin	manna ongkay	be : eday
ās	manna ongkar	be : edar
em	manna ongkam	be : edam
nim	manna ongkar	be : edar
ār	manna ongkar	be : enar

Pluperfect.

I might, could, &c. have been.

En	manna ongkan	ra : achkan
nin	manna ongkay	ra : achkay
ās	manna ongkar	ra : achas
em	manna ongkam	ra : achkam
nim	manna ongkar	ra : achkar
āṛ	manna ongkar	ra : achar

CONDITIONAL MOOD.

Present.

If I be.

Te en	manoŋ,	em	manom
nin	manoy	nim	manor
ās	manos	ār	manor

Imperfect.

If I were.

Te en	holle,	em	holle
nin	holle	nim	holle
ās	holle	āṛ	holle

Infinitive Mood.

manna, being
mannāge, to be

Kálage, to go.

Indicative Mood.

Present.

	Masc.	*Fem.*	*Dual.*
En	kālakdan,	kālagin,	nām irbatim kālakds
nin	kālakday,	kālakdi,	
ās	kālakdas, ad	kālgi,	
em	kālakdam,	kālagem,	
nim	kālakdar,	kālakday,	
āṛ	kālaknar,	kālaknay,	

Imperfect.

En	kālakkan	kālakkam
	kālakkay	kālakkar
	kālakyas	kālakyar

Perfect.

En	kerkan	be : edan
	kerkay	be : eday
	kerkas	be : edas
	kerkam	be : edam
	kerkar	be : edar
	kerkar	be : enar

Pluperfect.

En	kerkan	ra : achkan
	kerkay	ra : achkay
	kerkas	ra : achas
	kerkam	ra : achkam
	kerkar	ra : achkar
	kerkar	ra : achar

Future.

En	kāun	kāom
	kāoy	kāor
	kāos	kāor

Future completive.

En	kāla chachor	kāla chachom
	kāla chachoy	kāla chachor
	kāla chachos	kāla chachor

Imperative Mood.

En	kāun	kālon	kāum	kālom
nin	kaoy	kālakaloi	kāor	kāla
	kāos		kāor	

Potential Mood.

Present.

I can go

En	kāla ongon,	kāla ongom
	kāla ongoy	kāla ongor
	kāla ongos	kāla ongor

Imperfect.

En	kāla ongdan	kāla ongdam
	kāla ongday	kāla ongdar
	kāla ongdas	kāla ongnar

Perfect.

En	kāla ungkan	be : edan
nin	kāla ungkay	be : eday
as	kāla ungkas	be : edas
em	kāla ungkam	be : edam
nim	kāla ungkar	be : edar
āṛ	kāla ungkar	be : edar

Pluperfect.

En	kāla ungkan	ra : achkan
nin	kāla ungkay	ra : achkay
ās	kāla ungkas	ra : achkas
em	kāla ungkam	ra : achkam
nim	kāla ungkar	ra : achkar
āṛ	kāla ungkar	ra : achar

CONDITIONAL MOOD.

Present.

If I go.

Te en	kāun,	em	kāum
nin	kāe	nim	kāor
ās	kāus	āṛ	kāor

Imperfect.

Te en	kerkan	em	kerkam
nin	kerkay	nim	kerkar
as	kerkas	ār	kernar

PATICIPLE.

kālke
kālar
kālnosim

INFINITIVE MOOD.

kāna, going
kālage, to go

Nanáge, to do.

INDICATIVE MOOD.

Present.

En	nandan	nandam
	nanday	nandar
	nandas	nandar

Imperfect.

En	nanjkan	nanjkam
	nanjkar	nanjkar
	nanjas	nanjar

Perfect.

Enim	nanjkan	be : edan
ninim	nanjkay	be : eday
āsim	nanjas	be : edas
emim	nanjkam	be : edam
nimim	nanjkar	be : edar
ārim	nanjkar	be : enar

Pluperfect.

Enim	nanjkan	ra : achkan
ninim	nanjkae	ra : achkay
āsim	nanjkas	ra : achas
emim	nanjkam	ra : achkam
nimim	nanjkar	ra : achkar
ārim	nanjkar	ra : achar

Future.

En	nannon	em	nannom
nin	nannoy	nim	nannor
ās	nannos	āṛ	nannor

Future completive.

En	nanjchachon	em	nanjchachom
nin	nanjchachoy	nim	nanjchachor
ās	nanjchachos	ār	nanjchachor

Imperative Mood.

En	nannon	em	nannom
nin	nannoi	nim	nanor
ās	nannos	ār	nannor

Verbs.

to beat	laona
to drink	ona
to sleep	chandrna
to walk	ekna
to swim	ogna
to plough	oyna
to cut	choina
to sow	cháchna
to eat	mochna
to eat	ona
to ride	argna
to fall	katrna
to rise	cho : na
to see	eṛna
to hear	menna

to speak	kochna karna
to sing	páṛna
to blow	úrna
to dance	nalna
to sit	okna
to tie	chotna
to go	kána
to cook	biitna

ADVERBS.

below	kiṇya
near	hiri
within	ekatara
whence	ekaiants
how	ekane
not	ambo
yes	hae
whence	ekaianti
whither	ekatara
alone	oatoch

CONJUNCTIONS.

and	dara
then	antle
but	pahe
or	bhel
because	igune
also	hoṇ
when	ekabiri
if	je

The Lord's Prayer.

He embai je mercha nu ra: aday. Ninghai náme pavitr mano, Ninghai ráji bar: o; ninghai suuwak ekane mercha nu, ancho chochal nu ho mano. Emhai ulla ullanta asma ina emáge chia. Antle emhai dosan muaf nana, ekane omho emhai dosnanurin muaf nandan. Antle oman pariksha nu amba cha: a, pahe burainti chhar a ba: a Ráji, sáwang antle mahatm sadau sadau ninghai rai. Amin.

Creed.

En bishwás nandan Dhames embas nu, ás je mercha dara chechalgahi sángias sirjanhāras taliás, antle ásgahi ortostonka tangdas. Prabhus Jisus Christusnu, je Dharmatmanti Kulnu barchhas dindam Mariamauts kundrus, Pontius Pilatus tarti dukhan chedas, Krusnu kilras keras, ketchas keras, mándras keras, antle narakun itiás, ulmundnu ketch ka gusti ujias dara chochus mercha nu argias, antle sawangias tambas Dharmeshgahi mandi cheka tara uk : as be : edas ; eksanti ás ujnárin antle ketch karin nisáb nanáge phen bar : os.

En bishwás nandan dharmatma nu : Dharmir Christáner gahi go honda nu dhar mir gahi salha me, pápgahi chhema, med gahi jia cho : ona antle jug jug gahi jia nu. Amin.

Ten Commandments.

1. Dharme nimhai Dharme entol konnek apum dosar Dharmesin amba man : a.
2. Indri im juthi gahi dewt a puja amba nana.
3. Dharme ninghai Dharmes gahi namin begar bujhra : am amba ana.
4. Dharmes gahi ulan paoits niáge amba modr a.
5. Ninghai ágo babásin mahá tmchia.
6. Alawein amba chetár chia.
7. Nanna mukkargane amba naña bekamma drál tarah amba mana.
8. Chalal amba chara.
9. Phásiar amba ana, ninghai orsi porsir un phásiar gawáhi amba chia
10. Ninghai orsi porsir gahi erpa erpanta tálach amba nana.

APPENDIX

Brief Vocabulary of the Moondah and

English.	*Moondah.*	*Ho.*	*Kherriah.*
Man	horo	ho	hibo
Woman	era	era	kanseldo
Boy	coora	cooa	baboo
Girl	corsi	cooi	bui
Head	bohu	bo	boko
Hair	ub	ub	ulloi
Ear	lutur	lutur	lutur
Eye	med	met	mud
Mouth	.....	a	tamode
Tooth	data	danta	goineh
Hand	tihi	tih	tih
Foot	kata	kata	katta
Bone	jang	jang	.....
Blood	myam	myum	enjam
Egg	billi	.....	.....
To-day	tiping	tiping	mupoo
Night	.....	nida	eedib
Sky	sirma	sirma	o
Sun	singi	singi	borho
Moon	chandu	chundu	lerung
Star	epil	epil	sencom
Heat	lolo	lola	lolo
Fire	singil	sèngil	tingson
Water	dah	dah	dah
Wind	hoyo	hogo	kogo
River	.....	.....	.....
Stone	.....	.....	.....
Tree	daru	daru	.....
Village	.....	.....	.....
House	ora	ora	o
Snake	.....	beeng	bungham

F.

cognate Languages of the Kolarian type.—*By Lieut.-Col.* DALTON.

Putoons or Juang.	*Sonthal.*	*Bhumiz (Latham.)*	*Coour (Dr. Voysey.)*
juang	horh	horro	hoko
mukha	.....	.....	suttan
lunda			
lundi			
bocob	buho	buho	
juta (H)	ub	ub	ap
lutur	lutur	lutur	
emor	met	met	meht
tamon	mocha	alang	ah
goneh	dátha	dátta	
.....	thi	thi	
	kata	kata	
[illegible] (H)	jang	jang	
iyam	myum	myun	
susuté	billi	pito	
missing	teheng	tising	
berote	níndhá	nídhá	
akas (H)	sirma	reiumil	
suruj (H)	singi	singi	
lerung	chandu	chandú (H)	
konjinda	ipil	ipil	ipil
lalai	sengel	sengel	singhél
dah	dah	dah	da
kovo			
[illegible]oi (H)	garra	garra	
olag	dirrí	dirrí	
sumsing	dáré	dárú	darao
jaon (H)	athú	hathúgó	
.....	órá	ora	oarru
bubung	bing	bing	

APPENDIX G.

Language of the Kolarian Aborigines;—Grammatical construction of the Ho language.—By Lieut.-Col. TICKELL.*

I hope due allowances will be made for the imperfectness of the grammatical details here given, when it is remembered that the Ho language has no written character, nor does there exist a person, native of the Kolehan or otherwise, who could give me the slightest assistance on this point.

It would be trite to observe that grammar is as inherent and essential to all languages, even the most barbarous, as a vocabulary itself. By first learning a number of the words and sentences arbitrarily, the system on which they are founded may be detected in due time by patient comparisons of them, even when the speakers themselves are unable to give the inquirer the least information on the construction of what they are saying. With this difficulty once mastered, it is inconceivable with what ease the most (apparently) complex and difficult languages become familiar.

The sounds of the Ho language are exceedingly pure and liquid, without strong aspirates or gutturals, and may be well rendered by the English alphabet, or still better the French one, as that admits of the slight nasal inflection which prevails in many words in the Ho dialect.

Let the following conventions be made to the sound of the vowels, in the ensuing dialogues, &c.

á ——— as in "father," "rather,"
é ——— „ "prey," "été,"
ī ——— „ "skip," "trip,"
ee ——— „ "sheep," "peep,"
ȳ ——— „ "fly," "try,"
aī or aȳ —— „ longer sound as in "aye, aye?"
ō ——— „ "bone," "stone,"
oo ——— „ "tool," "stool,"
†n (nasal n) „ "Ton" "Faraon," (French.)

* Reprinted from As. Soc. Journal, Vol. IX. p. 1063.
† Also g, as the French liquid g, in Cologne, Boulogne.

The long acute vowel sounds, such as *oo* and *ee*, also the letter *r*, are pronounced too liquidly and subtilely to be easily imitated by a stranger, and in some words the inflections of the vowels are inconceivably complex and mellifluous. The general euphony or cadence of the language is sprightly and cheerful; if the subject be of a complaining nature, it subsides into a strange chaunt, the sentences being linked together by such see-saw sounds, as "ná-do na-do enété ná-do" which have no meaning, but serve to connect together the speaker's ideas.

When two or more words come together, the former ending, and the latter beginning with similar vowels, they are joined by ellipsis. as "Hola'lé seniéna," instead of "Hola allé seniéna," *we went yesterday.*

ARTICLE.

There is none, (properly speaking), definite or indefinite.

NOUN.

There is no distinction of genders, marked or influenced by termination, it being determined by the sense or meaning of the word, whether referring to a *male* or *female* being. Besides *man* and *woman*, erril" and "èra," *boy* and *girl*, "koá" and "koöee," names of relations, and those of a few domestic animals, all other nouns are distinguished in their gender by prefixing "Sandee" *male*, or "Enga" *female*, as in Persian or English نر ریںچ ومادن ریںچ *he-bear, she-bear.*

A noun has three numbers, singular, dual, and plural, as in Greek.

The nouns can scarcely be said to have declension, as the terminal does not vary either according to number or case, although a distinguishing adjunct, which may be called a 'Pronoun article,' from its nature and use, is added.

	Singular.	Dual.	Plural.
Nom.	Sètá, *a dog.*	Seta king, *two dogs.*	Sèta ko, *dogs.*
Gen.	Sètá-á, *of a dog.*	Seta kingya, *of two dogs.*	Seta koà, *of dogs.*
Ab.	Seta-té, *from a dog.*	Seta king tè, *from two dogs.*	Seta ko tè, *from dogs.*

The dative, accusative, and vocative cases do not differ from the nominative, being only known from their position in a sentence.

In composition the noun in an accusative case takes the first place in the sentence, if the nominative be a pronoun; otherwise the noun-nominative precedes, the accusative follows, and the oblique or dative case comes immediately before the verb, sometimes immediately after

it. "En ho kajikeeáï áÿa èra," *that man said to his wife*, "Dendka oé tootigoikeea," *Dendka shot the bird.* "Eeán hŏn do chowlee seta emadÿa," *my son gave the dog some rice.*

Adjective.

The adjective does not alter in termination, either in number, case, or gender; and always precedes the noun it qualifies. As "Boogee ho," *a good man*; "Boogee ho-á," *of a good man*; "Boogee ho lo té," *with a good man*, &c. There are no degrees of comparison, but as in Hindustani the qualifying words *very*, or *most of* all, are prefixed to denote grades of quality, as "Etka," *bad*, "Enâ té neeá o etka," *this is worse than that.* "Sabee ré nee o etka minna," *this is worst of all.* "Boogee lèka èra," a *pretty woman.* "Boogee lèka èra ko," *pretty women.*

Pronoun.

The first personal pronoun has four numbers, the singular, dual, plural, and plural comprehensive. The others only the three first, as noticed in the noun-substantives.

The possessive pronouns are the same as the personal, with the genitive inflection *á* added.

Personal Pronouns.

	Singular.	Dual.	Plural.	Pl. comprehensive.
1*st.*	Eeng *or* aing, *I*	Alleeng, *we two*	Allé, *we*	Aboo, *we all*
2*d.*	Um, *thou*	Abben, *you two*	Appé, *you*	„
3*d.*	Aÿ *or* áÿo, *he*	Aking, *they two*	Ako, *they*	„

In speaking, if the person include the person addressed, himself, and every one present, as nominatives or agents, he uses the plural comprehensive. If he exclude the person addressed, he employs the first person plural, as "Hola aboo senièna," *yesterday we went* (i. e. you and all of us.) "Hola allé senièna," *yesterday we went* (i. e. not you, we alone.)

The personal pronouns in the nominative case both precede and terminate the verb, optionally with the speaker, as, I *speak*, "Eeng kajitanna" or "Eeng kajitannaing" or "Kajitannaing."

I go, "Eeng senotana," or "Eeng senotannaing," or "Senotannaing."

And to give energy to the sentence, the pronoun is repeated, with the connect "do" between them, as "Eeng do eeng kajitanna," *'Tis I who speak*," Um do um kombookenna," *Thou alone statest it.*

The most difficult part of their construction is in the dative and accusative cases, which are absorbed in the verbs they are governed by, in a manner unknown to other languages, being placed in the centre of the verb, after the root, and before the tense terminal.

As, *I speak to thee*, "Eeng kaji*me*tanna;" *he spoke to me*, "áÿo kajiked*ing*ia;" *he spoke to them*, "kajiked *koái*;" *the tiger saw me* "koola do nelded*ing*ia;" *he killed him*, "áÿo goiked*áÿa*." Here I have underlined the oblique or accusative pronoun, where it comes in, just before the tense terminal of the verb.

POSSESSIVE PRONOUNS.

	Singular.	Dual.	Plural.	Pl. comp.
1*st*.	Eenga* or áingia, *my*	alleengia	allẽa	abooá
2*d*.	Umma, *thy*	abbena	appéa	„
3*d*.	Aÿa, *his*	akingia	akoá	„

These always precede their substantives.

DEMONSTRATIVE PRONOUNS.

Singular	Dual.	Plural.
Nee *or* inee, *this*	neeking, *these two*	niko, *these*
Neeá *or* ineeá, *of this*	neekingia, *of these two*	neekoá, *of these*
Neeté, *or* ineeté, *to, with, &c. this*	neekingté,	neekoté,

En, *that*	enking, *those two*	enko, *those*
Enâ, *of that*	enkingá, *of those two*	enkoá, *of those*
Enté, *by, from with &c. that*	enkingté,	enkoté,

"Nee" *this*, is sometimes used idiomatically by a person referring to himself. If a Kole were to be asked what countryman he was? he would answer, "Ho nee gé," *I am*; or literally, *this is a Kole*. Of what clan are you? Answer, "Poortee neegé," *I am a Poortee*.

INTERROGATIVE PRONOUNS.

Okoĩ, *who?*	chikan, *which?*	chiá, *what?*
Okoiá, *whose?*	chikaná, *of which?*	

RELATIVE PRONOUNS.

Relative pronouns are very vague, the sentence being generally so rendered as to obviate the necessity of them, thus, instead of saying, *The man who went*; a Kole would say, *The gone man*, "Senien Horo."

* Pronounced, as 'mignon,' 'Ligne,' &c. in French.

But at times "Chikana," *whatever*, and "Ena," *that*, are used relatively, as "Chikana um kajeeá, èna ceng áïooma," *what you say, that I will listen to.*

VERBS.

Verbs are either active or neuter. There is no passive voice.

The Infinitive mood is formed by adding *téá* to the root.

The present participle by adding *tan* or *té*.

The Past participle by affixing *kedté*.

In the active or transitive voice, the Present tense Indicative mood adds to the root "*tanna*," in the neuter voice, "*akanna*."

Imperfect tense there is none, the Present tense being used, and its Imperfect signification understood by the context.

The Perfect tense is formed by adding in the active voice, "*kidda, keea, kenna, lidda*, or *tadda*," to the root. In the neuter voice, "*lena*," or "*ièna*," sometimes "*kenna*."

There is no Pluperfect tense, but greater completion is expressed by conjugating the verb "chabteá," *to finish*, added to the root; much the same way as "chookna" in Hindustanee.

The Future is formed by adding to the root *eea* or *oá*, or sometimes simply *á*, in which latter case the sound of the root is prolonged. Except "nooiteá," *to drink*, which makes "noonooá;" and "roteá," *to gore* (as a bull) "roroá."

The Imperative is formed by adding (in the 2nd person singular) to the root, "*mèn*" and "*oméa*" or "*ymén*," if the root end with a consonant. In the other persons *ká* precedes the pronoun, and the simple root of the verb, which will be more clearly shown in conjugating. In a negative sense, "*alum*" or "*alo*" is prefixed to the 2nd personal pronoun, *á* being added to the root; if in the 3rd person, singular, dual, or plural "*aloka*" is prefixed to the pronoun, and the root alone of the verb is used.

The Subjunctive mood is vague and imperfect. In the Present and Future tenses "*rèdo*" is added to the root, sometimes together with the word "*honang*," "*derang*," or "*torá*" (signifying conditionality) affixed.

The Past tense is formed in the same way; indeed there appears to be no Past Subjunctive tense; but sometimes the conditional terminal "*rèdo*" is added to the Past perfect Indicative.

This word "*rèdo*" admits the vowel to be affixed to it, or to come immediately before it and after the root.

Conjugation of the verb "Kajčeteá," *to speak.*

INFINITIVE MOOD.

Present tense—Kajčetéa, *to speak,*
Present Participle—Kajitan, or Kajienté, *speaking,*
Past Participle—Kajikedté, *having spoken.*

INDICATIVE MOOD.

Present tense.

Sing.		Dual.	Plural.
1st. Person, Aïng,	Kajitanna,	Alleeng—Allé,	Kajitanna,
2d. „ Um,		Abben—Appé,	*I &c. am speaking.*
3d. „ Aÿo,		Aking—Ako,	

Perfect tense.

1st. Aïng—Alleeng—Allé,	Kajikidda, Kajilidda *or* Kajitadda.
2d. Um— Abben—Appé,	*I &c. spoke or have spoken.*
3d. Aÿo— Aking— Ako,	

Future tense.

Aïng, Um, &c. &c. &c.—Kajeea, *I &c. &c. will speak.*

IMPERATIVE MOOD.

Sing.	Dual.	Plural.
Eeng Kakajee, *Let me speak.*	Kajeeaboo *or* Abookakajee, *Let us all, &c.*	
Um Kajeemén, *Speak thou.*	Kajeeben *or* Abbenkakajee, *Speak you, &c.*	
Ayo Kakajee or Kakajee o kái, *Let him speak,*	Kajeealling *or* Allingkakajee, *Let us, &c.*	
	Kajeeallé *or* Alléokakajee *Let us, &c.*	
	Kajeeako *or* Akokakajee *Let them, &c.*	
	Kajeeaking *or* Akingkakajee, *Let them, &c.*	

NEGATIVE.

Sing.	Dual. Plural.	
Alokáïng kajeea, *Do not let me speak.*	Alo k'aboo kajeea.	*Do not let us &c. &c. speak.*
Alum kájeea, *Speak not.*	Alo k'allé kajeea.	
Alo kaï kajeea, *Do not let him speak.*	Alla'bben kajeea.	
	Al'appé kajeea.	
	Alo ka'ko kajeea.	
	Aloka'king kajeea	

SUBJUNCTIVE MOOD.

Present tense.

Eeng Kajeerèdo, *If I speak.*	Aboo,	Kajeerèdo, *If we &c. speak.*
Um Kajeeredo, *If thou speakest.*	Allé,	
Aio Kajeeredo, *If he speak.*	Abben,	
	Appé,	
	Ako,	
	Aking,	

Perfect or Pluperfect.

Eeng, Um, &c. &c. &c. Kajeekedrèdo, *If I &c. &c. &c. had spoken.*

CONDITIONAL, OR POTENTIAL.

Eeng Kajëäing honang, *I would speak.*	Allé &c. &c. Kajeea honang,
Um Kajeeum honang, *Thou &c.*	*We might or would speak.*
A··o Kajeea honang, *He, &c.*	

NOTE. As has been before explained, in all these tenses and persons (except in the Imperative) the pronoun may be either prefixed, or affixed, or both.

The same Verb, Conjugated with its Objective pronoun.

INDICATIVE MOOD

Present tense.

Eeng or Aÿng	Kajeeing tanna,	*I speak to myself.*
,,	Kajee metanna,	*I speak to thee.*
,,	Kajee áïtanna,	*I speak to him.*
,,	Kajee' létanna,	*I speak to ourselves.*
,,	Kajee' ling tanna,	*I speak to us two.*
,,	Kajee' ben tanna,	*I speak to you two.*
,,	Kajee' pètanna,	*I speak to you.*
,,	Kajee king tanna,	*I speak to them two.*
,,	Kajee kotanna,	*I speak to them.*

The same exactly for all the other persons, and tenses, &c.

Perfect tense.

Aing, Um, Aÿó, &c. &c. &c.	Kajikedingiá.	*I, thou, he, &c. &c. &c.*	*spoke to myself.*
	Kajiked'mia.		*spoke to thee.*
	Kajikedáïá.		*spoke to him.*
	Kajikede'lia.		*spoke to ourselves*
	Kajiked'lingia.		*spoke to us two.*
	Kajiked'bena.		*spoke to you two.*
	Kajikedpéá.		*spoke to you.*
	Kajikedkingiá		*spoke to them two.*
	Kajiked'koá.		*spoke to them.*

Examples of this construction, especially in the Imperative mood, will be given in the Vocabulary, so need not be further dwelt on here.

It is scarcely possible to reduce the verb "*to be*" to conjugation, unless we suppose the varied forms in which it is used as inflections of separate verbs, wanting in many tenses. For "*to be*" is expressed by different verbs, according to its allusion to time, a person, or a thing; and its relation to mere existence or to the nature of existence. In short, there is no auxiliary verb "*to be*" which can be independently conjugated. The unchangeable word "minna," or "minnakana," is applicable in the present tense alone, to denote a *state* of existence, as "Eeng, um, aÿó, &c. menna, or minnakana," *I am, thou art, he is*, &c. But in past and future tenses some other verb denoting *presence*, as the verb "*to come*," "*to reside*," &c. must be employed.

But the verb "*to be*," when implying the *nature* of existence, can be rendered in the past and future tenses, as well as the present, by adding to the participle or adjective, *oá* in the future, and *iena* in the past, as "eeng laga akanna," *I am tired*; "eeng lagaoá," *I shall be tired*; "eeng lâgièna," *I have become tired*; "eeng rènga akanna, or renga akannaing," *I am hungry*; "eeng rengaoá or rengaoing," *I shall be hungry*; "eeng rengaièna," *I was hungry*. *Oá* and *iena*, it is to be remembered, are inflections of the future and past tenses in all neuter verbs.

Again the verb "*to be*" can be simply represented in the future and past tenses, when speaking of a *thing*, by the word "hobawa," *it shall or will be*, and "hobiena," *it has been*; also in the present, "hobowtanna," *it is*. This mode of expression commonly refers to the success or accomplishment of any project. In the English idiom we should say for "hobawa," *it will do*, or *it will answer*; "hobiena," *it is all over*, or *has succeeded*; "hobowtanna," *it is going on*.

That boy will be a thief, could not be rendered, "En koá do komboo hobawa," but "En koá do komboo oá."

Your business will be done to-morrow, not, "Umma kajee gappa oá," but, "Umma kajee gappa hobawa."

This will never do, "Ka hobawa;" *go away, it is all over* "Marsenomén hobiéna."

In English and other languages, state, nature or condition, is rendered by affixing or prefixing the various tenses of the verb "*to be*" to the adjective, as to be hungry, *I am hungry, I was hungry;* "*to be glad, I am glad, &c. &c.*" But in the Ho dialect the adjective itself becomes a neuter verb, and is conjugated by affixing to it the different inflections denoting time and mood—*to be hungry,* "rengatéá;" *I am hungry,* "renga akannaing;" *I was hungry,* "rengaiénaing;" &c.

NEUTER VERBS.

After what has been said, it would be unnecessary to give any example of the conjugation of neuter verbs. It only requires to be remembered that their present terminal is "akanna" instead of "tanna;" and their past inflection "iéna," instead of "kidda, tadda, lidda, or eea," all of which latter are transitive forms.

Some verbs are both neutral and transitive, as "chabateá" *to finish.* They have therefore both inflections. In the transitive form "chabatea" is frequently added to the root of some other verb, to denote completion; but it may also be used alone: in the neuter form, it is of course confined to the third person.

EXAMPLES.

Yŏmchabakiddaí, *He ate it all up.*
Bÿchabakidallé, *We finished (making) it.*
Kajeechabÿmén, *Finish speaking.*
Gappa miang chabawa, *It will be done to-morrow or next day.*
Nádo chabiéna, *It is now finished.*

The word "hereá" is placed between the root and terminal of a verb to denote positiveness or certainty; as when the speaker means to state something as an incontrovertible fact, as, "Kajee hereákiddaí," *most assuredly he spoke.* "Oodoob hereámén," *speak positively.*

The causal form is rendered by putting "chee" between the root and terminal—as "landateá," *to laugh,* makes "landacheeteá" *to cause to laugh;* "aïoomtea," *to hear,* "aïoomcheetea," *to cause to hear,* as in Hindustani *á* is inserted (with a few exceptions) for the same purpose as Hunsna, Hunsána; Soonna, Soonána, &c.

Continuity (in the Imperative mood alone) is expressed by adding "akán" to the root, as "doobmén," *sit down,* "doobakanmen," *remain sitting;* "Aïoom mén," *listen,* "Aïoomakánmén," *continue listening.*

Finally, the thoroughly performing an act, is often rendered by adding

the verb, "jōmeteá," *to eat*, to the root of the expletive verb, as "nel-oomkidallé," *we all saw it (thoroughly)*; "aïoomjōmmén," *listen (attentively)*; "Geetee jōm-meén," *sleep (soundly)*. And should the verb be of a violent nature (referring to some violent act) the particle "táb" between the root and inflection gives force to the meaning, as "Goïtabkiddaï," *he slew him (outright)*; "Toltab kidallé," *we bound him (forthwith)*; "Neertabmén," *Run (quickly) fly!* so "Ooiteá" is *to jump*, and "Ooitabtea," *to bound (as a tiger)*.

Ká before the pronoun gives the verb a negative form, as has been before explained in describing the Imperative mood.

There is no verb "*to have*," possession being denoted in the same manner as in Hindustani. *I have*, "Eeñgtra minna"—"Méré pas hÿe."

From the foregoing remarks may be gathered, that in the active or transitive voice—

The present terminal is, "*Tanna.*"

The past, "*Kidda, tadda, lidda, kenna* or *keea.*"

In the Neuter Voice—

The present terminal is, "*akénna.*"

The past, "*iéna* or *léna*;"

In either Voice—

The conditional, subjunctive, } "*redo*" or "*kedrado,*"
and potential mood terminate in }

these terminals being of course subject to the inflections of their nouns, which are, as has been said, as often affixed as prefixed.

A nondescript species of Verb is used in rendering the sentence *what shall or can I, (thou, he, &c.) do?*

Future and Present.

Ch'eeng chikÿa,	*what shall or can*	*I,*	*do?*
Chee'm chikya,		*Thou,*	
Chee chikÿa,		*He,*	
Cheeboo chikya,		*We all,*	
Chee'lé chikya,		*We,*	
Chee'pé chikÿa,		*You,*	
Chee'ben chikÿa,		*You two,*	
Chee'ko chikÿa,		*They,*	
Chee'king chikÿa,		*They two,*	
Chee'ling chikÿa,		*We two,*	

Past tense.

Chee'ng chikakidda, *what could I have done?* &c. &c. &c.

The verb "*to be able*" is rendered by "Dỹtea" in its moods and tenses, as "Niádo ceng bỹdỹa," *I can make this;* "Umdokadỹa," *you cannot;* "K'áï dỹoá," *he will not be able.*

Many little exceptions and variations occur to these general rules, which it would be impossible to become familiar with, without constant practice in their arbitrary use; but the foregoing remarks comprise all that would be of practical utility. The constant elision and confluence of words beginning and ending with vowels must be remembered, and that the particle *do*, has no meaning whatever. This will render the examples above given to the different rules simple and illustrative.