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*Dates of issue of the different numbers of the Journal,  
Part II, 1883.*

- No. I.—Containing pp. 1—64, with Plates II, III, IV, V, VI, VII, & VIII, and “Explanation of the Plates,” was issued on October 24th, 1883.
- No. II (called Nos. II, III, & IV on wrapper).—Containing pp. 65—100, was issued on March 6th, 1884.
- The Title-page, Index, and List of Plates, with Plates\* I, IX, & X, were issued on January 23rd, 1885.

\* The drawings of which these plates are chromo-lithographic reproductions were not sent to England until March 4th, 1884, and the plates themselves were not received by the Society till January 13th, 1885.—[J. W.-M.]

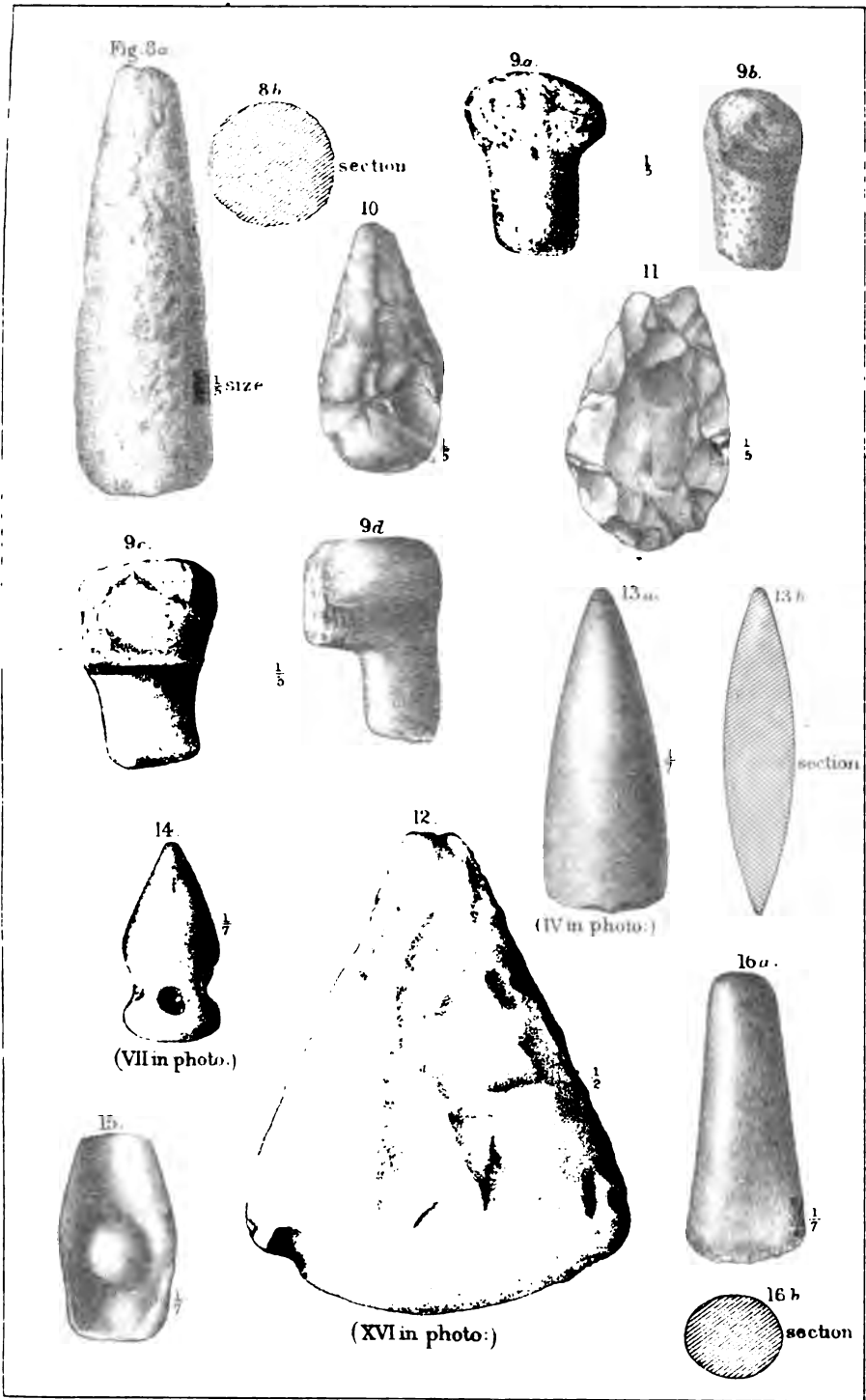
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From a Photograph.

STONE IMPLEMENTS FROM THE N. W. PROVINCES OF INDIA.--J. H. RIVETT-CARNAC.

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nervure; the disco-cellular nervules defined with a fine black line; beyond which is a bow-shaped figure composed of two lines joined at their ends, the outer line straight, the inner one curved, with their points resting on the second median nervule and subcostal nervure; below the cell a pair of streaks reaching the inner margin, the origin of the inner one being where the first median, and the outer one where the second median nervule is given off, the space between them being thickly irrorated with black scales, leaving but little of the ochreous ground-colour visible; two discal lines from the subcostal nervure to the inner margin, the outer one lunulate, the inner one sinuate, the two lines being nearer together at their middle, wider apart at the inner margin, the space between them and within the inner one being irrorated with black scales; a submarginal series of seven bright ochreous spots, broadly defined inwardly with black, one in each interspace except the two lower, which are smaller and placed between the first median nervule and the submedian nervure; the outer margin broadly black, bearing two obsolete paler lines. *Hindwing* crossed by four black lines, the space between each pair, and between both pairs being thickly irrorated with black scales, especially at the lower extremity of the outer pair, where the ground-colour is entirely black, at the upper extremity the ground-colour increasing to the costa is very pale ochreous; a submarginal line composed of six lunules, each lunule having a bright ochreous spot placed outwardly against it; the outer margin more broadly black than in the forewing, the black portion ending at the first median nervule, bearing two intensely black lines, the outer one defined on both sides with a pale fine line, the outer of these two pale fine lines becoming almost pure white from the tail to the anal lobe; which latter, together with a round spot above it is bright ochreous, defined (especially outwardly) with black. There are also some small white, black, and metallic deep steel-blue markings above the round ochreous spot. The tail black, the extremity white. **UNDERSIDE** pale ochreous, the outer portion of the *forewing* and on either side of the submarginal lunules on the *hindwing* somewhat deeper ochreous, becoming ferruginous at the anal angle of the latter. All the markings of the upperside, but narrower and better defined, with no black irrorations, the outer margins (except the extreme margin which is black) concolourous with the rest of the wings; the veins throughout pale ochreous. *Antenna* black, the extreme tip ochreous. *Thorax* and *body* rich ochreous above marked with three black lines, beneath pale ochreous.

Length of forewing 1.15; whence expanse = 2.4 inches.

HAB. Great Nicobar.

Closely allied to *C. thyonneus*, Cramer (pl. ccxx, figs. E, F), from Amboyna and Bouru in the Malay archipelago, but differing from the

above quoted figure in its much darker colouration throughout on the upperside, more especially on the outer margins; but on the underside it is much paler.

II.—*On the Measurement of Solar Radiation by means of the black-bulb Thermometer in vacuo.*—By S. A. HILL, Esq. *B. Sc. Metl. Rep. to N. W. P. and Oudh. Communicated by H. F. BLANFORD, Esq. F. R. S.*

[Received March 29th:—Read April 4th, 1883.]

The interesting results of sun thermometer observations, published by Mr. Blanford at page 72, Vol. LI, Part II, of the Journal of the Asiatic Society of Bengal, suggest the possibility of making use of the instrument to measure the heat received from the sun. Even with all the precautions adopted by Mr. Blanford, the excess of the maximum temperature in the sun, above the maximum in the shade, is affected by variations in the following and perhaps other conditions, as well as by variations in the heat emitted from the sun.

I. The thickness of the atmosphere traversed by the sun's rays, which, for moderate degrees of obliquity, may be taken to be proportional to the secant of the sun's zenith distance.

II. The absorptive power of the clear transparent atmosphere, which probably varies with the proportion of water vapour in it.

III. The quantity of haze and dust in the air.

IV. The radiating and reflecting powers of the ground surface in the vicinity of the thermometer.

V. The excess of the maximum air temperature above the temperature at the hour, when insolation is most intense.

The last mentioned condition is subject to a very distinct annual variation. At Allahabad, where hourly observations have been made on four days in each month since 1875, the insolation is most powerful on clear days within a few minutes of noon, while the average excess of the maximum above the noon temperature of the air is the following:

Jan.	Feb.	Mar.	Apl.	May	June	October	Novr.	Decr.
3.5°	3.5°	3.9°	4.1°	3.9°	4.2°	4.3°	4.4°	2.9°

In order to obtain comparable values for the several months we should therefore add these corrections to the figures for Allahabad given by Mr. Blanford. In table I the figures in Mr. Blanford's second table are thus corrected, and the table is extended down to the end of 1882.

TABLE I.—*Excess Temperature of the Sun thermometer on clear days at Allahabad above the air temperature at noon.*

Year.	Jan.	Feb.	Mar.	Apl.	May.	June.	Oct.	Nov.	Dec.	Mean for 9 dry months.
1876	66.1°	65.7°	63.9°	60.6°	56.5°	57.8°	60.3°	64.0°	64.0°	62.0°
77	63.0	66.7	63.6	62.4	60.0	57.4	59.8	63.0	63.4	62.1
78	65.9	64.3	65.2	64.5	62.3	57.8	59.6	64.7	64.6	63.2
79	64.2	63.9	63.7	62.6	61.3	61.0	61.1	64.9	63.5	63.1
80	63.0	63.8	60.3	59.9	62.0	61.5	58.3	62.5	60.6	61.3
81	62.3	60.9	61.9	60.4	60.3	63.0	54.8	61.8	59.9	60.6
82	60.5	61.5	60.1	61.1	60.6	59.1	54.8	62.2	58.2	59.8
Mean.	63.6	63.8	62.6	61.6	60.5	59.6	58.4	63.3	62.0	61.7

Variations in the fourth condition, above specified, cannot be allowed for or corrected, unless by means of a long and troublesome experimental investigation, but those of the first, second and third conditions may perhaps be estimated by mathematical methods from observations already made. Pouillet's formulæ, it is true, has a rational basis only when it is applied to radiation of one definite degree of refrangibility; but, as an empirical rule, it probably gives results not very wide of the truth when the altitude of the sun above the horizon exceeds 40°, as it does at noon in Allahabad during every month of the year. If, then, we take  $\alpha$  to represent the diathermancy coefficient of dry air, or the proportion of the total radiation, transmitted vertically, through a layer of dry air which produces a pressure of 1 inch;  $\beta$ , the diathermancy coefficient of vapour, the tension of which is 1 inch; and  $\gamma$ , the proportion transmitted through an atmosphere containing dust or haze to the extent of one unit on an arbitrary scale, we have—

$$\log r = \log R + b \sec z \log \alpha + f \sec z \log \beta + d \log \gamma.$$

The proportionate number for dust and haze,  $d$ , being somewhat uncertain, there is no advantage in applying to it a correction for obliquity, especially as the vertical thickness of the dust layer is greatest in the hot weather months, when the sun's rays fall almost perpendicularly. The number for May, the dustiest month, being taken at 10, the proportionate numbers I have assigned to the other months are:

Jan.	Feb.	Mar.	Apl.	May	June	Oct.	Nov.	Dec.
3	4	7	9	10	5	0	1	3

The mean values of  $b$  and  $f$ , barometric pressure and the tension of vapour, are given in tables II and III. In strictness these should be

taken only for the clear days in each month, but the means for all the days here given, are practically the same in the case of barometric pressure, and there is no difference in the pressure of vapour, of any importance, except in the month of June.

TABLE II.—*Mean Barometric Pressure ; 29 inches.*

Year.	Jan.	Feb.	Mar.	Apl.	May	June	Oct.	Nov.	Dec.	Mean for 9 dry months.
1876	·681	·626	·541	·389	·300	·199	·605	·670	·787	·533
77	·795	·736	·585	·506	·369	·236	·601	·676	·733	·582
78	·771	·704	·599	·478	·380	·198	·482	·615	·693	·547
79	·723	·646	·554	·402	·274	·210	·546	·686	·717	·529
80	·679	·652	·509	·390	·305	·164	·562	·727	·768	·528
81	·779	·690	·598	·417	·326	·219	·619	·653	·743	·549
82	·751	·652	·557	·416	·337	·182	·492	·689	·711	·532
Mean.	·740	·672	·563	·428	·327	·201	·544	·674	·736	·543

TABLE III.—*Mean Tension of Vapour in inches of mercury.*

Year.	Jan.	Feb.	Mar.	Apl.	May	June	Oct.	Nov.	Dec.	Mean for 9 dry months.
1877	·312	·295	·356	·330	·524	·744	·678	·447	·343	·448
77	·428	·349	·450	·534	·592	·784	·642	·474	·424	·520
78	·364	·431	·392	·486	·630	·640	·648	·454	·318	·485
79	·325	·354	·356	·325	·491	·746	·704	·365	·306	·441
80	·335	·349	·417	·400	·650	·823	·605	·409	·340	·481
81	·284	·357	·431	·433	·642	·354	·612	·352	·306	·475
82	·335	·289	·300	·348	·469	·855	·635	·428	·348	·445
Mean.	·340	·346	·386	·408	·571	·778	·646	·418	·341	·471

Unless there be more than is generally admitted in Dr. Balfour Stewart's theory that the occurrence of sunspots is determined or controlled by the positions of the planets, it may be assumed that solar activity is not subject to any important variation of a period equal to one of our years. The monthly mean results of table I may therefore be taken to represent the radiation of a mean sun modified only by terrestrial agencies ; and we may proceed to apply the above modification of Pouillet's formula to these monthly means, in order to find out the relative absorbing or scattering effects of dry air, water vapour and dust or haze. The nine months give



nine equations, from which, by the method of least squares, I have arrived at the following results :

$$\begin{aligned} R &= 80^{\circ} 434^* \\ a &= \cdot 99856 \\ \beta &= \cdot 71186 \\ \gamma &= \cdot 99398 \end{aligned}$$

The value of  $a$  is identical with that which I obtained from Mr. Hennessey's observations at Mussoorie, while that of  $\beta$  is intermediate between the two values computed from the observations of the 12th and 14th November 1879, at Mussoorie.† Clear dry air of 80 inches pressure absorbs about  $4\frac{1}{2}$  per cent. of the total radiation which falls upon it vertically ; while water vapour, with a pressure of 1 inch below and the average vertical distribution, absorbs 29·8 per cent. The effect of dust is less than might be expected, the loss due to this cause in May being apparently only about 6 per cent. ; but this is doubtless because the dust is not a simple absorbent, for it scatters or reflects the rays in all directions, and some of these reflected rays reach the globular bulb of the thermometer. An actinometer, arranged to receive parallel rays only, would indicate a much greater loss, on account of suspended matter in the atmosphere.

The monthly means computed by these constants, and their variations from the observed means are as follows :—

Jan.	Feb.	Mar.	Apl.	May	June	Oct.	Nov.	Dec.
62·9°	64·0°	68·4°	62·9°	59·6°	57·4°	58·6°	64·4°	62·2°
—0·7	+0·2	+0·8	+1·3	—0·9	—2·2	+0·2	+1·1	+0·2

The most important difference is in June, when the computed value is 2·2° in defect. This is almost certainly the result of taking the mean vapour tension for the whole month, instead of that for the clear days only. The other differences are probably due, in great part, to the unavoidable neglect of variations in the condition of the ground surface.

Applying the formula to the observed mean radiation temperatures for the nine dry months of each year, and taking the proportionate number for dust to be the same each year, we arrive at the following results :—

Year	1876	1877	1878	1879	1880	1881	1882
Corrected radiation temperature. }	80·05°	82·60°	82·67°	81·23°	80·23°	79·12°	77·11°

The last minimum of sun spots having occurred in 1878, while 1882 was probably a maximum year, these figures indicate a variation in the solar heat of very considerable range, and in the opposite direction to that

\* The degrees of the sun thermometer are only arbitrary units, which cannot be readily converted into units of heat per unit of surface per unit of time.

† Proceedings of the Royal Society, No. 219, page 486.

made out by Mr. Blandford. This contradiction in the results of the two investigations, and the range of the variation here indicated, which amounts to 7 per cent. of the total radiation, make it sufficiently clear that, when every possible allowance is made for disturbing causes, the indications of the black bulb thermometer are an uncertain measure of the sun's radiation. The absorption coefficients for dry air and water vapour, now determined, agree, however, so well with those deduced from Mr. Hennessey's excellent actinometrical observations that they may be accepted with some confidence.

III.—*Notes of a trip up the Dihing basin to Dapha Pani, &c., January and February, 1882.—By S. E. PEAL, Esq.*

[Received June 24th;—Read August 1st, 1883.]

(With Plates II, III, IV, V and VI.)

The question of the treatment of savage races bordering on, and trading freely with, a civilized power, has always been a difficult one to solve. Whether at the Cape, New Zealand, America, or Central Asia, it has generally involved the paramount power in a series of petty wars, injurious to both sides and ending in the subjection, and too often the degradation, or extermination of the savage.

This contest—inevitable in the end, where the civilized and savage communities are in juxtaposition, is often regretted by the former, and efforts made to mitigate the result, which is well known among Ethnologists.

The treatment of the various savage tribes that surround Asam and offer such marked contrast to the Aryans of the plains, is therefore a matter of some moment. Most of them have no doubt had a common origin, their ancestors having peopled the centre, north, and east of Bengal, of the plains of Asam, whence they have been driven (by the advance of the great Aryan tide) to the hills around.

Looking back into the far past, we should probably see the whole of India a huge and almost interminable tropical forest. Here and there Jím clearings, with villages at some little distance apart, the houses of which, perched on pile platforms, would doubtless be the exact counterpart of those built by these hill men at the present day—and characterized by their length and low eaves. The spear and dao would be in every hand, and the dug-out on every river. To the latter these tribes gave names which survive to our day, and attest their presence. Head-hunting and tattooing would probably be universal, isolating and no doubt differentiating the communities then as now, for the extraordinary number and variety of languages and dialects on the non-Aryan basis, contrasts with the Aryan group, and would point to "head hunting" as the cause around Asam.

A conspicuous feature among these Hill tribes, and one to be expected, is their great intelligence in everything relating to their jungles, customs,

cultivation, or warfare, and equally conspicuous is their incredible ignorance of us and our power.

When examined, however, this is to be expected from their long tribal isolations, which precludes the possibility of their gaining standards at all capable of measuring us. They may see a good deal, and hear more, but the power of realizing it is absent, they must judge of us, our works and aims, by their own absurdly inadequate standards. This is a misfortune for them, which *we* hitherto have only partly realized, and is the cause to some extent of our failures in dealing with Hill savages, notably also do we as yet fail to realize the danger (to us) of their ignorance.

Anything which can remove this, now that we have settled as the paramount power alongside them, should be welcome to both sides, and taken in hand by us as a matter of state policy.

Missionary effort, trade, or pure travel, are all means whereby knowledge of us may be steadily and safely extended. The first is specially advantageous, and in most cases produces among savages such as these, the happiest results. Its advantages immensely outweigh all attempts at civilizing by Government in other directions, as secular schools, courts, &c.,—and is also much cheaper. Its effectiveness also is enhanced by the fact that Missionary effort is often self-propagating, the desire is natural among converts to extend to friends living in lawlessness and danger, their own quietness and peace. As a means of weaning at least one generation from their unruly habits, and head-hunting propensities, ere we absorb them as "subjects," this argument is of the utmost importance. Missionary effort should precede by at least a generation, any attempts at settlement, and taxation.

Trade is undoubtedly one means of extending some knowledge of us, but unfortunately develops qualities of a lower order. The desire to cheat is innate, and both the desire and opportunities to steal, are often irresistible. Thus one of our difficulties with these Hill men is fostered and developed as time goes on, excellence in cunning ensuring success; thus the Missionary can do more good than trade.

The usual result of all attempts to civilize the unsophisticated savage right off is to exterminate him, there is need of an intermediate stage of some duration in which our civilized stimulants, and smartness are not experienced. A stage during which the savage surroundings and traditions can die down, if not die out, and render the new generation free to see, and adopt, what is advantageous.

Freedom to adopt our vices is hurtful, and our later civilization should so to speak be administered by a spoon. Unless we turn attention to these matters we shall find that the growth of "intelligence" among these Hill savages is also a growth in our difficulties in dealing with them.

Travel alone is one good means of disseminating knowledge of us and our aims, and of counteracting the endless series of rumours to our detriment. Notably useful is it in politics and our state relationships.

Formerly our Empire was scattered, and the need for consolidation by conquest and annexation imperative and patent. That day has departed, but its traditions remain on all our frontiers, needing reiterated refutation.

The experiences of travellers to the east and south-east, confirm this. On the present expedition the extraordinary and sudden change in every one, as soon as it was explained that I was only a "tea planter," out amusing himself was frequently suggestive and ludicrous. A Government officer is both dreaded and suspected, as a rule, when found travelling among these hills to the east. But apart from the questions of legitimate attempts by us, to favourably influence those around our borders, or explain our good wishes, lies the fact, that we stand almost as much in need of enlightenment regarding them, as they do of us, and that the results of our ignorance may be—indeed must be—a decided disadvantage to all. Anything which tends to remove that mutual ignorance, may be hailed as a decided gain. Large and highly appointed expeditions are here out of the question, or entail serious risks, the main obstacle being the difficulty of procuring supplies, and transport. On the other hand a small and unobtrusive party, can generally secure sufficient to enable it to push on, especially if independent of the need for "transport."

But while the benefits to be conferred and gained by travelling among the hill races on our N. E. frontier are clear to all who know the country and people; there are other matters of interest that can be investigated at the same time, *Commercial*, *Ethnological* and *Geographical* problems these await solution even if the discovery of a feasible route to western China be admitted as demonstrably impossible. The discovery of a trade route east out of Asam, viâ Patkai and Hukong towards the Shan States, had engaged my attention, since 1869, and following the example of Mr. H. L. Jenkins, I was enabled by actual observation, to determine the heights of Patkai and the Nongyang valley on the southern or Burmese side, demonstrating that the line taken by the Burmese of old was really easy and feasible, even for a cart-road, and not the formidable or insuperable barrier that so many supposed. I am here glad to be able to record the conversion of Mr. Lepper, to my views, the more so as he so strenuously opposed them for so many years. It is, however, one thing to find a route out of Asam towards the east, and quite another to find an easy one into western China.

Formerly most of us supposed that if once out of Asam, there would be little or no difficulty in entering China, the main difficulty of a trade route was supposed to be Patkai.

The travels and careful observations of, Gill, Baber, and Colquhoun, however, leave no reasonable doubt that our dreams of an easy trade route to western China cannot be realized, and Patkai is but the first of a series of increasing difficulties.

Exploration for the purposes of a trade route are more needful east than west of Irawadi, and the unsettled state of upper Burma, compelled me to look to the upper Dihing basin, as the site of this trip. The only European who had visited it being Wilcox in 1827.

The following is an account of my expedition during part of December 1881, and January and February 1882.

As on former occasions, I took my own load carriers, and depended as little as possible on getting "locals." To lighten their loads, and at the same time carry things securely from theft or temptation, I had 8 or 9 small Sasi wood boxes made to hold most of the things, and measuring about 18" x 12" x 8" weighing 8lbs. and with locks and hinges, 3 alpine tents of strong Jean, 7 feet square, and weighing 8lbs., poles included; when rolled up served as padded poles or "kanmaris" to tie loads to, and they enabled us to house ourselves comfortably in a few minutes, the whole load being about 80lbs. per man. Provisions for the men, such as rice, oil, salt, ghi, sugar, &c., I procured as we went along and laid in a good supply at the last of the little shops up the river. My own provisions largely consisted of Kopf's soups, sausages, Californian beef, desiccated soup, "coffee and milk" &c., in tins, also biscuits, butter, tea, and coffee &c. At the same time most of these were really carried as reserves, my daily commissariat being generally furnished locally en route, by presents or purchases of fowls, ducks, eggs and fish, or got by shooting.

Thus a traveller really need not fear a difficulty in carriage of provisions, until he leaves the inhabited tracts, and has to face 10 or 12 days of complete isolation.

As before when on similar expeditions I took a good kerosine wall lamp and a supply of thick buggy candles that require no stand; also as arms a D. B. C. F. No. 12 shot gun, revolver, and a beautiful little Martini Henry Carbine weighing only 4½lbs. that carries to about 900 yards and has cartridges of 14 to the lb., a very handy little weapon that can be carried slung all day long with no fatigue. Presents of beads, strike fires, a few cloths, and electro mugs for the chiefs also, were necessaries, as well as a small selection of medicines.

Starting from Jaipur on the Dihing at Christmas we went to Makum by land which is a mistake, and travellers should at once take canoe for Bisa, or as far beyond as possible. Having to wait for Daks we camped early at the "Jura Pung" the road to which was along the boundary of the Makum forest reserve. The Pung is a salt lick and shows the remains

of the elephant catcher's stockade, ditch, and rampart, made in the time of Purundur Sing the last king of Asam, 1830 or so. Close by, the men found on a little hill top a grove of tenga trees, limes, shadocks, oranges, and citrons, and I measured a nahor tree 10 feet girth at 12 feet up and some 45 to first branch, the stem straight as a pipe, near by also were huge mekais, or *Dipterocarpi* 12 feet in girth and 100 to first fork.

For a considerable distance around the Pung, the jungle was a perfect maze of little paths of clean white sand, and one could easily get lost. Here, while two of the men were collecting dry logs for the camp fire, they espied some animal, and at once stalked it among the paths, taking it for a deer, soon, however, they became aware that it was stalking them, and that it was a remarkably fine tiger. Both sides simultaneously discovering that the other was not a deer, decamped in opposite directions, I went out but of course only saw the track, which measured 19" in circumference. As night closed in, the usual uncanny jungle noises broke out, the "Koot-Koot," or "Boot-Boot," of the large land Lizard or Gui up to 6 feet at times, in the twilight depths has a peculiarly unearthly sound, and the large owl called "Húndú," also has a sort of moan about the "Húndú" it utters. The three calls are by the *pair*, and not one bird, this can be often verified as they now and then sit in different trees, first 1 then 2 and 1 again. The clear scream, or yell, of the "Mor Sorai," is another of those weird sounds that night birds seem to delight in, and it favoured us several times, despite the firebrands flung towards it.

Next morning we had breakfast ere starting, and at 10 A. M. all the loads were tied and we got off, but I had to make my servant mark out our track among the paths by small fragments of paper dropped behind, for the Dak to come by. We soon entered a remarkably fine forest, trees of 100 feet to first branch, and 13 feet girth, not uncommon, and smaller ones pretty close. The undergrowth, largely ferns, canes, and herbaceous jungle on a sandy soil, the latter very red among the little hills we soon entered, the path going at times over, or among the knolls and up stream beds. Here and there Tokú palms, *Livistona Jenkinsia*, rose to what all estimated as fully 50 feet, the huge fan shaped leaves spreading out above as a sort of green canopy. The Dak soon overtook us, thanks to the pieces of paper, and without which the men would have been "tried" all night fasting, and appeared (perhaps) at Dúm Dúma next day. At dusk we camped at the Powai having again made a very short stage purposely.

Starting about 8 A. M. next morning we very soon reached Makum on the Dihing, where we breakfasted, and I stayed some time getting stores and information. In the afternoon we proceeded again and camped at a small Duonia village called "Tora Kusi," as I heard that men from "Bor Kamti" were there.

These soon made their appearance, and I learned they had only lately come over from the upper Irawadi or Mlikha, together with some "Kunungs." Two of these latter I was glad to see and found them as pale or paler than the Kamtis, colour as near as possible 83 to 45 of M. Broca's scale. Hair straight and cropped *a la Mishmi*, no arms with them, and not tattooed. Though dressed like Kamtis in a white dhoti or waist cloth, and another round their shoulders, there was an unmistakably "Noga" cut about one of them, and it was some time ere I could detect that it lay in the way the hair was cropped. Later on I saw a good many more of them, and so far, they seem to unite the Noga groups to the south, with the Mishmi and Abor groups of hill men to the north of Asam, but their colour is paler than either. At the camp fire I learned a good deal regarding them, and the route they had travelled.

Next day we made the Kamti village of "Bor Phakial," the head quarters of the small colony of Buddhist Shans in Asam, and which I described on my last visit.\* I here found that the party of Kamtis over from Mung Kamti on the Mlikha or upper Irawadi, were staying at the "Munglang" Kamti village just below, so I went to see them, finding also several other Kunungs who it seems had come over in the same party, to see the wonderful country where all their daos went to. None of these Kunungs, and only one of these Bor Kamti men had ever seen an European. The information gained now was added to subsequently, and may be summarized further on.

At Bor Phakial I had many enquiries as to where I was going this year, all the better informed men at once declared it either too late or too early to attempt to reach "Mung Kamti," and that beyond Khomong on the Dihing three days east of the Dapha Pani I could not go (before April at least) as the snow had now fallen on the ridges of the water parting beyond, called on our maps, Phungan Bum, and occasionally by them "Bongan." The party, indeed intended to wait till April for this reason. They also represented my party as too numerous, and this I found true, for while it might not be difficult to procure cleaned rice at villages *en route*, for six or seven persons, it would not be so easy to get it for 12 or 14 without waiting a day. This determined me to reduce my party and 6 men were sent back, leaving me 5 load carriers, my servant, self and two boatmen or guides. These latter and a canoe I secured, and with them started up-stream the next day; the loads in the boat and the men going along the banks and sands, were crossed by the canoe at the deep pools. All hands assisted the boat at the rapids. As on last trip, we camped at the Tirapmúk, where the regular Noga hill route to Burma over Patkai emerges, *vid Kheringams* village. Next day we went on to

\* Vol. L, Part II, 1881, A. S. B.

Moko, near Nthem, and camped on the sands near the little Singphu village, where I found the remains of a large bund running due north to the sources of the Dibru, some 12 miles off the bund being called the "Pangori Gor." The ditch was to the eastwards and none of the villagers could tell anything about it, or the meaning of its name, though attributing it to the Ahom Rajas. In the early morning ere the fog cleared off, we were much amused by watching a large troop of the common "Bandor" monkey, collected on the opposite banks and gradually all swimming the river, a couple of hundred yards above us. The river being at its lowest and about 100 yards over. There were about 200 of them, and the very smallest crossed on their mother's shoulders, holding on to the head.

Many of them on our shallow side seemed to leave the water reluctantly, it was warmer than the air, by some degrees, and all scampered about on the sands to dry themselves. After some bargaining for fowls, eggs and rice in exchange for opium, we started on. The plan, being to draw entirely on local supplies where they can be procured, which saves those in store.

At "Paka-i-ling" where we camped again early, the river takes a bend past some sandstone ledges with a very deep pool. On the wide flat sand were the tracks of elephants, wild and tame buffaloes, tigers, leopards, and several cats, otters, lizards, turtle, large and small, the eggs being found, deer of three kinds, *i. e.*, horse deer or Sambur, Horina, and Huguri, or hog deer, monkey and bird tracks also crossed. Even insects left their mark, for in the drier portions near the bank the sand was quite pitted by the ant lion.

The following day we reached the Kerim Pani at 11 A. M. camping at Bisa, a little way up-stream. Formerly this dried suti was the main one, but for some ten years or so the water now comes down the M'ganto.

As there seems to be confusion arising as to the names of the rivers here—I may state that the term "Buri," as applied to Dihing from Brahmaputro up ends here, the upper portion of this river is simply *Dihing*, and the "no Dihing" is only that portion that broke out some years ago and flows to Sadia.

At Bisa I was obliged to stay several days waiting for another boat, the village consists of about 16, more or less dilapidated sheds, of the usual pile-platform type. Formerly it was of considerable importance as the residence of the Singphu chief "Bisa Banka," or Bisa Gam, and since his death in 1878, the place is of less moment.

The late chief's head wife, has now adopted as husband, Chauging son of Latua, one of Banka's brothers, and he is called "Gam." Eventually there may be a dispute as to who is to be Gam, as the late chief's son Chautong is now growing up and will be a smart lad. While here, my visit



was considered most opportune, as the Gam's wife before mentioned, had presented her adopted husband with a son, I was informed that had I not appeared auspiciously, it might possibly have turned out a daughter; I also here met a young Singphu chief from Hukong named "Urup no," who had come over to espouse Banka's second wife, a rather good specimen of a Singphu girl. Urup no, gave me some little information, and confirmed more, regarding Hukong. He had travelled down Dinei for some distance, towards Somjok which he called Somshok. The Lanier, or nam Pagna, he also called the Pang-lai-kha.

Though anxious that I should see Hukong, and certain that I should be well treated, he told me, it would be necessary to obtain the consent of the Gams ere going, and that simply as one chief's son alone, he could not invite me officially over. He corroborated what I had before heard as to the difficulties being not so much of a physical nature, as the dealing with such a disunited series of petty chiefs all bent on extorting as much as possible, and in fear of no paramount authority. Passage from the Burmese side he considered far easier, if with the Woon's consent. I gave him a few sundries "to shew his friends," as he said, such as a spring tape measure, and electro table-spoons, also a few sorted beads, among which large red and blue bugles, pleased him immensely, not that he would wear them, for Singphu men do not care for beads, but as something quite unique.

As a sample of a chief's son, he was above the average perhaps—tall, well built, a fine expressive face, plenty of long straight black hair rolled up in a knob on top of his head, good hands and feet. His manner was authoritative and at times excitable, and when playing a favourite game with cowries and dice, he could dash them down and yell out as loud as any of them. The little M. H. carbine of course took him immensely, and the accuracy of its fire at 200 yards, at the same time he recognized its uselessness to them on account of the difficulty of the cartridges.

I also here at Bisa saw two more of the Mung Kamti party, and learnt a good deal from them as to how the Kunungs smelt their iron ore which is of two kinds, stone-like, and sandy. It is converted in a small furnace of hour-glass shape, to which blast is applied from 6 or 8 pairs of the usual vertical-tube bellows, the pipes from which converge to the furnace, in the centre, and relays of men work the blowing. Fresh ore and fuel (of charcoal) is now and then added, and after about 12 hours, the ore is formed as a flattened lump at bottom weighing about 4 to 6 seers. Hammers and anvils are of stone, the former held by a creeper and often with two handles. The bellows, a pair of tubes made of the large Wra bamboo, with feather-edged pistons and vertical rods to hold, there are no valves I believe.

A little rain fell while we were camped here, which all were glad of, as it was bound to come on us otherwise when travelling. We also laid in stock of rice, sugar, ghi, oil, salt, flour, tobacco, and on the 5th went down to the river and met the canoe Chauing had lent me, a large party of Sonkap Nogas down about rubber, passed me on the bank, and as before in 1879 sidled and scuttled past, as if in fear of their lives, turning round after for a good stare, quite a contrast to the Nogas of the west, where they see Europeans often. Their chief stayed to look at the little rifle, and was rather astonished to see the bullet from it fall close to a snag at 400 yards off that I aimed at, in the water.

As our guide Lutak Kamti desired to get a mate in lieu of the one who returned with the other canoe, I camped at once, and in the morning he came with a middle-aged Singphu named Thang, a right good willing fellow, and the only drawback to him was he could not speak Asamese, he was quite equal as a rule to the work of two ordinary men, and said nothing about it. These two managed the boat and foraging at villages, Lutak being interpreter.

From all sides I had heard that we should never get the canoe up M'ganto, and the prospect was not pleasant, as for three or four days after leaving Jagon (the next village) there were none near us, and the country was wild; however I trusted to get up as I did Namtsik, where at the rapids all hands in a line cleared the worst of the boulders from a narrow (2 feet) channel and then dragged the canoe up, the same channel serving to return by.

At night it rained, and we had the pleasure of hearing at once a tiger on each bank, giving their loud sharp whistle, so well known to all jungli-wallas. They seem to indulge in it mainly when hunting, and hence can be distinguished at once from the leopard, with his deep "haunk-haunk," whence he is called the "Hawkra Bagh." The tiger's whistle is loud and sharp, closely imitating that of the Samber deer, and may be due to natural selection, as the deer go to the sound, as hunters well know. The whistle of the tiger, however, can generally be distinguished from that of the Samber. The peculiar "creep" it sends up one's back seems due to association, as I know a man who used to go out whenever he heard it, unarmed, to try and "see the deer," as he thought, and never felt anything but curiosity, until the case was explained.

The roar of the tiger again is so like that of the elephant that few can tell the difference, and as we heard it also, were not certain that elephants were near, until we saw the tracks next morning.

At dawn the rain left off and after breakfast we loaded and started on, most of us on the sands and shingle meeting some Nogas who had come about rubber from Numyung side, about five days beyond Patkai, some among

them wore the peculiar little narrow slip of cloth tied tightly between the legs, that keeps the testacles in the abdomen, and which is common among the Sonkap, Namtzik, and Tirap Nagas. We soon reached Jagon a small Singphu village and as it was our last village for some days and I had to get opium from the Kyah there, we camped just above it. Here I noticed many mounds, bamboo clumps and some trees, that the inhabitants who were Singphus, declared must have been remains of Ahoms in former days. I also saw and sketched here, a "Gabru Morong" or house in which all the single girls of the village sleep. All through these hills north, east, and south, the various tribes have a peculiar custom in common, and under various local names. It is that the single folks (generally the lads) have to sleep in separate houses called by Asamese, "morangs." These are of two kinds, *i. e.*, the Deka morangs, of the grown young men, who also act as guards, their houses being often on the outskirts or outlets of a village, and the little boys' morangs, where they all sleep together, and are under certain laws or regulations of their own. In some villages as among the Bor Duria Nogas there are as many as 10 and 12 Deka morangs, several boys' morangs, and three or four, for the unmarried girls. Incautious or abrupt questions regarding these latter, especially by strangers are apt to produce denial or evasions, as these hill men well know that our ideas of chastity are not theirs. But at times they speak out plainly. Lately a "Bor Duria" Noga who was giving me a list of his village morangs, in reply to my query as to whether the young men went to the girls' morangs, said "na pai, na pai, dinot na pai," not in the day, they would be ashamed, but after dark after all had eaten, then they went and all had great fun, it was their custom.

Among all these tribes this is more or less the custom, and we may truly say their chastity begins with marriage, juvenile chastity is not the rule, but the exception, I am aware that this is contrary to the recorded opinions of many; nevertheless I am sure it is true, nay more, it is apparently a race character of long standing, undoubtedly existing among these hill savages ere their dispersion by the Aryan invaders. We see this identical custom now among the races, north, east, and south, of Asam, races whose languages (originally from one stock) are now so different as to be quite mutually unintelligible. The custom also is so similar and peculiar as to preclude the idea of separate origin in each tribe. Like the "pile platform" houses we see among these same races, it appears a relic of very high antiquity. A custom that has survived the dispersion of these tribes from some common centre, and proof of original unity. To anthropologists it is of value as a link joining our present system of morals with the pre-historic past.

As we see the custom about us, it generally appears that the unmar-

ried have to sleep away from the parents' house, at times only the boys and young men, at others the young women and girls also, but in this case they have different houses, though all are called by the Asamese "morangs." Among the Bordurias, Mutons, Banparas, Jobokas, Sanglois, and the tribes near, they are called Pá, (pah) ; west of the Diku river I hear these morangs are called "Ari zu," and there are different tribal names for them among the Singphus, Mishmis, Miris, and others, on the north or river bank of the Brahmaputra ; attached to them are I hear fixed rules or laws, which it would be most interesting to collect and collate, and which may doubtless yield a clue to their origin. Viewing the "morang" as a phase of social evolution, it is probable that we have here before us one phase or form of the transition from original sexual liberty, to our institution of marriage and modern ideas of chastity.

The idea that sexual fidelity begins with *marriage* is here obvious, and almost implies that the institution began by capture, or purchase, giving a pair the right to live separate, as has been urged by many. A curious feature of the case confirmatory of this, is, that sexual infidelity by the female *after* marriage seems rare, much more so than among civilized communities. At this Jagon village there was only one morang and that for girls, the allusions to it I heard when we were returning, were unmistakable.

After starting next day I stalked a pair of the large brown Brahmini duck, a wary bird on these open sand flats, and only to be got by wire cartridge or when flying over. It then occurred to me, to note the relative distances at which game of all sorts takes alarm, a great deal depends on the presence or absence of cover. As a rule wild buffalo, or Gaur called here Mithon, moves at 300 to 400 yards, pig and deer in the open 200 to 300, but in forest these often stand at 100 or even less. Tiger and leopard, if in the open, make off at from 100 to 200, though I have known the former on a path in front of a man, to walk aside some 20 yards *to let him pass*, and quietly walk on after he had done so ; most monkeys scamper off at 50 yards, and do not mind being seen. The Hulok or ape on the contrary though arboreal, can seldom be seen, at least within 50 to 100 yards. Otter become fussy and try to frighten one at 80 yards, but if quiet they will often come quite close. Turtle generally drop off the snags they rest on, into the water, when I get to within 30 or 40 yards. Among birds there is a marked difference between the vultures as a group and most others of equal size, unless they are habitually protected, like the wild geese on the Sibsagar tank, storks &c. Insects seldom rise before three or four yards, while those that mimic inanimate objects can be actually pinned often ere they attempt to move. Probably our ancestors soon became expert missal throwers, and this differentiated them from the nearest allies. But to re-

sume our journey, by 2 o'clock we reached the mouth of the Namrup river, up which on the last trip I travelled for Patkai and Nongyang. It was now deep and sluggish at the mouth, while the M'ganto we now entered was conspicuously shallow and rapid, the water being remarkably clear. Inland all along on each side, was much the same jungle, as below, the same tangle of rattans, creepers, tall grasses, and tora or wild cardamum, 15 feet high. The trees of the ordinary Asam mixed forest, Modar, *Erithrina Indica*, Simol, or cotton tree, *Bombax malabaricum*, Sahm, the wild jack *Artocarpus chaplasha*, ajar, *Lagerstromia Regina*, figs unlimited, (except *Elastica*) Acacias, Eugenia, Michelia &c., &c. The huge reed-grasses as Nol, Kugra, &c., covered the edges and flats wherever possible.

Snags were plentiful all along but in the M'ganto remarkable for their numbers and size. At one place where there was a channel of deep water spanned by a huge stem, we all used it as a bridge, and the men said a canoe of 150 maunds could be made out of it. The large and straight stems I met with here and there fit for canoes struck me forcibly.

The regulation taxing all timber of certain kinds found in the river beds, might well in these wild places up-stream be suspended, the more so as in this same river Dihing lower down as much as Rs. 2,000 has this year been actually given by Government to remove by employed labour the snags and trees so dangerous to navigation.

Probably the regulation taxing the drift timber was instituted to meet cases where men might otherwise fell and float off timber growing near the banks, but apart from the fact that this of itself would be doing a service rather than the reverse, it might be borne in mind that the total harm these people could do as at present organized, could not possibly equal even 1 per cent. of the loss constantly going on through ordinary natural decay and storms.

Our camp was pitched at the tail of a small island four or five bends up the M'ganto suti, on sand close to a rapid and while some pitched the tents, others took the canoe as usual and got in a lot of large and small dry logs and branches, for camp fires and cooking. The tents and the guides' bivouac of leaves, generally formed a cross with a roaring fire in the centre, and small ones outside. With large fires no one would mind much the visit of either tiger or elephant. The wild solitary male buffalo was the only one we desired to keep clear of, as they frequently charge madly at anything that is strange, and disregard firebrands. Our three tents would certainly have been unbearable, luckily the only wild buffalo we came across were in herds or females.

After an early dinner I issued some "tea" and we had quite a jolly party round the fire, I usually lay at full length on my bedding and listen-

ed to the stories, or *guided the conversation*, in the dusk after dinner. The moon also was out and lit up the scene, and made us feel a little more at home.

I noticed our guide's mate Thang, both now and subsequently, very careful not only in how he tied the canoe in case of a rush of water taking it adrift, but also in the selection of a site for it, on enquiry it turned out that his caution was to enable us easily jump on board and push off in case of any sudden emergency. The old fellow was full of "wrinkles," though we probably did not see half of them, from his not speaking Asamese.

In the early morning at dawn we heard in the fog, a bear coming down along one bank, but though we all kept quiet, he turned off, ere he came near, perhaps having winded us. It is very curious that bear tracks are so seldom seen on the ground, and yet so very common up and down large tree stems. Judging by the tracks alone, here in Asam, one would suppose (of course erroneously) that bears were entirely arboreal. To one track on the ground, I have probably seen as a rule thousands on tree stems, one reason is that the latter remain, and those in mud or sand are soon effaced. At times they make what the Asamese call "nests," in trees, and I have examined several unmistakably made and used by them. They are, however, only "roosts," made by clawing in, and breaking, leafy branches that grow near, so as to form a comfortable place to sit or lie on, in the sun. I have seen as many as three in one tree, at various heights, the lower two broken with branches hanging, where they said the bear had, in rolling about, gone through; in all three the foliage had turned brown while the rest of the tree was bright green, and these roosts were thus conspicuous; the tracks were plentiful as marks and scratches on the tree stem but on the ground none. Generally the marks on a tree stem are those of the five claws.

At about 10 A. M. we got off as usual after breakfast, and found the rapids rather troublesome. At one place, going along the bank near a flat, all covered with high tufts of ekra grass, an Asamese on ahead suddenly bobbed down and pointed in, and creeping up we saw at about 100 yards a very large female wild buffalo, quietly browsing, and as usual a lot of mainas about, and on it. We waited to see more but she seemed alone, and had the long thin horns usual in some females. Later in the day we saw another, and while watching it grazing, several others appeared, eventually we counted nine and no big males. The four Asamese and the Kamti Lutak would not of course eat buffalo, and thus there was only four who would, *i. e.*, myself, a Kachari, my servant, and the Singphu Thang who would have eaten several shares, so I selected a calf and fired with the little M. H. C. at about 200 yards, not being able to get nearer. At once several other

buffaloes rushed up and they formed a group and then rushed into the jungle alongside, the wounded one among them. On going up we found blood but to follow them in such jungle was madness, and we had reluctantly to lose the calf; we subsequently found that a party of rubber-cutters had come across it dead, and jerked the meat.

Further on we passed a cunningly selected camp site, of five men who had been out elephant shooting. The ease with which the signs were read, the story completed, was noteworthy. Not an item escaped, it was no mere guesswork either, as they could explain their reasons for all they assumed.

About 3 P. M. we camped on what is an island in the rains, and whence we had a fine view of hills to the north-east that turned out to be beyond Mana Búm. In the morning we saw snow on a spur of Dapha Búm called Joitho, but it soon clouded over. A male and female Samber had been quite close to our tents in the night, their tracks plain in the sand; this latter became gradually less and less, and gave place to shingle which is not so comfortable to sleep on.

At dawn or as soon as I was up, old Kamti, as usual, brought me some beautifully baked yams, white, flowery and piping hot, with some fresh butter, they make a capital start for *chota haziree*.

In the night the men found the cold so great that several got up and sat at the fire and half asleep droned out long monotonous ditties, the thermometer several nights stood at 45°, which in moving fog is pretty chilly.

Again after breakfast we went on, and had some stiff rapids to cross, at about 3 P. M. again, we reached where the No Dihing forks, in a wide flat valley with islands, while hills right, left, and beyond broke in view, the best certainly seen so far. The extent of the great shingle beds and banks, however, was the feature most noteworthy. I had expected to see something where a little engineering might be expected, to work wonders, in the water-courses, of either river, but as I stood there the idea of the attempt even with hundreds of labourers looked absurd, evidently in the rains these huge shingle flats are submerged, and all little efforts at cutting or damming would be obliterated.

This question of the diversion of the waters of the upper Dihing wholly back into their own old channel, down Buri Dihing, is likely to come up in the future, as the need for more water in the dry season for steamers arises. Having this in view I examined the lay of the country at the bifurcation, and went over the great shingle beds, taking note of their size and elevations. About half the total quantity of water just now was passing off, *vid* No Dihing, and from where our camp was pitched, on the long spit dividing the two rivers, the levels were pretty much the same,

if viewed from either river or the central ground. A leading feature in the case is that for some distance down, either the No or Buri Dihing, there are frequent rapids with a fall at each of several feet, the channels in both cases lying well *below* the general level of the wide shingle flats on which the river divides, but quite an infinitesimal fraction of the total *water-way* as seen in the "rains." Thus while it might be possible by considerable expenditure of labour at the end of the rains to increase the flow down one particular river, as the Buri Dihing, by removal of shingle at the first and second rapid, at the fork, all this work would be quite obliterated by the ensuing floods of next year, which shifts the shingle and fills all depressions. The possibility of so far altering the channel as to render floods of extraordinary height likely is very remote. This indeed is not possible physically as long as the No Dihing outlet exists, only if this were completely closed (as it was originally) extraordinary floods might occur, (due to upper Dihing water) and for such occasions the Asam Rajas provided the bunds or Mataoris we see lower down along each side of the river some way in. If these are kept in repair there need be no alarm felt by residents on the Buri Dihing. On the contrary if they have anything to fear, it is that the whole river at least above Namrup may eventually take to the No Dihing branch and aggravate the present difficulty regarding *water in the cold season.*

Those who look at this question must remember that in "the rains" there is no likelihood of water being too low, the northern drainage from Patkai on which rain falls freely from the Namsang sources to those of the Namrup would alone give ample. It is in the cold season when the Tirap, Namtsik, and Namrup run dry, that the more elevated sources of the Diyun Kha and Daphapani hold good, and from whence a large proportion of the Buri Dihing water comes. The natural tendency would seem for this upper Dihing water to flow more and more *vid* the No Dihing and cut off these cold weather sources from the old channel.

Early next morning as expected, I had a fine view in dark outline of the Dapha Búm, and the ranges beyond to the south-east, called by us Phungan Búm, the crest of the latter remarkable for its rugged and turretted skyline as seen through the large telescope at dawn with a power of 100. Both groups were more or less snowed, and the crests presented the decided, rugged, and hard outlines indicative by its texture, of bare rock, which hereabouts is one key to elevation.

As the light increased the view became better, to the south-east rose Miao and Wahambo over 5,000 feet wooded to the tops, and their lower spurs flanking the wide flat valley on that side. In the distance due east, lay the N'chong Búm, at the foot of which flowed the Dihing, behind it being the Phungan group. Towards the left rose the series of peaks culminating



in Dapha Bum, 15,000 feet in front, at that side lay Katoh, and below it the smaller "Mana Bum" ridges. Here and there in the open flat of the valley wooded islands stood out clearly and broke the monotony effectively. With the exception of "Maium" peak 6,939 feet no part of the Patkai was visible, and it was seen with some difficulty in the haze. After enjoying the view for a couple of hours making some notes, and having breakfast, we started on, and soon passed what is an island in the rains having trees on it, the age of which I estimated at 20 to 25 years, and another one beyond, at 12 to 15 years. We soon came to the end of the dividing spit as seen now at least (in the cold season), and found the Buri Dihing water pouring down a rapid at one side, with a fall of probably 4 feet in the first 50 yards, the shingle was all large, and in crossing at the head of the rapid, wading was not easy even though the water was not more than a foot to two feet deep. The stream was very strong, so much so that very little force sufficed to start the large stones rolling down. Except at the very throat of the rapid the bed was wide and flat for considerable distances all around and it would have taken a large amount of work to carry the gut of the rapid (as a depression) up into the wide, shallow, and swift sheet of water above, so as to drain it off. If done, however, there could be no reasonable doubt, that very little of the water would have reached the No Dihing.

It took all hands to run the canoe up, and at one time I feared she would be filled; however, we got her up all right.

As we went on we found it true that gradually the sand would become less, and give place to shingle. I had brought strong lace boots with projecting screws in the soles, but soon discarded them for wading shoes similarly screwed. Here the latter were particularly suitable, as the stepping from stone to stone for hours, and at last days, makes one expert, and it is necessary to be "light-footed." Boots become at once filled with small pebbles, at rapids, and cannot be as easily taken off, or put on, as shoes. Pantaloon should be wide and cut off just at or below the knee. Some light material (as strong jute), is preferable; and two or three pairs should be kept handy to change after each wading if wetted to the hips. I hardly need say that about eight or nine good large pockets, are indispensable, and an orderly with as many more, close at hand, who should carry shot gun, binoculars, and sketch book, &c.

The rapids up here we found far worse than those below, in M'ganto, and the whole river-bed was covered by much larger shingle, even over the tops of the wide flat islands, where in floods the water must sweep with immense force, great tree stems were piled up here and there and jammed into masses. In other places the cold weather scour had undermined the banks of shingle so far at least that the stones often rested more like a

wall, or steep slope, the slightest touch often sending large boulders rolling down, that started others in turn.

One rapid we met was particularly difficult, and took us a full hour to ascend, at another soon after, we cleared a channel where it was shallow, and so ran the canoe up a little track fully a hundred yards. These rapids at last were about four or five to the mile, and made progress slow. Later in the day we suddenly met five or six Singphu women and girls out fishing, and they gave us some they caught, begging in turn for some opium. They were from a village called Ndong not far off. This was rather a hard day's work and we camped late, *viz.*, at dusk; I issued some tea, however, which cheered them up after dinner. Just ere going to sleep we were all surprised to see two Singphus appear, with some fish; they would not stay and promised to come in the morning and take me to their village.

At dawn for a few minutes I again had a good look at the hills ere the mists covered all in, and it seems true what these people say, that the best time to see their hills is at the paddy-cutting, about November, or end of the rains.

While at breakfast the Singphus came and some of us started off inland, crossing large flats, of river formation, sand and boulders, covered by grasses, and here and there having water-courses, now dry. After a couple of miles of these island flats, we reached the land proper, though here and there we still saw boulders and bedded shingle. At last we arrived at their village of Khagam, which was a collection of more or less dilapidated sheds, on piles. Of the large "Wra Bamboo" there are several planted clumps, as usual at all Singphu villages. The people use the joints for buckets, and some I measured were 20 and 21 inches in circumference, and about 80 feet high, growing remarkably closely in the clump.

The enquiries for tobacco, (Sadr Dhopat) were here a positive nuisance, opium and tea also, they seemed to know only too well. The large number of children struck me, and I afterwards found my men had noticed it also. To all appearance there may have been six or eight to each house, and two to one compared to the grown people.

*En route* on we had crossed a small stream which they call the Manmo, or as we should call it Bamo, and it is named from that place in upper Burma. Passing on we came to another village called Phúp, near which I obtained the only view of the Patkai crest near the Nongyang pass. The haze was considerable, but I could see that the crest towards the east was lower than at the pass, and over it ran the Loglai hills that divide that river from the Turong. Returning to the river near Loang I found the men vainly trying to get the canoe up a bad rapid, so I decided to leave her in charge of the Gam. We therefore unloaded the boat and camped.

A very smart and intelligent young Singphu, whom I had allowed as

a favour to carry my little rifle from Phúp turned out here to be the Bishi Gam's son. He could not speak a word of Asamese, but I sent word by him that I should pass through his village next day, and should need some rice. His father is rather an influential man, not only on account of his intelligence, but from the position of his village which may be called the last on the line from Asam to Mung Kamti. Khomong at five days further on being about the half way house. This compels all travellers to buy paddy at Bishi both going and coming and thresh it out ere starting again.

While at this Loang Ghat, I had several applications from women for medicine to cure goitre, of course in such a limited time and without a special stock of Iodine, I could do very little.

At these Singphu villages I observed a cultivated variety of *Plectocomia* (the large cane); the seeds are eaten. The stem and leaf stalk is almost completely destitute of the spines generally so densely set all over both, and the midrib. Unfortunately I could not procure a single seed, though I bid well for it, nor could I get a flower as it was not the proper time.

Next morning after breakfast we packed up all our loads, handed the canoe over to the Loang Gam's charge, and started for Bishi. We passed some suties of the river from which the water had been cut off and where the villagers of Bishi were fishing. *En route* we saw some of the rice fields, and bamboo clumps, where villages of captured Asamese had been interred by the old "Dapha Gam" in former days. These Singphus used each cold season to raid Asam and carry off slaves which all ended in our expedition under Col. White (?) and the Dapha Gam's retreat, first to the Mbong yang and thence to Hukong, where his descendants now live on the Dinoi east of the Turong and Tsak tsai.

The path into Bishi from the west, is over a low spur from the Mana Bum ridge that comes down quite to the river, and a little east of the village ends in precipices, spurs from the Miao Bum also approach from the south and do the same, so that Bishi is really situated where the valley is narrowed to a sort of gorge. The village, however, is on an alluvial plateau about fifty feet high or so, and the site is open, the hills not being high.

A straight and level line edges the river on the opposite bank, and suggests a similar alluvial terrace there also; in which case it seems likely that these terraces were at one time part of a large plain. This feature appears here and there all the way on hence to the Mbong yang where it, so to speak, culminates, and is seen in situ, as a large plateau. The Gam and all his people were out at the fishing, but I was agreeably surprised to find his village quite a contrast to the others, all

the houses were in good repair, the chief's especially, there was a look of substantial prosperity about the place, and the houses were mostly in a regular row on each side of a wide sort of road, the Gam's at the eastern end. Not desiring to camp actually in the village where dogs and pigs are a nuisance, we descended east to the river, and found just enough sand to pitch the tents on in a depression of the bed now dry. In the evening I sent the guide up with a pocket flask filled, for the Gam, and a smaller one for his son, also to explain matters a little, as otherwise the visit might be unintelligible. In the morning he came down, with some of his people, and I at once saw in him the best Singphu chief I had seen so far.

He was above the average in height, and proportion, about 40 to 45 years old and held himself upright without any affected airs. Features large and strongly cut, but a quiet kindly and shrewd look, that became him as the "father" of all his people, old and young. The only difference in his clothes, being, that his were quite clear. In speaking I could see that what he said was generally to the point, and well weighed. Altogether he was by far the best sample of what a chief should be that I had met. From where we stood he pointed out on the hill just above us, the clumps of Wra bamboo growing now, that were planted by the Dapha Gam, at his village, which was on the hill.

The difficulty of reaching Bor Kamti he explained, and confirmed what others said, as to the likelihood of having snow on the passes, which all these people seem to consider a formidable obstacle. From Bishi to Dapha Pani, is usually two days, thence to Khomong (last Singphu village east) another five; from Khomong the path leaves the Dihing (or as these people call it *Diyún Kha*) and crossing the Songsan Bum (which I believe is a southern prolongation of Phungan Bum) reaches and goes down the "Mung lang Kha," or "Nam lang" and over other spurs to the Bor Kamti villages. Another eight or ten days, or total from Bishi to Mung Kamti about fifteen days. The path beyond Khomong he declared difficult, and said it went large part of the way up or down gullies, that practically there really was no track or path at all, the danger to a party like ours being, that if any accident occurred, we should certainly run short of provisions.

All parties going to or coming from Bor Kamti had to carry at the least ten days' provisions, and this made the journey between those places difficult to those carrying loads for sale or barter like daos.

The difficulty of transport of a Commissariat indeed we saw now ourselves, for I had to ask the Gam for three men to carry rice for us to Dapha Pani, as I calculated I should be absent from Bishi fourteen days, and get no supplies elsewhere meantime. Knowing that the Singphus and Kamtis when travelling cover great distances compared to what I should

do on a trip like this, I allowed double their time, *en route*, and for six days to camp at the Dapha Pani, total fourteen days.

The Gam and his people had an idea that Europeans cannot walk or climb, and spoke of the difficulty I should meet in surmounting Nchong Búm, that we saw lying as a ridge across the end of the valley eastward, which from Bishi, again opens out as a wide flat tract with low hills on each side. I had an idea that I could get along better than they expected but kept this to myself and was glad of it, as I thereby had a key to the difficulties of the route in other places, I here had to bargain for more rice and found that they would only take opium in exchange, at the rate of six seers rice per tola of opium, but as the local rate for opium was eight annas and twelve annas on our return, and mine was bought at  $5\frac{1}{2}$  I did not lose so much.

Money is thought less of, as the rubber trade enables them to earn it easily at times for Re. 1, and even, if lucky, Rs. 2 a day, and I have heard of a Naga making at the rate of Rs. 4 a day for a week.

A lot of women and girls and boys came to see the big telescope, and as it magnified to one hundred diams. (if necessary) were pretty much astonished; the binoculars, and a smaller telescope were also in request.

The Gam was much struck with the revolver, and its range which I could shew him by firing down the river. The little M. H. Carbine also as usual was a surprise to them all.

In the afternoon I paid a short formal visit to the Gam's house, ere he went out to the people fishing. I noticed the elephant ropes or phands, hung in his roof that are occasionally used hereabouts by the Muttok Gosain. The ploughs also, four or five, were all slung up in a row so that a little smoke might help to preserve them from the attacks of insects, the Chinese cast iron socks all removed and stowed in doors. His wife was a homely and sturdy woman with no pretensions to beauty, though she was evidently a good house-keeper by the number of hens, and their nests I saw, and the various odds and ends I could see from the outer compartment, beyond which I did not go. The total length of the house might be 90 or 100 feet by 30 and divided into many compartments in which the various members of the one family live; a strapping big daughter was married to a Singphu who lives with them, and who was nursing a youngster. The Gam's brother lives in the next house, also a good one.

Having arranged regarding the rice, some vegetables, and three men extra, also about leaving a few of my boxes, with stores for the return journey, in the Gam's charge, we went down to camp again, I had a long talk with an old man who spoke Asamese. Next morning after weighing out the rice and tying it up, settling the loads which the Singphus shirked (as usual), issuing a little tobacco to the ladies, old and young, who came to

see us off we made a start. I noticed the Gam go round to each of the four men who went with us, and give him a little screw of tobacco and wish him luck. The men with loads at once waded, but an unloaded man would hardly have got across that way as the stream was so strong and waist deep. I and the servant and guide crossed on a bamboo raft, kept here on purpose.

On the off side is a large flat chur quite open and used for grazing cattle on, a small offshoot of Bishi called "Pen gaon" being on the southern terrace flat, as Bishi, is on the north one; on the map it is marked Kasan, and in Wilcox, Kusan, which the people did not seem to recognize, until my guide pointed out that they were of the Kasan Singphu clan. Passing the cultivation to the east, we emerged suddenly at the steep edge of this alluvial terrace, from whence the view is very good, as it overlooks the valley for some distance and shews the hills beyond well. The bottom of the valley was a wide shingle flat, here and there cut up by water-courses mostly now dry, and with scattered rather irregular forest, the hills at the flanks being very low. The valley which is constricted at Bishi, by hills coming down on each side now opens out and is about eight or nine miles long by one or two broad, the wooded hills on the right (to south) rising pretty steadily to Wahambo and Langu búm, as shewn in Col. Woodthorpe's map, which is careful in detail. After passing the Kachong and the opening to north where the Pakan comes out, we camped, where there was firewood, at an old shanty built by rubber cutters, and were soon all housed. Had we started early, we could easily have reached the Nchong Búm, as I afterwards found out, *i. e.*, the usual march from Bishi. But as I was out as much for pleasure and health as anything, I did not attempt to force the pace, or camp at certain defined spots at all risks; besides I always made it a rule to camp early if possible, *i. e.*, while there was an hour's sunlight, at least. While at dinner we were all surprised to hear a gun go off about a mile away, so after an interval of about a minute I fired my carbine, as reply, and to invite the other party over. No one appeared but as they turned out to be Mishmis, (probably after elephant) it is likely enough we were examined after dark.

In the morning at 9 A. M. the air was 66° and the wind as usual from the E. N. E. and we had a beautiful day. We soon came across the Mishmis, three men, two girls, and a Singphu son of the Dungon la. While the guide was talking to them, one of our Singphus pointed out where there was a lake up in the hills, which he saw when searching for rubber two years ago with five other men, on Langu búm. The summit of one of these hills they found quite inaccessible, though from below it did not seem particularly steep. At the extremity of the valley where the path crosses the river, we had to wade, the Singphus at once stripping and tying their

few clothes in their huras, or baskets. After all were in, I saw that where shallowest, the stream was strongest, so I took a middle course. The nails or rather *screw* heads in my shoes, were very useful as the stones were so large and slippery; a stick was indispensable, not put in down-stream though, to save one going that way, but up-stream to lean on; in fact, if put down-stream it could not easily be forced to the bottom, whereas up-stream the moment it touched the water, it went to the bottom "like a shot" and stuck there, if put in at an angle. The water was up to our hips, and only one man, my little Kachari Bhodai, had to be assisted. After a short distance we came to another rapid that had to be forded, a very ugly one below, where the water all rushed close under precipitous rocks, neither I nor the guide were then aware that really there was no need to cross at all, so we all went in for it. I, however, made the Singphu go over first and then return to assist if needed, and having donned my swimming belt as a precaution, walked in.

At first it seemed all right, but the boulders were such a size in some places, two and three or more feet across, that they caused eddies, and in turning to avoid one in front of which the stream had scooped a hole about four feet deep, I was suddenly aware that I had stuck and hung poised as it were a moment.

Sideways I had got on all right but the increased resistance in facing the stream three to four feet deep made a difference. Nden gam a powerful young Singphu, accustomed to all this, at once came towards me, but I managed to get on, and pointed him to little Bhodai behind, whom he took in hand just in time, as his load had touched the water, (and wet all my clothes), as they all said again, "loaded people get on best, as they have more hold of the bottom."

Each person took about five or six minutes to cross, and in this case I went in at times to the waist. We were now close under a pretty high hill and a strong cold wind blowing made us pretty cold, but we pushed on, and came to where the Dungan Kha falls in from the north, and the Dihing emerges from the south-east between the hills, in a gorge. The place is called Dungan yup.\* Here we discovered that if we attempted the ascent of N'chong büm that day, we should again at once have to cross at another bad ford, so rather than do this and to give time to dry clothes I camped. We had, however, not selected a good site. It was all right in fair weather, but after an early dinner it clouded over and we heard thunder, our tents were pitched on the sand, in the middle of the gorge with high hills on each side, and seeing this I had the edges of the tent sunk some 6" in the sand all around, and good large stones piled in a row all around outside; lashings all doubled and some branches held to wind.

\* Yup in Singphu "sleep," a resting-place.

ward by stones, to break the force of the wind which now began to rise. It was hardly dark ere the storm broke. The thunder rolled and roared as it only can in the tropics, and the lightning played here and there as a constant flickering blaze. Rain fell as heavily as it well could, but my water-proof was lashed taught outside, and though I hardly expected it, I rode out the storm which lasted some three hours, without getting wet. The men though they had a large water-proof got wet gradually, and in the early morning at dawn, I got up and donning my great coat (which I never needed so much in my life before) I got in some logs and tried to start a fire. It was, however, useless as the wind was a perfect hurricane, blew all but the big logs clean away and I had to start and build a low stone wall of big stones, to windward. By filling the larger holes with sods, I at last got shelter enough to try again, and arranged the firewood and logs, ere I struck a light; by using up half a candle I got it caught at last, and it soon was a fine blaze. I looked in and saw the men asleep still and roused them, I made my servant issue tea for a big brew, that soon put all square; such wind, however, they all never experienced before. The guide, four Singphus and Thang, as soon as they saw the storm coming, ran from their bivouac near us, and made for a couple of big holes in the bank under the stem and among the roots of a huge tree; where, at five feet from the ground, they crawled in and lay all night in fear of the tree falling, in which case all were at once dead men. Old Lutak said he had not closed his eyes once, and he certainly looked like it. It was some time ere the driving clouds, down the gorge, allowed the sun to come out, and meantime we had breakfast. By this time we spied men in a shanty on the opposite bank but could not be heard as the rapid was in the way, yesterday on our arrival here I forgot to say we came up just as two Singphu men and one woman, emerged from the same ford, and reported it waist deep, the two men came up wet and shivering and the young woman soon after, shivering certainly but not wet which was a mystery, and after a talk they started on for Bishi, we now discussed the passage, and the men opposite beckoned us to go upstream. Nden Gam volunteered to shew us an alternative track. By going up some distance on the west side and scrambling on the rocks at side, we came to a place where a huge tree stem lay out in the stream and off it he stepped into water not more than two feet deep and took an oblique line to where the men opposite stood, and we crossed easily.

There was here some more discussion as to the proper route, and eventually it was settled that the old direct route over the hill was too steep for the loads, and in lieu of it we were taken along the most execrable track I ever saw. At times we had all to help each other up places steep as



a ladder, partly by rocks and by roots, or down to the river. In two places we had to wade along the crest of a narrow shingle ledge in the centre of the stream and deep blue water on either hand.

Suddenly we came across the shanty and stores of men out for rubber, but the only thing taken was a light for a pipe. Here while halting a few minutes to give the weaker men breath, I could not help admiring the gorge and wishing I had my Rob Roy. The river was flowing though very sluggishly through a sort of rift or chasm in the hills, and in the bed at the sides were huge rocks. The sides of the gorge had jungle in every nook and cranny and its rockiness did not look so conspicuous. At every few hundred yards, there was material for a really fine picture, up-stream or down. On starting up, we took to a gully and it led up—up till our legs ached. Progress was very slow, at last after about half an hour's climb we came to where there was a small ledge of soil, about 12 feet  $\times$  8 or 10, and a spring. The Singphus were for stopping as they said we should get no more water that day or night, and when I insisted on going on they filled bamboo tubes. This was rather too good, so I told my men to follow me and fill their *stomachs*, and proceed. It turned out that the track above certainly was steep, indeed it was a case of holding one's breath now and then, but by going at it steadily we got on, and at last the track got more level, and then quite so, and as I guessed we began to descend. Two of the Singphus now went on ahead, and I soon pointed out to the guide where we could have got water down a gully. At last we espied the valley below and listened and heard the rush of the river, so pushed on down at as rapid a pace as possible, and at dusk emerged off a flat ledge on to the river. After marking the track by paper, we crossed a little knoll, and found the remains of an old camp at a cliff overhung by a rubber tree. As a large rock of some eight or ten tons had fallen on and collapsed the former hut, we voted it best to camp to one side, and finding bamboos handy, the men were soon housed. The two Singphus who had gone ahead now turned up with two large fish (mahseer) which they had netted, and came in very handy. Here again I issued a little tea all round, and we soon got to sleep. In the morning we were all surprised to find the little branch of the river that ran beside us the night before clean gone. While having a wash at the rapid not far off, I could not help every now and then remarking a deep-toned noise or ring coming from the water, I had heard this noise before in Disang at a rapid and could not make it out. It was not regular, but occurred now and then. At last I concluded it was caused by very large boulders, poised in such a way that an extra rush of water overset them against another rock down-stream, and the concussion was the sound I heard. The boulder falling back again so soon as the extra rush was somewhat abated, repeated the sound. Just above

our camp site up-stream I was shown a conical wooded island called "Khomong morang" said to be one solid block of stone? To the south lay a wooded hill called "Kumtsai kú" (*lit.* sand hill) and by degrees we emerged from a pent-up gorge, to a wide and flat open valley running east and with low hills along the flanks. Here and there to the south, I noticed horizontal lines in the forest, at about (as far as I can recollect) 100 and 150 feet up, evidently wooded flat terraces.

In some places the edge had fallen away and shewed a clay and sand formation with *bedded water-worn stones* large and small, as though the whole valley had once been filled up with this, ere the river cut down to its present level, through the gorge we had passed. Presently we came to the hut of some men out rubber cutting, who also had killed an elephant. The usual bamboo pole and conical receptacles for offerings to the Nats, was stuck up and the tail and one foot attached; a little way off was a rough platform covered with great lumps of meat being smoke-dried. I had to stand to windward while some of the Singphus selected tit-bits in exchange for opium. As the great irregular lumps of blackened flesh, were fingered, and pawed about, and nodded over, at this jungli "exchange," I couldn't help noticing that some of them looked quite as intelligent, as their owner's face. Away all around behind him, what a view! one fit for heaven more than this earth; yet this smoke-dried old fellow, though brought up there, had probably never seen it. Had passed through life as an intelligent vegetable.

In about an hour after we met two Singphus, one with a gun, and in answer, to the query "where from," the eldest replied "Khomong," which I much doubted, seeing no trace of bag or baggage; eventually after hearing that I was *not* a Government officer come to haul him up for elephant shooting, he admitted he was a rubber-cutter, out shikaring. I had guessed something of the sort as he came up (with a conspicuous swagger, about the legs).

Soon we noticed an extremely level spur from the north, around which they said the path and river lay, it became gradually quite a conspicuous feature; clouds, however, had covered in most of the ranges behind. At last rounding this spur, we came out on the Dapha Pani and a very wide grassy flat valley extending some miles towards the north and bounded on the west by the spur abovenamed, while to the east extended all along the side running north and south a *very remarkable level and straight cliff*, alluded to by Wilcox when passing there in 1827. It was so level and straight as to be more like a huge railway embankment, and at a short distance behind could be seen another. They extended thus for some miles. We passed across the open level of the valley bottom, which was all burnt *ulu* grass, and had stones and boulders rounded and polished

sticking out of the turf everywhere, coming to the river which flowed along the eastern side. Here at the mouth of the Dapha Pani near its junction with the Dihing or Diyunkha, we pitched our camp, and got in plenty of firewood as both elephant and buffalo was reported about, and the tracks seen.

Here though fairly close to Dapha Búm, I still observed the wind to be south-west and north-east watching for the clouds to pass off the crest of the ridges in vain, until twilight, when I saw that the peaks had as yet comparatively little snow on them. I had only a few minutes left to examine the higher ridges with a high power to see how far they were bare or covered by vegetation. In the very early dawn and until sunrise I again was able to see the summits, but for very short time only, as mists came out below, all over the valley, and when these had cleared off below, the hills were all clouded over. I therefore determined to go up the valley and have a look round generally wherever possible. The old Kamti and I took "Kumku nong" with us, as he knew the place somewhat. He was one of our loadmen, and the wonder to all was, how, with such thin legs, he could carry his load and walk as far and fast as the best of us. One good feature about him was, that there was generally some information to be got from him, and at the least, he had a joke and a grin, always ready. In former times when a strong young man, ere he had small-pox—he had been up the Dapha Pani hunting—as far as the water parting towards the north-east up the "Shi kha." He described it as having jungle more or less everywhere, with tracks and paths, but not a nice country to have to push through rapidly as in travelling, in consequence of the frequent detours necessary to avoid impassable gullies &c. Otherwise as a place to quietly camp and shikar about in, it was all right, if one had some rice, for there was a good deal of game, among which on the upper ridges there was "Takin."

As we went up the valley the signs of erosion and deposit were very conspicuous all round. Our progress except for a few yards here and there, was at first entirely over large rounded stones, and the stepping from stone to stone for an hour or so on end, is monotonous. At last we spied smoke, and then saw two men watching us from our left, Miju Mishmis as it turned out, and we at once hailed. They said they had seen the smoke of our camp, and were going to see who we were, and to examine their fish traps. One of them had a fine cross bow, the other a long and beautifully made Mishmi spear. Both had the regular Mishmi basket, or haversack, that lies in the small of the back and is usually covered with bear or monkey skin. We looked into their cunningly made hut as we passed; a wild animal would hardly notice it, being part and parcel of a great snag or drifted tree, stem and roots, with stones and turf added. Thence we went along in

the *ulu* grass, on one of the many flats on which here and there a few small trees grew, but our course all the time was northward up the valley, and parallel to the river, which in an endless series of roaring rapids, winds and twists down the eastern side of the valley at, or near, the peculiar cliff that borders it all along, on the east. At the mouth, the Dapha Pani valley may be a mile and half wide, and the length 7 or 8, the entire floor being a flat, covered by *ulu* grass, and a few scattered trees, among which water channels, lined with rounded boulders and stones, meander. One could gallop on horseback almost anywhere, as far at least as the jungle was concerned, though the great (and small) rounded boulders projecting from the burnt turf, and in the grass, would not be nice to fall on. After going about five miles and still not coming to the end of the east cliff I sat down, and had a good look at it all along, with the binoculars, at the distance of about half a mile. From what Kumku nong said, there is only one passage up to the plateau above, in the whole length of about seven miles, and the top is perfectly flat and level to the foot of the second cliff, and thence flat again for a long way in, the entire plateau being called the "Mbong Yang." The edge of the cliff being perfectly level and straight for such a distance gives an extraordinary importance to it in the view, even though it is wooded all along the edge at the top and for part of the way up from below, all over the talus, which extends the whole way also. The upper half is precipitous and though here and there ferns and creepers hold on, large portions are quite bare and red, showing the clay and rounded boulders of which it is composed (for the upper half at least). Towards our camp where the river is cutting the base of this cliff, the lower third of the height is of vertically bedded clay slate and shale, the upper part as before of clay with bedded *rolled* boulders.

The height of the cliff I here estimated at 200 feet. We returned along the western edge of the valley where the land seems to rise a little in wide flat benches, five or six feet at a time, towards the range along the western flank, which is tolerably level in the main, but not so conspicuously so; at the east cliff the benches also are not regular, altogether it looks as though the land had once been continuous between the western spur and crest of the east cliff, and that the whole Dapha Pani valley had been slowly cut out to its present depth. Among the boulders as we returned I found a fine rounded block of hornblend porphyry weighing about 100lbs. and had great difficulty in breaking it, so as to get a specimen. Though the Singphus and Mishmis see so many thousands every day, they all declared they had never seen that kind of stone before. One feature of the Dapha Pani that struck me, was, the great variety of colour, in the bed, due to the extremely clear water; the natural colour of the rocks (all more or less smooth and rolled) was brought out conspicuously as though they were

varnished. As far as I could see, none of those in the bed were in situ, even though often of large size. I had great difficulty in getting up on one monster of gneiss, which measured about 40 feet  $\times$  20'  $\times$  perhaps 15 or 16 and was one solid irregularly rounded mass, partly in the river, and some way from the cliff, and though it projected some ten feet above the water on the up-stream side, there was a deep blue basin of rushing water in front of it. Blocks of the size of a hogshead were common, everywhere in the bed, and on the bare shingle flats the size was less. Evidently the river has a rapid fall, and in the rains the floods must be heavy and violent, extending all across the valley except perhaps here and there on the flat ledges. Only a small proportion of the boulders were sandstone, most were of gneiss, and granitic, though none of pure granite; apparently serpentine and trap constituted a large percentage, also chlorite, and metamorphic conglomerate. The evening gradually clouded over, and in the night a little rain fell. Next morning was foggy until about 10 A. M., when I started to ascend the hill south of the valley mouth, to get a good view over the Mbong yang. We had to wade the river, and found the face of the hill near the bank, so precipitous that it was some time ere we got a place to climb up; I selected where there had been a landslip, as it had cleared the face of the hill of the forest and vegetation that otherwise would be in the way. We found it no easy job to get up and not very safe, as now and then, a stone slipped and bounded past, rather too close to be pleasant. At about 200 feet up, I halted, as it seemed both difficult and dangerous. An accident to any one would have been highly inconvenient, and after a good survey of the valley and making a few sketches we came down and re-crossed to camp, where I found some eight Miju Mishmis, the most striking feature as we approached, being their large crossbows.

I now heard from "Kreng sha," the one we had met before, that a colony of them had come over this year from the "Kamlang" and also I believe the Teng kha, north-west, and intended to settle permanently near the Dapha Pani, and up the Inké which falls into the Dapha Pani from the north-west having their jums on the spurs at the western head of the valley. This I was glad to hear, and told them so, as it would tend to render travelling much easier if supplies could be got from villages all along. They asked many questions, on various topics, such as the price of rubber, and if I thought they were being badly cheated by the dealers, &c. In return I also made numerous enquiries, as to routes, animals, the forests, &c.

None of them any more than Singphus seemed to recognize the name of Dapha Búm which is seen on our new maps as "Mai thai Dong," all shook their heads and had never heard such a name, their's being for central

highest cone "Wa-thong," a summit to the south-west "Kambro," and the continuation of it "Kunjong."

A conspicuous double peak on the snowed ridge going east, they called "Taiyún." None of them had been to the east of Wathong, and described the routes there as difficult and over snow. A party had come over probably from Bor Kamti valley, some years ago and two of the men had to be carried in, having lost their feet through warming them at a fire when frost-bitten. No one seemed to know that hard rubbing with snow might save a limb, and I described the process. As we sat talking, the clouds moved off, and we had for the rest of the day a fine view of all the hills. A peculiar persistent grey green shade, all over the lower part of Kun jong had struck me for some time as contrasting with the upper part of the same. I had attributed it to cloud-shadow, and the upper yellowish brown, to sunshine, but as it remained there after all cloud had gone, I at once saw it was caused by some change in the vegetation.

On enquiry it turned out that the yellow ochre colour was caused by dry grass and a small bamboo, called by them "Shu mu," the leaves of which turn yellowish. It grows in scattered clumps all over the hills at a certain elevation, with and above the belt of firs.

This belt could be well seen in the large telescopes and the individual trees, their branches, tufted heads, and shadows could be even distinguished. As usual with fir trees, they grew often up the steep ridges, and gullies, or ran in a line up the shady southern side of a ridge, among the snow fields, and had it all to themselves, barring the "Shu mu" little bamboo, and grasses. The takin is partial to this region, and difficult to shoot from its wariness and agility. They also report the elephant as wandering up as far as the snow at times, say 10,000 feet or more. Musk-deer and yak also reported.

The crossbows these men had, were very powerful, 5 feet long, though the stock was small, and light as possible (barely long enough for the short arrows) and had the ordinary crossbow trigger of bone. Arrows plain, and poisoned with aconite, were carried in a small tube of bamboo about 18" x 2" with a worked cover to slip on, the quiver tube being carried under the left arm and breast, cap upwards, handy. I was surprised to see no regular dao such as other tribes use, and in lieu of it they use the small nearly straight and pointed knife carried on a sheath or in one. The spears were beauties, heads well made and strong, the shaft of caryota stem or nahar wood, and the spike a foot long and thin, but strong also. Most had the basket covered by some skin, worn in the hollow of the back, the suspenders going a-la-knapsack over each shoulder, and hitched in front by the bone fastening, which fastening is noteworthy for its simplicity.

Ere leaving, one of them gave me a little knife such as they use to cut their Sali with, and in return I gave several of them little tin boxes with beads of various kinds, and bugles. Of course the guns and telescopes were sources of wonderment as usual, and they went away after giving me an invite to their future village, if I again came this way. The evening brought one of the grandest sights I ever saw in my life. The gorgeous effect of the sunset on the hills, and the snows especially, was simply indescribable. It was heightened by the contrast of the intense blue-greens, blues, and purple, of the lower ranges as they passed into shade, while the upper snow covered ridges and peaks were in a blaze of pink and golden sunlight. The sky behind being a clear and pale emerald green grey. The Asamese who were eating their dinner, came and stared at it, and variously expressed their admiration of a "snow mountain," which till now they had none of them seen. The snowed peaks retained for some time, a clear grey light that enabled the telescope to be used on them, long after all detail in the valley was merged in darkness. At night we heard a tiger hunting over the plain, and also elephants first to the north-west and then north-east and next day saw where they had ascended the Mbong yang plateau near where the cliff ends, close to us.

To-day at 9 A. M. I found the water boil at 210·10 by two tubes of B. P. thermometer, the air being 56° and we had fog till about 10 A. M. It is a pity there is no good site near for a camp opposite the mouth of the valley at 400 or 500 feet up as we should then see the hills over the fog. "Kumku nong" says that eight years ago, he was up east of Dapha Bum, near Mailam Bum, and camped for some ten days at a flat called "Mailam yang," which the others had heard of. By his account it is a high and comparatively flat tract, at the head waters of the Shi kha and near a route, from Bramakhund side to the Mung lang and Bor Kamti Shans and Kunungs, called the "Noi kong-isong" bat. He places this tableland (not large) at east-north-east of Dapha Bum.

If this be plotted on M. Desgodin's map, (Pro. A. S. B., 1880, Litho. 1881,) it should fall uncommonly near the boundary of Djrouba, the south-west corner of the boundary of eastern Tibet, which is there placed in the corner between the upper tributaries of the Mli kha branch of the Irrawadi; and the Brahmaputra (a little north of the Gulm thi).

I had (so far) considered the range encircling the Mli kha valley on the north, as very high and ending in the peak called Nam yen, (on Wilcox's map) and as an impassable barrier, with some high peaks rising perhaps to 20,000 feet on it.

If, however, it turns out (as it now seems likely) that the Mli kha, where these "Kunungs" live, drains the southern edge of a high plateau around which there is probably a range, it may be true what one of the

Kunungs told me, *i. e.*, that he had travelled northward and gone into Tibet for a short distance, that there *was* a route, though difficult, and few travelled on it.

He also stated that there were routes between the Mli kha and Brahmaputra on the one side west, and (though none north-east) others existed over the ranges to the east, going to the Disang or Sang kha, on which also Kunungs resided, and thence east towards China.

Until these tracts are examined it will not be possible to say whether or no this "Mailam yang" is a prolongation of the "Djrouba plateau" or not.

While looking at a snow field this morning I was surprised to see very clearly the tracks of two avalanches, distinctly marked out, as long curved depressions having a ridge thrown up at the sides, and the snow piled at the bottom, one of them was about 1,000 to 1,500 feet in length; neither were there the day we had come.

The colour of the rock forming the crest and peaks that appeared where there was no snow, was a dark "purple grey." In the early morning ere the fogs arose and when the air was at times very steady, I could put on the telescope, a power of 800 (diameters). This enabled me to get as it were close to the summits and see detail with no exertion. Though the distance was 16 miles I could detect easily the sharp outlines of the rock, even the larger fractures or cracks, but no trace of vegetation. The first seen appeared to be grass, after which there are two kinds of bamboo, at least so the Mishmis say.

From all I could learn I might by now have reached Khomong the Singphu village on Dihing towards Bor Kamti at four or five days from Bishi and three from here, but I was told the journey was almost precisely like the part already travelled over, if anything more fatiguing; and that when at Khomong, I should see the usual dilapidated Singphu sheda, and learn very little more than I already knew. This might be partly true, but I still wished I could have gone on, the fact was that I had already pretty nigh exhausted the little stock of presents I brought, and to go empty handed, where if anywhere, presents are *de rigueur*, might not be good introduction, or conduce to future success in these quarters, so I perforce made all the enquiries I could, here and elsewhere as to what lay beyond. The Phungan or Bongan ridges that stretch away south from the eastern end of the Dapha group I saw from several places, and from the western edge of the Dapha valley, up a tall tree I had a good view, and found them pretty heavily snowed. The route to the north of these hills and over the saddle between them and the Dapha by which Wilcox crossed is called I am told the "Teau rang" bat, and not now used as it is more difficult than the one round the south end of Wangleo, over a ridge



called Song san Búm. There are now no villages between Dapha Pani and Khomong as there were in the year 1827, though the sites are known; at the same time Wilcox's names are not always spelt correctly, for instance, his Koom koor, I saw the site of and it is Kum ku. (Ku is hill in Singphu.) Kum ku was in fact the name of one of my men, who had been born here, ere the village was removed to the Kam lang, and part of this village I hear is about to return to its old site again, under the old chief's son, (whom we had met with the five Mishmis, near the Dungan). Again Willcox's "Puseelah" just east of the Dapha múk, is intended for "Bisa la." (= Secondary Bisa), Oglok is correct but the village gone.

His "Insoong" is intended for Nchong. There are also no large villages of the Muluk tribe where he has them unless it be the *one* of Khomong Singphus. Next day I determined to shift camp to the western side of the valley ere returning viâ the Nchong Bum route, so as to avoid the gorge. We therefore packed up in the morning after breakfast, and I directed the men to go about four miles up the valley and camp on the west side, while I and the guide, Nden gam and Uren nong, started up the Dihing for a mile or so and proposed crossing the Mbong yang plateau, coming down by the only outlet known, and so across to camp, in the afternoon. After seeing all the loads tied up, we waded the Dapha—not a nice job at the mouth where the stream was strong and the stones large; the Singphus were up to their waists, so I selected a place where there appeared to be a line of big stones and stepped from one to the other, to reach each, however I had to make the attempt to step a foot too far up-stream, even then I was up to the hips, at last one of the boulders rolled over, and I went in, but was out again ere my note book got wet inside. About half a mile up-stream, we spied some Singphu rubber-cutters, on the off-bank, and saw another trophy and remains of elephant and deer, tied to it; Nden gam here pointed out the mahseer, literally and truly paving the bottom of the river, there must have been hundreds, (probably thousands,) from two to three feet long, though obliquely through the water they seemed only about a couple of inches deep.

In about half an hour after we ascended where a great rock barred our passage on the north side (or Bank of Diyun) and reached the top of the plateau after a little roundabout climbing and over undulating land.

Once on the top we found it remarkably flat, and tolerably free from jungle; it had been largely trampled down by elephants. The forest was very second-rate, few or no large timbers or straight. Some way in we came across two small burial mounds that belonged to the former village of "Bisa la;" the course lay on straight for the upper end of the Dapha valley, and as far as I could see the land everywhere was practically quite flat and had large rounded boulders embedded. At last we saw light

ahead, and expected to look over, and see the Dapha, but were all surprised to find we had been on the second terrace all the time, and now overlooked the lowest one bordering the valley; at the edge we found traces of a village in more burial mounds with a ditch around. Descending the slope which was at about an angle of  $45^{\circ}$  we could easily see the rounded boulders *in situ* in the sandy loam or clay (none angular). At foot of the slope, which might be 100 feet high, we came out on a sort of flat swamp or where peat and mud rested on sand and stones. Passing on we were probably an hour ere we again saw daylight ahead, and knew we were approaching the cliff, ere reaching which, we heard the rapids below.

We had come obliquely and now made straight for the edge, the men getting fits all the way from the Hingory-seed spines. Coming out at last and looking over, we were all astonished at the height, instead of about 200 feet it looked more like 400, and cautiously looking down while holding a sapling I involuntarily drew back, as I could not see the cliff face at all, and seemed to be standing out on a ledge. The old Kamti kept back some distance, and "felt as if something was pulling him over," I got to another place and lay down and thus looking over, could see the face of the cliff, pretty clean for some 80 or 100 feet down, after which ferns and such grew, then creepers and grasses, shrubs and saplings. Tree tops often touched the cliff face below. To get down was now the difficulty, "Nong" who alone knew the place, I had to send back, ere this, to the Dapha múkh, where we waded, as my belt and keys were dropped there, and now we had to trust to our wits. There was but one passage down we all knew, so we worked south along the edge. Animals go up and down this path, so we kept a sharp look out for tracks. While going thus, we were suddenly started by a loud deep growl or rumble, and saw the jungle moving, at once all called out "magui," (elephant) and Lutak saw it, so we moved on as quietly and rapidly as we could, and were glad to get past such a very awkward enemy in such an awkward situation. I was hardly prepared to find it literally true that there was no chance of getting down except at this one rift, but so it turned out, and we went on and on, till at last tracks were found to form a path or *puti*, and then out we came to where many of these converged at the mouth of a very small gully, wide enough for one at a time to enter. Here we rested and ate our lunch, and I had time to ask as to the singular feature we saw here and there, where huge Hingori trees had fallen over eastwards, at the verge of the precipice, in all cases the roots being at the *very edge*, and the stem lying in at right angles, (and none oblique), for some time it was not obvious, but at last we saw it was caused by the loss of root-anchorage on the precipice edge, and that the "Nor-westers" could thus overturn the larger trees pretty easily in consequence—the regularity of the phenomena was remarkable. The

entire Mbong yang plateau seemed covered by Hingori (*castenopsis*) and this was the great feature also of the plateau on the western flank of the Dapha valley. Ere going down I asked Nden gam to point out any traces he saw of human habitation, as it must have been once a carefully guarded point, in the old and unruly days of the Dapha Gam. Our troops indeed had to fight their way by this same gut. On looking about he at once pointed out, first a small circular burial mound and ditch twenty yards south-east of the entrance of path; secondly, a good many large trees called Modar, *Erythrina Indica*, planted to train pan on, these and the planted Wra bambú indicated a village site.

I also measured the height of cliff approximately by dropping heavy green sticks and hard lumps of clay, also stone, and counting the pulsations ere they reached the bottom, or talus, the average being six beats.

Before starting down I left my mark, in the shape of two bullets fired into a morhal, *Vatica lancifolia* or copal varnish tree, close to the mouth of pass on the south at four feet from ground.

The animals that frequent this plateau, and pass up or down, I had one means of ascertaining at this pass or gully, and carefully watched and recorded all tracks as we went down, meeting elephant, buffalo, sambur, horina, and huguri, deer, tiger, monkey, pig, cats, and what seemed wild dog. But no bear. Some way on, the path forks, becoming tolerably easy, and near the bottom we came to a coal seam, and shales, bedded at high angles. The upper part of the cliff was composed of clay, with water-worn stones and boulders embedded. From the edge we had a fine view of, and across the valley below, where we could see the Dapha Pani all along as a series of foaming rapids, and even hear it if we stood still; away on the other side of it the bottom of the valley was like a plain of grass, with scattered trees. It had been set on fire by the Mishmis, and was burning in large patches. On the other parts left black and smoking, we now and then caught sight of the men of our own party as little pigmies, moving along in Indian file to the new camp.

Looking across the valley to the western plateau, and realizing that the little stream below had slowly eroded it, one had an impressive lesson in geological time. The sun was now getting towards the West, and warned us to start on, for where the camp was, we as yet did not know.

On reaching the bottom, the river was close, and we forded it, also two other branches further, all swift but none deep. Nden gam, though a remarkably fine and strong young fellow, was a great opium-smoker, and he at once went ahead for the Mishmi hut, we had before seen, to get a light, and bamboo tube. Lutak and I followed at our leisure, and at one place passed the body of a python, seventeen feet long, that had been caught by the fire among the grass and burnt to death. Soon after, we heard a

man shouting and it turned out to be Kumkú nong looking for us, and of say the camp was pitched more to the south, so we had to turn and retrace our now weary steps, and at last at dusk got in, all of us three very tired. Luckily everything was as I could wish, and dinner ready—soup nice and hot, and I soon felt better. As I was at dinner, we heard a most peculiar noise (in the air seemingly) that gradually got louder and louder, and at last we realized it as an enormous flock of Hornbills, (the large Huang Sorai).

Neither I nor the Asamese had ever seen more than at most twenty or say twenty-five in one flock before, and yet here they were in hundreds—evidently they had intended to roost in the tall bor tree (fig) we were camped under, and all suddenly sheered off as soon as they saw our lights and smoke, settling a little way on. I tried stalking very quietly, but no use, this very particularly wary bird, or hundreds rather, was not to be caught, and they all suddenly and simultaneously flew, with a deafening noise. Ere I got off to sleep, which I did pretty early, I heard “old Kamti” at his gabbling sing-song prayers, mental sort of “prayer wheel,” as far as the real devotion seemed concerned. If addressed to me, I certainly should not have blessed him, more likely the opposite. He went in for them pretty regularly at night, all in Burmese, as he was a good Shan-Buddhist, and finished off with the usual invocatory “Om, om.”

At night we had a severe yet comical scare. The Singphus (even old Thang included) insisted that there was danger from wild elephants, and half-felled lots of young trees and saplings all about, so that the fall of them should give us all notice if anything came too near, they had also selected the bor tree as good to swarm up in emergency and notched the trunk and ribs ready. About midnight I was startled clear out of bed and tent, (with revolver in hand) by the hubbub, indeed the smash of a tree first roused me. In an instant every one was up and running about, and the cry was “hati,” “magui,” and as I at once fired, *something* went off to the right, a shot from the carbine made it go on again, and then all was quiet, and we listened, some said hati, the Singphus magui, and while one of the Asamese suggested what I also thought, *i. e.*, samber, suddenly we were yelled to from *above*, and looking up in the revived firelight, discovered master “Sin-neng-gam,” the young Singphu, hanging helpless over the said fire, unable to go up or down, and probably twenty-five feet up. The sight so convulsed everybody, that for the instant he was left there, but Nden gam soon went up to the rescue (no easy matter though) and when Sin-neng was got down, and came round a bit, he found he had no recollection of going up at all, said he must have done it in his sleep!

The shrieks of laughter this induced from my fellows, were enough to keep any wild animal away all night. Between one Singphu being so literally

"treed," and the others shouting me to shoot, to *frighten away a deer*, it lasted as a joke some time. Next morning my fellows sure enough found it was a "hor pobu," samber. At the same time there could be no mistake that immense numbers of elephants must pretty frequently be all over the place; it was, as one Singphu said, all "hati gaon." About 10 A. M. we started to find the return path that led over the west plateau and the saddle between Nchong Búm and Joithó, we were hours at it, and came again and again out at the same place; at last going up the spurs towards the Mishmi jums, where after about two hours, we emerged, and found them all clearing the jungle.

These Mishmis do not cut and slash so vigorously as the Nagas when clearing, but go to work quietly with their small knife daos, and get through a great deal quickly, I noticed that they left a great deal, such as bamboo clump stems standing, that Nagas would have cut, but they pile small stuff about them, and when dry the fire does the rest of the work for them. Looking at their work from a prehistoric point of view, I could well imagine that a very small cutting implement aided by fire, could really make extensive clearings, for if the fires are made around the larger tree stems, it soon kills them, and in about three to four days the whole of the foliage is dead, and in a week is ankle deep all around underneath, and the *shade has disappeared*.

The study of the dao is worth pursuing, and might be expected to yield some results (so far unknown to us) regarding the stone age here, there are many forms more or less serial, and related to the Asamese "Pat kutar" (lit. leaf-axe) and the Andaman p. axe. Both are forms that could be closely imitated in stone. Illustrations of a few are given hereafter. Celts also are found all over the hills during juming, but regarded with superstitious awe. At several places as we came along we found large clumps of the planted Ura bamboo, indicating old Singphu village sites, and at one place in particular where Wilcox places Koom kur near the upper edge of the western plateau, saw as many as five or six large mounds, say forty feet across and six high, around which large ditches were dug leaving as usual at four opposite places, little causeways to cross by, most of these mounds had bamboo clumps on them.

It was now past midday and we had only just found the entrance to the path on the plateau above, I had upbraided the Singphus and "Uren nong" especially whom the Bishi Gam had given me as guide and a safe man. It now turned out that it was about ten or twelve years since he had been by this path, and the country was so trampled about everywhere by wild elephants that he continually lost the track. Every now and then we had all to sit down while he and his men scouted around to find it, and from the edge of the plateau on the west overlooking the Dapha valley I

had several good views, not only down on, and along the same, but over the Mbong yang plateau beyond, to the east. The long level cliff was very conspicuous, wooded to the very edge, and the second line of cliff behind, which was more pronounced on its northern extremity towards the Dapha group, and where the plateau was also bounded by another cliff, not quite so regular.

Some distance beyond the second terrace to the east a third was visible, and beyond all, far off another much higher and also flat-topped. The southern end of which was broken up, and at last consisted of a few isolated low hills, rising above the lower level.

They report the Mbong yang plateau altogether to be a good day's march from east to west. From here also, the continuation of the Dapha group eastwards was well seen, ending a long way east-south-east, in the Phungan ridges, snow covered, and which (in the view) closed up to hills along the south side of Dihing and distinct from Patkai (which was behind) and not now visible, though I constantly endeavoured to see it.

The ridges and flats west of Dapha do not appear at all regular, at least we several times had pretty stiff climbing among spurs and gullies, eventually, however, we came to where the land for a long way was very level, and the path well defined, and here, as on the "Mbong yang" the Hingori tree so predominated that the spined seeds, or seed cases, caused exclamations at every step; being shod I did not feel them. It was getting well on in the afternoon when we came out on a sort of natural clearing, and finding there was water to the south in a slight depression, determined to camp, though we had come such a short way, as we should not find good ground for it at the Nchong kha. The site here was covered for about twenty acres or so, by rank long grasses, now withered, and trampled down by elephants until quite open, a few large trees being scattered here and there, and it looked like an old Júm site. Several immense thistles stood dead, with the leaves fallen over and hanging close to the stem, the head branched and carrying the well known seeds. To make certain I cut several down, and took off the heads. The total height was from 15 to 18 feet in one case, and the hollow stem, 2" diameter. None of the Asamese had seen them before, nor had the Kamti, or Singphus (so they said). It certainly seemed out of place in these forest jungles, and it occurred to me as having come transported on the north-east winds from the upper open ridges of the Dapha Búm. There were only some four or five of them, as far as we saw, and all—as they stood—looked remarkably handsome and suitable as designs for Candelabra.

Very soon our camp was pitched near the little pool or sedgy hollow, near trees, and hearing several remark how very cold the water was, I found it at 43° F. I made the men fire the grass, and being very dry

it soon caught and roared and crackled till it gradually burnt out, leaving the view along the upper Dihing towards Khomong pretty clear, and I could get the telescope to work. The crests of the Phungan bearing 120° whereon snow lay in several large patches, and many small ones, appeared to have the hard rocky outline seen on "Wathong," indicating frost and an utter absence of vegetation. We were here much nearer this latter, and the peaks to the east at sixteen miles were well seen even with the binoculars. The deep purple-grey of the bare rock contrasting beautifully in the evening sunlight, with the light and shadows, on the snow. We were at probably 1,500 feet elevation, and the air remarkably clear and steady, so that the distance seemed really less than half what it was. The ridges bearing 120° were on the contrary, only about twenty-eight miles (if "Phungan Bum"), yet appeared fully twice that distance. Several times I was tempted to look on them as much nearer the Mli kha than Wilcox put them.

After all had eaten, I put on a power of 200 and shewed them all the new moon. The old Kamti, who usually carried the telescope and legs, was particularly taken and sat out in the cold for a good half hour, after the others had had enough.

I may mention that the carriage of a fairly large telescope would be no easy matter if taken as it usually stands, with long brass tube and heavy tripod legs five feet long or so. To enable me to have the advantage without the difficulties of carriage, I made a light sassaie wood square tube weighing 3 lbs. and 4'6" long in which the cell of the O. G. 3"·5 fitted, the other end so made as to have the eye-piece tube and rack motion, easily attached, the tripod of a strong magnetic compass, served to mount it, and the whole when complete, only weighed about 8 lbs. Having the ability to put on a high power at times, as when camped at Dapha Pani, it enabled me, often when lying at my ease in the tent, to take long excursions all over the Dapha Bum, and very fairly among the snows, "without turning a hair," so to speak. It was particularly interesting at times when the sun was behind, to take up the lower part of some of the great seams or gullies on the face of such a hill as "Bum rong" in front of the Dapha, and to trace it up higher and higher. Lower down, as a deep shady chasm filled with tree ferns, plantains and fallen rocks, water dashing over and among them, the sunlight almost shut out in parts, where a straight piece gave quite a vista in. Again, great bare slippery rocks on all sides with the stream as a snow white streak, obliquely coming down the face of one at back (evidently a waterfall in the rains). Higher up, a long chasm, filled with shingle and tree stems, and still higher, where great shoots of stone have piled in the bed, and shew the clear surface of the bedded rocks. Above again numbers of feeders fall in on all sides, and not a trace of vege-

tation, all is bare hard, glaring rock, shimmering in the hot sun. Or at another time taking "Kunjung," in the region of firs, one could wander about almost as at Shillong among the grass and boulders and firgroups; some of which were very picturesque, and at last were so well known by sight, that I could almost sketch them from memory, ending my journey of two hours or so by a visit to the snow fields on "Wathong," the return journey which in person might take four days' hard work, being done now in as many seconds.

The drawback of a high power on a *small* O. G. is that the loss of light is so great that either detail cannot be seen, or it can only be used on such an object as the moon; again, while the best small O. glasses will only stand a power of 50 and 60 diams. per inch, larger object-glasses up to 3".5 dia. will stand 100.

Here on the top of this spur we found many large rounded boulders as on the Mbong yang and all seemed to be various forms of sandstone, not the gneissic or granitic kinds seen in the Dapha bed.

Early in the morning I took the temperature of the water in the pool at 39°, no doubt it was caused by the intense radiation. At the Dapha muk I had several times taken the temperature of the river in the morning and found it generally 51° F. air being 40° to 43°. The temperature of the *soil* at the same time by springs was, 62°. The temperature of sand must fall a good deal in clear nights. In the mornings all the boulders embedded in it, had a *white* band of dry sand right round. Here and there white patches were seen, large and small; one *invariably* found a boulder just below, at an inch to 1½, the heat from which had prevented the deposition of dew, on the sand over it.

Late at night and early in the morning we had heard the rush of the Dapha river, to the east, so in starting I calculated as if marching from that river, and we got off at about 10 A. M. as I always make the people eat first, (also their own custom).

We very soon came to the Nchong stream now a little dell and with not much water, all of us had a good drink as we should not get another chance till late in the day, At one place we came on a party of nine Mishmis, and some of our people exchanged opium for rice, they were crossing from the Teng kha (Tenga Pani) to the new Júms on Dapha, one girl had the peculiar pewter or silver coronet as an inverted crescent over the forehead, several had cross-bows, others spears, and one a sword. We then crossed the saddle between Nchong Búm and Joitho, which was pointed out by the Singphu, and over a long flat tract, in which we were shewn the site of old Bishi, where Wilcox passed, and which he marks. It could hardly have been noticed but for the forest being just there almost entirely of "Kot kora," the fruit of which can be eaten, raw or dried. The present Bishi Gam was born here.



Some way on I detected a peculiar smell in the jungles, and on enquiry was told we were close to a Pung, and ere long descended into a deep triangular depression with swampy bottom, on sand. The water, of a pale bluish colour (as if diluted with shale mud) rose in an irregular jet about 6" and 8" high in a little pool and passed off as a stream. It had a peculiar saline taste, I took a sample, but later on lost it, the Singphus look on this water as a cure for goitre.

About fifty galls per minute rose. The place has been used as an elephant trap, a skull and bones lay there of one shot some time before. The Muttok Gosain now and then shikars here I believe. The Hingori seeds were all day a perfect nuisance, first one then another got the thorns in their feet, and I now ascertained why the Singphus took us round by the gorge. It was to avoid them. There are thus three quite distinct routes for passing Nchong Búm, one by the gorge which we took, and which is very nearly what Wilcox calls "impossible," another straight over the hill at once, very steep and fatiguing, so all say; and the other which Wilcox went by, and we were now on, tolerably level and easy, (bar the thorns). The men all tried sandals of wood and bark, but they tripped and caught so often, that one pair after another, were blessed and flung away, and they hobbled along here and there, like a row of cripples in preference. Eventually "Uren nong" lost his way, and I called a halt for half an hour, as the wandering about was only wearisome. On his finding it we soon after came to the Dungan kha, and as Wilcox says, it is "one continued rapid." And we emerged from it, at last! opposite the mouth of the gorge where we were all so nearly blown away. Not wishing to chance a repetition of the gale we went on and camped in a cosy corner under a big bluff that projected into the river, and where we found already, two log huts and piles of firewood, we were here very nearly at the end of our rations, and had only one good meal all round left, so they had half now, and kept the rest for the morning. During the night the wind rose and though no rain fell, we should have again fared badly if it had not been for the shelter of the corner we were in. They say that this is always a windy site, and the name is "Dungan yup."

Very early in the morning I made three of the Singphus start off at once for Bishi for rice and to return and meet us, they went very much against the grain, but there was no help for it, we then started at about 9 A. M. the load men by a detour, to avoid the steep rock, up which the Kamti and I climbed, with difficulty, as it in places overhung. As we started, a large party of men and seven women, appeared on the off-bank, from Khomong having come viâ the gorge, Lutak and I soon after crossing the bluff, met them as they emerged from the bad ford, where all the women joined hands, (held up) as they crossed, in a line up-stream, a very sensible plan.

Hardly one of the men, and none of the women had ever seen a European before, so I was considerably and closely criticized. Many brought over daos to exchange for salt, to carry which specially some of these strong girls had been brought over, and were to take back 2 maunds each, *i. e.*, 180lbs., all seemed in good spirits, however, and soon after waded the river again, and pushed on faster than we cared to follow. By slow but steady walking we at last got to "Pen" gaon, by about 3 P. M. and found that our men had failed here in getting rice, which was at famine rates, and had gone on to Bishi, where we followed, and camped at about 4 P. M. having done from near Dapha Pani, in two days, what took four in going and in a pinch might perhaps be done in one, if certain of the road. Of course we here got plenty of rice, vegetables, &c., which mainly we were short of. Some old fellows, and one who could speak Asamese, came to enquire how we had got on, and confirmed a good deal I had heard as to routes, &c. It seems the Dapha Gam, when he fled from Bishi, went to the site we had passed at Nchong búm, and was there some time, but his unruly habits and raidings obliged us to follow him up with the "Singphu expedition" and he then fled to the Mbong Yang to be safe. He was, however, dislodged from there by a party under native officers (Lola Sing Sylhetia) the Europeans being I hear, wounded *en route* near Bishi and Miao, and at last decamped for Hukong viâ Khomong, from whence there is a route into upper Turong.


It is said that for some time, the cattle that had belonged to the Gam and his people, ran wild, and even had been seen not many years ago, I could get nothing certain as to this, and doubt there being any now with Mishmis, and rubber-hunters all through the hills.

Early next morning we packed up and I made some small presents, an electro-mug to the Gam, assortment of needles, tapes, and such, to his wife, &c. The load-men I paid, Rs 6 each for the trip of about eleven days, and gave them some opium in, I should like to have been able to be more liberal, but there are many incidental expenses connected with an expedition of this kind that swell the sum total, to no small amount ere all is over. What would be considered extremely moderate, by Government, or to any subsidised expedition, may be heavy on any single individual, especially when no return in the way of profitable trade is yet possible.

Passing west for Loang village we first saw the site where these Singphus devoted offerings to their demons or nats. It was a picturesque site among some tall Jutuli trees that threw a more or less mysterious shade on the cleared space below, where there was a house some 330 × 12, of the usual kind, and the skulls of buffalo here and there tied to the tree stems, as relics of the feasts and offerings. Singphus are grossly superstitious, and their entire belief seems to consist in a series of demons who

must be propitiated or evil results will follow. The slightest pain or sickness, is considered the work of a Nat, and must be counteracted by an offering of eatables, a bad spleen will therefore cost a man of standing seven or eight buffaloes, ere he is killed or cured himself, and the chances of the latter are small.

Any ordinary native doctor should here make a fortune in a very short time, as the people are ready to look on all drugs as charms, more or less, and pay accordingly. In a rice flat west of Bishi we were warned to look out for a wild male buffalo that was gradually becoming one of a herd of tame ones, and which the Singphus soon intended to shoot for a feast; sure enough as we turned into a small flat of open land we saw about eight or ten buffaloes, mostly lying down, one of these a male then got up and stared at us, gradually but slowly moving off to the edge of the scrub, where he disappeared when we were only about eighty yards off, the others all remained. As an instance, where a large and usually very wild animal can become more or less tamed, and semi-domestic, by associating with tame cattle, it was a very good case, and noteworthy to naturalists.

The very marked difference towards eastern Asam especially between the tame buffalo there, and in Bengal is due to the above, and that the large wild males so often have access to the tame herds. The Bengali tame buffalo indeed can be usually picked out at once in a mixed herd by the *degraded horns*. Smaller, more curved down, and giving the frontal region a rounder contour, the horns also are not so nearly in the plane of the face and nose, less effectual as weapons in fact. When two male buffaloes fight they first appear to circle around and take each other's measure. Then suddenly with a rush collide, their heads held down and face to the ground, the skulls meet with a fearful blow. Each then endeavours to force the other backwards using all their huge force and making the sods and jungle fly. If well matched they struggle thus for some time and endeavour to gore each other's shoulders and neck, by lateral thrusts of the horns, twisting the head round as they push, and this explains the peculiar sweeping curve the horns have as .

Once turned, the victor pursues the vanquished for hours, if not a whole day. At first, strength and weight are the elements in a buffalo's favour, subsequently speed. The wild males in Asam are at times fully twice the weight of an ordinary male as seen in Bengal.

After reaching Loang and pitching the camp, I wandered out north for a sketch of Patkai if possible, but the distance all along was haze. Coming home I saw some Singphus returning from "Turong ku," whence they had brought buffalo, and who found Patkai no difficulty. One of the party, a native of Hukong, was particularly inquisitive, and a great opium smoker.

The night was cold and windy with a little rain, the morning cold and foggy till 11 A. M. The men after eating tied a large bambu on each side of the canoe to steady her at the rapids, and we packed up for departure; some boxes and a tent, by four men, went off by land for Bisa, and were to meet me there three days hence. We then embarked and after shooting several rapids, found that two of the men in the boat were hardly equal to emergencies; so I landed them and several of the boxes that I desired to keep dry, telling them to meet me at Bisa, and if possible overtake those who had started first and recall the Kamti.

We therefore had only Thang as steersman, while self and servant were in the bow, several rapids we shot thus, very well, though the pace was no joke now and then, and I donned my swimming belt as precaution. At one rapid we found a second shoot near the bottom, and taking Thang's advice kept to the left side, flying down it at speed, though we bumped here and there. When near the bottom where the river suddenly turned sharply to the right, we saw to our dismay a huge snag right across our path, which he had forgotten, so using all my strength I ran her ashore in a little bay at the side, striking the shingle with such force that the canoe ran a long way upon it and we were all thrown out. The stream, however, had caught the stern, swung her round, ending in a capsize, just as we had jumped up and were pushing her off. Luckily by pushing hard as she rolled over she cleared the snag and was carried down the rapid. Running along the bank we got ahead, waded in and caught her; but no easy job to hold and bring to shore. The lashings we found intact that had been passed over the boxes tent &c., and the two guns were safe (for a wonder); in fact very little was lost though everything was wet. While the other two got some firewood, I opened a cartridge, rubbed some of the powder on piece of the lining of my hat, which was dry, and with about quarter of a dram powder fired it in the air, getting fire at once; some dry leaves and grass soon were blazing and the logs caught.

Afterwards we lit several roaring fires and hung everything we could about to dry. My man at once started a kettle of tea and we got on very fairly. Our great anxiety, however, was to dry our clothes ere night, as rain threatened. Thang and I now got in more fuel while the servant got me dinner.

From what he said there was no possibility of avoiding a spill, and the Singphu's belief was that if we had held on, the canoe would have jammed *under* the snag and we should have lost all, and been unable to get her out. Ere dark we had a good many things dry and rain came on at night. Early next day we again got big fires going and about 11 A. M. were surprised to see the old Kamti, Lutak, our guide, and my Asamese "Milbor" turn up. Luckily for us the old fellow was superstitious, and got quite uncomfort-

able the night before, because one of the men had a dream that we had met some disaster in the canoe, so he had started at dawn and hunted upstream and came upon us, quite expecting, as he said, all he saw, and heard.

For once I was thankful as to a "belief in dreams." With their help we got the bamboos relashed, everything again stowed, and embarked, going down the first five or six rapids most carefully but getting more confidence as we went on. Certainly the way we shot some, was enough to make any one hold his breath; there was little or no danger from rocks: it was mainly from the speed and bumping on boulders, that often threw the canoe violently aside, and at times the want of room to turn suddenly where the stream rushed down a side channel. The excitement was considerable, as often from the canoe we could not see the proper channel lower down, where all was hidden by the frothy tops of the small waves. There was hardly time to speak; in fact, one could not be easily heard with the rush of the water; and each time as we emerged into the deep and agitated water below (going fully ten miles an hour), we felt a relief. By and by we reached the rapid at the entrance to "Buri Dihing" and all got out, holding the canoe as we waded, and let her down, each getting in as he came to the deep water. Now and then we had a little trouble but gradually rapid after rapid was passed till we had come down a distance that had taken us three days in going up, and camped at one of the places we stopped at when coming up. Early next morning we got off and again got over what had taken three days going up, camping close to Bisa at Kherim Pani mouth.

At Jagon we got out and procured some rice as what we had been eating was bad, having got wet. We also found time to bargain for some vegetables that we were much in need of.

At Bisa I received my dâk (letters); and after the land party had joined, I procured a second canoe and we all went down by water.

Nothing of moment occurred till we reached Bor Phakial, the Kamti village above Makum, where I again stopped to see the Kunungs, and men over from "Mung Kamti." They came and spent a day with me, which enabled me to collect and verify a good deal of geographical matter, and write a limited Kunung Vocabulary. These men are called "Aung" by the Chinese (so they say), and trade with them eastward. I observe that these are the race that M. Desgodin locates there as "Loutse," and says the Chinese call them "A-nong;" undoubtedly they are these people who call themselves "Kunung" as did also Wilcox in 1827. They say their tribes and villages are scattered all over the country from the Mli kha and Mung Kamti, to the eastwards, and are not confined to the Mli kha alone. They are celebrated as workers in iron which they smelt from ore of two sorts, sandy, and in lumps, like stone.

They extend somewhat to the north, and also a little southwards, and have colonies in the valley of the Nam sang or Disang, the tributary of the Irawadi about three days east of, and parallel to Mli kha.

As the trip practically ended here I may as well summarise the results, some of the information was new, and some of value as either corroborating former reports, or useful for checking them. First as to the direct route east up Dihing, or Diyun kha, past Bisa, Bishi, and Khomong for Mung Kamti, I learnt that the route as far as I went, and possibly to Khomong, was not so very difficult, was in fact much easier than I had expected as far as the Dapha Pani, being in the main a wide flat valley, and not a gorge.

From Khomong it is said to be ten days to Manchi, and the route soon leaves the Dihing or Diyun, crossing Songsan group, though between December and February snow may lie on the passes. This route or "Songsan bat," then goes to, and down the "Mung lang kha" from which a path leads north-east to Manchi, and the Mung Kamti villages. It is reputed easier than the Tsaurang bat route followed by Wilcox in 1827, north of Phungan Boom, and also shorter. A difficulty on each being that it is all uninhabited, and supplies for some ten days or so must be carried. Indeed, now there are fewer villages than when Wilcox passed; as between Pen or Kusan, and Khomong, while some five or six are mentioned by him, there are none now. The signs of former population we saw pretty often, and always where indicated on Wilcox's map; though the names are sometimes oddly spelt, thus his "Insoong" is the Nchong, "Puseelah" is Bisa-la, "Koomkoo" is Kum-ku. At each of these there were villages in 1827, as also at Oglok and Lujong.

The want of villages is insisted on, by the Singphus and Kamtis themselves, as the greatest difficulty, as people must now travel fast and have no time to spare, either to look for easier tracks, or improve those in use. At the same time it is not so very long ago that these villages existed, and that, "Lall Chand Kyah" sold his wares on the Mbong yang plateau east of Dapha Pani, as I am told.

This want of population (which is also a drawback on the route over Patkai to Namyang for Hukong), does not exist to the same degree east of the Mli kha, whence there are several routes east, over low hills, then a central ridge, occasionally snowed, and down to the Disang or Sang kha (called also Nam sang), a journey of some three days. Thence they say the route crosses a range dividing this Disang from the Do ma or Nam Do Mai, also a tributary if not the main stream, of the Irawadi, and which is known under so many names.\* East of this there are ranges north and

\* Shue mai, Sgin mai, Shuey mai, or Shoe mai, Zin mai Phung mai Kha, Myit nge, Do Mai.

south that divide this river from another (evidently the Salwin); but none of them had been so far, and they seemed to confuse the Salwin and the Mikong together; traders, however, pass east and west across the tract dividing them from the boundary of China.

According to these Kunungs and a Kamti who seemed well acquainted with these matters, the Do mai is the same as the Shoe mai and a somewhat larger stream than the Mli kha, or Sang kha, confirming the supposition of Dr. Clement Williams, and the paper on this river by Dr. Anderson (read before the R. Geographical Society some eight or ten years ago) in which he fairly demonstrated it as the main source of the Irawadi. This, and the references thereto, in Mr. Jenkins' paper and my former reports, seem to have been overlooked by Mr. C. H. Lepper when lately claiming this as a new discovery. There can be very little doubt but that Dr. Anderson is right, that the Shoe mai kha rises in Tibet. The only doubt in my mind was whether it was the lower portion (or not) of the river known north as Nú kiang. Recent observations, however, by Gill, M. Desgodin and others seem to prove that the Nú kiang and Salwin are really the same as shewn on the map by M. Desgodin.

While on the matter of routes I may mention that the Kunungs report routes north; one of these men, indeed, had been that way into Tibet; another route from the Mli kha, led north-west towards Brahmakund, and the Mishmi country. They could give me no information as to any from their villages towards the north-east, though it may exist. Routes south seem pretty numerous. People often come and go by them to Bamo and the Shan states, also to Hukong.

It is a noteworthy fact, and one deserving careful attention that the country lying east of Asam, between it and China, seems even in our day so little known through the absence of traffic over it, that we cannot even name the rivers in succession, with absolute certainty.

This is no doubt caused by the difficulties due to its peculiar formation. It is situated at the south-east corner of the great Tibetan plateau, where the rivers converge, and have such a rapid fall, to the level of the southern plains, in channels more or less parallel, that they have cut out deep valleys and even gorges, extremely difficult to *ford*, or *ferry*, or *bridge*, except by iron chains. Every here and there the line of route, otherwise not easy, is completely severed by a deep valley and gorge, and long detours are necessary.

Here and there on this tract we see the iron chain bridges that demonstrate the character of the obstacles, and that have successfully *linked the route fragments together* so far. The local engineering capabilities, however, are crude, and no doubt if longer spans were possible, these impassable gorges could be crossed at far more eligible sites for a route.

If one is ever feasible between Asam and say Atentse viâ Mung Kamti and the Lutze or Kunung country, it will be by the construction of a few light wire bridges, at a few selected sites at present impassable.

Even in times long past, when both the Government and people of China were, from religious motives, anxious to find easy routes to India there was none known, over this short section. Those used were the sea route viâ Quantung or Cantou, the Straits, and the Bay of Bengal; the other was "the old route" through the northern deserts to Khoten and Kashmir.

In the Journal R. A. Society, October 1881, page 552, the Rev. S. Beal, in an article on the "Chinese Buddhist inscriptions found at Buddha Gaya" gives a list of priests and others who travelled by these routes, and are recorded by I-tsang, A. D. 671 to 690, (1,200 years ago). In one case reference is made to a party who came over 500 years before, so that even under far more favourable conditions and great inducements to find a solution to this problem in the far past, it remained *insoluble*. I attribute it mainly to the gorges and river torrents that defied the engineering capacity then available. If a route from Asam due eastward viâ Mung Kamti is ever feasible, it will be by means of light wire bridges at carefully selected points.

With the experiences of Gill, Baber, and others before us, it seems, however, doubtful now if the game is really worth the candle. The difficulty of getting out of Asam at the eastern extremity is one thing, that of getting into China is quite another. The former I have drawn attention to for some ten years as quite feasible, viâ the Nongyang pass over Patkai; the latter has I fear been equally well demonstrated as the reverse, by others who have actually passed over the country in question.

I may also here say that the idea of a "neutral zone," surrounding Asam on the east and south-east, must appear erroneous to most of those who have studied this matter, and I observe that Mr. H. L. Jenkins is ominously silent on it.

As far as the tracts lying to the east and south are concerned, I believe them to be claimed by the king of Burma. It is not so very long ago that the Burmese Woon, attempted to overreach us, and step *over Patkai* to place his boundary north, on the Namtsik. Burmese influence also in Mung Kamti is equally assertive, and I heard complaints regarding it this last time, so that we may rest assured that the Burmese will be the last to admit Hukong as "neutral," even though filled by various unruly clans disclaiming their authority.

When making enquiry as to the comparative value of various routes, east and south, I ascertained that the one from Makum viâ Khomong to Mung Kamti, east, was about equal in distance and difficulties to the one from Makum viâ Naga hills to Hukong, (now commonly used and called the Tirap route). The elevations too, were much the same, and we hence



get a clue to its feasibility. When examined on the map it will be seen that this distance is about half the total on a direct line to Aten-tzu on the Kinsha kiang. One-third of this total I had just seen, presented no great obstacles, *i. e.*, from Makum to the eastern end of the Mbong yang plateau Longitude  $96^{\circ}45'$  (near Khomong). Thence to Mung Kamti is over the Songsan Boom with perhaps elevation of 8,000 feet. The Mli kha valley is pretty level (see Wilcox also) and the hills east of it have passes at about 3,000 feet leading to the Disang. Thus we know something of this route for rather more than half the way, (*i. e.*, four-seventh) and only about fifty miles remain, to join it to Gills' route. But of this fifty miles all I know, is, that it must cross the Shoemai, Salwin, and Mikong. It is a great pity that Government has not finished up the survey of Asam even within our own frontier, as far as Phungan Boom, and the head of the Dihing valley, especially as there cannot possibly be any objection locally; and we have men such as Col. R. G Woodthorpe, R. E., thoroughly competent and probably willing for the work; were the Surveys on our own side executed, it would go a long way towards simplifying this rather complicated question.

The possibilities or otherwise, of opening a route from Asam either direct to Aten-tzu, or *via* Hukong to Tali fu, and western Yunan is one thing, the advantages or otherwise of such routes compared to their difficulties is another, and a matter I at present do not discuss, especially after the late Capt. Gill, E. Colbourne Baber, and Colquhoun have so emphatically denied the value. In the present I confine myself to the borders of Asam eastwards and the passes and people around.

## Some words in Kunung, S. E. Peal 1882.

Vowels.	a as in Rat a as in Father e as in a in say.	u as oo in poor.	i as ee,	ch as tsh.	ai as in aisle aw as in awe
One	ti	Ear	a na	Neck	nyin
Two	ani	East	nam shai	Nail	ling
Three	asam	Elephant	magoi	Net	kon
Four	{ a vli { a bri	Eye	ne	Night	a gui
Five	pangə	Father	a pai	Nose	sa na
Six	kru	Fence	duen	Oil	su
Seven	syen	Finger	de gong	Opium	kani
Eight	{ syet { kyat	Fire	tami		
Nine	tai gu	Fish	na chi	Path	pa ra
Ten	{ san { ti san	Flower	sing wat	Plantain	langu si
Twenty	ani san	Fly	si.	Plough	pung kang
		Foot	hi ben		
		Fowl	kha	Rain	su wa
		Frog	deri and dri	Rice	ma kum
Arm	uur.	Goat	tang kre	Rivulet ?	vang chi tu
Arrow	ta ma	Gold	kham	River ?	to sin de kha
Axe	pa jeng	Gong	tseng	Road	pa ra
Asam	Mong Nung	Goose	obit	Salt	sa la
				Sand	ching phi
Bambu	ma sang	Hammer	to jan	Shield	ta ga
Bead	{ re sit { ra cit	Hand	u ben	Silver	ya
Bear	sui	Head	a phe	Sister	a nam
Bellows	la sut	Hill	ma jui	Small	nys chan
Big	ga ba	Horse	mung rang	Smoke	{ ma ui { (Fr. Butter)
Bird	pa chi	House	kin		bur
Blood	su	Iron	sam	Snake	ta nan
Boat	kong si			Snow	a chan
Bone	ra ga	Jungle	a rum	Son	ka ni ta
Box	tyek			Spoon	tsam and tai
Brass	syen	King	{ n'k'm ju { r'kom ju	Steel	gu met.
Bridge	nam phan	Knife	khi	Star	nam gang
Buffalo	nu ga			Sun	
Cat	ning aw	Lake	si kong	Tea	phalap
China	khe	Leaf	ta wa lap	Thigh	ma chi
China man	khe a sang	Lead	hik	Tibet	Ching ku ga
Cloth	yo	Leg	ma chi	Thunder	mu din
Coal	wam	Calf of leg	mo bo	Tiger	kang
Crow	tang kha	Leech	ka phat	Tobacco	ya mum
Cotton	pu si	Loom	yo ra	Tongue	pa lai
Country	ya ga				
Cow	pan su	Man	a sang	Village	mereng gube
		Mat	pa lu	" (small)	mereng chan
		Milk	nung		
		Monkey	a goi	Water	wang
Dao	sam sum	Moon	se la	War	ts bu
Knife axe, }		Morong	tum la	West	nam nup pha
Day	rang	Mother	a mai	Wind	nam bung.
Daughter	chan mai	Mount	ma jin	Woman	po ma shang
Dog	gui	Mouth	noe	Wood	kham.

IV.—*On the recent existence of Rhinoceros indicus in the North Western Provinces; and a description of a tracing of an archaic rock painting from Mirzapore representing the hunting of this animal.*—By JOHN COCKBURN, Esq.

[With Plates VII and VIII.]

[Received 7th June—read 1st August, 1883.]

On the 5th of July 1881 while hunting in the ravines of the Ken river two miles due south of the town of Banda, I had the good fortune to discover the fossil remains of a rhinoceros.

My attention was first attracted by a number of minute fragments of teeth which whitened the surface of a ridge. On closer examination I clearly identified the outlines of the skull of a Rhinoceros, marked by a faint trace of fragments of bone. A glance at the pattern of a fragment of a molar satisfied me of the correctness of my identification; and carefully marking the spot, I returned next morning accompanied by J. La Touche, Esq., the Collector, H. Miller, Esq., the Assistant Magistrate, and C. F. Knyvett, Esq., the Superintendent of Police. These gentlemen with much spirit, aided me, and we dug up an area of about 4 square feet with our own hands till no further trace of bone occurred.

The appearance first presented was deceptive; the inferior lateral half of the skull was not perfect as might have been expected from the outline observed, and all the bones were in a fragmentary condition.

The bones and teeth obtained were the ascending ramus of the left inferior maxilla as far as the insertion of the last molar in four fragments; a fragment of the glenoid cavity of the right scapula; the right incisive tusk nearly perfect; several lower molars; and one perfect upper molar, which I regret to say was much split and dropped to pieces, when it was found impracticable to put it together again.

A large quantity of fragments of teeth together with some longitudinally split pieces of the shafts of long bones were also obtained.

The presence of well defined cingulum on the upper molar led me at first to suppose that the remains belonged to an extinct species, but on carefully comparing the extremely fragmentary fossils in company with Mr. Richard Lydekker, the remains were found to resemble those of *Rhinoceros indicus* sufficiently closely to enable us to tentatively assign them to that species.

*B. namadicus* to which species we might otherwise have assigned the fossil is now admitted to be identical with *B. indicus*.

The mineral state of the fossil, the nature of the locality it was obtained from, and the associated genera found in the Banda ravines closely

resemble the conditions under which Mr. Foote's *R. decannensis* was found.

Immediately below the rhinoceros bones was a hard stratum, 4 feet thick, which has yielded bones of *Bos*, *Equus*, *Portax*, and antelope.\* The rhinoceros bones were slightly impregnated with mineral matter and studded with small nodules of kankar but not sufficiently so to imply any great antiquity. Other fossil bones picked up in these ravines are very highly impregnated with mineral matter possibly with a ferric base. Within 4 feet of the rhinoceros bones I picked up several chert and shell knives on the surface of the soil.

A molar of *Rhinoceros indicus* considered recent was obtained by Mr. Bruce Foote in the alluvium of Madras and is remarked on by Mr. Lydekker as "very interesting as showing the former range of that species far to the south of its present habitat, which Jerdon gives as the Terai from Bhotan to Nepal." (J. A. S. B. Part II for 1880, page 32.)

Carefully weighing the facts I came to the conclusion that these remains were not necessarily *very* ancient, and the split bones and shell and chert implements were evidence to my mind that the animal had been killed and cut up by savage man, at no remote period. Recently, (October 1881,) when asked by R. A. Sterndale, Esq., to contribute a chapter on *Rhinoceros* for his forthcoming work—"A Popular Natural History of the Mammalia"—describing *R. indicus* I wrote as follows:

"It is probable that this *Rhinoceros* was found throughout the plains of the North Western Provinces in unreclaimed spots as late as the fifth or sixth century."

According to the observations of Dr. Andrew Smith in South Africa these huge pachyderms do not absolutely require for their support the dense tropical vegetation we should think necessary to supply food to such huge beasts.† Since marching through the forests of the Maharaja of Benares in Keyra and noticing forest forms like *Shorea*, *Tectona*, *Diosperos* in alluvial country, their gradual disappearance when the humidity is lowered by debasement and the substitution of forms like *Butea* and *Zizyphus* characteristic of the scrubby jungles of the N. W. P., my ideas on the subject have considerably enlarged. I was not aware at the time that the Emperor Baber had recorded that he found both the rhinoceros and elephant common under the walls of Chunar when he visited that

\* A list of the fossil shells found by me in the same locality and presented to the Indian Museum was given me by Mr. G. Neville, but I have unfortunately mislaid his letter.

† The tapir alluded to by General Cunningham as occurring on the sculptures of the Bharhut stupa is a mythical rhinoceros. The pensile lip is tolerably characteristic.

fortress in 1529, never having had the good fortune to meet with a copy of that rare work, Erskine's "Baber."

The accompanying tracing of an archaic petroglyph from the Ghormangur rock-shelter near the fortress of Bidjeygurh in the Mirzapore district, testifies to the recent existence of the Rhinoceros over this tract.

This drawing is of surpassing interest not so much on account of the portrait of this huge animal fast receding before civilization, and practically extinct in continental India—or of the vivid and spirited hunting scene probably many centuries old which it recalls, as owing to the clear and characteristic manner in which the spears used are depicted.

*These spears I consider to have been made of wood and stone only.* The reasons for this conclusion will be stated further on.

Admirably executed drawings of *Bos arni*, *Bos gaurus*, *Rhinoceros*, *Elephas*, &c. occur in most of the rock shelters in the neighbourhood and at first sight might be supposed to be of great antiquity, but it appears to me that they need not be more than 800 years old, if not less. For if the rhinoceros and elephant were found near Chunar on the banks of the Ganges in 1529 they were probably more numerous at the same time and continued to exist later, on the banks of the Sone where these shelters occur, a country yet covered with forests harbouring the tiger, bear and sambar.

Granting the possibility of these drawings being comparatively modern, we find ourselves face to face with the astounding conclusion that the "stone age" has but recently passed away among the aborigines of the Kymores.

A state of stone culture calls up a host of anthropological questions; but before going further I may mention that I had long before come to the conclusion that the aborigines of the Kymores were in a stone age as late as the 10th century A. D. The remarkable piece of sculpture from Kalinjar, now in the Indian Museum, which was supposed in the short note by H. J. Rivett-Carnac, Esq. (read by me before the Society, P. A. S. B. January, 1883,) to represent an aborigine armed with a stone axe is possibly, from the absolute identity of the axes and chert implements found in the rock shelters of Mirzapore and on the surface in the vicinity of Kalinjar, intended to represent one of the same race as those who hunted the rhinoceros in Mirzapore.

The tracing of the rhinoceros hunt Plate [VII] is a faithful tracing of a petroglyph in the Ghormangur cave in Pergunnah Bidjeygurh of the Mirzapore District.

This cave was visited by me on the 17th of March 1883. Its exact position is two miles due south of Mow Kullan bridge, and within three miles of the celebrated fortress of Bidjeygurh, and five of the river Sone.

This rock shelter has the appearance of a huge mushroom. It is a

gigantic boulder, the remnant of some rocky ridge with the sides scooped out by atmospheric agency for three-fourths of its circumference leaving a huge central pedestal or stalk on which the drawings have been executed.

The drawings are in the usual red pigment which was generally hæmatite, pieces of which were dug up in caves. This was probably mixed with animal fat and laid on with a fibrous brush, while the outlines were executed with a pointed stick.

These drawings are as a rule in tolerable preservation probably owing to the fact that they have been protected from the weather by the situation of the cave.

The first drawing of a rhinoceros observed by me was in a shelter about 400 yards south of the camping ground at the village of Roup in Pergunnah Burhur. It was at this village that Dr. Hooker camped on the 3rd of March 1848, (See *Him. Jour.* Vol. I, p. 60) and its position is plainly marked on the map that accompanies his work. The sketch was about 3" long, and I am not ashamed to confess that I did not recognise the animal at the time, probably unconsciously deeming it incredible that the animal could have occurred here. The following extract bearing on the subject is from my note book.

"February 9th.—There is a group of three men attacking a boar whose tusk is planted on the tip of his nose like the horn of a rhinoceros. Two of the men who are in advance wear short skirts, but the form of their lance heads is on too small a scale to be defined. Attacking him from the rear is the obliterated figure of a man on a large scale, and the form of lance-head he is using plainly indicates the chip spear."

The next step in the process of the discovery is detailed below in an extract from my note book.

"March 14th.—Harni Harna cave near Bidjeygurh. There are numerous well executed drawings of Sambar hinds identified by the stag alongside, but the most remarkable drawing is what looks much like a rhinoceros hunt. The drawing is much injured; there are traces of six men (whose uplifted arms are evidently discharging spears) pursuing an animal, which the evidence of my senses compels me to say resembles a rhinoceros. The horn is perfectly represented, and had not half an inch more of the snout scaled away, I should have been able to identify the animal with certainty."

The same night in a foot note to the notice of their Roup cave, I remarked.—"Having since found several drawings of boars with the tusks in the right position I consider it improbable that men who represented animals so accurately as these savages, would have drawn a boar's tusks, thus (on the top of the nose). This may be evidence in favour of the animal seen to-day in the Harni Harna cave being a rhinoceros." Knowing I was

in a promising locality, I strained every nerve to find a more perfect drawing, walking twenty miles a day, and undergoing more fasting and privation than the most enthusiastic votary of superstition.

The question no longer admits of doubt for the animal in the drawing now exhibited is as plainly a rhinoceros as the objects around it are men.

On the 17th of March I had the good fortune to be shown to the Ghormangur cave which is well-known to the Kol and Gond wood-cutters in the locality, though they were quite ignorant of the fact that scores of other caves with paintings existed higher up the bluff. This cave is called the Ghormangur or horse cave, and was said to contain drawings of horses, but I was quite unable to find a single drawing of the horse although this animal is not uncommonly depicted in other caves.

I may now proceed to a description of the sketch [Pl. VII.] which is a faithful tracing taken by brushing tissue paper with kerosine oil to render it transparent securing it on the rock with pellets of wax and going over the lines with a blue pencil. The kerosine oil afterwards readily evaporates on exposure to the air.

A group of six men have attacked a rhinoceros identified at present with *R. indicus*.\* One of these the animal has tossed with his horn and the position of the man sprawling in the air is comically like our own drawings of people tossed. A man wearing an unusually large head-plume who is in the rear has tried to draw the animal off by plunging his spear into its hind-quarters. His attitude indicates that he has thrown his entire weight into the thrust.

In front of the enraged animal are two men, the lower of whom in an attitude highly indicative of action, has what appears to be a simple spear of hardened wood with two supplementary barbs, levelled at the animal's breast. The upper of these two figures has nothing remarkable about him, his head-plume differs slightly, and he seems to be armed with the ordinary triangular-headed spear with two supplementary barbs which is found throughout these cave drawings.

\* The sentence in Jerdon's Mammals, p. 234 under *R. sondaicus* "One of these species formerly existed on the banks of the Indus where it was hunted by the Emperor Baber," has been usually considered by subsequent writers to allude to *R. sondaicus*. I am strongly inclined to think that the species hunted by Baber was *R. indicus*. I am not aware what authority Jerdon had for saying that *R. sondaicus* was found on the northern range of the Rajmahal Hills near the Ganges, but have a faint recollection of seeing some such statement in an old Indian sporting publication.

Ball questions the fact. It is, however, unfortunately but too true that neither Blyth nor Jerdon knew *R. sondaicus*, Blyth having named a characteristic stuffed specimen of *R. indicus* as *R. sondaicus*. Blyth Cat. M. M. A. S. No. 460 A.

Only one of these men appears to be absolutely naked, the others appear to have on a short kilt which is elsewhere represented in this cave and may have resembled the fringed kilts commonly worn by savages in all parts of the world.

All save two it may be noted wear head-plumes, a characteristic of savages although our field marshals might demur to this statement. In the hindmost individual this plume is of unusual size. An examination of a head 3" long in which the plume is plainly shown leads me to believe these plumes were coloured feathers and other objects worked into a queue or scalp lock somewhat similar to those indulged in by the Nagas and North American Indians at the present day. The lines which occupy the head and body of the rhinoceros I have noticed elsewhere. They may be intended to represent the segments into which this animal almost appears to be divided by the overlapping coat of mail, but are more probably a conventional way of filling up blank space in a drawing. There are a few other objects of interest in this cave which have not been noticed elsewhere. In the hand of a plumed individual to the left of the rhinoceros hunt is a spear valuable as being drawn on a somewhat large scale and being in a very perfect state of preservation. [See Plate VII.]

This spear closely resembles the mongile or double-barbed spear which is a favourite pattern with the modern Australians and Polynesians, and is always cut out of solid hard heavy wood.\*

A very similar spear but with eight such barbs is figured by Brough Smith, in his *Aborigines of Victoria*. [Pl. VIII, F.]

It occurs to me at this stage that I have not yet brought forward the evidence, which has led to so bold a hypothesis regarding the material of which these spears are made and will do so now.

Stone-tipped implements of three kinds are, I consider, figured in the various caves I have hitherto examined, viz : spears, arrows and stone knives ; but it must not be inferred from this that iron implements are wanting.

\* With reference to the efficiency of wooden and stone spears for destroying large mammalia, it may not be generally known that an Australian savage has been seen not only to transfix but nail a man to a tree at 30 yards with a wooden chip spear thrown by the woman.

They readily kill *Macropus major*, cows and even horses belonging to the settlers with these weapons and even the mighty whale succumbs to a slate harpoon-head in the hands of an Esquimaux.

Nearer home the Naga panjie which will penetrate any living thing shews how effective pointed bamboo may be. It is more than probable that some of the spears here represented were of bamboo. The bamboo found in the vicinity of Bedjeygurh is valued at the present day for spear shafts and lances beyond all others, and having had my own hog spears shafted with it I can testify to its superiority.



On the contrary almost every cave contains well defined drawings of iron implements which form one of the best proofs I have that the other implements so closely resembling those of modern savages were made of stone and wood.

For example, in a painting in a cave at Lohri I found what is an iron-headed spear [Pl. VIII B] But in this very shelter occurs also a drawing of a man spearing a stag sambar with a weapon, which is similar to one represented in the Likuniá rock-shelter, and which I am convinced every anthropologist will be prepared to accept as a non-metal weapon. [Pl. VIII, E] Another form of iron spear head, not uncommonly found in the hands of horsemen, is a typical form not unlike a lozenge-shaped form of head yet used among ourselves. [Pl. VIII, A.]

The metal arrow-heads here and there observed [Pl. VIII, C] are as obviously of metal\* as the pike staves of the spears are of wood.

Lastly, I may mention that the foreigners usually represented in these drawings are often armed with round shields and curved sabres which apparently differ in no wise from the modern tulwar. I have also to state that I have actually found a portion of an iron arrow-head in a cave.

The best evidence we can have in support of the idea that the drawings above alluded to represent stone weapons is the fact that stone implements occur in abundance in the soil of the caves mingled with the identical material with which the drawings were executed.

The spear head D [Pl. VIII.] is I believe intended to represent a wooden spear as it is yet a favourite pattern with savages. A painting in the Lickunia rock shelter near Shahgunge represents a man about to spear a hind. The weapon in his hand referred to above is a spear with a broadly angular head followed by nine barbs. [Pl. VIII, E] The aboriginal Australians in smoked bark-drawings, and doubtless in caves, represent their stone spears in a manner so very similar to this drawing [See Pl. VIII, G] that I have no hesitation in expressing my opinion, that the similar weapons represented in the Mirzapore rock shelters were headed with stone, wood and bone, convinced as I am that further researches will abundantly prove the truth of this theory whatever the age of the drawings may be.

No modern form of iron spear-head resembling E is known to me. In a single instance I have observed, that the huge sword-shaped blade of the Naga spear was followed by two supplementary barbs which were of a piece with the blade.

The Andamanese not uncommonly whip on two or three supplementary iron or bone barbs to their pig arrows, but these latter are not usually in pairs but alternate.

\* Specimens of this type made of iron are in the Indian Museum.

Both these Tribes have not long passed out of a stone age and the persistence of the custom points to the fact of their having used many barbed spears in other material at no distant period.

A multibarbed form of copper harpoon or spear-head appears to have been used in India during what here corresponds to the Bronze Age. Three such harpoon-heads were ploughed up in a field in the Mainpuri District of the Gangetic Duab, associated with flat copper celts and copper bangles. [See P. A. S. B. 1868, pp. 251-262.]

The celts were of exactly the same type as one found in a Buddhist mound at Muttra by General Cunningham (Arch. Surv. of India, Vol. II, p. 16). One of these copper spear-heads is now in the collection of the Indian Museum, and two other similar specimens were in the Allahabad Museum when I was Curator of that Institution.

The specimen in the Indian Museum is well worn on the first barb by grinding and has two eyelets at the base. The short thick truncated rounded tang in all three specimens favours the idea that they were fixed in a shifting socket as the Andamanese pig arrow is at the present day. They were not therefore necessarily harpoons for spearing aquatic creatures.

A larger and different form of copper spear-head, said to be from Bithur? near Cawnpore) is also in the collection of the Indian Museum. It has three pairs of blunt rounded supplementary barbs below the blade. I am not disposed to think that the broadly triangular head and fine sloping lines of the barbs of the cave-spears were intended to represent either of these forms in copper. The great number of barbs on the cave-spear adds much to the probability of these barbs having been of stone.

A peculiar class of angular flakes [Pl. VIII, H] very common in these caves were I would suppose let into grooves in wood as shown in the restoration of a stone spear [Pl. VIII, I.]

I cannot here refrain from stating that this discovery is entirely due to the liberality of H. Rivett-Carnac, Esq., C. S., C. I. E., F. S. A. without whose constant aid I should neither have been able to find the caves nor write this paper.

*Notes to the above.*

Two important objections might fairly occur to a critic after reading the above. *First*, that Baber's identification of the rhinoceros at Chunar in 1529 is at the best doubtful. *Secondly*, that the occurrence of the rhinoceros in the vicinity of Chunar would imply the presence of forests there, whereas the district now is semi-arid.

With regard to the *first* objection I would point out that Baber was *previously acquainted* with the rhinoceros. His description of the rhinoceros hunted by his son on the banks of the Indus is most accurate, and leaves no room for doubt as to the genus of the animal he described. He compares the folds of its skin to housings and its internal anatomy to that of the horse, a fact which subsequently required the

genus of Cuvier to detect. With regard to the *second* objection as to the existence of forests in the vicinity, there is in my opinion ample evidence to show that *tree* forests existed not only near Chunar, but right through the Gangetic Duab as high as Cawnpore till the 16th century and later.

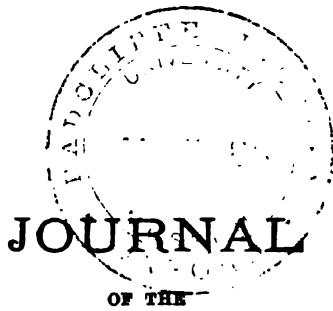
It requires some abstraction to conceive that this now semi-arid region largely productive of reh and usar was covered with forest so recently, but such was without doubt the case. Wild elephants are stated in the Ayeen Akbari to have been found near Kalinjar in Banda, in Kuntil, in Mirzapore, Kurrah Manickpore, in Allahabad and Chunar. These points define a former forest tract throughout which stone implements occur.

*Rhinoceros indicus*, it may be noted, frequents grass by preference, while *Rhinoceros sondaicus* is a forest and mountain loving species. But the habitat of *R. indicus* at the present day, the great grass jungles on the banks of the Brahmaputra, and those of the Himalayan terai are in either case bordered by forest, in which the rhinoceros is occasionally found, and seeks refuge when pursued. In the occurrence of both the rhinoceros and elephant near Chunar in 1529 there is evidence that extensive forests did exist in the immediate vicinity of the river's bank; for granting that the rhinoceros did frequent the heavy grass which was certain in places to have covered the alluvium within the immediate influence of the great river, such would not have been the case with the elephant, for the food of *Elephas indicus* consists of succulent leaves, shoots and twigs, and it requires large tracts of forest to maintain itself; differing in this respect from its African ally. We have, however, the evidence of a modern Englishman which shows that my supposition regarding the bordering forest is correct. Capt. Blunt who marched from Chunar to Ellora in 1795 records that a "thick forest" existed between the Jurgo nadi below Chunar and Sukteesgurh, (*Asiatic Researches*, Vol. VII, 1801, p. 57.) The Chinese Pilgrim who in the 7th century marched from Allahabad to Kosim stated that he passed for several days through a vast forest infested with wild bulls. I have marched by what is considered by General Cunningham the same route, and was struck by the absence of vegetation, and the prevalence of reh. Bits of dhak jungle (*Butea*) scattered over this tract may be the remains of what was once a forest. This growth everywhere in the N. W. P. appears to replace true forest forms, once the conditions necessary for their existence are altered.

The change effected in the climate has undoubtedly been great, and everywhere in the plains of the N. W. P. dried watercourses and rivulets, barren ravines, and saline efflorescence, attest to the slow but certain progress of aridity and exhaustion.

As regards the precise locality where the drawing of the rhinoceros hunt was found, sal forests yet exist there in patches, and the occurrence of numerous characteristic drawings of the Bison (*B. gaurus*), a forest loving animal, renders it nearly certain that primeval forest existed at the time. In the swamps engendered by these forests I would suppose the rhinoceros depicted to have lived. Both *R. sondaicus* and *R. sumatrensis* frequent what must be very similar localities at the foot of the Garo, Khasia and Naga hills where I was informed by the late Major C. B. Cock that he had seen both species.

The cover frequented by the rhinoceros seen by Baber on the banks of the Indus would better be discussed by some one more familiar with the Province than I am, but there is much probability that forests harbouring elephants existed at the period of the invasion of Semiramis.



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## ASIATIC SOCIETY OF BENGAL.

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V.—On new and little-known Rhopalocera from the Indian region.

By LIONEL DE NICÉVILLE.

[Received and read the 7th March, 1883.]

[With Plates I, IX and X.]

Family NYMPHALIDÆ.

Subfamily NYMPHALINÆ.

1. *HESTINA ZELLA*. (Plate I, fig. 2, ♀.)

*Hestina zella*, Butler, Trans. Ent. Soc. Lond., 1869, p. 9 (with a woodcut), *male*; *id.*, Moore, Proc. Zool. Soc. Lond., 1882, p. 240.

Mr. Butler in describing the male of this species, but not knowing the exact locality from whence it was obtained, stated that "it is remarkable as being an excellent mimic of *Danais juvenata*, a widely distributed and tolerably common East Indian and Oceanic species." *Danais (Badena) juvenata* is certainly superficially very similar in markings to *H. zella*, but according to present knowledge it does not occur in the N.-W. Himalayas, being in fact confined to the islands of Java, Lombock and Billiton as far as I am aware. Nor is there any other common *Danais* occurring in the same region as *H. zella* that it could mimic, except it be *D. limniaca*. It at once struck me when capturing the female here figured on the forest-clad road between Chumba and Kujiah on the 22nd May, 1879, that it was an excellent mimic both in the slow and sailing mode of its flight and in general appearance of *Metaporia caphusa*, Moore (Proc. Zool. Soc. Lond. 1872, p. 564), which is an exceedingly common butterfly in the Spring in many parts of the outer N.-W. Himalayas, and is doubtless a protected species. It is more probable that our *H. zella* mimics the *Pteris* rather

than a *Danais*, especially as on the underside both species are washed with yellow on the hindwing, which the *Danais* are not.

The female has not been described. It differs from the male (known to me by Butler's description and figure only) in being considerably larger, both wings broader, and the outer margin of the forewing less emarginate. Expanse 3·4 inches. It is not a common species apparently, though Mr. Moore in describing Mr. Hocking's collection gives for it "Kangra district generally."

Family LYCÆNIDÆ.

2. LYCÆNA ? LELLA, n. sp. (Plate I, figs. 3, ♂ ; 3 a, ♀.)

HAB. Ladak.

EXPANSE: 1·1 to 1·2 inches.

DESCRIPTION. MALE. UPPERSIDE, both wings blackish, powdered up to the discal rows of spots with metallic pale green scales. Forewing with a prominent black white-encircled spot at the end of the cell, and a discal curved series of five (in one specimen) or six (in two specimens) whitish spots, with indistinct dark centres. Hindwing with a spot closing the cell, less prominently black than in the forewing, a white spot placed outwardly above it, and four spots on the disc, whitish. UNDERSIDE, greyish-white, pale brown on the disc of both wings, and the base pale greenish. Forewing with a spot in the middle of the cell, a large one closing it, a discal series of six or seven spots, of which the two lower ones are smaller than the rest and (when both are present) geminate; all black with prominent white margins; the outer margin almost pure white with an indistinct series of spots. Hindwing with a spot below the costa near the base, a very large spot at the end of the cell, a very irregular discal series of seven spots, and a marginal double series of coalescing lunules, white. Cilia very long and white. FEMALE. UPPERSIDE, both wings deeper coloured, with a few scattered pale greenish metallic scales at the base only. Forewing with the discal series of spots prominently centred with black, and variable in number from four to six. Hindwing with the spots smaller and less prominent than in the male. UNDERSIDE variable in tone of colour, being much darker in some specimens (including the type specimen figured) than in others, the discal markings sometimes blurred and running into the pale margin beyond, otherwise much as in the male.

Closely allied to *Polyommatus ellisi*, Marshall (Journ. A. S. B., vol. li, pt. ii, p. 41, pl. iv, fig. 4 1882), male, but the male differing from the type specimen of that species now before me in having the apex and the outer margin of the forewing more rounded, in *P. ellisi* the apex is acute, and the outer margin straight; the upperside of both wings paler in colour and more broadly irrorated with greenish scales, the discal spots more numerous, the markings on the underside throughout more prominent, and with an additional spot in the cell of the forewing. The colouring of the

figure of *P. ellisi* is much too vivid, the metallic colouring of the base of the wings and the body is a very pale green.

*Lycana wornosenskii*, Ménériés, (Cat. Mus. Petr., Lep, vol. i, pp. 58, and 95, no. 964, pl. iv, fig. 6 1855), is also a closely allied species, the upperside being figured with the apex of the forewing very acute, the figure of the underside showing it quite rounded. It is recorded from "Kamchatka."

This species was found by me only on passes; the female figured was taken near the top of the Zoji-la on the Ladak side at about 11,000 feet elevation on June 27th, 1879; on July 2nd seven specimens of both sexes on the Mamyka Pass, Ladak, 18,000 feet; and lastly, on July 8rd seven more specimens on the Fotu-la, Ladak, at about the same elevation.

The next seven species described and figured belong to the *puspa* group of the genus *Cyaniris* of Dalman, described by Moore at page 74 of his "Lepidoptera of Ceylon." As these species are all more or less closely allied, a few preliminary remarks regarding them may perhaps be of interest, and enable entomologists to separate them more easily, which remarks are perhaps best embodied in a key.

*Key to the males of certain species of Cyaniris allied to puspa.*

A. Upperside without any pure white or irrorated white patches.

C. FLACIDA.

B. Upperside with irrorated white patches more or less prominent on both wings, sometimes obsolete on the hindwing.

a. With the black border of the forewing very narrow, not reaching the hinder angle or obsolete, leaving the anteciliary black thread only; no black border to the hindwing.

C. DILECTUS.

b. With the black border of the forewing broader, especially at the apex; hindwing with a somewhat narrower similar border.

a<sup>1</sup>. The markings on the underside small and regular.

C. LYMBANA.

b<sup>1</sup>. The markings on the underside much larger and placed irregularly.

C. PUSPA.

c. With the black border of the forewing a little broader still, perceptibly broader in the hindwing, apex of forewing more produced than in *C. puspa*.

C. TRANSPECTUS.

C. Upperside with pure white patches on both wings.

a. A small patch on both wings, outer black margins very wide, markings on the underside usually exactly as in *C. puspa*.

C. MARGINATA.

b. Patches large on both wings, outer black border of the forewing less wide than in *C. marginata*, and not reaching the hinder angle; no black border to the hindwing; markings on the underside very small and regular.

C. ALBOCERULEUS.

*O. akasa*, *O. lavendularis*, *O. lanka*, *O. singalensis*, and *O. limbatus* all apparently belong to this group, but the absence of specimens makes it impossible to place them in their proper places in the key.

3. *CYANIRIS PLACIDA*, n. sp. (Plate I, fig. 8, ♂.)

*C. placida*, Moore, *M. S.*

HAB. Sikkim; Sibsagar, Upper Assam (*S. E. Peal*).

EXPANSE: ♂, 1.1 to 1.4 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* rather deep lavender blue. *Forewing* with the costa very narrowly, and the outer margin more widely but decreasingly to the hinder angle black. *Hindwing* narrowly black, the inner edge of the black border lunulated, sometimes reduced to black spots between the nervules, and a black anteciliary line. UNDERSIDE, *both wings* white, slightly tinted with blue. *Forewing* with a fine disco-cellular streak defined outwardly with whitish; a discal series of five or six more or less irregularly shaped and placed spots; a submarginal lunulated line, marginal spots and anteciliary line. *Hindwing* with three sub-basal black spots; a faint slender disco-cellular line; a discal very sinuous series of eight spots, the upper one on the costa and the lower one on the abdominal margin deep black and the most distinct; marginal markings as on the forewing. *Cilia* white on both sides.

Next to *O. puspa*, this seems the commonest *Cyaniris* in Sikkim; I took it at various elevations in October, and Mr. Otto Möller has taken it in large numbers in the Spring. The males are very constant, but I have not seen the female.

*O. placida* is very close to, if not identical with, the *Lycæna cagaya* of Felder (*Reise Novara, Lep.*, p. 278, no. 347, pl. xxxiv, figs. 11, 12 ♂, 13 ♀, 1865, from Luzon). In *C. cagaya* the marginal spots on the upperside of the hindwing in the male are more prominent than in *O. placida*.

4. *CYANIRIS DILECTUS*. (Plate I, fig. 5, ♂.)

*Polyommatus dilectus*, Moore, *Proc. Zool. Soc. Lond.*, 1879, p. 189.

HAB. Simla; Nepal; Sikkim; N. Cachar; Sibsagar, Upper Assam (*S. E. Peal*); and Upper Burma (*brought by the Yunnan Expedition*).

EXPANSE: ♂, 1.05 to 1.40; ♀, 85 to 1.35 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* pale blue, with a very fine black anteciliary line, which towards the apex of the forewing in some specimens becomes slightly diffused inwardly. *Forewing* with a patch of irrorated white scales on the disc below the cell and between the median nervules, very prominent in some specimens, obsolete in others (as in the Sikkim specimen figured). *Hindwing* with a similar patch, but placed be-

tween the second median nervule and costal nervule, and almost reaching the apex. **UNDERSIDE**, both wings as in *O. albocæruleus*, but with a more or less prominent submarginal series of dusky lunules. **FEMALE**. **UPPERSIDE** almost as in *O. albocæruleus*, but the outer margin less broadly black, the basal area glossed with very bright metallic blue, not unmetallic pale lavender-blue as in the latter species; the disco-cellular streak more prominent. *Hindwing* with the submarginal series of round dusky prominent spots inwardly defined by bluish lunules. **UNDERSIDE** as in the male.

Both sexes of this species were taken by me in the neighbourhood of Simla, most frequently on Tawa Devi, also at different elevations in Sikkim in October. Mr. Otto Möller has also taken males in large numbers in Sikkim at low elevations in the Spring.

Figure 5a of Plate I represents what is now believed by me to be the female of *C. puspa* from Simla, but which was at first mistaken for the female of *C. dilectus*.

5. *CYANIRIS IYNTANA*, n. sp. (Plate I, fig. 7, ♂; 7a, ♀.)

*C. iyntana*, Moore, *M. S.*

**HAB.** Sikkim; Shillong.

**EXPANSE:** ♂, 1.05 to 1.4; ♀, .9 to 1.25 inches.

**DESCRIPTION: MALE.** **UPPERSIDE**, both wings somewhat deep lavender-blue. *Forewing* with the outer margin, widest at the apex, sometimes reduced to a point at the hinder angle, dusky black; an indistinct disco-cellular streak sometimes absent; and the disc between the median nervules just beyond the cell irrorated with white scales in some specimens. *Hindwing* with the outer margin dusky-black, its inner edge lunulated. In some specimens the apical area is obscurely irrorated with white. **UNDERSIDE**, both wings pale grey. *Forewing* with a pale brown slender disco-cellular streak, a discal series of five similar spots, of which the upper one is much out of line, being placed nearer to the base of the wing; a submarginal lunulated line and marginal spots very pale brown; the usual fine anteciliary black line. *Hindwing* with three subbasal black spots; a slender brown disco-cellular streak; a very sinuous discal series of nine spots; marginal markings as on the forewing. **FEMALE.** **UPPERSIDE**, *forewing* with all but the middle of the disc (which is white glossed with iridescent blue) black; a disco-cellular black spot. *Hindwing* blackish, white in the middle, glossed with blue, and along the veins irrorated with black scales; a submarginal series of pale lunules. **UNDERSIDE** marked exactly as in the male.

Four male and two female specimens of this species were taken by me at different elevations in Sikkim in October. The males differ in size, in the absence in two of them of the white patch on the disc of the forewing







on the upperside, and also in the width of the marginal black border, which in some specimens disappears at the hinder angle. The underside is very constant, all the spots and markings being very small and distinct.

6. *CYANIRIS TRANSPECTUS*. (Plate I, fig. 6, ♂ ; 6a, ♀.)

*Polyommatus transpectus*, Moore, Proc. Zool. Soc. Lond., 1879, p. 139.

HAB. Sikkim ; Khasi Hills.

EXPANSE: ♂, .95 to 1.4 ; ♀, 1.20 to 1.35 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* lavender-blue. *Forewing* with the costal margin somewhat broadly, and the outer margin very broadly, especially at the apex, dusky black: a patch of irrorated white scales on the disc between the third median nervule and submedian nervule, obsolete in some specimens. *Hindwing* with a broad even outer black border, somewhat divided by a series of bluish lunules, which are most prominent at the anal angle, and often enclose black spots. UNDERSIDE, *both wings* white, slightly tinted with blue. *Forewing* with a slender dusky disco-cellular streak, a discal series of six elongate spots, arranged in a regular sinuous line in some specimens (as in the female figured), or in others more irregularly (as in the male figured); a submarginal lunular line, a marginal series of linear spots, and a fine anteciliary line. *Hindwing* with the spots arranged as in *O. puspa* but they are less prominent, those on the margin reduced to linear marks. *Oilia* white on both sides in both sexes. FEMALE. UPPERSIDE, *both wings* very deep blue, almost black. *Forewing* with a broad pure white patch from near the subcostal nervure to the inner margin, a prominent disco-cellular streak, and the base thickly irrorated with deep blue scales. *Hindwing* with the outer margin rather less deeply blue than in the forewing, and bearing a series of pale lunules including black spots, the disc white but irrorated towards the abdominal margin with blue scales, as is also the base of the wing. In some specimens the white area on both wings is much restricted, appearing on the hindwing only at the middle of the costal margin. UNDERSIDE as in the male.

Both sexes of this species were taken by me at different elevations in Sikkim in October, there are specimens also in Mr. Otto Möller's collection taken in the Spring.

7. *CYANIRIS MARGINATA*, n. sp. (Plate I, fig. 9, ♂.)

*C. marginata*, Moore, *M. S.*

HAB. Sikkim.

EXPANSE: ♂, 1.45 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* highly iridescent deep lavender-blue. *Forewing* with the costal margin including the upper half

of the cell, and the outer margin, widely, especially at the apex, black; a patch of pure white scales on the disc outside the cell between the lower discoidal and first median nervules; a black disco-cellular streak. *Hindwing* with the costal and outer margins broadly black, including a submarginal lunular series of bluish marks, obsolete in some specimens except at the anal angle; a patch of pure white scales above the discoidal nervule. **UNDERSIDE**, both wings white, slightly tinted with blue. *Forewing* with a disco-cellular blackish streak, a discal series of six large very irregularly shaped and placed spots, a submarginal lunular line and marginal linear spots blackish; a black anteciliary line. *Hindwing* with three subbasal spots, a disco-cellular streak, and irregular discal series of eight to ten spots: marginal markings as in the forewing. *Cilia* white on both wings on both sides.

Three males of this species were taken by me on the Darjiling cart-road at about 5,000 feet elevation in October. There is a single male in Mr. Otto Möller's collection taken on Senchal, Sikkim, at about 8,000 feet elevation, in August, and another taken at a low elevation in December.

8. *CYANIRIS ALBOCÆRULEUS*. (Plate I, figs. 4, ♂; 4 a, ♀.)

*Polyommatus albocæruleus*, Moore, Proc. Zool. Soc. Lond., 1879, p. 139.

**HAB.** Simla; Deyra Doon; Nepal; Sikkim.

**EXPANSE:** ♂, 1·2 and 1·4; ♀, 1·35 inches.

**DESCRIPTION: MALE.** **UPPERSIDE** pure pearly white. *Forewing* with the outer margin broadly at the apex and decreasingly towards the hinder angle dusky black, this black border being reduced to a very fine black line at the hinder angle; the base, broadly along the costa and inner margin and within the outer black band pale clear shining blue, thus leaving a patch of the white ground-colour on the disc of the wing only. *Hindwing* with the base and abdominal half of the wing irrorated with very pale shining blue; the spots of the underside showing through slightly on the disc; an indistinct marginal series of dusky spots, and a fine anteciliary black line. **UNDERSIDE**, both wings white, slightly tinted with blue. *Forewing* with a slender blackish disco-cellular streak, a curved discal series of five or six elongate spots, and a marginal series of very indistinct small spots, obsolete at the hinder angle. *Hindwing* with ten or eleven small dusky spots, of which three are subbasal, the rest arranged irregularly across the disc; a submarginal series of small spots, and a fine marginal black line. **FEMALE** with the costal and outer borders very broadly dusky black, the discal patch white, the inner margin broadly irrorated with blue. *Hindwing* with the discal area between the nervules bluish-white, all the rest dusky; a submarginal series of oval dusky spots, and the marginal

black line. **UNDERSIDE**, both wings exactly as in the male. *Cilia* white on both sides in both sexes.

Nearly allied to *Oyaniris akasa*, Horsfield, from which (*apud* Moore in 'Lep. Cey.') the male differs on the upperside of the forewing having no dusky on the base and costal-margin, and the outer black border being narrower throughout.

Two males were taken by me in the bed of the Simla river on the 26th October and 2nd November, 1879, respectively, and one female also at Simla but the exact locality and date were not recorded. All three specimens are quite perfect; and the males agree absolutely except in size. I also took one male in Sikkim in October at about 3,500 feet elevation.

Mr. Moore seems to have described the female of some other species as the female of *O. albocæruleus*, as he states that in that sex the broad outer marginal black band on the upperside of the forewing does not reach the posterior angle, whereas in my female the band is very wide at that point. As the undersides of both sexes of the specimens described above agree absolutely, I think I have paired them correctly, while if the females of this species be variable Mr. Moore's description would be correct.

9. *CYANIRIS CHENNELLI*, n. sp. (Plate I, fig. 10, ♂.)

**HAB.** Shillong, Assam.

**EXPANSE:** ♂, 1.1 and 1.25 inches.

**DESCRIPTION: MALE.** **UPPERSIDE**, both wings lavender-blue. *Forewing* with the outer margin widely dusky-black, widest at the apex; a dusky disco-cellular streak. *Hindwing* with the costal and outer margins widely dusky-black. **UNDERSIDE** pale grey. *Forewing* with a slender disco-cellular streak outwardly defined with whitish, a discal slightly sinuous series of six rounded spots also outwardly defined with whitish; very pale and indistinct submarginal lunular line, marginal linear spots, and anteciliary line. *Hindwing* with two subbasal small black spots, a faint disco-cellular streak, and an irregular discal series of nine black spots outwardly defined with whitish, of which the third, fourth and fifth from the costa are much paler; marginal markings as on the forewing. *Cilia* of both wings somewhat dusky on the upperside, concolourous with the wings on the underside.

There are two male specimens in the Indian Museum, Calcutta, which were taken by Mr. A. W. Chennell, after whom I have named the species; they differ only in size.

10. *NACADUBA BHUTEA*, n. sp. (Plate I, fig. 13, ♂.)

**HAB.** Sikkim.

**EXPANSE:** ♂, 1.1 inches.

**DESCRIPTION. MALE.** Differs from Sikkim specimens of *N. ardatæ*, Moore, in being larger, the band crossing the middle of the cell on the

UNDERSIDE of the *forewing* in *N. ardates* not extending below it in *N. bhutea*, and the lower spot of the discal series well retired from the line of the five spots above it, whereas in *N. ardates* there are two lower spots out of line, one being additional.

I took a single specimen on the Darjiling cartroad between 2,000 and 5,000 feet elevation, in October, 1880, and numerous specimens have since been taken in Sikkim at low elevations. It seems a constant and well-marked species.

11. NACADUBA NORA. (Plate I, fig. 14.)

*Lycæna nora*, Felder, Reise Novara, Lep., vol. ii, p. 275, no. 341, pl. xxxiv, fig. 34, ♂ (1865).

HAB. Amboyna (*Felder*); South Andamans.

EXPANSE: 1 inch.

DESCRIPTION. UPPERSIDE smoky deep purple. *Hindwing* with a marginal series of increasing lunules, the one between the first and second median nervules inclosing a prominent black spot, the final one two much smaller spots. UNDERSIDE bright castaneous brown. *Forewing* with a catenulated band across the middle of the cell from the subcostal nervure to the inner margin, a similar band closing the cell, a discal band of spots somewhat broken and directed inwards at the fifth spot from the costa, a submarginal band of lunules, marginal linear spots and black anteciliary fine line. *Hindwing* with a basal chain of spots, another closing the cell, and a discal much curved and broken band; marginal markings as on forewing, but with a prominent subanal black spot between the first and second median nervules, crowned with an orange lunule, and marked outwardly with a few metallic green scales; two minute similar spots at the anal angle.

Mr. de Roepstorff has sent a single specimen which seems to be identical with Felder's *L. (= h.) nora*. It is allied to *N. ardates*, Moore, but differs in the discal chain of spots on the underside of the forewing which are larger and less broken, also in the straighter outer margin of that wing.

12. NACADUBA? DANA, n. sp. (Plate I, fig. 15, ♂.)

HAB. Bholahât, Malda; Buxa, Bhutan; Sikkim; Chittagong District.

EXPANSE: ♂, .95 to 1.05; ♀, 1.05 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* violet blue, with the outer margins evenly narrowly black. UNDERSIDE *both wings* fawn colour. *Forewing* with a white-bordered dusky spot in the middle of the cell, a similar one at its end, a discal chain of six similar spots, the two lower ones out of line, (in some specimens the sixth lowest spot is absent); submarginal and marginal indistinct series of pale lunules. *Hindwing* crossed by three

much broken bands of white-bordered dusky spots, and submarginal and marginal lunules as in the forewing; two small black spots at the anal angle on the margin. *Cilia* dusky throughout. FEMALE. UPPERSIDE, *forewing* black, the disc whitish and covered with pale blue metallic scales, the disco-cellulars marked with a black spot. *Hindwing* dusky, with pale bluish-white streaks between the nervules, a black disco-cellular spot, and obscure marginal pale lunules. UNDERSIDE cream-coloured, the markings as in the male, but all the spots and bands (except the two black anal spots) pale ochreous.

Two male specimens were taken in the Sikkim Tarai in July and August, 1881, by Mr. Otto Möller, and four males from Bhurkhul and one from Demagiri in the Chittagong District were taken by Mr. H. M. Parish in February, 1883. All these specimens are very constant, showing no variation whatever. They present a superficial resemblance to *N. ardatus*, Moore, but are a different colour on the upperside; they have also no tail, and should therefore probably be placed in a different genus. Mr. Otto Möller has also obtained numerous males at low elevations in Sikkim during the summer and autumn including the female described, Mr. Irvine has sent it from the Malda District, the Museum collector took it at Buxa, and I took it in the Great Runjit valley, Sikkim, in October.

13. *CASTALIUS INTERRUPTUS*, n. sp. (Plate I, fig. 12, ♀.)

*C. interruptus*, Moore, *M. S.*

HAB. Khurda, Orissa; Bholahât, Malda; Sikkim.

EXPANSE: 1.15 to 1.20 inches.

DESCRIPTION. MALE and FEMALE. UPPERSIDE, *both wings* pure white. *Forewing* with the base thickly irrorated with black scales, beyond with a dense black patch widest on the costa, inwardly recurved below the submedian nervure, from whence it suddenly narrows. (In some specimens the irrorated black scales at the base of the wing and the black patch beyond are entirely merged into one black basal patch, and the costa throughout is widely black.) The apex widely, the outer margin as far as the first median nervule less widely, then to the inner margin more widely again deep black; with a round black spot above the first median nervule coalescing with the black border, this spot is sometimes entirely separated, in other specimens very indistinct, and lastly in others its form is entirely lost in the black margin. *Hindwing* with the immediate base and a few irrorated spots beyond black, the outer margin also black, enclosing immediately within a black anteciliary fine line a more or less prominent and complete series of white oblong marks between the nervules. UNDERSIDE with the markings arranged as in *C. hamatus*, Moore, but smaller and more restricted, especially on the *hindwing*. *Cilia* on both sides on both wings white, marked with a black spot at the tip of each nervule; *tail* black with

a white tip. The male differs from the female only in having the apex of the forewing more produced.

Closely allied to *O. decidia*, Hewitson, and *O. hamatus*, Moore, but differing from Ceylon specimens of the latter in that the black markings on the upperside of both wings are far more restricted, and on the underside of the hindwing much smaller and partially separated into spots.

The specimen figured (a female) was taken at Khurda, Orissa, by Mr. W. C. Taylor; I have since received numerous males and females from Bholahât in the Malda District, Bengal, where they were taken by Mr. W. H. Irvine in the cold weather. There is also a single female specimen from Sikkim in Mr. Otto Möller's collection.

14. *CASTALIUS ANANDA*, n. sp. (Plate I, fig. 11, ♂ ; 11a, ♀.)

HAB. Sikkim; Kadur District, Mysore.

EXPANSE: ♂, .85 to 1.15; ♀, .85 to 1.05 inches.

DESCRIPTION. MALE. UPPERSIDE, *both wings* deep shining purple, the outer margins black; and with all the black markings of the underside showing through by transparency in some specimens. UNDERSIDE, *forewing* sullied white, with the following black markings:—a basal streak, a transverse streak from the middle of the costa to near the middle of the wing, almost joined to another wider streak placed within it from the subcostal to the submedian nervure; a very irregular discal series of four or five oblong spots, an even submarginal series of seven spots, and a similar but smaller series on the margin divided from the cilia by a very fine white line. *Hindwing* with numerous spots placed irregularly over the whole surface, and with the submarginal and marginal series as in the forewing; the spot, however, at the base of the tail, and the two confluent ones placed within it irrorated with metallic greenish scales. *Cilia* dusky throughout; *tail* long, black with a white tip.

I have only seen three specimens of this species, the male figured and another one much smaller I took in the valley of the Great Runjit, Sikkim, in October, 1882, the third was sent to the Museum by Mr. Kearney from the Kadur District, Mysore; the latter is much the largest specimen of the three, and has the apex of the forewing more produced. All three specimens differ slightly in the markings of the underside, but all undoubtedly belong to one sex of the same species.

Since the above was written I took a male and a female also in the Great Runjit valley in October, 1883, and have seen numerous specimens from Sikkim in Mr. Möller's collection, including two females, which latter differ from the male on the upperside in being pale dusky fuliginous, the markings of the underside showing through even more prominently than in the male, and the base of both wings thickly irrorated with metallic blue scales. Underside as in the male.



## 15. MILETUS HAMADA. (Plate I, fig. 16, ♂.)

*M. hamada*, Druce, Cist. Ent., vol. i, p. 361; id., Elwes, Proc. Zool. Soc. Lond., 1881, p. 882.

This pretty little species was recorded by Mr. Druce from Yokohama, Japan, and has not hitherto been figured. I took two specimens in the valley of the Great Runjit, Sikkim, in October, 1882, and Mr. Otto Möller has several specimens of both sexes also taken in Sikkim during the summer and autumn. The expanse of these specimens differs from .85 to .95 of an inch; Mr. Druce's specimens measured  $1\frac{1}{8}$  inches. There is a considerable general resemblance between the markings of the underside of this species and of *Castalius ananda*, but the latter is very different on the upperside, and is also furnished with a tail. The extent of the white discal patches on the upperside are very variable, in some specimens they are entirely wanting, but the markings of the underside are constant.

## 16. NIPHANDA? CYMBIA, n. sp. (Plate IX, figs. 8, ♂; 8a, ♀.)

HAB. Sikkim.

EXPANSE: ♂, 1.05 to 1.15; ♀, 1.15 to 1.4 inches.

DESCRIPTION: MALE. UPPERSIDE, *forewing* shining violet; the costa, outer margin, a disco-cellular streak and the veins black. *Hindwing* also violet, with the costal, outer and abdominal margins black, this black border ascending in two conical-shaped spots between the median nervules. UNDERSIDE sullied white, the markings fuliginous. *Forewing* with a basal streak, an increasing band from the subcostal nerve to the inner margin crossing the middle of the cell, an oval spot closing the cell, a discal series of six quadrate spots broken at the second median nervule, the two lower ones nearer the base of the wing, a patch beyond the four upper spots, wide on the costa, decreasing to the fourth spot, where it ends in a fine point, a submarginal irregular line and marginal spots, the two spots between the median nervules the largest and most prominent, a fine anteciliary black line. *Hindwing* with a spot at the base; three spots beyond, the one on the costa the largest and darkest; a double spot closing the cell, with two spots above it, the upper one very large oval and black; a very irregular discal series, marginal markings as on forewing. *Cilia* fuliginous on both sides of both wings, very long at anal angle of hindwing. *Antennæ* black, with the slender club tipped with white above, the shaft obscurely annulated with white below. *Body* black above, whitish below, the segments laterally marked with whitish. FEMALE. UPPERSIDE fuliginous grey, paler on the disc of both wings. *Forewing* with the disco-cellular and discal spots of the underside showing through. *Hindwing* with a submarginal series of pale spots, then a dark band, and finally a series of black roundish spots increas-

ing to the fourth which is the largest, the two anal ones small and linear, all outwardly defined with a fine gray line. **UNDERSIDE** with the ground-colour much paler than in the male, being almost white, all the markings larger and more prominent.

The markings of the female of this species are so like those of *Niphanda tessellata*, Moore (Proc. Zool. Soc. Lond., 1874, p. 572, pl. lxvi, fig. 6) from Penang, that in the Journ. A. S. B., vol. li, pt. ii, p. 61, (1882), I entered this species as occurring in Sikkim, with the remark:—"One female at about 1,500 feet elevation. It is rather smaller than the specimen described by Mr. Moore from Penang, and the upperside is entirely unglazed with blue," believing that the sex of the species described by Mr. Moore was male, my specimens being undoubtedly females. Having since obtained both sexes of my species I am able to describe it. It does not agree with Mr. Moore's generic diagnosis of *Niphanda*, as *N. ? cymbia* has only three median nervules to the forewing instead of four as stated by Mr. Moore, the subcostal nervules being probably meant for median; the first three subcostal nervules are all given off at regular intervals before the apex of the cell, the fourth subcostal branching from the third before its middle, and both reaching the costa before the apex of the wing.

It seems a fairly common species in the low valleys below Darjiling, the females largely predominating in numbers, however, over the males.

#### 17. *HYPOLYCENA NASAKA*. (Plate IX, fig. 2, ♀.)

*Thecla nasaka*, Horsfield, Cat. Lep. E. I. Co., p. 91, n. 23 (1829), male; *Deudorix nasaka*, Hewitson, Ill. Diurn. Lep., *Lycænide*, p. 24, n. 21, pl. v, figs. 45, 46 (1863), male; *Hypolycaena nasaka*, Moore, Proc. Zool. Soc., Lond., 1882, p. 249.

**HAB.** Java; Sikkim; Kangra District, N.-W. Himalayas.

**EXPANSE:** ♂, 1.0 to 1.15; ♀, 1.25 inches.

**DESCRIPTION: MALE.** Differs from Horsfield's description on the **UPPERSIDE** of the *hindwing* in that the cyaneous colour is placed broadly on the outer margin, extending upwards towards the middle of the wing between the third median nervule and subcostal nervure, not as stated by Horsfield covering the hindwing "excepting the exterior and interior borders." Hewitson's figure shows the hindwing entirely covered with the blue colour. The *forewing* is furnished on the underside with a bunch of long black hairs attached to the inner margin near the base and folded beneath. There is a corresponding cup-like depression on the underside of the hindwing, which is marked on the upperside by a shining bare round patch near the costal base of the wing and covered by the forewing. There are fourteen male specimens in the Indian Museum, Calcutta, all taken by Mr. A. Graham Young in the Kulu valley, and a single male from Sikkim,

which differs from the other specimens in the ground-colour of the underside being much darker and of a cupreous purple shade. **FEMALE.** **UPPERSIDE** glossy fuliginous, paler on the disc of the *forewing*. *Hindwing* with a conspicuous black spot on the margin between the first and second median nervules, marked anteriorly with scattered white scales, which also appear decreasingly in the two next interspaces beyond and in the one before, that containing the black spot, a fine marginal white line not reaching the outer angle, then a black line, the *cilia* white between the tail and the discoidal nervule, the anal lobe with an ochreous and metallic green spot, tail black with a white tip. **UNDERSIDE** agreeing in the ground-colour with the N.-W. Himalayan specimens.

The single female specimen described is in Mr. Otto Möller's collection, and was taken at a low elevation in Sikkim in October.

18. *HYPOLYCÆNA CHANDRANA.* (Plate IX, fig. 1, ♀.)

*H. chandrana*, Moore, Proc. Zool. Soc. Lond., 1882, p. 249, pl. xi, figs. 2, 2a, male.

**HAB.** Lahul; Kulu Valley.

**EXPANSE:** ♀, 1·15 inches.

**DESCRIPTION:** **FEMALE.** **UPPERSIDE** dull uniform fuliginous, the anal lobe (as in the male) black with an ochreous and metallic green spot. **UNDERSIDE** paler than in the male, being almost pure white, the markings similar but also paler and more diffused.

This species (of which there are two males and one female in the Indian Museum, Calcutta, all collected by Mr. A. Graham Young in the Kulu valley) is very near to the Javan *Thecla malika*, Horsfield (Cat. Lep. E. I. Co., p. 90, no. 22, 1829), and the male has similar secondary sexual characters as *H. nasaka*.

19. *NILASERA?* *ASOKA*, n. sp. (Plate IX, fig. 6, ♂; 6a, ♀.)

**EXPANSE:** ♂, 1·75; ♀, 1·8 inches.

**HAB.** Sikkim.

**DESCRIPTION.** **UPPERSIDE** dark glossy purple, the costa and outer margin of the *forewing* narrowly black, the inner and outer margins of the *hindwing* more widely black; *tail* long, narrow, black with a white tip. **UNDERSIDE,** *forewing* with a pale line across the middle of the cell (sometimes absent), a spot near the end of the cell variable in size and shape, a quadrate spot from one-fifth of the first median nervule to the inner margin, a chain of square spots divided only by the nervules beyond the cell from the costa to the first median nervule, the third lower spot being posteriorly lengthened towards the outer margin, the two following it rectangular, thus giving the chain a broken appearance at the third median

nervule—all these markings placed on a rich dark brown ground; the apex and decreasingly to the first median nervule paler and glossed with violet, inwardly sharply defined, the outer margin dark brown at the apex paler towards the inner angle. *Hindwing* with the base of the wing rich dark brown, with a pale violet even streak from the costa to the base above the cell; a discal irregular dark brown band placed on a pale violet ground, and other paler irregular markings beyond; a submarginal lunulated line, and three black spots beyond it at the anal angle almost covered with brilliant green iridescent scales. FEMALE. UPPERSIDE, *forewing* black; with the cell (all except its extreme end), the basal half of the lower discoidal, median, submedian and internal interspaces iridescent light ultramarine blue. *Hindwing* with the middle and base of the wing blue as in the forewing. UNDERSIDE with the markings as in the male.

The markings of the underside of the forewing of this species are nearest to the *Amblypodia diardi* of Hewitson (Cat. *Lycanida* B. M., 1862, p. 9, pl. v, figs. 41, 42 ♂); they differ largely, however, in the hindwing.

There are numerous examples of both sexes of this species in Mr. Otto Möller's collection, three males and a female in Colonel Lang's collection, and several specimens of both sexes in the Indian Museum, Calcutta, all from Sikkim.

20. NILASERA? ADRIANA, n. sp. (Plate IX, figs. 5, ♂; 5a, ♀.)

HAB. Sikkim.

EXPANSE: ♂, 1.6 to 1.9; ♀, 1.65 to 1.8 inches.

DESCRIPTION: MALE. UPPERSIDE as in *N. asoka*, but the black bordering at least twice as wide. UNDERSIDE, *forewing* marked as in *N. asoka*. *Hindwing* dark brown glossed almost throughout with pale violet grey but exceedingly variable, in some specimens the ground-colour is very pale, the markings therefore being very prominent, in others so dark that they are hardly traceable; the male specimen figured is about midway between these two extremes. Three subbasal small round spots, a chain of spots from the costa to the middle of the cell, another chain also from the costa crossing the cell at its end, a third chain from the subcostal nervure to the abdominal margin, a submarginal lunulated line, but no black, green-irrorated, anal spots, which at once distinguishes this species from *N. asoka*. FEMALE. UPPERSIDE as in *N. asoka*, but the blue colour more of a purple shade. UNDERSIDE as in its male.

This is apparently one of the commonest "hairstreaks" in Sikkim, Mr. Otto Möller obtaining very numerous specimens of both sexes throughout the warm weather. There are specimens of both sexes in Colonel Lang's collection.

21. NILASERA? FULGIDA. (Plate IX, figs. 3, ♂; 3a, ♀.)

*Amblypodia fulgida*, Hewitson, Ill. Diurn. Lep., *Lycanida*, p. 11, pl. v, fig. 31 (1863), female.

HAB. Sikkim; Dafia Hills; Philippines.

EXPANSE: ♂, 1.6 to 1.9; ♀, 1.6 to 1.7 inches.

DESCRIPTION: MALE. UPPERSIDE rich dark purple, the outer margin of both wings very narrowly black, *tail* black, short, tipped with white. UNDERSIDE, *forewing* with the basal area dark rich brown; a pale quadrate spot near the end of the cell, then a broad dark brown band from the costa to the first median nervule, then a narrower pale band, and lastly an even dark band also from the costa to the first median nervule; an apical decreasing violet patch, the outer margin dark brown. *Hindwing* with a narrow dark brown streak from the costa, then a broader pale violet streak, then a still broader dark brown streak; a dark brown streak from the costa to the first median nervule closing the cell, with a spot beyond, another streak beyond much diffused anteriorly, a black spot crowned with golden yellow scales on the margin in the first median interspace, and a similar larger one at the anal angle, with a smaller one attached to it outwardly. FEMALE with the middle only of both wings purple of a brighter and lighter shade than in the male. UNDERSIDE as in the male.

As Hewitson's figure of the underside of a female of this species from the Philippines is not very clear, I have figured both sides of both sexes of Sikkim specimens. There are several examples of both sexes from Sikkim in Mr. Otto Möller's collection, and I took two females on two different years at the same place below Darjiling at about 3,500 feet elevation in October. There is also a male taken by the Dafia Expedition in the Dafia Hills in the Indian Museum, Calcutta.

22. NILASERA? MOELLERI, n. sp. (Plate IX, figs. 4, ♂; 4a, ♀.)

HAB. Sikkim; Sibsagar, Upper Assam.

EXPANSE: ♂, 1.75 to 1.80; ♀, 1.8 inches.

DESCRIPTION: MALE. UPPERSIDE magnificent shining ultramarine blue, the costa and outer margin of the *forewing* and outer margin of the *hindwing* narrowly black, the costa of the latter wing more widely black: three short black tails, the middle one in continuation of the first median nervule rather longer than the other two, and tipped with white. UNDERSIDE dark rich brown. *Forewing* marked exactly as in *N. ? ariadna*, except that the discal chain of spots is less broken in the middle. *Hindwing* with a narrow pale purple streak at the base, then a broad dark brown































































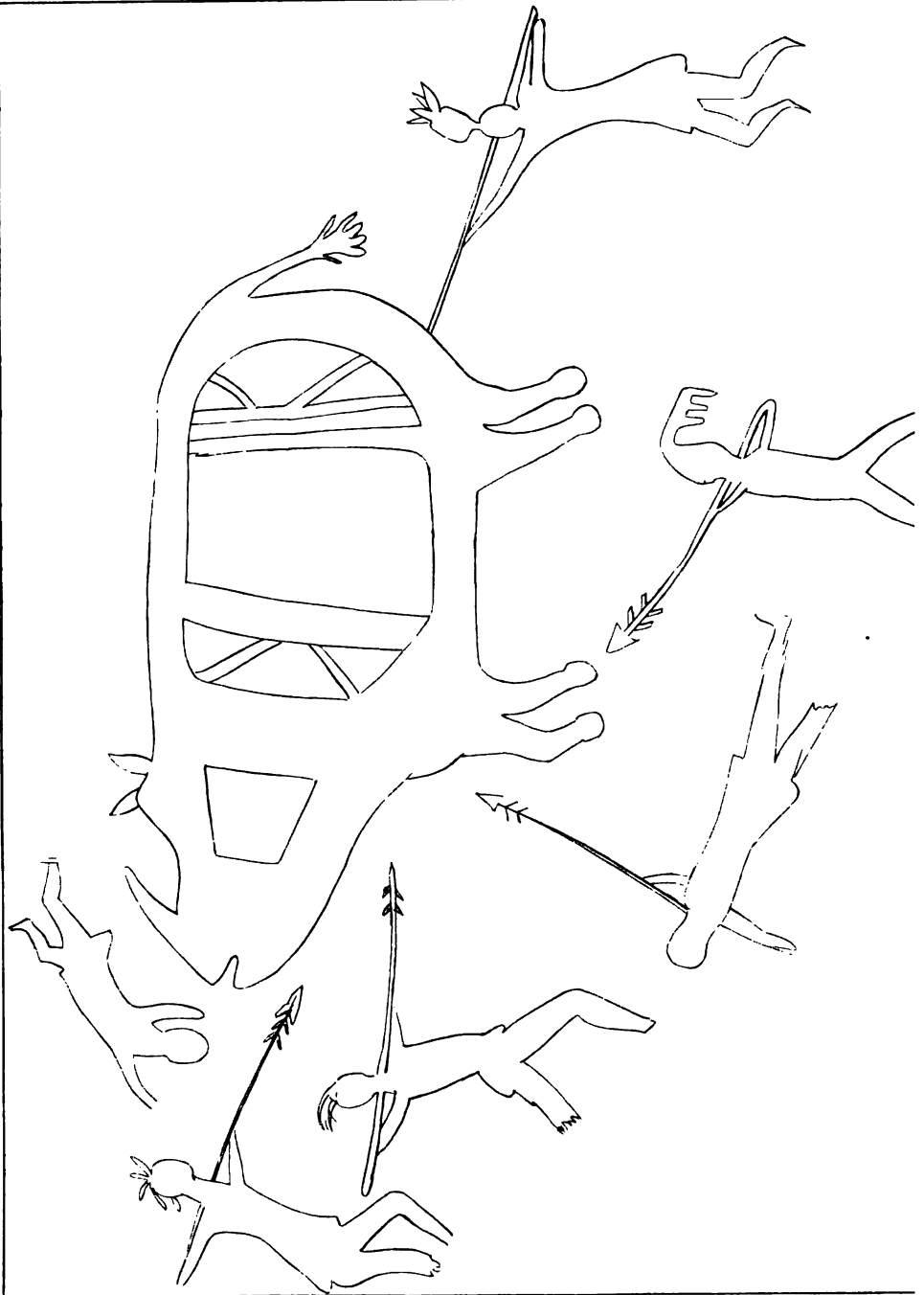












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