500. ? A small, but very ornamental shrub, with red and white flowers; every part covered with soft, hairy tomenta. Leaves opposite petioled, lanceolate, serrate, white, with down underneath. Flowers in crowded terminal racemes, or rather spikes, for the pedicles are scarcely perceptible. Bractes scattered, coriaceous, about 3-flowered, calyx tubular, 5-toothed, densely clothed with soft white down, corolla 5-partite longer than the calyx. Stamens 4-didynamous, exserted, 4 times as long as the calyx, Pestil bifid as long as the stamens, germ 4-lobed, ripe seed not seen. Clerodendron species? Mohom.

In conclusion, I have to observe, that I have generally preferred giving Roxburgh's names, although I am aware that many of them have been changed since his time. All the native names given in italics are Assamese.

(Signed) J. W. Masters.

Sibsagore, 29th March, 1844.

Journal of Captain Herbert's Tour from Almorah in a N. W., W., and S. W. direction, through parts of the Province of Kemaon and British Gurhwal, chiefly in the centre of the Hills, vide No. 66, Indian Atlas. (Edited by J. H. Batten, Esq., C. S.)

11th November, 1827.—Marched in the evening to Hawulbagh.

12th Nov.—Halted for Captain Manson to join.

13th Nov.—Halted for coolies, thinking these would prove a difficulty, deemed it advisable to detach him.

14th Nov.—Marched to Dharim Khola about six miles. Road good, almost level, mica slate the whole way, no good examples of strata. Temperature of the river 58, air 68, mean thermometer 48; in the evening making arrangements for the coolies. Dharim Kholaghur is small but rather picturesque, with a pretty good share of level ground; it contains one other village.*

* The line of march from Hauwulbugh was up the Kosilla river. Dharim Khola is a glen, which joins that of the Kosilla from the West.—J. H. B.

15th Nov.—Marched to Kotlee three hours, road distance about 8 miles. On ascending from Dharim Khola, granite of the crumbly type passing into gneiss. Road ascends to corner about 400 or 500 feet; descends to Bumunee-God under Majhera. Gneiss inclining to granite the whole way. No fixing the strata. Road up Bumunee-God to Kehera-ka-rao. The gneiss to Kotlee. Road level almost, and country beautiful; a valley falls in from the right, East*.

16th Nov.—Muhurgaon; the distance was shorter to-day owing to the sepoy's mistake, about two hours, five or six miles. The road leads up the Cosillah at first along the side of the hill, then descending to cross the river continues along a fine level piece† of some miles in extent, and half a mile wide, the whole of it apparently carefully cultivated. Ground preparing, for wheat has been sown in the cold places. Three villages on a steep to right: Neera, Lowrap and Soomket, three miles from camp. Tauna Suzowlee to left on the rise of the hill, four miles from camp. Opposite Phuleea, a Joodish village; about four and half miles, a valley falls in from right. Turn up and encamp at Muhurgaon. Scenery picturesque; road generally level.

The rock at starting was gneiss, of an anomalous character, having apparently taken in clay slate as one of the ingredients. This rock then extends from Dharim Khola, to the east and west; I suspect it has considerable development, and will open out a new feature of enquiry when properly pursued. Nos. 5 and 6, gneiss. No. 7, a cherty rock, a sub-granular quartz rock. It succeeds the gneiss. It is very abundant in this quarter, and forms imbedded nodules in the gneiss. It is the rock at Mala, occurring there intermixed with clay slate.

4h. 30m. 25.446; 66, 64, 65,70.33.

17th Nov.—Register thermometer at 33 (sp.) 34 (mercury) covered with dew. Hoar frost in all the hollows; road easy of ascent at first along

* This comes down from the Gunnanath ridge which divides the Kosilla, from the Suttralee valley and the Chana Biloree valley on the Bagesur road. At Gunnanath, Hustee Dull, the Goorkha chief, fell in battle with the English troops, 1815.—J. H. B.

† This is the Somesur valley on the Kosilla. There is a beautiful grove of deodar pines in the middle of the valley, shading a pretty temple. The villages in this vicinity are very fine, with some large white houses scattered here and there, nearly all belonging to families of Joshee Brahmins, the dominant tribe in Kumaon.

side of hill, latterly more steep to Geera Cheena. Bar. at 10h. 24.48, Th. 60.54. Then a steep and bad descent to camp. Splendid view of peaks (snowy) from Pass. The following villages: Dhoom right bank; Bhurur ditto; Chour left; Nakot right; Ujhura, Buseráree, Noukoora, all together right bank. The valley begins to narrow here, and there are no villages beyond. Our tent occupies the site of an *augur*, or village of iron-founders, which was formerly nearly at the head of the valley, and received its ores from a mine above the Khuree* copper ore. At starting, No. 8, a reddish quartzose slate verging on clay slate; No. 9, true clay slate, a thin layer; No. 10, the quartz rock under; No. 11 limestone at Nakote, silicious, I believe. These are the same rocks precisely as are found on the Suttralee road to Bageswur, and there also they succeed gneiss, which is found extending nearly from Jâk Bhetoolee to Thakoolee; also at Ramesur, on the Surjoo, the same succession occurs, and in the Ramgunga. No good indications of strata; the covering of debris is thick on these hills, which are of the rounded form; even the outline fails to detect the dip. The scenery was picturesque—4 P. M. 25.148, 61.5, 56, 48.5; 64 max., 41 min.; sunset at a quarter to 3.†

18*th Nov.*—No. 1, 1753; No. 2, 1754; No. 3, 1755; No. 4?

16*th Nov.*—No. 5, straight laminar gneiss containing something between talc and mica, might be called argillaceous gneiss perhaps, as the mica is like clay slate. No. 6, a better defined gneiss than the preceding, straight slaty, contains more felspar and perhaps chlorite. No. 7, very fine granular brownish quartz rock, Muhurgaon.

17*th Nov.*—No. 8, quartz rock passing into clay slate, red slaty, composition granular. Beyond Muhurgaon No. 9 olive-colored fine earthy clay slate, sub-schistose, Bhynsur. No. 10 quartz rock, reddish olive, a layer or veins in preceding ditto. No. 11, blue limestone with white veins, Nakote. No. 12, white compact dolomite? or silicious limestone, Nakote.

18*th Nov.*—No. 13, 1765, large crystalline granular dolomite, Doba.

* The Khuree copper mine to East of Capt. Herbert's route is passed on the road from Almora to Bagesur.—The ores are very good, but the mine is not productive, owing to the difficulty of working the soapstone rock, which is always falling in. —J. H. B.

† No miracle, but owing to the Western hills.—J. H. B.

No. 14, black talc slate. No. 15, 1767, granitic talcose quartz rock above confluence with Gaomuttee river.*

Marched to Dangun, village on confluence of a stream with Gaomuttee river; rocks very little visible, at first small patches of dolomite crystalline granular, intermixed with black potstone and black potstone slate. Then a large tract of compact quartz rock, and latterly of granitic structure, similar to what I have obtained in the Ramgunga and at Punnae.† This is a curious rock, and well deserves a name.

The road was an easy descent the whole way. Very little cultivation, except at Doba and about half way below Jowkande. Here there is a fine wide valley well cultivated. The Gaomuttee is a large stream, even in this month it is about breast deep. We crossed it by a *sunga*. Umsaree Kot-ka Gudhera is the name of the glen we came down from Doba. The village is below Jowkande. Sunset at 4 P.M. Ther. 73, min. 57. Dry 9 cylind. 13. wet 27, 4 P. M. 26.878, 77.5, 72.5, 58.76, max. 34 dew.

19th Nov.—Umtola and Kholee, two pretty white villages on opposite sides of a glen that comes down parellel to that of Doba. Mohot 1½ hour on left bank, fine deep place in the river like a small lake, about 2 or 300 yards long. Rock, which has been something of a gneiss, changes here to a hornblende or chlorite schist, a compound rock. Path generally good, with easy ascent along left bank. The rock is distinctly stratified in many places, generally the strata are vertical. Here the dip to North at an angle of 56°. The rock changes to the type No. 15, and continues all the way distinctly stratified, dipping near 20° N. W., with a high angle (50°). Road passes into a feeder of the Gaomuttee, and then back again over the side range without ascent to the parent valley. A Jood village on right bank. Encamp in bed of river about 3½ miles beyond. Time 3 hours = 9 miles. One or two difficult rocky places.

The valley is as yet narrow, except here and there for about ½ a mile or so, and then even of no great width. In some places the

* Great care should be taken in the Museum to compare Capt. Herbert's descriptions with his specimens. The mineral characteristics will at once shew to what series his numbers on the specimens refer. No. 11 is also 1763, and "Blue limestone with white veins" will at once shew its difference from any other. No. 11 is another series.—J. H. B.

† The fine valley of Punnae, on the Aluknunda between the Dhunpoor and the Pokree copper mine mountains.—J. H. B.

rocky banks almost meet. Features of this kind inevitably excite the idea of the gradual development of a river's course, and the previous formation of many lakes. 4 P. M. Bar. 26.476, 61; 59; 51,5, max. 72. River 56.3. Tent 61.54. Outside 59. 51,5.

20th Nov.—Marched to Poorena, about 6 miles. At 35m. Kunsaree, a deep pool in the river bed. Rock dipping S. E. A little further, valley opens and presents a fine sloping surface of some extent. The whole covered with jungle grass, with the exception of a few fields here and there; few villages visible. Cross a small stream near camp; gneiss dipping to N. direction, N. 80 E. 4 P. M. Bar. 26.286, 72, 67.5, 54. Byznath about 1¼ mile on the Gaomuttee. The confluence of the Guroor close to this.

21st Nov.—Nowgaon. Road not so good to-day; to Nowgaon about 6 or 7 miles. First part level, leaving Goamuttee valley and following that of the Guroor, picturesque valley, the former looking towards Runchoola; strange that such a fine valley should be so ill cultivated, or rather uncultivated. Here and there a field in the middle of the jungle grass, indicates perhaps the commencement of a different state of things.*

Gurser Lillu, 2 villages. Puchunna to right 50 miles. Geonaee to left 90. Babburtola right a little back. Rock a chloritic schist, dips N. E. 20°.

Ghersun-ka-khola, Kot-tulwaree. .. 100 min" to right.

4 P. M. Bar. 25.686, 66, 59, 50.

No. 16, 1768, a schist of an anomalous character, perhaps a gneiss. Yellowish grey. Close to camp being like the rock near Ramgurh.†

No. 17. Talcose gneiss? the Punnae and Ramgunga rock.

No. 18. Chlorite or hornblende schist.

No. 19. Talcose schist. No. 17, but with straight laminar structure.

20th Nov.—No. 20. Gneiss bluish-grey, approaching to mica slate.

* This valley, now called the Bijnath valley, is the largest in Kumaon, and although 3,500 feet above the sea, no cultivators can remain in it on account of its insalubrious climate. It was once thickly peopled, and at *Kuthoor* and on the Runchoola ridge which stretches into the valley, was the seat of the ancient hill dynasty, called the *Kuthoor Rajahs*, now quite extinct. Ruins of temples, cutcherries, chaboutras, &c. some of them beautifully carved, abound hereabouts.—J. H. B.

† Ramgurh, between Almora and Bhamouree.

21*st Nov.*—No. 21. Olive green chlorite schist.

No. 22. Dark green ditto.

No. 23.* A vein of gneiss in preceding, a beautiful rock.

22*d Nov.*—To camp in jungle, owing to the stupidity of the sepoy who went on. We had a hard day's work of it, the ascent to the Pass† occupying 5 hours, the first few miles were easy with good road, but the latter was for the rest of the way very bad, chiefly in the bed of a torrent, Guroor-Gunga, which we crossed and recrossed about one dozen times. Latterly, leaving its bed, the road ascends one of the spurs thrown out by the high ridge, when it improves a little. There is, or was, a pool on the top of the ridge where we expected to find the camp, but had to descend about a mile on the western side, where I found breakfast prepared, but no ground or place fit for a tent. After breakfast, went on 2 hours farther, the descent most steep, and in many places even dangerous. At last, we came to a tolerably level spot where was water, and where I pitched for the night. An extraordinary feature in this descent was the deficiency of water even where the ground was a little level. Barometer on the Pass, 22.82; 54, 49, 40, at 11 A. M.

The rocks, as the preceding days, anomalous, sometimes verging on gneiss, sometimes on chlorite slate, but most generally quartz rocks, all the fragments too, of which there are an immense number, both on the ascent and descent, belong to the last named species. Very few examples of strata, or indeed of the rock in situ at all. One on the ascent was observed N. 60 E., (direction N. 30 W.), angle of inclination 75. A wild bee's nest was observed, which had been robbed by a bear or other wild animal. The bee is of a different species from the cultivated, much smaller, and marked with yellow rings. It is said to be much more vicious; the domestic bee seldom or ever stinging, the other severely. The cells of the honeycomb were hexangular. This is the third species of bee I have observed in these hills.‡

* This should be 1775.

† This Pass is over the Bhutkot and Pinnath range of mountains, visible N. W. from Almora, very high, from 9,800 feet to 7,500 feet above the sea.—J. H. B.

‡ It is somewhat strange that Dr. McClelland in his "Enquiries into the Geology of Kumaon," blames the people for using only wild honey instead of domesticating the bee. Nearly every house in the province has *bee-hives*, and the honey is excellent in some places, and a profitable article of trade.—J. H. B.

23rd Nov.—To Turrag-ka-tal. Our yesterday's march having kept the people on their legs all day, and allowed but little time for their meals; made a short one to-day to Turag-ka-tal, an open spot in the bed of the feeder of the Ramgunga, which though now dry, they say, in the rains becomes a lake. Distance about 5 miles, road at first more steep, afterwards less so; a descent the whole way, and mostly good, very little rock, the fragments always the talcose granular quartz rock. Found the Englefield barometer out of order to-day, and obliged to open the cistern. A large bubble of air had got $\frac{2}{3}$ up the tube, readjusted, but without boiling. It is evident that the Englefield barometer unless checked by another, is of no use.

3-45, P. M., 26.100; 64, 61, 49-5 sunset. Set watch at 12 by Theodolite.

22nd Nov.—No. 24. A thin slaty gneiss, bluish grey, dirty.

No. 25. An almost compact fine grained quartz rock, contains most probably felspar. This is the rock of which the dip was observed.

No. 26. Large grained talcose quartz rock, with very little appearance of stratification. The Ramgunga and Punnaë rock.

These specimens anticipate the Journal by four days.—J. H. B.

23d Nov.	No. 27. A green (chloritic) gneiss, sublaminar.
24th ,,	,, 28. Limestone, Turag-ka-tal.
25th ,,	,, 29. Gneiss, straight laminar.
	,, 30. Quartz rock.
26th ,,	,, 31. A tender mica slate passing into gneiss. It certainly contains felspar, ascent from Sohngaon.
	,, 32. A true gneiss, silvery mica, top of ridge.
	,, 33. Ditto.
27th ,,	,, 34. A mica slate or gneiss, brown. Bed of Benee Gunga, or Bino below Ooperara.

24th Nov.—To Bural near Doluree, along the level plain, which in the rains becomes a lake, and therefore called Turag-ka-tal. It is almost shut in to the West, which is the direction of the glen, by a low ridge of limestone which runs across the valley, leaving but a narrow opening for the discharge of several streams, which even at this season take their rise here. This ground though remarkably even, is not I think quite level, having a fall to West, as proved by the streams which have a considerable current. The whole length is between two and three miles, and the breadth at the widest about a $\frac{1}{4}$

to ½. The soil appears excellent, and is partially brought into cultivation. In the rainy season the depth is said to be such, that some tall trees, which are situate about the middle, are completely submerged. The extreme steepness of the mountains which surround it, must carry down their supplies quicker than they can run off; and in this way has a deep and rugged glen been filled up with silt and detritus, and converted into a fine level piece of ground; doubtless the surface will continue to rise till the waters find a wider outlet over the top of the limestone ridge already noticed, which is not many feet above the present surface.

The descent from this ridge is considerable, the difference of level between its top and the bottom of the glen being four or five times what it is on the side of the lake, a proof that the latter has been raised considerably. After descending, there is a good deal of level ground, and the path is pretty good, with the exception of occasional boggy places which are troublesome. The road after leading down the glen, enters the bed of the Ramgunga* with such a straight continuity of direction, that though I was on the look-out for the meeting of the two vallies, I did not observe it, and was surprised to find myself encamped on the bank of the latter river. A very extensive piece of level ground occurs here, and it is well cultivated; a fine valley appears E. or S. E., very wide and very level, no rocks were visible, but limestone more or less pure. A good deal of it was seen in the bounding ridges to right, as indicated by the black and yellow precipices.

25*th Nov.*—Sohngaon; road excellent to-day, level the whole way, the march a short one, being Sunday, about 5 miles. Down the Ramgunga, the bed of which is here a noble plain of many miles in length, and upwards of ½ a mile in breadth in some places. Left the village of Nâgadh to right in a little glen of 1 or 2 miles. Crossed the river and ascended a larger glen, which though of some extent, is said to lead back upon the Ramgunga, or rather upon the

* Care should be taken not to confound this Ramgunga which, *rising in the central hills*, flows to Moradabad and Bareilly, with the Ramgunga *which rises in the snowy range* and joins the Surjoo river at Ramesur, a few miles from the junction of the latter with the Kalee river.—J. H. B.

Kutsaree* stream. No rock visible, but one which seems to be a gneiss of very flat laminar structure. In this glen appear some strata dipping to W. N. W. at a low angle (30°) quartz rock. We have in this valley a fine section of the bank, exhibiting distinctly the manner in which these level pieces are formed. Three strata appear distinctly marked, perfectly parallel to the present surface. The lowest consists chiefly of very coarse gravel. The second is a fine silt or mud, with scarcely any gravel. The third, or uppermost, is like the first, but the gravel rather smaller, and more earthy towards the top. These three divisions are most distinctly marked.

26th Nov.—Camp above Jynta, ascent to lateral ridge, path good and easy. Then along face of ridge with a view of the Ramgunga, and that most beautiful flat in its bed nearly 10 miles† in length, cultivated every inch of it. Opposite appears Nythana fort, it bore 5° S. E. from the top of the ridge. Mica slate is the rock all the way to the top of the ridge. A patch of the gneiss found near Almora, and on the road from Dooâra Hâth to Palee then occurs. Day cloudy. 4 P. M. 24.835, 65.5, 58, 50.

27th Nov.—To Goorja Chowra below Ooperara 3½ hours, about 10 miles. On starting, accompanied by gneiss. Path good, oblique, ascent along gentle slopes thinly covered with Cheer pines. Summit of the ridge,‡ a fine level piece, picturesque spot for a house, water close, with plenty of fine timber. Descend obliquely along smooth grassy hills, excellent road winding round a glen. Pass a village just established (last rains,) cross over a low ridge, and come down upon Ooperara. This part not so picturesque, or path so good. Every where gneiss. Descend from Ooperara to the Bino path better gneiss, but of a different type, small grained, grey and approaching to mica slate. Encamp on bank of river, which here re-

* The Kutsaree valley, six miles long, and from half a mile to nearly a mile in breadth, joins the Ramgunga from the north at Gunnai. It is beautifully cultivated, and the surrounding mountains yield the best iron ore (chiefly red hæmatite,) in the province, and here are the most extensive iron mines.—J. H. B

† This part of the Ramgunga valley is the richest portion of Kumaon, and forms with other fertile tracts, the pergunnah of Palee.—J. H. B.

‡ This ridge is called Jowrasee and Doorga Dhee, and would be the finest position for a large town in the whole hills.—J. H. B.

ceives another stream from East. *Dheeghat** is below, about two or three miles. Encamped there in my Sorenugur journey. This was one of the most pleasant marches we have yet had. Cloudy all day, and now I think threatening rain. 5 P. M. Bar. 26.595, 64.

28th Nov.†—To Paton, steep ascent of an hour and a quarter, two patches of gneiss run down the hill, as indicated by huge blocks scattered over the surface. Pass through Bhumoree. Khyldora nearly opposite camp and a little above. The following is a sketch of this river valley. (*See plate No.* I.)

After ascending to separating ridge between Beonee and Bino rivers, the path leads along the summit nearly level. The whole of this ridge, at the summit at least, is gneiss, occasionally passing into granite. Many of those huge blocks curiously supported are observed, similar to those at *Dhee.*‡ This is an appearance I believe characteristic of granite. Day excessively cloudy, and threatening. The sun has not now been visible these three days; huge banks of clouds are collecting towards the plains. It appeared to be snowing on the Jowahir peaks, of which we had a glimpse this morning. 4½ P. M. Bar. 24.512, 57.49, 40.5.

29th Nov.—Rained all day, a most miserable day.

30th Nov.—A good deal of rain on the night of the 29th.

1st Dec.—To Dyra, morning truly dismal. Towards 10 o'clock a few gleams of sunshine, which tempted me to move for Dyra. The road was tolerably good, being an easy and uniform ascent, the time was four hours, about nine or ten miles. The rocks I think gneiss; the specimens 1 and 2 are hardly doubtful. They are small grained, grey structure, sub-schistose. No. 3 is a kind of granite containing schorl. No. 4 a semi-transparent quartz rock. In a small patch of mica slate, remarkably tender, containing veins of quartz; the latter though possessing all the aspect of the hardest specimens, yet broke between the fingers.

* Dhee Ghat, a fine valley below the junction of the Bino and Beonee rivers, tributaries to the Ramgunga.—J. H. B.

† Captain Herbert here enters British Gurhwal, and leaves Kumaon Proper.—J. H. B.

‡ Dhee-Dhoom, a remarkable spot between Almora and Lohooghat.—J. H. B.

This village is small, rice is not grown, the elevation being too great. Wheat* sown in October and cut in May. At Paton rice is grown. At Almora they sow wheat latter end of November. Half way it began to hail and rain, and continued to the village nearly. Encamped on a delightful grassy and level spot above the village; very cold.

2*d Dec.*—Last night to my astonishment heard the Almora gun, distance is upwards of 40 miles. I had doubts on the subject till this morning at day-break, when I heard it again.

Lovely morning, not a cloud visible. Hoar frost on the ground, and tent all stiff with it. Temperature at 8 A. M. 41.5 moist, 35.5 glass in shade 35. Bar. at 10½ A. M. 23.005; 55, 44.5, 37.4 moist; in tent 53.47.

At 12 started for Marora. Steep ascent at first, with snow, to good sized temple—Binsur. No account when built, a figure of the bull in front, and iron bells hung about his neck as offerings; trees Deodar, all male that I saw, and kursoo oaks; rocks, gneiss the whole ridge from temple level; after two hours descent begins. Here observed barometer, 2 P. M. 22.13, 54, 41.5, 37. Much snow, and descent very bad; two hours of it to stream with an intermediate small ascent. At stream fine Rons trees or Roons, also Neegalas;† hemp‡ sown here, and on the ascent to Dyra, which requires apparently a cold climate, was now cut. From river easier descent, wheat fields two inches above ground. Cross Sanee, a little below the confluence of the stream followed on two planks, goodish stream; road up its bed to Sarkot. (High Pass higher than that crossed, by name Doodoo-ke-jolee. (B.) Sarkot a large village with 60 houses.) Small ascent to Murora, village of 50 houses. Many sheep and goats—former little fellows black, with short tails and curly horns; unwilling to sell; hemp soaking; arrived at 5 much fatigued, five hours on road. Gneiss the whole way, in some places so soft and earthy, as to be like the brown tender mica slate of Almora; here

* In all elevated places wheat is sown very early, in order that the young plant may be strong before the frost and snow begin. In one day's march, young green wheat and rice can be often seen.—J. H. B.

† Ningalas, Hill bamboo, only found on high mountains.—J. H. B.

‡ Great quantities of fine hemp are grown in Gurhwal by the lower caste of Khussias. The Kumaonees have a prejudice against growing it.—J. H. B.

huge blocks of a hard and porphyritic type, like what I observed on the road to Mason. 11h. 40m. A. M. Barometer 24.070, 61.55, 45.5.

3d Dec.—Halted.

Specimens.

28th Nov.—No. 35, 1787, gneiss well defined, summit of ridge dividing Bino from Beonee.

1st Dec.—No. 36, 1788, a brownish grey gneiss of a fine grain, passing into quartz rock.

No. 37, 1789, ditto less like quartz rock, more like mica slate.

No. 38, 1790, an amorphous granite gneiss, containing schorl disseminated light buff.

No. 39, 1791, pure haloidal (milk) quartz.

2d Dec.—No. 40, 1792, reddish-brown gneiss, summit of ridge.

4th Dec.—Murora to Bugwaree 3 hours; 5 P. M. barometer 24.422, 62, 54, 44. High peak bears 93 N. E., road very bad to-day at starting, and for some miles leading up and down through and over huge block of gneiss, scattered about in every possible variety of confusion.

At two hours descent to bed of stream here called Seons* as well as Sanee, receives the Nana-gad from the west. Brasee village left bank, Goree right bank, then gradual ascent to Bhugwaree. Encamp south of it about half or three-quarters of a mile.

Cloudy again; gneiss the whole way, but very seldom visible in situ, never in strata. Huge scattered blocks, sometimes tender like mica slate.

5th Dec.—Bhugwaree to Gunguon three hours or more. The road to-day was a general descent, but very uneven, continual ups and downs. We have come down, however, about 1000 feet altogether.

At ½ an hour ran 58 S. E. At 1¾ Kunyoor. At 2. Descent to bed of Seons or Sanee, rather of its feeder, just above confluence. A very

* Sanee river rises at Doodoo-ke-tolea mountains, and after receiving the Chippala from Chippulgat, joins the Ganges under the name of Nyar river, 30 miles above Hurdwar.—J. H. B.

pretty spot. The whole descent from Kunyoor* was pretty. The path then ascends again and continues alongside of mountain, then descends to cross the river knee-deep, and again crosses close to camp, which is on a fine grassy level with the river close by our door. Splendid pools for bathing, six to eight feet deep, and 40 or 50 feet long. The tributary stream is that crossed in the Sreenuggur trip on the march from Kunyoor.

Rocks to-day at starting, gneiss, more or less well defined. At Kunyoor perfect, with much granite, also probably veins. The latter contains schorl; much of the granite was so soft, that it might be dug with a spade. On descending from Kunyoor, the mica slate with garnets were found near Aeön, which is also on the border of a gneiss district. Latterly approach towards chloritic and argillacious schist; no good examples of strata any where, as usual the more perfect gneiss district covered with huge blocks so characteristic of this rock. A cloudy day.

5 P. M. Bar. 25. 315, 62, 52, 48.

6th Dec.—Halted, strong hoar frost during the night. Ghursaree, Punna, Kolinda Godee-gad and Babta.

7th Dec.—Hoar frost from Bindhelee to Jawaee, 3¼ hours, road very uneven and baddish, ascend to ridge and descend to Ghursaree 1 hour, Punna, opposite high, ascend to Kolinda 1h. 45m. and to ridge 2 hours, wind and descend to Godee-gad, join Seons 2¼ hours. In river bed to village, latterly small ascent.

The rocks to-day schists and quartz rock, being the same series, and accordingly every variety of compound between their extremes is found. The schist is sometimes inclining to chlorite schist, sometimes to argillaceous, but I think always inclining to the character of magnesian, indicating the presence of talc rather than mica as the schistose constituent. Near the village, a nucleus of greenstone desquamating in crusts, just like the granite at Dhee in the neighbourhood of the amorphous mass strata of the same rock, with more or less contamination of quartz. The views suggested by these facts, full of interest, require development.

* Kunyoor is three quarters of the way from Almora to Sreenuggur, and was once a Thanna and Tuseeldaree. The Senior Assistant Commissioner in Gurhwal has a bungalow here, and the roads in its neighbourhood in every direction are now excellent.—J. H. B.

SPECIMENS.

4th Dec.—No. 41. Perfect gneiss grey, contains garnet and schorl. Murora to

5th Dec.—No. 42. Small grained dark grey gneiss.

No. 43. Small, oscillating towards mica slate.

„ 44. Large grained granite, Kunyoor.

„ 45. Small grained ditto.

„ 46. Schist, talcose? or micaceous, like the rock at Aeena.

7th Dec.—No. 47. Talco-quartz, argillaceous schist, greenish grey.

No. 48. Talco-quartz, greenish grey.

„ 49. A curious quartz rock.

„ 50. Still better defined talcose schist, bluish grey.

„ 51. 1803, [1752*] Greenstone, amorphous, desquamating in crusts.

„ 52. 1804. A greywacke sub-schistose, micaceous, argillaceous quartz rock, (greenish.)

„ 53. 1805. Ditto, grey light.

„ 54. 1806. Argillaceous quartz rock, dark-bluish.

8th Dec.—4m. 10h. 25.775, 66.5, 61.51. A short march to-day owing to mistake.

Quartz rock of various types, *i. e.* more or less impregnated with the green constituent, direction 300 S. E. dip. to E., passed through Sookhaeë. Encamped at Mudeeala. Usal-gad and Meets Seons from East.

9th Dec.—4 P. M. 25.857, 68, 65, 55. Partially cloudy, a short march of 2½ hours, cross Usal-Gad at starting, along river side, ascend to Pass above Lachee village in lateral glen, (E. side.) Descend passing through village, come down glen, and enter valley of the Sanee again. Down the same passing Hurkandee, which is on the right bank. Encamp at Bhungār and Nowgaon, latter left bank, former opposite.

Rocks to-day fine greywacke slate and quartz rock, passing into greywacke with every possible mixture of these rocks. Direction whenever observable, North and South, strata nearly vertical, but

* I do not know what the No. 1752 refers to, the series No. 1 of this Tour is 1753, vide subsequent note, sheet 7; 1572 must be added to all Nos. of this series — J. H. B.

dipping to W. A plant here used as a *turkaree*, bears black berries, sown.

10*th Dec.*—Nowgaon to Chundolee. Descend and cross river along flat to Bhungár about 15 miles, fine peepul tree. Above Nowgoan Seeonsee, 1 hour to Sera. Bhakund-Purind; one and quarter to Munjee. Above is Chundolee, opposite Domgla, large village, road generally level, except last place steep ascent. River takes turn here. Rocks, quartz rock, passing into greywacke. Therm. 64° to 39° covered with dew.

11*th Dec.*—Chundolee to Syndhar, gentle ascent up side of hill, oblique, ½ an hour. Usoor Gurhee* to right high up, 50 miles to Neelee, 65 to Myla, latterly ascending. Ascend Pass, descend to stream and ascend to Kylmar. Descend again and ascend to Syndhar which is in a lateral glen, and away from the Sanee. Rocks more inclining to greywacke slate latterly. A good deal of very red earth here; houses painted. Hills remarkably bare. 5. P. M. 25.535, 64.5. 56.52. soon after 52.2, 51. Opposite Neelee is Choundool.

12*th Dec.*—Thermometer min. 41, general fog. Up glen good road and easy ascent, one hour to breakfast, as it was stated Soonkolee, the first village, was a long way, and no water procurable beyond this point.

Rocks, the argillaceous quartz rock and greywacke slate, the reddish type; fog still in valley at 10 A. M. Air 52, moist 50, in the shade of a tree 49 46.

Another observation gave in the tree shade 52.5, 48.5, and in the sun 66.5, 56. Here the point of deposition must have been the same, as the thermometers were kept nearly in the same spot.

After breakfast proceeded one hour ascent to Pass. Bar. at 12 or a little after, 23.935, 53, 52, 45. Lungoor† bearing by needle 275° 54′.

Depression, ...	15.20
R.	6.20
	10.50

* Usoor Gurhee, one of the numerous hill forts with which this frontier of Kumaon and Gurhwal is studded. Joonia Gurh, Gunnea Gurh, Goojroo, &c. &c.—J. H. B.

† Lungoor fort, a conspicuous place in the South of Gurhwal, not far from the plains at source of Kohriver. Here the Gurhwal Raja held out for some years against the Goorkhalee invaders of his country.—J. H. B.

A remarkable isolated spreading hill, 295°. A high hill with broad top 324° 43′—12½° E. + 4½°=17—steep descent from Pass, afterwards easier. One hour to Nowgaon. Soonkolee about ¾ mile further, total 3 hours, and good road. From the Pass down greywacke slate, with frequently a talcose aspect on the laminar planes, remarkable for splitting in the direction of the lamina, and for breaking with a sort of cleavage across them.

13*th Dec.*—Ther. to 58° at 1 P. M., 5 P. M. 25.255, 61.5, 57. 56.5 52. Cloudy. Nowgaon to Lireea on the left bank of Muchlad, 2¼ hours, about 7 miles, road good. Ascend and descend several times, passing by Musmoor and Poktar, latter up a nulla, which falls into Muchlad. Rocks greywacke slate, olive bluish, &c., much of the red colour. Cloudy and I fear snow. Present dip=47, so far good. Hill uncommonly bare round.

14*th Dec.*—Ther. 41 minimum. Heavy dew, steep descent to cross Muchlad, a middling stream. A very crabbed ascent, wind round glen to right and descend a little to Khergoan.

Greywackes late the whole way, some appearances indicating the passage of this slate into chlorite slate and talc slate. Another peculiarity is the nodules of quartz or amorphous masses, also veins of every shape and size.* It has often struck me, that quartz is the granite of the clay slate and greywacke formations.

15*th Dec.*—Cloudy with partial gleams, time of marching 2½ hours. Descend to stream and ascend, wind round to Kande village on hill. Descend to stream, steep ascent, and wind round to right to Dang, part of Binjolee. 4—Bar. 25.665, 66.59, 51.5.

Occasionally cloudy, rocks to-day the same greywacke slate, very smooth and shining laminæ. Often breaks into prismatic fragments; here the slaty structure predominates, and I think excellent roof slate might be found, perhaps even writing slate and an inferior whet slate.

16*th Dec.*—Ther. min. 44. Cloudy morning, a long, and fatiguing march to Chamasee village on flat banks of Sanee. Steep descent, 3h. 40m. time of march, rocks same as yesterday. Bar. 24.27, 715, 69.5, 67.5, 59.5.

* I have certainly seen slate rocks very much disturbed in the neighbourhood of quartz veins.—J. H. B.

Cloudy, crossed one ridge and round glen, cross a second and descend; mango trees here, good road. Ther. max. 73.5, min. 50, dew 61.8, cloudy.

17*th Dec.*—Thermometer 50, dew. Cloudy. Choumasoo to Bud Kholoo, time 2½ hours, level along river bank for two miles through cultivation, one mile to Oaklet, cross river four times, and Chipila, here close by village, once.

Barometer at the confluence of Chippula and Sanee, 9 A. M. 28.16, 62.5, 60.3, 56.5, river 58. Latterly road much obstructed by round stones and jungle rock. The greywacke slate continues, but changing a little in character. There are the greenish grey beds too which distinguish the junction of this formation and the sandstone. The rocks are in fact exactly like what we have above the Bulees,* and also above Bar,† color purple-blue, more rarely olive, cloudy day; the max. 72.5. The Chippula is much smaller than the Nyar, the latter is getting a great body; a road goes to Lungoor from Choumasoo by Koolharoo.

SPECIMENS.

10*th Dec.*—No. 55, 1807. A greenish sub-schistose, scaly greywacke slate, less of quartz than the preceding; breaks with a hackly transverse fracture, (structure, bladed?)

11*th Dec.*—No. 56, 1808. An undoubted quartz rock, bluish grey, contains little mica.

No. 57, 1809. A variegated sub-schistose, irregularly-bladed greywacke slate, predominant color buff, intersected by veins of argillaceous matter and of quartz.

12*th Dec.*—No. 58, 1810. A bluish green slate, contains mica, with an approximating appearance to talcose schist, structure lamellar, like an oyster shell.

No. 59, 1811. Ditto olive, contains mica, much nearer talc slate, curved laminæ.

No. 60, 1812. Fine greywacke slate, the scales of mica not distinguishable without a lens; more talcose, sub-schistose, quite soft.

13*th Dec.*—No. 61, 1813. Ditto, dark olive, talcose lustre and very soft.

* Bulea, between Bheemtal and Bamowree.

† Barh, at foot of Simla hills.—J. H. B.

14th Dec.—No. 62, 1814. Ditto, olive, still more talcose.

No. 63, 1815. Ditto, amorphous, with quartz almost perfect talc.

No. 64, 1816. Ditto, more inclining to chlorite and quartz. These three were all in the same spot.

15th Dec.—No. 65, 1817. Greenish grey greywacke schist, inclining to chlorite.

No. 66, 1818. Straight laminar olive slate, with talcose aspect.

16th Dec.—No. 67, 1819. Curved laminar ditto.

No. 68, 1820. Purple greywacke schist, scales of mica very visible.

No. 69, 1821. Ditto, more granular and amorphous.

17th Dec.—No. 70, 1822. Purple granular greywacke mica.

No. 71, 1823. Transition to slate.

No. 72, 1824. Fine greywacke slate.

N.B.—These three from same spot.

18th Dec.—Thermometer min. 50, Heavy dew, fog all round and above, two hours to Bilkhet,* where halted on account of rain. The path ascends alongside of bank and turns up glen. Rock as yesterday, cross small stream and ascend; descend to flat and along river. This is rather an extensive piece of ground. Rained all the forenoon but not very heavily, a little thunder and one flash.

19th Dec.—A miserable day, rained the whole preceding night and this day, tent leaking, field where encamped a swamp or rather lake, about 5 inches of rain during the night of the 18th, 2½ as measured by the chillumchee.

20th Dec.—A gleam of sun about noon gives hopes of clearing. I may note here some remarks I made, which may lead to some conclusions. The rain came on apparently with difficulty, at first very gently, then with thunder and lightning, each discharge being followed by a smart but limited fall, which again intermitted, when another flash brought another fall. This continued for many hours, and even through great part of the night. The following day we had comparatively steady rain, though with intermissions, which appeared to depend on change of wind, but scarcely any thunder or lightning. The nearest flash was about 5000 feet.

* Belkhet and Choumasoo are the finest parts of the Sanee or Nyar valley. This country, *Mulla Sulan*, is very uninteresting.—J. H. B.

21*st Dec.*—Rain at intervals yesterday, and a most bleak and uncomfortable day. This morning universal fog till near 11 o'clock, when it cleared up, and we had a most splendid day to dry the tents, &c.

10 A. M. Barometer 28.22, 56, 51.5, 48.

4 P. M. Barometer 28.09, 63, 57, 51.

Ther. max. 64°.

22*nd Dec.*—Ther. min. 38.3. Universal fog, cleared up between 10 and 11, start for Dunda Mundee, cross the Nyarhip-deep in a canoe, beautiful scenery, the prettiest spot I have seen this tour. Fine flat. After crossing the river a steep ascent, latterly less so to the Theka Punee. Lungoor to S. E. and not above 2 miles direct distance, a village, Rookuraree, about 1 mile or less, 4 hours and a quarter. Encamp.

Rocks clay slate, *i. e.* greywacke slate intermixed with quartz rock, a patch of limestone, then greywacke and quartz rock. Arrived late.

Thermometer morning 23d, 41° or 2.7 higher than at Bilket.*

23*d Dec.*—Thermometer 41° at sun-rise. A little ascent to Dooarkhal. 8½ A. M. 24.76, 47, 42, 40. Descent rather gradual, two hours to Dewsa. Thence 1½ hour down to river† bed and along in it. Danda Mundee.

Rock on the Pass and below, a greywacke slate nearly allied to talc slate; then mica slate continues nearly to this place. Dip near this N. W., no getting any accurate measures. A good deal of quartz rock the whole way. The mica slate begins just at Dewsa. A small patch of brown rotten mica slate was observed yesterday near where we encamped. Day cloudy.

4 P. M. Barometer 27.13, 63.58, 50.3.

Specimens.

22*d Dec.*—No. 73, 1825. Bluish grey, fine greywacke slate.

22*d Dec.*—No. 74, 1826. Purple ditto, less lustre.

No. 75, 1827. An amorphous rock compound, requires examination, two specimens.

No. 76, 1828. A variety of 74, laminæ straighter.

* In the cold weather the mornings and nights in the vallies are colder than the hill tops, and the hoar frost is much more severe.—J. H. B.

† The Koh river.

No. 77, 1829. An impure limestone, veins of crystallized dolomite, two specimens.

No. 78, 1820. A black schistose rock, (carburetted?) It is the same as that mixed with the limestone, and perhaps answers to the gypsum rock, intersected by veins of carbonate of lime.

No. 79, 1831. Greywacke, greenish-grey, contains some mertal; lead?

No. 80, 1832. Ditto.

23*d Dec.*—No. 81, 1833. A compound anomalous greywacke slate, contains talc, summit of the Pass.

No. 82, 1834. Talcose schist, undulated laminæ.

No. 83, 1835. Micaceous schist, (gneiss?)

No. 84, 1836. Micaceous argillaceous schist near Dunda Mundee, curious stain, two specimens.

24*th Dec.*—Thermometer min. 40°. Cloudy. Ascend to Pass Kunda Khol. Course due West. Descend and ascend, and again descend to Oomulda 1¼ hour. Ascend to Pass, course varying from West to South-west. Fine view down small river valley, Sorgaon or Sonargaon. Along ridge level and good path, 1¾. Total 3 hours. Descend ¼ hour to Poorangaon. Rain came on.

25*th Dec.*—Rained all night. In the morning Ther. 37° min. Snow on ridge to be crossed and on other peaks. At 12, gleams of sunshine, start at 1. One hour's ascent to Konda Gullee. Langoor 42° N. E. Yesterday's Pass 18° N. E. (*See plate* II.)

Barometer 2 P. M. 25.245, 53, 46.5, 42.

A little more oblique ascent, and splendid view of the plains. Descend and wind round glen, then descend again to flat. One house and fields. Steeper descent with sandstone suddenly appearing in fragments, the previous rocks having been quartzose greywacke. Limestone and greywacke schist, cross small stream, and ascend to Pudinda. Small village on ridge in sight of the plains. High ridge and curious flat form, peak to N. and N. E. The true serrated stratiform sandstone ridges appear South and West.*

26*th Dec.*—Bar. 10 A. M. 26.40, 63.5, 55, 49. Miserable afternoon yesterday, fog and latterly rain. To-day appears fineish, but

* At Churck Khal, in this neighbourhood the Civilians of Bijnore have built a bungalow, and the high road from Sreenuggur to Nujeebabad passes by it.—J. H. B.

still unsettled; start at 10, a steep and rugged descent in great part to Kotdwara, a chowkee and thana, formerly a stockade with regular gate. The Dunda Mundee stream flows here. Kotdwara is on the very first little rise from the plains, a four hours' march.

Rocks the whole way, sandstone with the red and green clay found at Nahun. The uniformity of the sandstone types here is unusual. Hurdwar is by far the most fertile place I have seen, and from the Bheem Gora Pass, a very fine suite may be collected. 9 P. M. Barometer 28. 66, 66.49, 48.

During the night rain. They say no road through theh ills from here by the Patlee Doon. It breaks off near Dunda Mundee.

27th Dec.—To Kourhea, a short march of 1 hour. As our baggage was almost all wet, and we had been marching rather severely, I made this short march, instead of a halt. Plain road;—Cross the Kotwara which goes to left, afterwards the Koh, no water in it. The former a good deal. Map very erroneous.* 11. A. M. Barometer 28.89, 68, 65, 56.5, 81, 65.5, 62. 56.

24th Dec.—No. 85. An argillaceous gneiss? Ascent from Dunda Mundee.

No. 86.—A ditto, approaching to clay slate.

25th Dec.—No. 87. Purplish argillaceous quartzose greywacke or agillaceous quartz rock.

No. 88. Siliceous limestone, with veins of calcareous spar.

No. 89. Red and green fine argillaceous schist, very like shale.

26th Dec.—No. 90,† 1842. Sandstone, two specimens.

No. 91. Ditto, softer.

No. 92. Compact felspar?

No. 93. Greenish grey sandstone, approaching to greywacke, splintering fracture.

No. 94. Ditto, argillaceous sandstone.

No. 95,‡ 1752. Ditto amorphous green rock.

31st Dec.—No. 96,† 1752-1848. Argillaceous sandstone.

No. 97,† 1752-1849. Ditto.

* No. 66.—Indian Atlas is totally incorrect in its delineations of the lower hills, and especially of the Patlee Doon.—J. H. B.

† Note by Capt. Herbert.—Add 1752 to all these numbers. This note explains the former insertion of 1752.—Eds.

The Nos. here after 1848, anticipate Journal.—J. H. B.

No. 98.† 1752-1850. Ditto.

No. 99.† 1752-1851. Ditto.

No. 100.† 1752-1852. Perfect sandstone hard, in contact with a loose sand, almost a quartz rock.

3rd Jan.—No. 101 (1)* 1752-1853. Micaceous sandstone.

No. 102. (2)† 1752-1854. Ditto bluish grey (Surek-a-rao,) Patlee Doon.

No. 103. (3)† 1752-1855. Argillaceous, reddish, almost clay, with green spots, (to Gurur) Patlee Doon.

No. 104.—(4)† 1752-1856. (Shale?) compact argillaceous sandstone, greenish grey.

3rd Jan.—Specimens of Nos. 105.—(5) 1752-1857. The clayey type greenish grey.

28th Dec.—Cloudy morning. Kooreea to Tanda 7¼ to 8 miles, vile road through jungle, feet quite wet, as if dipped in water, cross a river supposed the Koh, course about South or a little East of it. About 2 miles before reaching Tanda, emerge. Country a little cultivated.

29th Dec.—Ther. min. 44. Cloudy. Day-break 45 from Tanda to Burapoora. A march of 8 or 9 miles through a tolerable country, latterly ascend a table of the red earth and cross the Kotdwara nulla. This place is a middling town with some pucka buildings. It is similarly situated to Kasheepoor just on a rise, the ground undulating. The ascent to it was quite perceptible. Barometer 4h. 15m. P.M. 29.080 67, 5 P.M. 60.55.

30th Dec.—Partially cloudy, a mild morning. Heavy dew on the jungle grass.

To Bheerbhanwala 8 miles, the road through jungle, latterly undulated, so as to have the appearance of small hills. The surface from Burapoora is the hard reddish clay, which bears a resemblance to that of the strata, not only in colour and consistence, but in the small tubercular pieces which form a hard gravel on its surface when washed by the rains. It has the same arrangement of surface as is observable to the westward, that is, of isolated mounds with perpendicular sides and step-like terraces. Whenever a river occurs, this terrace or raised sur-

* Here a new century of Nos. commences.—J. H B.

face is broke through by a broad and tolerably deep valley. Did not observe any gravel till close to this place. It occurs on the surface, and imbedded also fragments of sandstone. The immediate neighbourhood here is highly picturesque, nor do I know of any similar spot to compare it with. The undulations of the ground are sufficient to constitute small hills, the view is changing every step, the roads are good, and the disposition of the trees extremely varied and agreeable; it is really a beautiful spot.

A great scarcity of water, the beds of water-courses quite dry, the water of the village is obtained from a *gool* or canal. Were it not for this scarcity, I cannot conceive a more eligible spot for villages.

31*st Dec.*—Bheerbhanwala to Boksha's village. Cloudy morning and threatening rain, a pleasant and good road for about 2 or 3 miles through open forest to Kaloo Shaheed.* Ascend a little to Pass not above 100 feet or 200 at the very most, sandstone. Descend and hold on through narrow tortuous valley, high sandstone hills on either side, cross several small streams. Latterly road more uneven to a comparatively wild valley, with the only cultivation yet seen. A guard is stationed here. The valley appears to extend towards N. 15° E. and also in the direction S. 45° E. The direction in which we have come about S. 40° W. appears closed up. The course in the forest was N. 10° E., afterwards N. 40° E., latterly N. and W. of N., and again E. of N. The valley is even here of no width, not a mile.

A stratum of the red clay (specimen) with tubercular gravel (*kunkur*) lying between two strata of sandstone, rendering it more than probable that the red clay so often noticed as occurring in the Turai, belongs to this formation. Observed also earth of various colours passing into this clay or this sand, all of them members of the regular strata. Observed a stratum of very hard sandstone lying on mere sand, so loose that the application of the hammer to the upper and hard rock set the sand in motion. Observed many instances of the sandstone approaching the conglomerate structure, containing pebbles of every size, and always rounded and imbedded, amongst them fragments of the olive coloured greywacke slate. Observed in a rounded piece of sandstone when broken, concentric stripes apparently indicating the

* The Pass of Kaloo Shaheed (so called from the tomb of a saint) is the main entrance into the Patlee Doon over the outer range of sandstone hills.—J. H. B.

existence of nuclei in this rock similar to what are found in granite. Another resemblance it bears is in the amorphous masses it is so often seen in. And if it be distinctly stratified much oftener than otherwise, this is more than is true of granite, or rather gniess, between which and granite there is the same difference, and no more, as between the stratified and unstratified sandstone. Is not every rock found occasionally unstratified? clay slate certainly; witness greywacke, mica slate; witness quartz rock, limestone assuredly, hornblende slate, talc slate in potstone and greenstone slate in greenstone. If so, then what means the turmoil made about granite, and why is the same rock in this instance to have two names, and so much stress laid on a difference of feature equally applicable to *every* rock?* 4 P. M. 28.95, 68.5, 65, 56.

1st Jan. 1828.—A most dense fog, cleared up at 10. Motee Laul to Khata on the Ramgunga. Course South-east, down narrow valley watered by the Sona nuddee which we crossed several times (9). The sands are washed for gold,† whence its name. Mercury is used to take up the gold, but is again lost in the fire, as they have no apparatus of collecting the vapour of it. Four men working all day will earn two annas. A miserable pittance, if true. Ascend a little and pass through a forest of saul trees, not very thick. Descend to the Khadm of the Ramgunga. Large round stones in the bed of the river, cross, rather wide and half thigh-deep, encamp on east bank, rather a pretty place, fine plain, but of no great extent, enclosed by low hills covered with jungle. Khuta village ½ koss, distance about 8 miles.

Sandstone the only rock. To-day observed the yellow clay alternating with sandstone, and distinctly stratified, though in very thick strata. In another place observed a stratum of round stones overlying distinct strata of the sandstone, and over that, a stratum of the common

* I hope I shall not be considered presumptuous in offering this. Granite *per se* and gneiss *per se*, only differ in regard to stratification; but granite in contact with schistose rocks, and appearing to be erupted, and *altering* the strata into which it enters, causes the *turmoil* to which Capt. Herbert refers. The Himalyan (snowy) range presents examples of gneiss in enormous beds, and of apparently cotemporaneous granite; but it also presents numerous instances of *obtruded* granite, at least as far as appearances go.—J. H. S.

† The gold washing in Patlee Doon is farmed for Government at 25 Rs. per year!

mud-colored clay, both of them with the same inclination as the inferior strata.

From the observations made in this day's march, I have no hesitation in considering not only the Doon as composed of strata of the new red sandstone,* but also the part of the plains lying at the foot of the sandstone hills, and marked by the hard red clay so often noticed. 5 P. M. Bar. 28.975, 69, 62, 57. Max. 75.5.

2*d Jan.*—Thermometer min. 42. A dense fog cleared up at 9, along by river perfectly level, after which turn a corner over some low stony hills, and enter the Patlee Doon, a very pretty valley, about 5 miles by 2, surface quite level and not only cleared of jungle but of grass, a fine short green herbage. When I say of even surface, I except a bank which runs along its whole length, and as a step divides it into nearly two equal parts. The Ramgunga continues to left at some distance, only one village, Seera-ka-rao, where encamp. Formerly it was inhabited and highly cultivated; but great sickness prevails in the months of Usoj and Bhadon, which carried off the people. This village,† as well as Khuta and Mooteesaul are inhabited by Bokshas, a race who seem to be the same as the Tharoos on the Goruckpoor frontier. The hill people do not eat with them. No rocks visible to-day; traces of wild elephants. Bar. at 4, 28.82, 73.5, 70, 57.79, 69, 60.5, 56.

3*d Jan.*—Ther. min. 38.5, moist, 37.5. No fog, a great change, dew point from 50 to 36. Heavy dew on the grass. Seera-ka-rao to Gurur 12 miles, people up by 1.

A good road in general, but some ups and downs, three miles was a continuation of the Patlee Doon, and the remainder a succession of narrow flats opening out more or less. Upon the whole it ought to be a fine country, yet there is not a village along this line. A range of low hills shut in the Ramgunga towards the plains. A road breaks off about four miles back which leads through them to Juspoor. There is also a road to Chookoom on the Kosillah; sandstone prevails all the way, and in one of the torrent beds crossed, is seen a fine example

* This may be true, but why refer every thing to the European types? When Capt. Herbert wrote, the Sub-Himalyan fossils had not been discovered. *These* determine the age and the analogies of the range, and not mere *mineral* characteristics.—J. H. B.

† This tract, though still unhealthy, is slightly improved of late in regard to cultivation. The tobacco and turmeric are particularly good.—J. H. B.

of those shattered beds of parti-colored materials which have been noticed elsewhere, specimens were collected. The peculiar interest of these beds is the transition they present on the one side into common earth or clay, and on the other into sandstone. Another remarkable feature is the number of colors often exhibited with in a limited space. Reddish brown, greenish grey and yellow are the most prominent. Frequent traces of elephants. Day cloudy.

4½ P. M. Bar. 28.325, 67, 59, 55.

How is it the dew point is again risen to 51?

5. P. M. 28.300, 63, 58, 54.5.

The Ramgunga here takes a bend to N. E., having hitherto accompanied us on a S. E. or E. S. E. course.

4th Jan.—Ther. 49. Moist 46.5. Cloudy and threatening, 10° warmer than yesterday. Gurur to Jumera and Sankra 10 miles; ascent gradual to Aonla Boongee-ka-khal.* Bar. 8½, 27.31, 53, 51, 44. Hills to S. W. highish, sandstone, descend latterly through bed of stream where greywacke slate is found, but the junction of the rocks not visible. Go along a level piece. Ramgunga close, villages Dandree and Kala Khan, latter on N. bank of river, gradually ascend, latterly more steep, below greywacke slate covered with numerous round boulders, similar.

SPECIMENS.

4th Jan.—No. 206, (1)† 1858. Sandstone passing into greywacke to Jumera and Sankra.

No. 207, (2) 1859. Argillaceous sandstone, bluish grey.

No. 208, (3) 1860. Olive ditto, fine schistose greywacke slate.

No. 209, (4) 1861. A greywacke—all the same place.

No. 110, (5) 1862. Sandstone below the preceding.

No. 111, (6) 1863. } Greywacke slate, fine olive sandstone in con-
No. 112, (7) 1864. } tact almost.

No. 112½, (8) 1864½. Red earth, white ant hill.

6th Jan.—No. 113, (1) 1865. Same as No. 2.

Numbers in anticipation of the Journal.

No. 114, (2) 1866. Quartz rock, contains chlorite and talc.

No. 115, (3) 1867. The red and green earthy rock.

* Here Capt. Herbert re-enters Kumaon Proper.

† The middle Nos. are merely those of the day.—J. H. B.

7th Jan.—No. 116, (1) 1868. White quartz rock.
No. 117, (2) 1869. Purple quartz rock, contains talc.
No. 118, (3) 1870. Fine dark greywacke slate.
No. 119, (4) 1871. Greenstone.
8th Jan.—No. 120, (1) 1872. Fine greywacke slate, smooth.
9th Jan.—No. 121, (1) 1873. Quartz rock with brown stains.
10th Jan.—No. 122, (1) 1874. Quartz rock.
11th Jan.—No. 123, (1) 1875. Coarse greywacke slate.
No. 124, (2) 1876. Limestone slate.
No. 125, (3) 1877. Schist in contact.
No. 126, (4) 1878. Ditto, near.

Similar to those belonging to the sandstone, and a little higher I discovered a small patch of that rock in situ, I think. Higher up the round boulders disappeared, and nothing but fragments of slate are seen decomposing into a very teddish earth. Descend to a small flat by side of Ramgunga. Sankra village a little above. Slate mountains opposite bank. Very cloudy and threatening. Bar. 4 P. M. 28.13, 65.5, 60, 55.

No strata any where visible. Road breaks off to Chookoom and Chilkra here.

In anticipation of the Journal.

11th Jan.—No. 127, (5) 1879. Fragment, amygdaloid?
No. 128, (6) 1880. Limestone with pyrites.
12th Jan.—No. 1881, (1) Quartz rock.
13th Jan.—No. 1882, (1) Greywacke slate above Kyoonsal.
No. 1883, (2) Above.
No. 1884½, (3) Ditto in the bed of the river.

SPECIMENS OF 12TH JANUARY.

No. 1881, (1) Quartz rock.
13th Jan.—No. 1882, (1) Greywacke slate above Kyoonsal.
No. 1883, (2) Ditto above in the bed of the river.
No. 1883½, (3) Ditto in the bed of the river.

JOURNAL OF THE 5TH JANUARY.

Rained all day. Halt.

6th Jan.—Sankra to Ujolee. Towards noon cleared up, and we started for Ujolee about 3 hours' march, steep ascent and then descend,

and again ascend to village, which is at no great distance from the river. Two remarkable peaks North of the river. The rocks are greywacke slate of the usual colors: olive, reddish-purple, &c. and quartz rock of a granular composition occasionally. This latter rock has an extensive development, but no strata are visible, so deep is the covering of debris over both it and the slate. Very warm when in exercise, particularly in the ascents.

7th Jan.—Cloudy. Ujolee to Hurnra 3½ hours. A steep ascent at starting. Greywacke slate olive coloured. Wind round glen with quartz rock. Descend to stream and ascend. Greywacke slate-pass a third glen. Some fragments of green-stone. A very bad road to-day, and the march very fatiguing.

Both yesterday and to-day I fancied I observed traces of serpentine, in union not only with the slate, but with the quartz rock. Nothing like a specimen of that rock, but slight impregnations; judged of more from color than any other test; see specimens to-day and yesterday. These two days we have entirely left the river* and ascended, it being at some distance to left. High peaks on its North bank. Passed under Goojroo-gurh this morning, where was a Goorkha post formerly. The plains are visible thence. Almost all the high ranges are deep in snow.

4 P. M. 25,775, 52, 46. Rainy.

8th Jan.—Rained all yesterday afternoon, a little hail. This morning fine, with some snow fallen on the high ridges, but not so much as I expected. At noon start for Ják, about 3 or 3½ hours. I delayed much on the road in consequence of the heat. Descend by a moderately steep road by nullah, small; bed full of debris, 50 feet thick at least. Channel cut out of the debris, greywacke slate, steeper ascent to ridge, greywacke slate and quartz rock. A mangoe tree near summit; say Bar. 26. Wind round glen in which are the following villages: Sonkut Bomun, Kotlee, and Hunera. From the second ridge, Indolee bears a little west of north. Ramgunga very tortuous just there, a longish stream joins it with rather a long course, and some level cultivated spots are seen in its bed. Budungurh river is left behind, a succession of small descents and ascents leading round small glens brought

* Ramgunga.

us through a small hamlet to Jâk, which is near the head of a glen watered by no very large stream. Phulsone is said to be in a north-east direction. Bhutronj in a south-east, latterly the slate more talco-argillaceous.

9th Jan.—Jâk to Doonpôt or Doonpo about 3 hours, a steep ascent of about three-quarters of an hour brought us to the ridge, a lateral one, which divides the Jâk glen from another belonging to the Ramgunga valley, in which are situated the villages of Phulson Kot, Ningrâlee Goojaree Gurhee, &c. Bar. at 12.45, 25.23; 52, 64, 42.

Sungoor Gurhee visible. Quartz rock is the prevailing rock, a singular type on this Pass, vide specimen. Descend from Pass and by a winding and moderately uneven path passing through Ningrâlee, reach the head of the glen at Doonpo Kôt to left. Sonkut is near. This glen contains a good deal of level ground, which is divided amongst the several villages. It has rather more length than the Jâk one; nothing but quartz rock with occasional patches of greywacke slate.

10th Jan.—Doonpo to Joshee Khola, about three hours and a quarter, ascent of nearly an hour to Bhertonj Khâl (*Bhutronj*, query?) Bar. 9, 25.03 44, 37.5, 34.5. (*See plate No.* III.)

Nothing but quartz rock more or less argillaceous; the Goojuree peaks remarkable, a high ground; they form North of the Ramgunga. This is the separating ridge of the two river* valleys, and it is remarkably low; emanating from it is a much higher one of considerable declivity with little forest, on which are spread the villages of Phulson Kot, &c. Descend to Rânee Bâgh two hours nearly, fine mango grove, certainly not 1,000 feet below the Pass. This is the fourth example of mangoes growing extremely near a Barometrical pressure of 25°. Quartz rock every where, with occasional traces of greywacke slate, latterly micaceous slate.† Down the glen, beautiful morning, and

* The river vallies of the Ramgunga and Kosilla. These Goojree or Goojroo Peaks must not be confounded with those of the same name on right bank of the Ramgunga, situated in Gurhwal.—J. H. B.

† The pilgrims from Buddrinath and Kedarnath after leaving the high mountains, descend the Ramgunga, until they reach the Pass which separates the Kosilla from that river. From Ranee Bâgh on the Kosilla, they follow the river route to Dhikkolee and Chilkeea. These pilgrims do not seem to dread the Terrai climate, for they move down in July and August, the worst months of the year.—J. H. B.

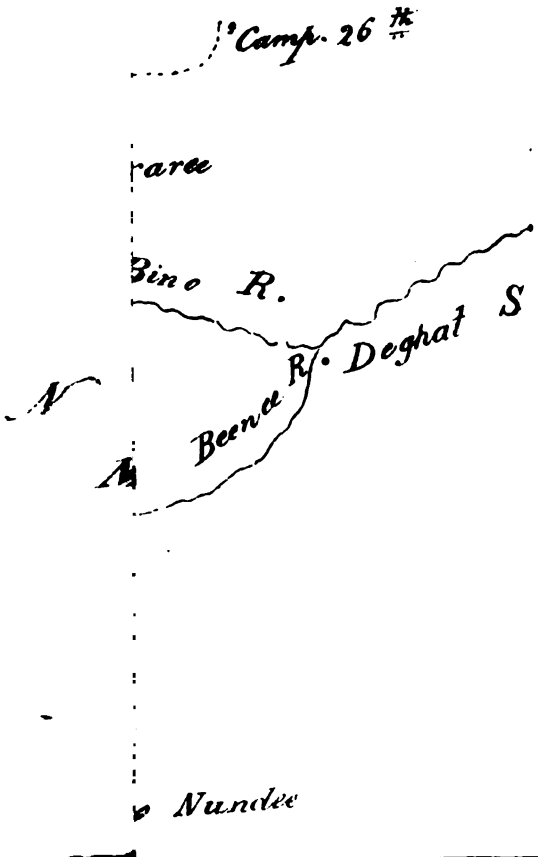

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Plate I.

Plate II.

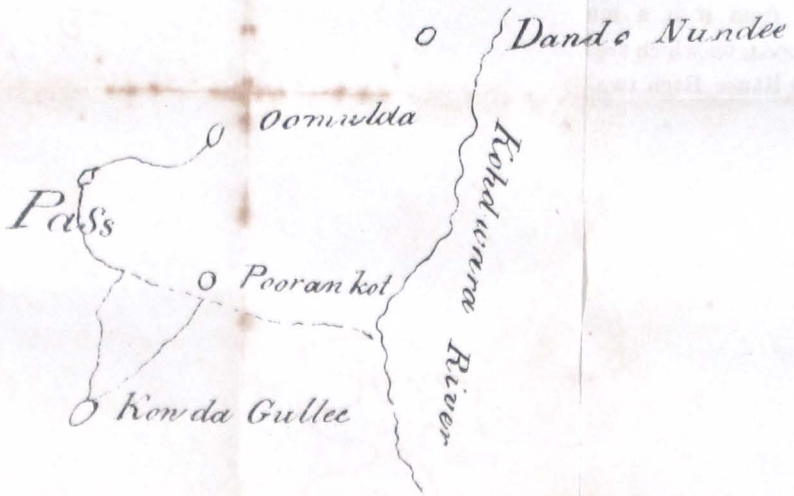
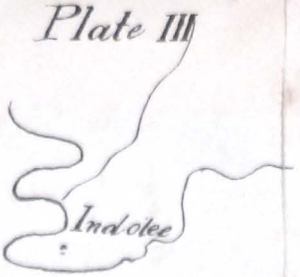


Plate III



tolerable road with rather picturesque scenery. Descend to the Peepul Punt glen and ascend to Joshee Khola, a small village. Turket is the other side of the high range that rises to S. E., which only separates two feeders of the Kosillah river.

18th Jan.—Joshee Khola to Dharee, 4 hours, about twelve miles. Descent passing by a village to river bed 40 minutes. The road then lies in the river bed, which for four miles presents a well cultivated and widish valley; a stony piece then intervenes for a few hundred yards, and then there is again an expanded bed, which continues with more or less interruption to a spot on the left bank, opposite to which commences the ascent to Dharee of about 30 minutes.

4h. 45m. Bar. 26.495, 60. 53.5, 44.5. Rocks, quartz rock at starting in bed of river, also with greywacke slate, which was I think oscillating towards micaceous schist, a bed of limestone observed at two places, most likely the same. It appeared as if a certain degree of transition took place, for the schist was more or less impregnated with lime according to its proximity to the limestone. The latter at first sight appeared part of the other rock, so little was there to remark in any thing like derangement or nonconformity of the strata. It was only by the hammer (and color) that the actual difference of the strata was to be detected. The limestone contained iron pyrites and veins of white carbonate. It strikes me, that valuable slabs might be found here.

The whole of the Ghagur* range, which here flanks the Kosillah, up is covered with the snow. There is a great change in the weather, which has in fact become inclement. A dreadful wind reigned the whole day; in the morning it was cutting.

12th Jan.—Thermometer 36° 5′ a little after sunrise. Dharee to Kecoonsal 2 hours. Descend to bed of Kosillah and proceed along to Bhojhan at confluence of Koojgyra. Mujhera close to left bank of river. At Bhojhan leave the river and go up the Koojgyra. Latterly ascend to Kecoonsal, rather steep.

Quartz rock at starting, a curious type (see specimen,) continued some distance. In the bed of the river observed fragments of the curious rocks formerly found near Mujhera. One single specimen of

* This is that portion of the magnificent Gaghur range in which Nynee Tal is embosomed.—J. H. B.

strata enabled me to determine the dip S. E., inclination about 10°. Quartz rock remarkable for the numerous parallel fissures in various directions. Latterly greywacke slate, but no good examples. 4 Bar. 26.32, 60, 56.5, 48.5.

13th Dec.—Keoonsal to Munnour 3 hours. Ascend ridge which overlooks the valley of the Suronta; descend obliquely to Kaggur Ghat, which is at the confluence of that stream with the Kosillah. A village, Nowgaon, a good deal of level ground here. The terrace apparently composed chiefly of granite boulders; cross the Kosillah, an easy winding ascent to Munnour, a small village. There is a curious arrangement here, a small peak is on the banks of the Kosillah, and round it is a valley, so that it appears isolated. I think the river must have once run there, and afterwards changed its course.

The transition from greywacke schist to micaceous schist becomes perfect I think in this march. The micaceous schist appears to dip N. W. 30° near Kaggur Ghat, at an inclination of 15°.

As the weather threatened change, went on in the evening to Chipila or Sipla 2 hours, micaceous schist. The strata dipping N. as near as could be determined on.

14th Jan.—Sipla to Almorah* 3 hours; easy descent to confluence of Sowal and Kosillah. Mica slate everywhere, strata dip here N. E. Bar. 9 A. M. 26.657, 52, 35, 33.

Easy ascent to Almora, giness or granite nearly the whole way. In the evening tried the temperature in 8 feet hole, air 52°. It was found 54.3, weather threatening snow.

* Almorah is situated on the ridge which separates the Kosilla from the Suwol river. It is only on one side (the NNE.) that Almora can be reached or left without having to cross a suspension bridge over one or other of these rivers.—J. H. B.

NOTE.—It would appear that Capt. Herbert's specimens of this trip end with the mica slate and greywacke series of the Sowal and Kosilla, found up to the bridge over the former river, from which the Almorah ascent commences, and the gneiss and granite appear. No. 1883½ being the closing number.

The M.S. Vol. from which this Journal has been copied, contains a diary from 14th January to 7th February, recounting nothing but dismal rainy weather, and ending with a fine fall of snow, and then fine weather.—J. H. B.