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Notes, chiefly Botanical, made during an excursion from Darjiling to Tongló, a lofty mountain on the confines of Sikkim and Nepal, by J. D. HOOKER, M. D., R. W., F. R. S., &c. Honorary Member of the Asiatic Society. (Communicated by the Hon. Sir JAMES COLVILE, PRESIDENT As. Soc.

May 19th, 1848.—Left Darjiling in the forenoon of this day, accompanied by my friend, C. Barnes, Esq. We took with us a small tent, about 15 Lepcha and Ghorkha coolies, together with as few servants as possible, these being bad mountaineers, and our route involving much ascent and descent. The direction is W.; the distance, in a straight line, little above 12 miles; but occupying good 3 days' march; for we have to descend from Darjiling 5000 feet to the intervening river beds, cross these and as many spurs of 1000—1500 feet, and thence ascend to a summit 10,000 feet above the sea. The route is of course wholly within the sub-Himalaya, and always through the forest region. What clear spots we saw were artificial, and large trees extend to the top of Tonglo; which is however below the lower limit of Alpine Pines in this parallel, and of the Arctic vegetation of the loftier Himalaya.

A Lepcha carries his load in similarly formed, but much ruder baskets, than those used by the Nepal races, and I observe that he uniformly used shoulder straps, with or without the belt across the forehead, which latter is most frequently wholly dispensed with.* The weight thus

* May not the use of the head-strap be a predisposing cause of goitre, by inducing congestion of the Laryngeal vessels? The Lepcha is certainly far more free of this disease than the Bhothea, or than any of the tribes of E. Nepal I have

transported to great distances is very surprising; on an average our Lepcha loads weighed 100 to 120 lbs. On our return we had the curiosity to weigh the then sodden tent, which was 180 lbs., and had been carried for 10 hours both up and down hill in this state. To keep the contents of the basket dry, the Lepcha makes a large hood of bamboo plating, enclosing layers of leaves of *Scitamineæ*; this fits over their heads and baskets, reaching as low as the hips, but open in front, and leaving both the upper and lower limbs free.

In point of climate Tonglo shares the excessive humidity of the rest of Sikkim, though when viewed from Darjiling it is often seen to be clear when all the northern and much nearer eastern and south-eastern mountains are wrapped in clouds. This arises from its position, and its protection from the S. E. or rainy wind. It rises as a long saddle, from that great southern spur of Kunchin-jinga, (which should bear the general name of Singalelah) and which, dividing Nepal from Sikkim throughout its whole length, extends from the perpetual snows of perhaps the loftiest mountain on the globe, to the plains of India. The direction of this ridge is of course meridional. At right angles to, and a little south of Tonglo, the Sinchul ridge of 9000 feet, meets that of Singalelah, and thus two sides of a box are formed, one of which, the meridional, encloses Sikkim to the west, whilst the other shuts it off from the plains on the south. Darjiling, placed on a spur projecting N. from Sinchul, is a ridge parallel to that of Tonglo, which bounds its western horizon. Throughout the greater part of the year the S. E. wind prevails, rising at sunrise, and its vapors are condensed at once on the forests of Sinchul; billowy clouds rapidly succeed small patches of vapor, and rolling over to the N. side of the mount, are carried N. W.,

mixed with, and he is both more idle and less addicted to the head-strap as a porter. I have seen it to be almost universal in some villages of Bhotheas, where the head-strap alone is used in carrying in both summer and winter crops, as who amongst the salt traders, or rather those families who carry the salt from the passes to the Nipalæe villages, and who very frequently have no shoulder-straps, but invariably head bands. I am far from attributing all goitre, even in the mountains to this practice, but I think it is proved, that the disease is most prevalent in the mountainous regions of both the old and new world, and that in these the practice of supporting enormous loads by the cervical muscles is frequent. It is also found in the Himalayan sheep and goats, which accompany the salt traders, and whose loads are supported in ascending, by a band passing under the throat.

over a broad intervening valley, to Darjiling. There they bank on the east side of the spurs, and this being clear of trees, the accumulation is slow,* and always first upon the rare clumps of woods. Very generally by 9 A. M. the whole eastern sky, from the top of Darjiling ridge, is a dense fog, the western exposure enjoying sunshine for an hour or two later. At 7 or 8 A. M., very small patches are seen to collect on Tonglo, which gradually dilate and coalesce, but do not shroud the mount for some hours, generally not before 11 A. M. or noon. Before that time however, masses of mist have been rolling over Darjiling ridge to the westward, and gradually filling up the valleys, so that by noon or 1 P. M. every object is in cloud.

Towards sunset it falls calm, or a light S. W. wind springs up. In the former case the mists rise, first from the S. E. mounts, and especially if the S. E. wind, exhausted of its surplus vapors, still blows. This raises the clouds first from Sinchul, and when this is not clear, Tonglo breaks through the western mists. If on the other hand a S. W. breeze sets in, or a W., or N. W., Tonglo clears first.

In descending from Darjiling the zones of vegetation are marked well at a little below 7000 feet, or between 6000 and 7000 by—(1.) The oak, chestnut and *magnolia*, the main features of 7000—10,000 feet. (2.) Immediately below 6500, the Tree-fern† appears (*Alsophila gigantea*, Wall.), a widely distributed plant, common to the Himalaya from Nepal eastward to the Malayan Peninsula, Java and Ceylon. (3.) Palms, a species of *Calamus*,‡ the “Rhenoul” of the Lepchas. This, though

* I have the singularly good fortune to occupy in Mr. Hodgson’s house the most favorable spot in the station, for watching the diurnal march of atmospheric phenomena. My host’s house is placed on an eminence, 500 ft. above the main body of the Darjiling spur, and at its upper or southern extremity;—it commands an unimpeded prospect to the N. W. and E. having the snows of Kunchin-jinga to the N. and the superb sweep of 80 miles of snow from its summit round by N. E. to E. To the S. E. Sinchul:—and to the west the Singalelah range, from Kunchin to Tonglo. The station stretches N. in fall front, as a sharp ridge. I have found it difficult to make old residents of one or other side of Darjiling spur, believe, that whilst their house in the western slope is enjoying hours of sunshine the whole western side is enveloped in fogs.

† Of this I have seen but one species in the mountains, a very similar, or possibly distinct species, grows at the foot of the outer range.

‡ The fruit of all the *Calami* are eaten by the Lepchas and the stems of larger species applied to various economic purposes.

not a very large species, climbs lofty trees, and extends some 40 yards through the forest; 6500 feet is the upper limit of palms in the Sikkim Himalaya, and one species alone attains so great an elevation. Four other *Calami* range between 1000 and 6000 feet, on the outer hills, some of which are found 40 miles distant from the plains. The other Palms of Sikkim are, "Simong"—a species of *Caryota*, which I have not procured flower or fruit; it is rare, and ascends to nearly 6000 feet. *Phoenix*,* a small stemless species, probably *P. acaulis*, Buch. (*P. humilis*, Royle?) which grows on the driest soil in the deep valleys (Schaap of the Lepchas). *Wallichia*† *caryotoides*, apparently the plant described by Roxburgh,‡ and if so, having a very wide range (Assam and Chittagong). It is the "Ooh" of the Lepchas, who make no use of it.—Dr. Campbell and myself, during a recent journey in Sikkim, found that it is an admirable fodder for horses, who prefer it to any other green food to be had in these mountains. A species of *Areca* unknown to me, is the 8th and only other Palm of these mountains, but a *Cycas* (*C. pectinata*) occurs in the deepest and hottest valleys, with the India-rubber fig,—the western limits of both these interesting plants. Of *Pandanus* there is one graceful species at elevations of 1000 to 4000 feet, ("Borr," Lepcha.)

3. The third striking feature in the vegetation in descending from 7000 feet, is a wild plantain, which ascends to above 6000 feet; ("Lukho," Lepcha.) This is replaced by another and rather larger species at lower elevations; both of them ripen their austere and small fruits, which are full of seed and quite uneatable; good specific characters are to be drawn both from the male flowers, and the size, form and color of the seeds. The commonly cultivated plantain of Sikkim is, I am always assured, an introduced stock, (nor have the wild species been ever cultivated,) it is very large, but poor in flavor and does not bear seeds.

The zones of these three conspicuous plants are very clearly defined in descending any where from Darjiling, and especially if the traveller, standing on one of the innumerable spurs which project from the ridge,

* The feathery fronds of the *Phoenix* are used as screens in hunting, no other use is made of any part of the plant except the young seeds being eaten.

† Von Martins in a forthcoming part of his superb work, retains Roxburgh's generic name of *Wallichia* for this palm.

‡ Roxb. Fl. Ind. v. 3. p. 621, (*Wrightea*).

cast his eyes up the gorges of green on either hand. Firing the forest is so easy in the drier months of the year, that a good deal of cultivation is met with on the spurs, at and below 5000 feet, the level most affected by the Lepchas, Limbos and Sikkim* Bhotheas. The mountain slopes are so steep, that these spurs, or little shelves, are the only sites for habitations between the very rare flats on the river banks, and the mountain ridges, above 6000 feet, beyond which elevation cultivation is rarely if ever carried by the natives of Sikkim. The crops are the usual ones of the plains, and the agriculture similar, with one important exception, that rice is hardly ever irrigated. This appears the more remarkable, as on crossing the Singalelah range into Nepal, in localities there as steep as those covered with rice-crops in Sikkim, irrigation is almost universally resorted to. The varieties of grain are different, but as many as 8 or 10 kinds are grown without irrigation by the Lepchas, and the produce is described as very good (80 fold). Much of this success is due to the great dampness of the climate; were it not for this, the culture of the grain would probably be abandoned by the Lepchas, who never remain for more than three seasons on one spot.

At the bottom of the valley is a small village of Lepchas, Limbos and Murmis, the tribe aggregated in groups, on one spur, and surrounded with small fields of the usual summer and winter crops of the plains. The Lepcha house is far more roomy and comfortable than that of the others; it is generally square, built on posts, with a stage in front of the door, and low-eaved thatch of bamboo stems, split and laid flat. The walls are of bamboo wattle-work. In all respects it resembles the Bhootea house, but these are larger, better, and the framework is of strong wooden beams, for it is not worth the Lepcha's while to render his habitation strong and durable. Both Limbus and Murmis build smaller houses, often on the ground, but more frequently raised; the roof is of grass-thatch or occasionally of a piece of bamboo work matting.

* I apply the term Sikkim Bhotheas to the more recent immigrants from Thibet, who have settled in Sikkim, and are an industrious, well conducted people. The Bhotheas again of Bhotan, to the eastward, rarely reside, except at Darjiling, and bear the worst reputation (and most deservedly) of any of the numerous people who flock to this station. These should not be confounded with any other Bhothean tribes of Thibet, Sikkim or Nepal.

The soil at the bases of these hills is very fertile, owing to the washing down of vegetable mould from above, the rapid decomposition of the rocks and the ashes of the burnt forest. Beneath the mould is generally a stratum of red clay which uniformly covers the hills at all elevations, and to a greater or less depth, even 15 feet. This varies much in quality, apparently owing to the admixture of matter from the subjacent rocks. Of the latter some gneisses decompose with the greatest rapidity, others resist for ages the elements. A clayey soil covers even the sharpest ridges, retained in its position by the arboreous vegetation; much of it makes excellent bricks, from containing a very large percentage of alumina.*

A large bamboo ("Pao," Lepcha) is the prevailing plant near the base of these valleys; it attains a height of 40—60 ft. and the culms average in thickness the human thigh; it is unarmed, deep green, or purplish and used for large water vessels. Besides this there are nearly a dozen kinds of bamboo known to the Lepchas, and all have been pointed out to me. Whether these are different species or no it is impossible to say, for different genera are too similar in their foliage to be thereby specifically distinguished. Three kinds usually flower, one commonly, and of these, two bear no leaf on the flowering plant, which dies after seeding. A certain patch of ground or clump of plants seem to flower at the same time, but I could not detect, nor do the Lepchas recognize any cause for this isolation of the flowering plants. Bamboos, in the general acceptation of the term (for remotely allied genera bear the same trivial English name,) occur at all elevations below 12,000 feet, forming even in the Pine-woods and above their zone in the skirts of the *Phododendron* scrub, a small and sometimes almost impervious jungle. It would take many pages to describe the numerous purposes to which the various species, even in Sikkim, are put. In an economical point of view they may be classed into those which do, and those which do not split readily. The young shoots of one or more are eaten: and the seeds of another, raw, cooked, and made into a fermented drink.

Gordonia is here the common forest tree; (*G. Wallichii*?) an erect and singularly handsome tree, much prized in all parts of the sub-

* Nearly 30 per cent. according to the analysis of my friends, J. and C. Muller, Esqs.

Himalaya, and universally adopted for ploughshares and other purposes requiring a hard wood: it is the "Sing-brang-kun" of the Lepchas, and ascends 4000 ft. on the mountains. In very dry soils it is replaced by "Sal" (*Vateria robusta*), and more rarely by the *Pinus longifolia*.

"Toon" (*Cedrela toona*) "Simalkun," Lepcha, and another species, probably *C. serrata*, Royle, accompany the *Gordonia*, as does *Englehardtia*, which ascends to 6000 ft. and several leguminous trees, *Acacia*, *Dalbergia*, *Terminalia* and a *Sonneratia*. Oaks at this elevation occur as solitary trees, of species different from those of Darjiling. There are 3 or 4 with a corn-formed fruit at this elevation, and 3 with spinous cups enclosing the nut, which generally affect a dry clayey soil.

Phyllanthus emblica, *Grislea*, *Symplocos* and other small trees and bushes of the plains, occupy the more open spaces near the streams. *Cucurbitacea*, *Marlea* and scandent *Leguminosa* skirt the forest. *Tici* and *Cloranthus* with Ferns inhabit rocky places, and an amarantaceous plant (*Arrua*?) climbs over the loftiest trees; its copious inflorescence, like hops, whiten the forest in some places. *Sterculia*, of 2 species, are common, as is *Pæderia foetida*, which, as well as many *Cucurbitaceæ* peppers, *Gnetum*, *Porana*, a few *Convolvulaceæ* and many *Asclepiodeæ*, *Hoya*, &c. climb high.

Though the temperature of the air was only 77° at noon, these valleys are close and oppressively hot: the streams small and varying in temperature, according to the exposure of their banks; that of the first we crossed was 70°.

Some low steep spurs which we crossed, were well cultivated, though the angle of the field was upwards of 25°. The crops, chiefly maize, now sprouting. The maize is occasionally hermaphrodite in Sikkim, the bisexual flowers forming a large drooping panicle and ripening small grains. This is a rare occurrence, and the specimens are highly valued by the people.

On the ridge a "Semul" tree (*Bombax*) grows, at upwards of 3000 ft.; it is a very rare tree at this elevation, or any where else within the mountains. *Mussaenda* is conspicuous for its white calycine leaves snowing the tree. A *Lysimachia*, very like the *L. nemorum* of Europe, grew near its foot.

Descending to another stream, the path led through a low dense

jungle of bamboo and figs* of several species. Indeed the general prevalence of these and their allies, the nettles, is a remarkable feature in the botany of the Sikkim Himalaya, up to nearly 10,000 ft. Of figs there were here 5 species, some bearing eatable fruit of enormous size and very palatable, others with the fruit small and borne on prostrate creeping leafless branches, which spring from the root of the tree and creep along the ground. The wild Mulberry is a common small tree in these situations, with three species of nettle,† several of *Bahmria*,‡ *Procris*, *Trophis*, *Celtis* and *Conocephalus*. Of shrubs are *Randia*, *Gardenia*, and *Rondeletia*, *Citrus*, *Rotlera* and other *Euphorbiaceæ*, some *Sapindaceæ* and *Terebinthaceæ*. *Scitamineæ* were not above ground, grasses are rare, and indeed most monocotyledonous plants at this season. Of terrestrial *Orchideæ* there are several species, *Dendrobium* takes the place in the valleys of *Cælagyne*, the common epiphytical genus at Darjiling.

A troublesome Dipterous insect swarms on the banks of the stream, it is very small and black, floating like a speck before the eye. The bite of this (the "Peepsa") leaves a small spot of extravasated blood under the cuticle, very irritating if not opened.

Temperature of the water (the Little Rungeet river) 69° at 4 P. M., and of the air 75°.

Crossing the Little Rungeet we ascended another steep spur from the base of Tonglo, and camped.

Night calm and clear, with a little cirrus, but no dew formed. A Thermometer sunk 2 feet in rich vegetable mould stood at 78° two hours after it was lowered, and the same after ten hours interval on the following morning. This probably indicates the mean temperature of the month at that spot, where, however, the dark color of the exposed loose soil must raise the temperature considerably.

May 20th.—Temperature at sunrise 67° ; morning bright, clear overhead, but the mountains looked threatening. Darjiling perched on a ridge 5000 ft. above us, has a singular appearance. Descended from the

* One species of this very tropical genus ascends almost to 9000 ft. on the outer range of Sikkim.

† Of two of these cloth is made, and of a third cordage. The tops of two are eaten, as are several species of *Procris*?

‡ Two species yield a fibre, one the "Poa."

spur to a narrow ravine, choaked with *Calami*, Figs, and the *Wallichia*, and crossing a stream ascended the Simonboug spur of Tonglo, so called from a small village and Lama convent of that name on its summit. The cultivation is of rice, murwa (*Eleusine*), millett, yam, brindjal, bhang, buckwheat of 2 species, fennell and cummin, &c. A white flowered Rue, *Ruta albiflora*, is sometimes cultivated, and very common; truly wild at elevations of 3 to 7000 ft.; it is commonly used for all diseases of fowls, mixed with their food.

Aquilaria, *Myrsine*, *Embelia*, *Ardisia* and *Mæsa* all occur at 3 to 6000 ft., and we passed through groves of a handsome shrubby *Tephrosia* in full purple flower. Near the top of the spur *Rubi* and *Osbeckia* appeared, the former of several species; and hence upwards the brambles are very frequent, to 12,000 ft., between which and this level upwards of 12 species occur. These flower at different seasons, one was already in fruit, bearing large-sized well-flavored yellow fruit, as big as a raspberry.

At noon, arrived at the top of the spur, and passing some chaits,* gained the Lama's residence and temple. The latter, nothing more than a rather large wooden Bhothea house raised on a stone platform. As we stopped here on our way down I shall allude to it afterwards more particularly.

Two species of bamboo, "Payong" and "Praong" of the Lepchas, here replace the "Pao" of the foot of the hills. The former flowered abundantly, the culms, 20 ft. high, being wholly a diffuse panicle of inflorescence. The "Praong" bears a round head of flowers at the apices of the leafy branches. Wild strawberry, violet, *Lysimachia* of several species, *Geranium*, *Polygona*, *Veronica*, &c. announced our approach to the temperate zone. In the outskirts of the temple were potato crops and peach trees. The potato thrives extremely well in Sikkim, though I think the root cultivated in Purneah district, from the Darjiling stock, is superior both in size and flavor.

Peaches never ripen in Sikkim, apparently from the want of sun;

* chait of Sikkim (borrowed from Thibet) is a square pedestal, surmounted with a hemisphere, the convex end down and terminated with a cone, crescent and disc. These are erected as tombs to Lamas, and in memory of illustrious people, and venerated accordingly, the people always passing them from right to left, often repeating the invocation "Om mani Padmi hom."

the tree grows well at 3—7000 ft. and flowers abundantly, and its fruit makes the nearest approach to maturity (according to the elevation) from July to October. At Darjiling it follows the English season, flowers in March and fruits in September, when the scarce reddened and still hard fruit falls from the tree.

It is curious that throughout this, the temperate region, there is hardly an eatable fruit except the native walnut.* English cultivated fruits are extremely poor; the native are confined to the walnut, some poor brambles, of which the "yellow" and "ground" raspberry is the best, some insipid figs and a very austere crab-apple. The European apple will hardly ripen, pear not at all. Currants and gooseberries shew no disposition to thrive, and strawberries, which grow well, ripen a flavorless berry. Vines, figs, pomegranates, plums, apricots, &c. will not succeed even as trees.

European vegetables again grow and thrive remarkably well throughout the summer of Darjiling, and the produce is very fair to look upon, sweet and good, but inferior in flavor to the English.

Of tropical fruits cultivated below 4000 ft. the orange and banana alone are frequent, with lemons of various kinds. The season for these is however very short, that of the plaintain might with care be prolonged, but the fruit, as I have said above, is poor; oranges abound in winter, and are excellent in flavor, but neither so large or free of white pulp as those of South America, the W. Indies or W. coast of Africa. Mangoes are brought from the plains; they do not thrive in the valleys, and though I have seen the pine-apple plant I never have its fruit.

A singular and almost total absence of sun's-light in the fruiting season, and of the heat of his direct rays, is the cause of this dearth of fruits. Both the farmer and orchard gardener knows full well in England, the value of a bright sky as well as a warm autumnal atmosphere. Without this his corn does not ripen and the fruit trees blight. The winter of the plains of India, being more analogous in its distribution of moisture and heat to an European summer, such fruits as the peach, vine and even plum, the fig, strawberry, &c. may be brought to bear

* The walnut of Sikkim has the shell extremely hard, of Bhotan as remarkably thin, in both the kernel is excellent; but not worth the trouble of freeing from the shell in Sikkim. Bhotan walnuts are largely exported from that country, and are in all respects excellent.

well in March to April and May, if they are only carefully coaxed through the previous hot and damp season, which is, in respect to the functions of flowering and fruiting, their winter.

Hence it appears that, though some English fruits will turn the winter solstice of India (November to May) into summer, and then flower and fruit; neither these nor others will accept the summer of 7000 feet on the Himalaya, though its temperature so nearly approaches that of England, as a compensation for the accumulated evils of its excessive rains and fogs. Further, they are often exposed to a winter's cold no less rigorous than the average of that of London, the snow lying for a week on the ground, and the thermometer descending to 25°. It is true that in no case is the extreme of cold so great here as in England, but it is sufficient to check vegetation, and to prevent fruit trees flowering till they are fruiting in the plains. There is a great difference herein between the climate of the central, and eastern and western Himalaya, at equal elevations. There the winters are colder and more comfortless than in Sikkim. The summer warmer and less humid. The rainy season is shorter and the sun shines so much more frequently through the heavier showers, that the apple and other fruits are brought to a much better state. It is true that the rain gauge shews a greater fall there, but this is no measure of the humidity of the atmosphere, or still less of the amount of the sun's direct light and heat intercepted by aqueous vapor. It takes no account of the quantity of moisture suspended in the air, nor of the depositions from fogs, which are far more fatal to the perfecting of fruits, than the heaviest brief showers.

In the valley of Nepal, Mr. Hodgson informs me, that at 4000 feet the apple, though flavorless, ripens well and is a good fruit, as are two varieties of the European fig, but these follow the seasons they do in the plains, the winters being so mild that snow is hardly ever seen, and never lies on the ground. There however the plantain and mango do not ripen, nor the orange always. It is too warm for gooseberries, currants and raspberries, and too rainy for the vine. Apricots may be produced with care, but hardly peaches.

The Indian solstices, which are marked by one season of excessive drought, and the other of excessive humidity, can never be favorable to a copious fruit market. The obstacles to the produce of good Euro-

pean fruits, either in the plains or hills is manifest, nor do the tropical flourish as in other quarters of the globe, where the seasons are not so contrasted. Hence there is not one good fruit peculiar to the country, and perhaps but one which arrives at the highest perfection; I mean the mango. The plantains are good, so are the oranges, pine-apples, but all these are far more abundant, most of them of much better kind, and all of them enjoying a much longer season in other warm climates. Who that has walked the fruit-markets of South America, the West Indies, or Western Africa, has not been struck with the perennial profusion of all the above fruits, and many more besides, which are unknown to India.

On ascending Tonglo, we left cultivation, and the poor groves of peaches at 4—5000 ft., and this on the eastern exposure, which is a good deal the sunniest, and at the average level to which agriculture reaches in Sikkim. Both in Bhootan and in E. Nepal cultivation is carried much higher, the more flourishing salt trade, and probably easier nature of the passes, favoring the formation of fixed habitations much nearer to the perpetual snow than in Sikkim, where the enormous mass of Kunchinjing, intrudes its snows considerably south of the main range, and forbids cultivation within upwards of fifteen miles from its summit, in any direction. The uniform clothing of the forest too allows of no pasturage.

Above Simonborg the path to Tonglo top is little frequented, and chiefly as one of the many routes between Nepal and Sikkim which cross the Singalelah spur of Kunchinjing, at various elevations, generally less as they are remote from the Himalaya crest, and varying from 6000 to 7000 ft. As usual, the track runs along ridges wherever these are to be found, very steep, and narrow to the top; through deep humid forests of oak, and *Magnoliaceæ*, many *Lauri*; both *Tetrathera* and *Cinnamomum*, one species of the latter ascending to 8500 ft., and of *Tetranthera* to 9000. Chesnut and Walnut here appeared, with *Elæocarpus*, and some leguminous trees, which however did not ascend to 6000 ft. Scarlet flowers of *Vaccinium serpens* strewed about, an epiphytical species, and above these the great blossoms of a *Rhododendron* and *Magnolia* lay together on the ground. The *Rhododendron**

* A drawing and description of this are preparing for publication in England under the name of *R. Dalhousiæ*.

is a beautiful epiphytcal species, growing on the larger oak limbs, and bears clusters of 6—8 flowers of greater dimensions than any known species; these are pure white and deliciously scented of lemon. This *Magnolia* forms a large tree very densely foliaged, the leaves a deep shining green. Most of the flowers drop unexpanded from the tree, and have a very sweet aromatic smell; they are as large as the human fist, the outer sepals purple, the inner pure white. Ovaria collected into an ovate, acute, very short, dense head. It may be the *Liriodendron litifera*, Wild. (Rox. 2, p. 654). The fruit differs from either *Magnolia* or *Michelia*, and I need not say equally so from *Liriodendron*. In every flower I picked up, there was either a coleopterous grub, or lamellicorn beetle, in the centre of the receptacle.

Heavy rain came on at 3 P. M. obliging us to take insufficient shelter under the trees, and finally to seek the nearest camping ground. For this purpose we ascended to a spring, called Sinasibong, at an elevation of 6000 ft. The narrowness of the ridge prevented our pitching the tent, small as it was, but the Lepchas rapidly constructed a house, and thatched it with bamboo and broad leaves of the wild plantain. A table was then raised in the middle, of 4 uprights and as many cross pieces of wood, lashed with strips of bamboo. Across this pieces of bamboo were laid, ingeniously flattened by taking lengths, crimping the cylinders all round, and then cutting it down one side, so that it opens into a flat slab, several inches across. Similar but longer and lower erections, one on each side the table, formed couch, bed or chair; and in one short hour, half a dozen men, with only the long knife and active hands, had fitted us with a tolerably water-tight furnished house. A thick flooring of bamboo leaves keeps the feet dry, and a screen of these and other foliage all round, renders the habitation tolerably warm.

It is at a little below this elevation, 3—5000 ft., that great scandent trees of the forests, enveloping trunks of others wholly or twisting round them, strangle the greatest of these, which decaying from out their folds, leave the reticulated sheath of climbers, as one of the most remarkable vegetable phenomenon of these mountains. Such belong to several orders, and may roughly be classified in two groups, 1. those which merely twine, and by constructing certain parts of their support, produce death; 2. those which form a reticulated mass or network round the trunk, by the coalescence of their lateral branches and rootlets, &c.

These wholly envelope and often conceal the tree they enclose, whose leafy bowers then appear aloft far above those of its future destroyer. To the first of these groups belong many natural orders, of which the most prominent are *Leguminosæ* (*Bauhinia*, *Cæsalpinia*, *Dalbergia*, *Galedupa*, *Butea*, *Robinia*, *Mimosa*). Vines, *Pothos*, *Bignoniaceæ*, *Menispermaceæ*, *Malpighiaceæ*, and a few other natural orders. The inosculating branched ones are almost all figs.

At night the Lepchas sit late chatting round the fire, wretchedly housed, miserably clad, and very insufficiently fed. A more thoroughly happy people it would be difficult to find any where; they very rarely quarrel amongst themselves, and their disposition is singularly cheerful and lively. The flute is their favorite and only musical instrument; it is of bamboo, has only 4 equi-distant holes, situated far below the mouth-hole, which again is remote from the butt end of the instrument. It is very difficult to sound, the tone low and sweet. I have often listened with real pleasure to the simple music of this rude wind instrument; its voice is singularly æolian, as are the airs usually played, which fall by octaves; it seems to harmonize with the solitude of their primæval forests.

A thermometer sunk 2 feet 4 inches in the deep vegetable mould and clay, fell to 62°, and stood at 61.7 on the following morning.

Except for the occasional hooting of an owl, the night was profoundly still for several hours, after dark, it being too early in the season for the Cicadas. A dense mist shrouded every thing and the rain pattered on the leaves of our hut. At midnight a tree frog broke into the stillness with his curious metallic clack, and others quickly taking up the burthen, they kept up their strange intercourse till morning. This is called the "Simook" (Lepcha), and like so many Butrachians, has a voice less like that of an animal, than any organized creature I know. The cries of beasts, birds and insects are all more explicable to our senses, and we can recognize most of them as belonging to such or such an order of animalia. But the voices of many frogs are like nothing else, and allied species utter noises which betray no affinity between them. In some, as this, it is the sound of the concussion of metals, in others of the ringing of steel or brass, any thing but the natural effects of lungs, larynx and muscles.*

* A very common Tasmanian species, utters a sound that appears to ring in an underground vaulted chamber beneath the feet.

May 21st.—Early this morning we proceeded upwards, our prospects more gloomy than ever. The road, still carried up steep ridges, is very slippery, owing to the rain upon the clayey soil, and only passable from the hold afforded by interlacing roots of trees. At 8000 feet some enormous detached masses of micaceous gneiss rise abruptly from the ridge; these are covered with mosses, ferns, *Cyrtandrea* and *Begonia* and creeping *Urticeæ*. Such masses occur on all the sharp ridges, and at all elevations, they project awkwardly through the soil, and are strangely confused and distorted in the stratification, down even to the ultimate lamination of the mica, felspar and quartz. They are split and never in situ, generally strangely shattered, and are evidently not the mere exposed top of any continuous rock forming the nucleus of the mountain. The invariably sloping faces of these hills and spurs, never broken into precipices, and never presenting flats or table-lands, are signs of their internal composition being a shattered mass. A uniformly dipping stratified rock of any extent would, if raised at the angle of the slopes of these hills, present a precipitous face somewhere; but the ranges of 4—8000 ft., ramify and inosculate in all imaginable directions, without presenting a bold face any where near Darjiling. The road cuttings from the plains to the Sanatarium, as well as the landslips, reveal highly inclined continuous strata, all variously distorted and much dislocated, but these are only at the foot of the hills. Above 4000 ft. all appears a strangely piled mass of gneiss rocks, with no uniformity of dip. Amongst these the red clay lies deeper or shallower as the masses are so disposed as to retain it or otherwise.

These rocks are sealed by the roots of trees, and from their summit (7000 ft.) a good view of the surrounding vegetation is seen. The mass of the forest is formed of (1) oak, 3 species of which, *q. annulata?* with immense lamellated acorns, and leaves sometimes 16 inches long, is the noblest in stature and the most abundant. (2) Chestnut. (3) *Laurineæ*, of several species, beautiful forest trees, straight-holed and umbrageous above, chiefly *Tetranthera* and *Cinnamomum*. (4) *Magnoliaceæ*, three species of *Michelia*. Other trees are *Pyries*, *Saurauja*, both an erect and climbing species, *Olea*, Cherry, Birch, Alder, Maple, (*Acer*), *Hydrangea*, and one species of Fig, Holly, several *Araliaceous* trees, *Sambucus* arborescent *Rhododendrons* commence here with the *R. arboreum*, which only occurs at one spot near Darjiling, (Mr.

Hodgson's grounds on Jillapahar, 7500 ft.,) *Helwingia** and brambles are the prevalent shrubs. Ferns are not fully expanded yet, and the tree ferns upper limit is passed. This is the region of pendulous mosses, lichens, and many herbaceous plants; of which latter, except *Arums*, few had yet appeared above ground.

The pendulous mosses are chiefly species of *Hypnum*, *Nerkena*, &c. the Lichens, *Borrera* and *Usnea*. Of *Arums*, a *Speciosum* particularly effects this level, with some green spotted compound leaved kinds, and the small *Remusatia (vivipara)* on the rocks and trunks of trees. Neither *Pothus (Scindapsus) officinalis, decursiva*,† nor *Scandens* are found higher up the mountain; *Arum curvatum*, Roxb., and several species of *Arisama* are very frequent. *Calla*, *Colocaria* and *Lasia* are confined to lower levels.

Peppers reach this elevation, but no higher, whilst very prevalent shrubs are *Adamia cyanea*, *Pittoporum*; *Eurya* and *Cumellia* in drier places. *Hypericum japonicum*? Some species of *Vitis* ascend thus far, and several *Cucurbitaceæ*, *Zanthoxylon* and *Sapindaceæ*. Still ascending along very slippery paths, a considerable change is found in the vegetation of the following thousand feet, from 8000 to 9000. In the forest trees, by two gigantic species of *Magnolia*, replacing the *Michelias*, and just past flowering. The *Quercus annulata* is less abundant. Chesnut disappears, with several *Lauri*; other kinds of Maple are seen, and the *Rhododendron arboreum* is replaced by a much larger species, with capitula of very large white flowers and magnificent foliage, 16 inches long. *Corneæ*, *Viburnum*, and *Lonicera* are frequent, with two or three *Hydrangeas*; many *Laurinæ* and some new oaks.

Helwingia is still more abundant as a bush, with climbing and shrubby *Smilacineæ*, epiphytical and other *Vaccinia* and *Qualtherie Stauntonia* forms a handsome climber, with beautiful pendent clusters of lilac blossoms. The *Arabaceæ* are chiefly scandent species, and

* A new species of this most remarkable genus, which I propose naming after M. Decaisne, the able describer of the natural order, which hitherto included but one species, a native of Japan. The natural order, whose place in the domain has been considered doubtful, I regard as next to *Araliaceæ*.

† The juice of this is used by Lepchas and Botheas for fixing the poison, and other plants, on to their arrow-heads. It is said of the poison.

herbaceous, as *pseudo-ginseng*. *Symplocas*, *Limonia* and *Celastrus* are common shrubs, and small trees. *Cipus capreolata* clothes the trees up to this height. I have not observed *Cyrtandraceæ* or *Begonias* to ascend higher than this.

At 9000 ft. we arrived on a long flat spur or shelf of the mountain, covered with lofty trees, and a dense jungle of small bamboo. *Magnolias* here formed the majority of the trees, with a few oaks, (*annulata* very rare). Great *Pyri* and two other species of *Rhododendron*, both attaining the height of 30 to 40 feet, *R. barbatum*, Wall., and *R. arboreum*, Wall., var. *roseum*, D., *C. Kadsura* and scandent *Arabaceæ* and a *Sauraja* climb the loftiest trees: *Stauntonia* crawls round their base, or over lower bushes. *Limonia* is the common shrub and *Symplocos*. A beautiful orchidæous plant, with pale purple flowers (*Coslogyre Wallichii*?) grows on the trunks of all the great trees, and perhaps attains a greater elevation than any other epiphytical species, for I have seen it at 10,000 ft. A very large, broadly cucullate spathe *Arisama*, first appears at 8000 ft. and is abundant thence to the top of the mountain, where smaller kinds also abound at 10,000 ft.

It is to be remarked that *Leguminosæ* nowhere appears in Sikkim above 6000 ft. except the *Parochetus communis*, which however I did not see on this ascent. This total absence of one of the largest and most ubiquitous natural orders, through 4000 ft. of elevation, is most remarkable, and characterizes the whole Himalayan range of Sikkim. I know of no parallel case to this any where on the globe. In the equally humid forests of South Chili and Fuegia, the order is extremely rare, but species do exist, and the whole flora of those countries is much poorer than this, in numbers of plants. Grasses also are extremely scarce, anywhere above 4000 ft. and below 10,000 ft., always excepting the ubiquitous bamboos, which by their giant dimensions may fancifully be supposed to compensate the want of many herbaceous species: or it may perhaps be stated better thus:—where the proportion of trees is very great, both in number, species and individuals, arboreous grasses replace the herbaceous species of less jungly regions.

A loathsome tic infests the small bamboo, and a more hateful insect I never encountered. The traveller cannot avoid these coming on his person (sometimes in great numbers) as he brushes through the forest. They are often as large as the little finger nail, get inside one's dress

and inserts the proboscis deeply without pain. Buried head and shoulders, and retained by a barbed lancet, it is only to be extracted by main force, which is very painful. I have devised many tortures, mechanical and chemical, to induce these disgusting intruders to withdraw the proboscis, but in vain.

Leeches* swarm at below 7000 feet, a small black species above 3000, a large yellow brown solitary one below that. They are troublesome, but cause no irritation. In August and September these absolutely swarm, and are no less troublesome to man than to the feet of ponies.

The rain continuing heavily, we rested the men by some large pools on the flat. A small *Lobelia*, *Chrysosplenium*, *Procris*, and *Callitriche*, formed a sward on the banks, amongst which some *Ranunculus* grew (*Diffusus*, Wall, and a similar species) a large and handsome *Carex*, flourished in the water.

Ranunculus, though so common a genus literally almost everywhere else, is extremely scarce in the temperate and tropical zone of the Sikkim Himalaya; *R. scelevatus*† abounds in the plains close to the foot of the hills, but between that elevation and 10,000 feet, I have nowhere seen this or another species. Here and probably elsewhere in the Himalaya, the genus is very rare in this zone, though perhaps more abundant in the Asiatic zone above.

Cruciferae is another natural order very frequent in the temperate and mountainous regions of all the world, except the Himalaya. A variety of *Cardanime hirsuta*? is absolutely the only plant of this order, occurring wild between the plains of India and the summit of Tongl6.

* I cannot but think that the extraordinary abundance of these *Annelides* in all the grazing ground of Sikkim, may cause the death of many animals. Some marbled murrains have followed very wet seasons when the leeches swarm more than ever, and the disease in the cattle described to me by the Lepchas as in the stomach, in no way differs from what leeches would produce. It is a well known fact that these creatures have lived for days in the fauces, nares and stomachs of the human subject, causing dreadful sufferings, and death in the latter case. I have seen the cattle feeding where the leeches so abounded, that 50 or 60 were frequently together on my ankles.

† I never could satisfy myself that this most abundant gangetic plant was truly wild in India. The natives have no name for it; it especially swarms in fields of wheat, flax, mustard, &c. and along the borders of greater and smaller rivers, near or below cultivated spots.

Compositæ again are far from represented in the scale they are everywhere else. Though about Darjiling, where clearances have been effected, the amazing prevalence of *Gnaphalium* and *Anaphalis*, &c., give this an appearance of the usual abundance of *Compositæ*, these very species will be found elsewhere scarce in the temperate zone of Sikkim.

Labiata are also poorly represented, except in clearances.

As far as I can guess, this paucity of representatives of orders for which the temperature of the Sikkim Himalaya is admirably adapted, can best be attributed,—(1.) to the uniform luxuriance of the arboreous vegetation, and the absence of either precipices or naked spots of any kind. (2.) To the humid atmosphere; for some of these groups, as *Leguminosæ*, are very rare in the only temperate climates which in the respect of humidity and equability of temperature, can be compared with Sikkim, namely New Zealand and Fuegia. There, as here, *Crucifera*, *Compositæ*, *Rammeuli*, *Labiata*, and above all, *Leguminosæ* and grasses are very rare in the forest region.

Our ascent to the summit was by the bed of a watercourse, now a roaring torrent, for the rain was heavy and incessant. A small *Anagallis* (like *tenella*) and a scapeless *Primula*, grew by its banks, also some smaller *Carices*, and an *Androsace*. The top of the mountain is another flat ridge, with depressions and broad pools or small lakes, in which grew an *Iris*. A square platform (raised by the Surveyor General, whose party were the only Europeans who had previously to ourselves visited this mountain) and which had been cleared from jungle, only the 8 months before, was already fast getting choked with bamboo and various trees.

Upon the very top, though only 500 feet or so above the flat, the number of additional species was great, and all betokening a rapid approach to the alpine or arctic region of the Himalaya, though large forest trees still abounded. In order of prevalence the trees are *Rhododendrons* of 4 species. (1) *R. arboreum*, var. *roseum*,* which covered the ground as large bushy trees, 40 ft. high. These ramify from the ground, the lower branches being low and patent, and the apices of all loaded with the superb scarlet inflorescence. (2) *R. barbatum*, a tree of nearly the same height, but not so spreading; flowers as copious and

* Leaves rusty colored underneath, and cordate at the petioli; probably a new species.

beautiful, but foliage brighter, more luxuriant and handsome. (3) *R. Falconeri*,* MSS., in point of foliage the most superb of all the Himalayan species; trunks inclined, 30 ft. high, branching but little, bark very smooth and papery. Branches naked, except at the apices, where clusters of small white flowers are borne; the corollas are 10 cleft and the stamens numerous. Leaves 18 inches long, very thick above, deep green and wrinkled underneath, covered with a rich deep chesnut-brown tomentum. Next in abundance to *Rhododendrons* are shrubs of *Limonia*, *Symplocos* and *Hydrangea*, forming small trees, but there are still a few *Magnolias*, very large *Pyri*, of three species, and Yew,† the latter 18 ft. in circumference; besides these, *Anisodus luridus*, now in flower, *Pieris*, *Andromeda*, *Olea*, *Celastrus*, *Cerasus* and *Daphne cannabina*. A white flowered rose, *R. sericea* †‡ was very abundant, growing erect, its numerous inodorous flowers pendent, apparently as a protection from the dashing rain. *Kadsura*, *Ochna*, *Stauntonia* and *Clematis acuminata*, were the prevailing climbers. I met with a cucurbitaceous plant at this great elevation, a *Smilax* and *Asclepiadaceous* genus (*Holostenura*?). A currant was common, always growing epiphytically on trunks of large trees. Two or three species of *Berberis*, and maple, I think nearly complete the list of woody plants. Amongst the herbaceous and smaller shrubby plants, were many of great interest, as a Rhubarb, *Rheum* (Webbianum?) *Aconitum palmatum*§ a very pretty species, which as well as an undescribed congener, yields the "Bikh" poison of E. Nepal, Sikkim and Bhotan. *Thalictrum*, one species. *Aconone vitifolia*, *Fumaria*, two *Viola*. *Stillaria*, *Hypericum*, *Geranium* 2 species, 2 Balsams. *Epilobium*, *Potentilla*, *Paris* (7—10,000 ft.) *Panax pseudo-ginseng*, and another species, *Meconopsis Nepalensis*, 2 species of *Gen-*

* I have now upwards of 20 distinct species of this superb genus from the Sikkim mountains alone.

† The red bark of the Yew is used as a dye and for staining the foreheads of the brahman Ghorkkas in Nepal.

‡ This is the only species of rose occurring in Sikkim below 10,000 ft.

§ Probably Bikh is yielded by various *Aconita*. The name of both the Sikkim *Aconites* is Bikh-gniong by Lepchas and Bhotheas, who do not distinguish the two species by the roots. Another, far more powerful Bikh, is yielded by a plant of the order *Compositæ*, which I have gathered abundantly at 10 and 9000 ft. and it requires care to distinguish its root from that of the *Aconites*; when mixed the Bhotheas could not separate them.

tiana and 2 *Crawfordia*, 2 *Arisaema*, *Anagallis*, *Ardrosael* and *Ajuga*, *Diaporum*, and three *Comallaria*, one with verticillate leaves, whose root is another "Bikh," and considered very virulent. *Graminia* were very few in number, but a large *Carex* covered the ground, amongst the bamboo.

Still the absence or rarity of several very large natural families at this elevation, which have numerous representatives at and much below the same level in the Western Himalaya, indicates a certain peculiarity in Sikkim. These are the following :—*Ranunculaceæ*, *Fumariæ*, *Crucifera*, *Alsinea*, *Geraniæ*, *Leguminosæ*, *Potentilla*, *Rosa*, *Epilobium*, *Crassullaceæ*, *Saxifrageæ*, *Umbellifera*, *Lonicera*, *Valerianæ*, *Dipsaceæ*, various genera of *Compositæ*, *Campanulaceæ*, *Lobeliaceæ*, *Gentianæ*, *Boraginæ*, *Scrophularinæ*, *Primulaceæ*, *Graminæ*.

All the above are genera of the north temperate and subarctic zones, which seek a much higher level in Sikkim than in the Western Himalaya or Bhotan. The difference in this respect being very much greater than the small disparity of latitude, will account for, or than any (if there be any) difference of mean temperature, for the snow line is certainly very little different here, from that of the N. W. Himalaya. On the other hand, certain tropical genera are more abundant in the temperate zone of the Sikkim mountains, and ascend much higher there, than in the Western Himalaya. Of this fact I have cited conspicuous examples in the palms, plantains and tree fern ascending to nearly 7000, and in the presence of many other orders at great elevations, figs, peppers, *Lauri*, &c.; and to these could be added many others, none more remarkable than *Balanophora*, of which there are several species above 4, and even 6000 ft. one ascending to 8000.

This ascent and prevalence of tropical species, is due to the uniform humidity and the equability of the climate in this temperate zone, and is perhaps the direct consequence of these conditions. An application of the same laws accounts for the extension of similar features (tropical) of vegetation so far beyond the tropical limit in the southern ocean; where various natural orders which do not cross the 30th and 40th parallel of N. Latitude, are extended to the 40th, 50th and 60th in Tasmania, New Zealand, the so-called Antarctic Islands south of that group; and to Cape Horn itself in Fuegia.

The forest region, encroaching so far upon, and in fact covering the

temperate zone of the Sikkim Himalaya, and the snow level not being proportionally higher, it follows that, *cæteris paribus*, the belt occupied by upland alpine and the Arctic species, is more confined, and in all probability less prolific in species than it is in the N. W. Of this the rarity of Pines (themselves indices of a severe drought in the air or soil) would appear to afford a proof; for between the level 2500, the upper limit of the *P. longifolia*, and the *Taxus*, 10,000, which also coincides with the lower limit of *Abies*, there is no coniferous tree whatever in Sikkim; except perhaps in the mountain faces immediately subtending the perpetual snow; and there they may descend 1000 ft. lower. There are only 6 species of *Coniferae*, including *Taxus* and *Juniperus* in Sikkim, of which two are not common to the N. W. mountains, and these six are by no means abundant in individuals; I shall however soon have the honor of laying before the Society, a short sketch of the limits of these, and shall therefore suppress further details here.

We encamped amongst the *Rhododendron* trees, on a spongy soil, of black vegetable matter, so oozy that it was difficult to keep dry-shod. The rain poured in torrents all the evening and thus, the calm, and wetness of the wood prevented our enjoying a fire. Except a transient view into the Nepal, a few miles west of us, nothing was to be seen, the whole mountain being wrapped in dense masses of vapor. Gusts of wind, not felt in the forest, swept over the gnarled and naked tree tops, and though the temperature was 50° this produced cold to the feelings in walking about, and exposure to it.

Our poor Lepchas were miserably off, but always happy under four posts and a bamboo-leaf thatch, and with no covering but thin single cotton garment. They crouched on the sodden turf joking with the Hindus of our party, who, though supplied with good clothing and shelter, were doleful companions.

I made a shed for my instruments under a tree; Barnes ever active and ready, floored the tent with logs of wood, and I laid a "corduroy road" of the same to my little observatory.

During the night the rain did not abate; the tent-roof bagged and leaked in torrents, so that we had to throw pieces of wax-cloth over our shoulders as we lay in bed.

May 22nd.—There is no improvement whatever in the weather. Two of the Hindus crawled into the tent during the night, with fever and

ague.* The tent being too sodden to carry, we had no choice but to remain where we were, and there being abundance of novelty within 20 yards of the tent, there was no difficulty, with such a pursuit as Botany, in getting through the day. Observing the track of sheep we sent two Lepchas on the scent, who after being absent the whole day, returned from some miles west in Nepal, with two sheep and as many lambs. The shepherds were Goorongs of Nepal, who were grazing their flocks on a grassy mountain top, from which the woods had been cleared; probably by fire. These to the Lepchas was a great boon, but the Hindus would not touch the flesh, and several more sickening during the day, we had the tent most uncomfortably full.†

Our inability to obtain a view was extremely disheartening, the mountain commanding a superb prospect. It embraces nearly 100 miles of the snowy range, from far west in Nepal, to Kunchinjinga and its five sister-peaks, varying from 20,000 to 28,000 ft., and from which an uninterrupted succession of snowy ridges sweeps round to east. The culminant points of this rise several to 21,000, and many to upwards of 18,000 ft. Chamalari, on the Thibetan plain, rears its head above the eastern amphitheatre of snows, at a distance of 80 miles. S. E. are the sub-Himalayas of Bhootan, and all between the billowy mountain masses of Sikkim. South, the eye should have ranged over the plains of India, the courses of the Teesta, the Konki, the Cosi, and the innumerable smaller streams which débouche on the plain.

During the whole of the 22nd, from 7 A. M. to 11 P. M., the Thermometer never varied 6° 5 degrees, ranging from 47.5 in the morning to 54°, its maximum, at 1 P. M., and 50.7 at night. At 7 the following morning it was the same. A Thermometer sunk 2 ft. 6 inches in deep vegetable mould and clay, maintained for two days the constant

* It is a remarkable fact, that both the natives of the plains under many circumstances, and the Lepchas, when suffering from protracted cold and wet, take fever and ague in sharp attacks. The disease is wholly unknown amongst Europeans residing above 4000 ft., similar exposure in whom, brings on rheumatism and cold, even in constitutions predisposed to the former, by repeated attacks of fevers in other climates.

† This was a most convenient hill tent, kindly lent us by Major Cromelin of Darjiling; it goes on one man's shoulders, and accommodates two persons with a little management.

temperature of 50.7. In spite of the heavy rain and fog the dew point was always below the temperature, with which I am somewhat surprized, for more drenching weather could not well be. The mean dew point was 50.3, and consequent humidity 0.973.*

These observations, and those of the Barometer, were taken some 60 feet below the summit, to which I moved the instruments on the morning of the 28th. At a much more exposed spot, the results would have differed no doubt. A Thermometer then sunk to the same depth as that below, stood at 49.7; or one degree colder than 60 ft. lower down.

The summit of Tonglo, by my Barometrical observations, taken simultaneously with those of Calcutta, gives the height 10,078.3 ft. Col. Waugh's, by Trigonometry, 10,079.4 ft., a marvellous instance of the perfection to which these instruments are brought, and above all of the accuracy of the tables† from which the altitudes are deduced. I hope shortly to have the honor of laying before the Society some proofs of the accuracy with which elevations by the Barometer may be obtained, together with some account of the most recent tables now in use, and which are no less remarkable for their comprehensiveness than simplicity.

May 23rd.—We spent a few hours of alternate fog and sunshine on the top of the mountain, vainly hoping for the most modest view. The air, which was always foggy, was alternately cooled and heated, as it blew over the trees, or the open space we occupied, sometimes varying 5° and 6° in $\frac{1}{4}$ hour. Whenever a lull occurred the fog was sensibly heated by the sun's rays.

The number of mosses, *Hepaticæ* and *Lichens*, growing near and on the summit, is very remarkable. There were various species of Ferns, and a small *Agaricus* grew on decayed twigs; Lichens infested the naked branches of the Rose, Barberry and Cherry. The trunks of both the *Rhododendrons*, owing to their smooth papery bark, and the bamboo, are remarkably free from Cryptogamic vegetation.

Having partially dried the tent in the wind, we commenced the

* As expressed by the quotient of the tension at the temperature of the dew point divided by that of the air.

† There are Bessel's Tables, translated by Col. Sabine, and published in the — number of Taylor's Scientific Memoirs.

descent, which owing to the late torrents of rain, was most fatiguing and slippery; it again commenced to drizzle at noon, nor was it till we had descended to 6000 feet, that we emerged from the region of clouds. Then I met with a species of *Balanophora*, pushing through the soil; it is a new species, monoicous, the earliest flowering of any in Sikkim, and may be distinguished from its congeners by its cyathiform involucre round the middle of the pedicel.

By dark we arrived at Simonbong, having descended 5000 feet at the rate of 1000 feet an hour, and here we were kindly received by the Lama, who gave us his temple for the accommodation of the whole party. We were surprised at this, both because the Sikkim authorities had falsely represented the Lamas as very averse to Europeans, and because he might well have hesitated, before giving ingress to a promiscuous horde of some 30 people, into a sacred building, when the little valuables on the altar, &c. were quite at our disposal. He made but one request, that the Hindus should not smoke their hookahs inside.

Simonbong is one of the smallest and poorest Gumpas (or monasteries) in Sikkim,* unlike the better class, it is built of wooden beams only, and has no monuments, except the Chaitis mentioned on our way up the mountain. It consists of one large room, with small sliding shutter-windows, raised on a stone foundation, and roofed with shingles of wood; opposite the door, which is at one end, (the east,) the altar is placed, of wood, chequered with black white and red diagonally; to the right and left are shelves with a few MS. books, wrapped in silk; a model of Symbonath at Nepal, in wood; a praying cylinder, and some implements for common purposes, bags of Juniper, &c. On the shelves are English wine bottles and glasses, with tufts of *Abies Webbiana*, *Rhododendrons* and peacocks' feathers.

On the altar seven little brass cups are ranged, full of water; a large shell carved with the sacred lotus; a brass jug from Lhasa, of beautiful

* There are upwards of 20 Lama establishments in Sikkim, numbering 800 monks. Many of these are of excellent masonry, Chinese in architecture, gorgeously decorated, and for so poor a country, richly endowed. During my more recent travels in Sikkim I have visited many, been an inmate in the monasteries, and met with the greatest kindness and hospitality from the good fathers. As the first European who has ever lived with the monks, this was the less to be expected. Dr. Campbell, who afterwards joined me, and whose delightful society I visited others, records the same opinion of these good-humored people.

design, and a human thigh bone, hollow and perforated through both condyles. The shelves above contained various trifles, clay ornaments and offerings, and little Hindu idols brought from the Hurdwar fair.

Facing the altar is a bench and chair, and on one side a huge tambourine, with two carved iron drum sticks. The bench was full of mysterious implements, bells handsomely carved with idols, censers with juniper ashes, the dorge which the priest holds in his hand during service, and various water vessels; on the stool or chair was a large platter, with a brass egg-cup inserted in it.

Of these the human thigh-bone is by much the most curious; it is very often that of a Lama, and the longer they are the more value is put upon them. As however the Sikkim Lamas are burned, these relics are generally procured from Thibet, where the corpses are said to be cut in pieces and thrown to the kites, or into the water.

The Lama was consecrated at Chungachelling, one of the oldest Sikkim convents (three centuries) and unfortunately was not an educated or intelligent fellow.

Two boys usually reside in the temple, and their beds were given up to us, which being only rough planks laid on the floor, proved clean in one sense; but contrasted badly with the springy couch of bamboo the Lepcha makes in your tent, and which renders carrying a matress or aught but blankets superfluous.

May 24th.—We were awakened this morning by the discordant orisons of the Lama, these commenced at sunrise by the boys coming in and beating the great tambourine close to our ears for several minutes; then blowing the conch shells, and finally the thigh-bone, each as long. Shortly the Lama entered, clad in scarlet, shorn and barefooted, with a small red silk cap. He walked along, slowly muttering and groaning his prayer to the end of the apartment, whence he took a small red bag in which were a brass bell and dorge. Sitting down he commenced matins before the chair with the brass cup, which he filled with water and placed again in the platter,—took off his beads and continued counting them or beating the bell, uttering most dismal prayers in a very deprecatory tone, of which “*Maliva oh Maliva,*” was the burthen. After various disposals of the water-jugs, cups and platter, which were filled and refilled, rice added and sprinkled about,—a large bell was violently rung for some minutes, himself snapping his fingers and uttering most

unearthly sounds. Having put away those instruments, incense was brought, of charcoal with juniper sprigs. This was muffled about, and put through many evolutions, and finally, with the water, thrown out of the window, when to our great relief the morning service was concluded, for the noises were quite intolerable.

After breakfast the Lama came to visit us, bringing rice, a few vegetables, and a large basket of fermented Murwa; the latter is invariably given to the traveller, either in the state of the fermented grain, or more commonly in a bamboo jug filled right up with warm water and grain; the fluid sucked through a reed is a refreshing drink.

A species of *Ptris* at Simonbong (which is very common elsewhere in Sikkim,) attains a height of 14 feet, as great as I ever remember having seen itself or congeners in New Zealand.

Leaving Simonbong, we descended to the little Rungeet, and crossed it lower down than before, thus avoiding some troublesome spurs; the heat of the valleys is very great, 80° at noon, and of the stream 69°; the latter an agreeable temperature for the coolies, who plunged teeming with perspiration into the water, catching fish with their hands.

We reached Darjiling late in the evening, and again drenched with rain, our people, Hindus and Lepchas, imprudently tarried for the night in the valleys below. Owing probably as much to the great exposure they had lately gone through and the sudden transition from a mean temperature of 50° in a bracing wind, to a hot close jungly valley at 75°, no less than seven were laid up with fever and ague.

Few excursions from Darjiling can, for their length, give a better idea of the general features and rich luxuriance of the Sikkim sub-Himalaya than one to Tonglo. I was amply rewarded, and my ever cheerful and active companion, pronounced himself so too, though we both had fully expected better weather, and some, however transient or confined, a prospect. It is always interesting to roam with an aboriginal, and especially a mountain people, though their thinly inhabited valleys, over these grand mountains, and to dwell alone with them in these forests, however gloomy and forbidding. No thinking man can do so without learning much, though slender be the resources at his command for communion. A more interesting and attractive companion in this respect than the Lepcha, I never lived with; cheerful, kind and patient with a master he is attached to: rude but not savage, ignorant

and yet intelligent ; with the simple resource of a plain knife, he makes his house and furnishes your's, with a speed, alacrity and ingenuity that steals away that well known long hour, when the weary pilgrim frets for his couch. In all my dealings with them they have proved scrupulously honest. Except for drunkenness and carelessness, I never had to complain of any of the merry troop, some of whom, bare-headed and bare-legged, with *absolutely* nothing but a cotton garment and long knife, followed me for 3 months (on a recent occasion, from the scorching plains to the everlasting snows ;) ever foremost in the forest or bleak mountain, and ever ready to help, to carry, to encamp, collect, or cook, they cheer on the traveller by their unostentatious zeal in his service ; and are spurs to his progress, for who would not go forwards where such followers are behind.

*The Polecat of Tibet, n. s. By B. H. HODGSON, Esq.
With a Plate.*

Every addition to the Mammalogy of Tibet is of high interest from the light it is calculated to reflect upon those very subtly varying circumstances which determine parity of climate in relation to organic development and distribution ; and I have therefore much satisfaction in presenting to the Society the following description of a new species of Weasel, bearing nearly the same remarkable resemblance to the ordinary Polecat of England as do the Raven, Magpie, Chough and Nutcracker of Tibet to those of our own country. Ere long, when the results of the recent scientific expedition to Gnári shall have been placed before the public, the mean elevation and temperature, the moisture and the soil of the Western Province of the great transnivean plateau will, it is hoped, no longer remain matters of speculation and doubt. But we possess not, nor have any prospect of soon obtaining, similar data in reference to the central province of Utsáng, or to the eastern province of Khám. Humboldt has, indeed, assigned 10,000 French feet for the