## Notes upon some Atmospherical Phenomena observed at Darjiling in the Himalayah $\operatorname{Hyountains,~during~the~summer~of~1852.-By~Captain~}$ Walter Stanhope Sherwile, Revenue Surveyor.

The Sanatarium of Darjiling situated in the lower Himalayah Mountains, at an eleration of 7,126 feet abore the sea, and distant from the perpetual snow thirts-five miles, affords both from its elevation and from its proximity to the vast masses of perpetual snow and glaciers, a favourable position for obserring several very beautiful phenomena that occur at all seasons of the year; added to which I may mention, that the full force of the South West monsoon is felt in these mountains. The monsoon blowing over the Indian Oceau and Bay of Bengal arrives at these mountains, three hundred and serenty miles from the sea, loaded with moisture, and loaded to such an extent as to precipitate, yearly, one hundred and thirty-six inches of rain. Much of this moisture is retained by the soil and forests covering the mountains, which assists in forming the phenomena now under consideration, and which may be divided into three classes.
Firstly; those that are caused by great cold and depend upon minute crystals of aerrially suspended ice for their prismatic colours.

Secondly; those that are dependent upon moisture for their prismatic colours, produced by the refraction of light in passing through clouds, fogs or mist.

Thirdly; those phenomena that are caused by cold and sudden blasts of wind rushing from the snows, which meeting the warmer air of the valleys, or the hot streams of air that rise from the plains of Bengal, serve to form clouds by condensation.

Of the first named class of phenomena I observed but two; the first was observed on the 21st May, 1852, at seven in the morning, the air was pure and bracing, Thermometer $55^{\circ}$ in the shade; the sky to the East was corered with a dappled and streaked mass of cirro-cumuli and cirro-stratus, at a probable height of 20,000 feet. Upon this true "mackarel sky" was depicted one of those glorious coronæ, only seen at great elevations or in high Latitudes.
The weather at Darjiling had been for the whole previous fort-
night a succession of heary showers, fogs and bad weather, but the morning of the 21st was the commencement of a bright sunny day; the power of the sun, when that luminary was at an elevation (calculated) of $17^{\circ} 34^{\prime}$ was considerably dimmed, shining with a pale subdued light through the frozen mass of clouds in front of it ; around the sun appeared a magnificent corona with a diameter of about $47^{\circ}$ and nearly a complete circle Vide Plate II.; $300^{\circ}$ of the circle being visible, the remaining $60^{\circ}$ being occupied by a gap where the corona appeared resting on the summits and sides of the Eastern snowy range, down whose slopes the ends of the corona dissolred and lost themselves. The corona was composed of two colours, violet on the edge nearest to the sun and red on the outer edge, the tro colours blending together and forming a neutral tint in the middle of the corona; the order here obserred with regard to the colours is similar to that observed in the rainbow.

The true sun was flanked on either side at the distance of 1145 by a parhelion or mock sun of a pale unrefracted light, at an equal altitude with the true sun, each parhelion forming the head of a segment of a circle with a radius of $23^{\circ} 30^{\prime}$; the segments of the circles attached to the parhelia hung as graceful curring fringed appendages, converging to a point below the true sun. The parhelia were equal in size to the true sun, and were equi-distant from the corona and true sun. Above the true sun was a segment of another circle with a diameter of $47^{\circ}$ and distant about $11^{\circ}$ from the true sun, the concave side or the side away from the sun, was beautifully fringed with prismatic and violet-coloured rays or tongues of moving light, the sharp extremities of the moving rays pointing and flickering upwards.

The main corona from its great size presented a magnificent object, and its prismatic colours were most brilliant, almost as brilliant as the colours of the true rainbow; contrary to the custom of rainbows which places the spectator between the bow and the sun, and which enables the spectator to gaze upon this beautiful object in the heavens with undazzled eyes, his back being turned toward the sun-the corona and parhelia are always between the sun and spectator and thus from the glare of the sun, much of their beauty is lost.


Mariotte, Arago, Herschell and others have referred the appearance of corona or halos to the refraction and reflection of minute crystals of ice, floating in the atmosphere.

This grand picture lasted about a quarter of an hour and was succeeded by heary rain at Darjiling, and a fall of snow upon the higher and neighbouring peaks.

In the next phenomenon witnessed, a totally different arrangement of colours to the last, consequent upon the refrangibility of light when passing through a bank of frozen clouds was observed.

On the 21st September, 18j2, at 6-45 A. 3. Thermometer 620. The heavens to the East rere overspread with fleecy cirro-cumuli at an elevation of fire miles; beneath the cirro small, light and transparent cumuli occupied a lower region at a probable eleration of 10,000 feet. Upon the frozen clouds above and a little to the South of the suc, there was projected a portion of an are whose radius might be $85^{\circ}$ of the most brilliant and vivid colours, the edge away from the sun being yellow, and the edge nearest to the sun red; the intermediate space being occupied by a combination of all the prismatic colours, not a perfect amalgamation of the colours, otherwise the colour would have been white, but small particles of each colour appeared sparkling and warering like the colours seen upon the inside of a pearl oyster shell.

At the lower end of the main segment, a distorted but very brilliant corona, was joined to it at an angle of $35^{\circ}$. This latter corona was about one-half the width of the larger segment, but much longer and with a similar arrangement of colours. Its shape, which resembled an $S$, threaded its way amongst a series of light flying cumuli until it disappeared amongst the small cirro-cumuli of the back ground.

A light easterly wind was blowing at the time with a drifting scud below the cumuli which occasionally obscured portions of the brightly-coloured coronm. The two coronæ had a gentle motion towards the South.

The group was seen between the sun and spectator, and lasted twenty-fire minutes.

The planet Venus shone brightly the whole time between the tro coron¥.

As before remarked, the two phenomena just described were seen between the spectator and the sun, the spectator haring his face turned torards the sun, and that they owed their brilliant prismatio colours to light refracted by small spicule of ice floating in the atmosphere; those now about to be described, on the contrary, were seen when the spectator ras between the sun and the phenomena; and with the back turned towards the sun; and further they owe their prismatic colours to the refraction of light, falling upon minute resicles of water containing air suspended in fogs; they are in fact Fog-bovs and all those seen by me were seen early in the morning when the sun was $12^{\circ}$ to $15^{\circ}$ abore the horizon.
The spectator must be placed betreen the sun and a fog; turning his face towards the fog he will see his figure reflected upon the opposite cloud, surrounded by a succession of concentric circles of brilliant colours, refracted by the watery particles of the fog; and following the order of the colours as seen in the rainbow. (Vide Plate III.)

A line drawn from the sun through the spectator's head to the common centre of the circles is a straight line.
The general appearance of a very perfect fog-bow, is as follows; by which it will be seen, that some of the colours of the prism are wanting, or taking violet or the upper colour of the solar spectrum as 1 , numbers, $2,3,4$ and 6 , are wanting. The spectator sees his figure about thirty yards in front of him, surrounded by a disc of a greyish, or pinkish neutral tint, with a diameter equal to his own height, but with the head exactly in the centre ; beyond this central disc which is edged on the outer circle with a pale violet, appear the following circles of colour, viz. violet, yellow, orange, their width bearing the correct proportion as ascertained by the prism, viz. the violet eighty parts; yellow forty; orange twenty-seven; the three circles occupy three semi-diameters of the central disc ; beyond this first series of circles another series is risible, observing the following arrangement of colours ; violet, green, yellow, orange ; the circles being much broader than those in the first series, the brilliancy of their colours much fainter and rather confused. Beyond this second series of colours a colourless or white bow is sometimes seen with a radius equal to six semi-diameters of the inner or first series of colours, viz. from the centre of the disc where the spectator's head is reflected, to the exterior of the first orange colour.

Depending from the shoulders of the spectator is a dark neutral tinted pyramidal shade, resembling a flowing garment, occupying about $72^{\circ}$ of the central disc.

From the outside rim of the inner yellow circle, long pencil-like rays of neutral tinted or gray colour, radiate in all directions, spreading and increasing in size in proportion to their distance from the centre, until lost in the surrounding haze.

The fog-bows with these spreading rays are rery beautiful objects, but these rays are frequently manting.

Another fog-bow commonly seen at Darjeeling, consists of the usual neutral coloured disc, one series of coucentric circles exhibiting violet, jellow, orange and blue (this latter colour it will be observed is contrary to the regular order of the prismatic colours) beyond these circles at three and half diameters of the disc, comprising the whole of the four colours is the usual unicolour bow but no radiating pencils of gray colour. Depending from the shoulders of the spectator is the constant garment-like appendage. The figure reflected upon the fog, follows all the motions of the spectator, who, is the accompanying sketch is represented with his hat in his right hand, whilst the left hand is raised above his head.

For the sake of easy reference I append the colours of the solar spectrum, together with their values as ascertained by Sir Isaac Newton; also the order of the colours of the ordinary rainbow.

Order of the colours as shern when refracted by the prism:

| 1. Violet, ........ 80 |  | 5. Yellow, ...... 40 |
| :---: | :---: | :---: |
| 2. Indigo,........ 48 | In the rainbor, | 6. Orange, ...... 27 |
| 3. Blue, ..... ... 60 | violet is nearest to | 7. Red, ......... 45 |
| 4. Green, ........ 60 | the sun. |  |
|  |  | Total length, 360 |

and red furthermost from the sun.
The upper rainbow from being produced by two reflections and two refractions of light, has its colours reversed.

Another, but transient and hurried, phenomenon of the second class is sometimes observed by a spectator, when he is standing with his back to the sun and looking down from a height upon a bank of snow-white cumuli, upon which the rising or very early sun is shining.

The bank of cloud becomes suffused with a shining opalescent light, too delicate to be described either by words or by colours; mingled with this opalescent tinge, distinct prismatic streaks or bands are observed following the order of the prismatic colours as arranged in the rainbor, but only displaying the three primary colours, viz. blue, yellow and red, which are repeated over and over again in succession.

The finest bank of this description I ever sair, was upon the 0th August, 1852; when standing upon the Singaleelah range at an eleration of 12,000 feet above the sea, I looked down upon a bank of snow-white cumuli that were about 5,500 feet below me, in the Nepal Territory. The Thermometer stood at 58 . These appearances so soft and delicate, last but a few minutes and then disappear.

It is an ariom in optics that a rainbor cannot be seen unless rain is falling between the spectator and that part of the sky which is opposite to the sun; the following description of a rainbow seen by me requires more explanation than $I$ am capable of giving to it, to account for its appearance and anomalous position.

Upon the 25 th September, 1852, at 2 p. M. Ther. $68^{\circ}$ whilst standing at an elevation of 7,165 feet above the sea, the heavens partly overcast by heary cumuli, and looking down in a North Easterly direction into one of the deep valleys, I perceived at 3,000 feet below me and two miles distant, a magnificent rainbow following for about one mile the exact wary outline of the crest of a sloping mountain; the colours being, a very brilliant riolet nearest the spectator, and then a dark and very vivid green, then yellow, red, then yellow; and upon the next mountain another red was shown; the trees in the forest, the Native clearances and their houses were all seen bathed in these vivid colours, but there was no apparent rain falling, only a brightly transparent mass of cumuli was passing over the sun, which obscured my position, whilst the bow and the mountain upon which it was projected were in bright sunshine.

The colours of the bow were far more brilliant than those seen in the brightest usual rainbow.

## Phenomena of the Third Class.

The 29th May, 1852, was a warm, dry summer day and had been highly favourable to evaporation and, though incisible to the eye, the air was charged with moisture which suddenly showed itself in an extraordinary manner as a huge cumulus, fifteen miles in length at an elevation of 11,000 feet, which was rapidly formed by condensation of the inrisible rapour caused by a chilled stream of air descending from the snorry-range distant thirtr-fire miles; the effects of this cold blast was first shown in the formation of a cumulus which rapidly formed, until as abore described, it extended to fifteen miles in length and about 5,000 feet in thickness. This fine body of vapour was driven rapidly to the South, and as it approached the mountain Tonglo which rises to 10,009 feet above the sea, the lower portion of the cumulus, which had hitherto been stratus or nearly horizontal, began throwing down about twenty water-spoutlike looking tails about one thousand feet in length each; which gyrated at a rapid pace increasing in length at the same time, until the whole cloud burst into heavy rain. The distance of the Tonglo mountain from the spot of observation was eleven and half miles, therefore the gyration of the tails must have been very rapid to have enabled me to see it with the naked eye.

The attraction of this cloud by the mountain must be referred either to electric causes, which caused the cloud to condense into moisture; or else that the cloud had entered a cooler atmosphere near the mountain than it had been travelling in before it reached the mountain. Tonglo. Snow lies in patches in May near Tonglo (I have seen it in large patches on the 12th May) which of itself is enough to condense any cumulus, hearily laden with moisture.
That there was some attraction is beyond a doubt, as the tails one mile North and South of the central mass of tails descended at an angle of $45^{\circ}$ with the horizon, and all seemed striving to reach the very summit of the mountain, upon which they all burst upon contact taking place.

The following rapid and consecutive formation and dispersion of clouds I have frequently observed during the summer months, when the sun, pouring dorn its almost perpendicular rays-Darjiling stands in North Latitude $270^{\circ}$-into the deep valleys, causes a rapid
ascent of heated air, and as rapid a descent of cold air to supply its place. Standing at an elevation of 7,000 feet and looking down into the valleys at the foot of the Goong range, South of Darjiling, small patches of clouds are seen to form at an elevation of about 3,000 feet, which rith great rapidity rush up the side of the mountains, increasing in size at every hundred feet from the rapid condensation of the heated rapoury particles as they meet rith a colder medium ; upon reaching the summit of the lofty Goong range a mountain 7,400 feet in height and encountering a cold Southern blast from the upper regions of the atmosphere, they are again dragged down into the ralley by this stream of air and at the same rapid pace they had ascended rith; but decreasing in size until at an eleration of 2,000 feet ther again disappear, then water particles re-expanding into an invisible vapour. I hare seen this wild race of clouds kept up for hours until the sun sinking in the West and depriving the ralleys of their heat put an end to this lively scene.
Looking down from Darjiling into the deep and capacious ralley of the Rungeet rirer, the following beautiful appearance may generally be seen during the early mornings of the spring and summer. The valler, from the source of the great Rungeet to its junction with the Teesta river a distance of fifty miles, may be seen filled to the height of 2,000 feet with a heary dense and snow-white mass of cumulus, resembling the softest and fairest carded cotton; the upper surface of the cloud upon which the spectator gazes is broken into a thousand softly outlined and rounded masses of cumuli. The whole mass has a gentle motion with the stream of the Rungeet.

This phenomenon is caused by the cold from the water descending from the snows and glaciers condensing the warmer vapour at the bottom of the valley.
The sun's appearance and warmth is the signal for the dispersion of this very beautiful object.
The last phenomenon that I shall notice, is one that from its singular appearance has given rise to the idea that Kunchinjinga, the highest measured mountain in the world, and which rises to the height of 28,177 feet above the sea, is a volcano.


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Upon any fine summer day when the heavens are pretty free from clouds a long and white smoke-like horizontal cloud is seen ex: tending for several thousand feet from the immediate summit of Kunchiujinga ; generally in a North Easterly direction; as this cloud is never seen on both sides of the peak at the same time, and as the cloud has a risible motion to the north-east, and as it appears to rise out of the crater-like face of the mountain, it certainly has all the appearance of a continued supply of white sulphureous smoke being emitted from the peak.
It may be explained as follows ; a current of air passing over the warm rallers of Nepal is driven up the face of the snory range, a portion of this current of warm air as it passes over the summit of Kunchinjinga is condensed by the bitter cold air on its nurth-eastern or Tibetan face and thus brought into sight.
An Indigo-planter, who had lived for forty years in the pluins and in sight of Kunchinjinga, declared, that nothing would convince him that the mountain was not an active volcano.

Note on two Inseriptions at Khunniara in the Kangra district.-By E. C. Bather, Esq. C: S.

The two inscriptions, of which rubbings have been already forwarded, and of which copies by hand are now sent, are cut on two large grauite boulders about thirty yards apart, near the village of Khumniara-pergunnah Rehloo, zillah Kangra.
They are situated in a field about half way between the village itself and the station of Dhurmsala on the edge of the high bank of a mountain torrent, which issues from the lofty Dhurmsala range about half a mile to the north-east.
They are so clearly cut that there can be little doubt as to the reading of either, one being simply-
"Krishnayasasa arama," in Arian Pali, (Plate I. No. 1) the other-
"Krishnayasasya áráma médangisya." (Plate I. No. 2.)
No. 2, which is in the square Indian character, has two additional symbols at its termination, one is the mere "swastika," the other,

