

Memorandum on the Survey of Kashmir in progress under Captain T. G. MONTGOMERIE, Bengal Engineers, F. R. G. S. and the Topographical Map of the Valley and surrounding Mountains, with chart of the Triangulation of the same executed in the Field Office and under the Superintendence of Lt.-Colonel A. SCOTT WAUGH, F. R. S. F. R. G. S. Surveyor General of India, Dehra Dhoon, May 1859. Read at a Meeting of the Asiatic Society on the 6th of July, 1859. By Major H. L. THULLIER, F. R. G. S. Deputy Surveyor General of India.

In No. 263 of the Asiatic Journal for 1857 a paper was published by Lieutenant (now Captain) Montgomeris of the Bengal Engineers, 1st Assistant Great Trigonometrical Survey of India on the height of the Nanga Parbut and other snowy mountains of the Himalaya range adjacent to Kashmir; and it was therein stated that although not equal to Mount Everest (29,002 feet) still the Nanga Parbut (26,629 feet) was as much the king of the Northern Himalayas as Mount Everest is the king of the Southern Himalaya. I have now the satisfaction, through the kind consideration of my friend Colonel Waugh, of laying before the Society, the actual results of the progress of this magnificent and unparalleled survey, up to a very recent date, and the maps now presented to the view of the meeting, together with the few details I am about to read, will prove better than anything else, the value and the character of the great national work which the Surveyor General of India is now rapidly carrying out to completion—a work which I believe will bear a comparison with any geographical operation undertaken in any country with which we are acquainted.

As the operations proceed, the labours of the Surveyors are rewarded with discoveries which certainly of late years have been but of infrequent occurrence. Another stupendous mountain has been measured and fixed by Captain Montgomerie, which perhaps is second in the world only to the one above alluded to, viz. Mount Everest, as measured by Col. Waugh in 1847. A snowy peak very nearly in the ray of Skardo from Sirinagur and distant N. E. about one hundred and fifty-eight miles from that capital, on the Kara Koram

range, termed for the present K. 2, proves to be 28,278 feet above the sea level, which is 122 higher than Kanchinginga, but 724 feet lower than Mount Everest. It is impossible to say therefore what the exploration of the interesting ground in the Northern Himalayas now under survey may bring forth. The project in hand of bringing all this difficult and hitherto comparatively unknown tract of country under minute and accurate survey is a grand one. For the eastern portion already achieved, and represented by maps in the form of degree sheets on the quarter inch scale, manuscript specimens of which are laid on the table, together with one sheet No. 47 of the engraved Atlas of India, containing a portion of the same survey, Colonel Waugh has been rewarded by the Royal Geographical Society with their gold medal in 1857; and when the whole of the Himalayas from British Gurhwal to the Indus is completed, it will form a noble memorial of the undaunted skill and energy of the officer who planned, and his subordinates who executed it.

This valuable map and beautiful specimen of Topographical Drawing now exhibited in manuscript, measuring 4 ft. 1 in. \times 4 ft. 1 in. embraced between the meridians of 74° to $75^{\circ} 40'$ East Longitude and the parallels of $33^{\circ} 20'$ to $34^{\circ} 44'$ North Latitude, has been compiled, on the scale of *half an inch* to the mile, from the Field work of the Trigonometrical and Topographical parties, under the immediate superintendence of Captain T. G. Montgomerie, Bengal Engineers, 1st Asst. G. T. Survey of India. It embraces eight thousand and one hundred square miles of country including the lovely valley and surrounding mountains of the romantic country of Kashmir, with no less than four thousand six hundred and six villages, depending on three hundred and fifty-two trigonometrical points, and gives the computed positions of the principal towns, mountains, &c. with all the topographical details, viz.: the villages, roads, passes, lakes, ridges, slopes of mountains, &c.

This is the original scale on which the survey has been projected, a reduction to the usual geographical scale of *quarter inch* to the mile is being likewise made and this will be incorporated into the Indian Atlas and engraved like the other sheets. .

The compilation of the Map has been executed by Mr. W. H. Scott, the able Chief Draftsman at the Surveyor General's Head Quarters,

under the immediate inspection and guidance of Colonel Waugh; and the drawing and printing which will bear close examination is due to Mr. Scott and Sheikh Gholam Kadar, native draftsman, the hills in brush work (Indian ink) being copied from the original plane table sheets or sections executed on the ground by the officers of the Survey. The skeleton chart of triangles shews the basis of the work on which the topographical map has been compiled, and is interesting as illustrating the rigorous and minute method with which every thing is conducted in the Department.

Captain Montgomerie in his report gives the following description of the country under survey.

“Kashmir is a large valley lying between two snowy spurs of the great Himalayan range drained by the ‘Vedasta’ or ‘Jhelum’ river which with its tributaries is navigable by large boats for about ninety miles. The greatest length of the valley from ridge to ridge measured from south-east to north-west, which is also the direction of the drainage, is about one hundred and eighteen miles. The flat portion is about eighty-nine miles long with an average breadth of sixteen and three quarter miles, and elevated about 5,200 feet above the sea.

“The flat ground consists of an upper, lower and level, the former separated from the latter by cliffs of clay, coloured with burnt sienna, called ‘kharewah’ by the Kashmiris and forming a distinguishing feature on the map, some 200 to 300 feet in height.

“The upper or table land is often found standing in isolated masses,* but is generally connected with the foot of the hills. Most of the upper level was formerly irrigated, but is now generally fallow and dry.

“The lower level is subject to inundation, and indeed the portion between the city and great lake, still forms one vast marsh, but vaguely separated from the lake itself.

“The slopes of the hills between the flat ground and the limit of forest are a mixture of cultivation, good grazing grounds and forests of cedars, pines, firs, &c.; the forests preponderating.

“The number of lakes in the valley, and of tarns in the mountains form a distinctive feature in Himalayan Geography, as they are but rarely met with on the Hindustan side of the Himalayan range.”

* Several miles in length and breadth.

The chief features in the valley are the Lakes which are of world-wide celebrity. These overflow the country and give it the marshy character so delicately depicted on the map before us.

The "Great Wulur" lake, the largest in the valley, is about twenty-one miles north-west of the city of Sirinagar, the capital. Its extreme breadth north and south is ten and a half miles; this does not include the marshes on the south side, and which continue past the parallel of the city. The extreme breadth a little north of the Island of Lunka is ten miles and the circumference nearly thirty miles.

During a storm the waters lash themselves into high waves, so that no boat will venture on it. The waters find their way out of the valley by the Burrumulla pass, dashing in a most fearful torrent through the mountains and at last meet the Jhelum river about one hundred miles above the town of that name. About half way up the mountains surrounding this lake a perfectly level water mark is to be seen running along them, which would seem to corroborate the belief of the natives that the valley was once a large lake.

The "Manus Bal" lake is twelve and a half miles from Sirinagar and in the same direction as the Wulur lake. Its length is two miles east and west, and breadth seven-tenths of a mile.

The hill of "Aha Tung" 6290 feet, bounds the southern face of this lake and is remarkable, owing to its isolated position and abrupt rise from the level of the surrounding country of 1000 feet.

The "Anchar" can scarcely be called a lake, it is caused by the waters of the Sind river, overflowing the low ground north of the city.

The lake immediately east of the city supplied by the Arrah river, boasts of the far famed Isle of Chinars (Chinar or *Platinus Orientalis* though considered an exotic thrives luxuriantly in the valley). The gardens and groves of poplars, cherries, walnut, peach, apricot, apples and mulberries along its bank, add considerably to the beauty of this lake.

All over the valley very interesting ruins are found, some near the Island of Lunka are entirely under water, whether these have been submerged from the ground sinking or owing to the water rising above its original level it is difficult to say.

The east end of the valley consists entirely of rice-fields. At the west part there is little or no cultivation, being very woody. Culti-

vation is carried on in the small valleys that run into the mountains, viz. the Daras valley, Teregram, Hurripore and Tevil (near Wurtapore). These are the prettiest spots, the east end is scarcely worth a journey to see it.

The Great Wulur Lake is a favorite resort of sportsmen in search of rare aquatic birds. The lake also abounds with fish of all sizes peculiar to hill waters, the larger kinds being speared or harpooned from small boats.

The river Jhelum is navigable from the city to the great lake, and indeed most of the marshes and lakes can be crossed in boats, so that sportsmen and travellers in search of the beautiful or romantic can be easily gratified.

Ibex, Bara-singha or Elk, brown and black Bears, Musk-deer and Gazelle are found on most of the higher ranges, but it needs a keen sportsman both willing and able to endure fatigue and hardship, to boast of having shot an Ibex. Many are the thrilling incidents of a chase after Ibex, over fearful precipices and slippery glaciers, where a single false step would have sealed the fate of the daring hunter.

The grandeur and beauty of Kashmirian scenery cannot be described, it must be seen to be fully understood or appreciated. The high masses of mountains, many covered with snow, which surround the valley on every side, the lakes and streams, the variety and luxuriance of the foliage and the mildness of the climate are together not to be met with in any other part of India.

The town of Kashmir or Sirinagur is quite an Eastern Venice, the place being intersected with canals in every direction and the houses built out from the water. The lake adjoining, with its pretty little island of Chinars, and its numberless floating gardens, is like a mirror reflecting the surrounding mountains on its surface, so as quite to give the idea when passing over in a boat that one is skimming over the peaks and crags in an aerial machine. At the bottom of these mountains on the borders of the lake are the famous gardens of Shalimar and Nishat. Streams from the mountains, are made to run through them, forming Cascades and canals, the Chinar trees casting their shade over them and the walks lining the sides.

The houses in the city of Sirinagur are chiefly of brick-work, built

up in frames of wood. The walls seldom exceed a single brick in thickness, so that but for the wooden frame work, these habitations would not be very safe. Sirinagar, like all Indian cities, is exceedingly dirty, and the inhabitants, except the shawl and wool merchants, vie with each other in uncleanness.

The bridges over the Jhelum, shewn on the map opposite Sirinagar, are entirely constructed of logs of wood heaped up cross wise, which serve as piers, over which a platform is laid of planks and beams roughly nailed or tied together, the spaces between the piles of wood being left open and of such width, as to allow of the passage of the boats on the river.

The garden houses and dhurrumsallas in the suburbs of the city are chiefly used by visitors.

"The mountains around Kashmir" Capt. Montgomerie observes, "are covered with snow for at least eight months in the year, many being from 15,000 to nearly 18,000 feet above the sea, include large glaciers between their spurs, and retain the snow throughout the year.

The chief peculiarities of the survey operations arise from this great elevation. Special arrangements were required for the protection of the natives and for the necessary supplies of food and wood, when the surveyors were working far above villages and even above the forest itself.

"The triangulation depends upon the Kashmir Series of the Great Trigonometrical Survey, which emanates from a side of the North-West Longitudinal Series in low hills near Sealkote.

"In order to connect the triangulation in the Punjab with Kashmir, it was necessary to carry it across the Chatadhar and Pir Punjal snowy ridges. This was done by taking observations from the tops of the snowy peaks best adapted to form a series of symmetrical polygons and quadrilaterals. In this way the triangulation has been carried on systematically from the foundation. It consists of one main axis, viz. the principal triangulation, which is composed of polygons and quadrilaterals. From this axis, diverge numerous minor Series of triangles, which starting from one side of the principal Series are tested by closing on another side of the same, or upon a side of the North-west Himalaya Series.

“From these minor series, secondary stations have been fixed, so as to cover the whole country with tested trigonometrical points.

“Though the country to be surveyed was so elevated, the rigorous rules of the G. T. Survey of India were adhered to throughout.

“The highest points suited to the triangulation were always occupied and observations were taken from stations upwards of 16,000 feet above the sea.

“On the principal series of triangles the observations were invariably made to luminous signals, viz. Heliotropes and Reverberatory lamps on the Argand principle with parabolic reflectors, notwithstanding the physical difficulties and the severity of the climate on the snowy peaks, so especially trying to the natives of India who served the signals.

“Numerous observations being required, it was necessary to reside on the peaks for at least two days and nights, generally more.

“Some of the peaks below 14,000 feet lose the greater part of their snow by September, but practically it was necessary to observe most of the stations earlier in the season, when the snow was still heavy at 11,000 feet, and occasionally in consequence of clouds and storms, the party had to remain pitched on the snow for upwards of a week at a time.”

Colonel Waugh thus speaks on this point:—

“The physical difficulties imposed by the nature of the country and survey arising from the necessity of ascending and encamping on snowy mountains of great elevation were very great. The character of a Trigonometrical survey demands that the stations shall be fixed on the highest summits, or on points commanding extensive views and the system of the department, requires that an adequate number of good observations shall be taken, which usually occupies several days. To accomplish this task, not only the observers, but the signal men (natives) must encamp at or near the stations. The heights of the snowy peaks, ascertained on the Punjal range were ‘Moolee’ 14,952 G. T. Survey and Ahertatopa 13,042 G. T. Survey and to the north of Kashmir Hara Mook 16,015 feet. Amongst the highest elevations visited in Thibet were the principal stations of Shimshak 18,417 and Shunika 18,224 feet. The difficulty of obtaining supplies and firewood at such elevations may be imagined, yet

they were every-day occurrences. Out of sixteen principal stations in Thibet fourteen exceed 15,000 feet in height. Great as the hardships entailed on the European officers undoubtedly were, they were slight compared with those endured by the native establishment, with the utmost cheerfulness. The signallers and headmen were mostly natives of Hindustan to whom extreme cold is a condition of positive suffering, yet these men were loyal and contented as they have been in all survey parties over India during the mutiny."

Capt. Montgomerie states "On the Pir Punjal peaks the electricity was so troublesome even when there was no storm, that it was found necessary to carry a portable lightning conductor for the protection of the Theodolite.

"Space sufficient even for the very small camp could never be got quite close to the stations on the peaks. During the day this did not matter, but at night, though the distance might not be more than two hundred yards, it was rather a difficult matter to get back from the Observatory tent after the Surveyor had finished taking observations to the lamps. Soon after sunset, the surface of the snow becomes as slippery as glass, affording by no means a satisfactory footing on a narrow ridge with either a precipitous slope, or a precipice on either side.

"The country was found too difficult to admit of the transport of a twenty-four inch theodolite without great delay and expense. Capt. Montgomerie was therefore directed to take the principal observations with a *fourteen-inch* theodolite, a first rate instrument made by Troughton and Simms which gave every satisfaction.

"On the Secondary Series or Minor Triangulation, the ground covered by which is shewn by shade on the chart, twelve, eight and seven-inch Theodolites were used, according to circumstances.

"By means of the principal and secondary triangulations the whole country was covered with Trigonometrical points at an average distance of little more than four miles from each other."

During the first two seasons of the Kashmir Series, no less than sixteen thousand square miles of close triangulation have been executed, i. e. an area of more than half of Scotland has been covered with trigonometrical points and thirty-two thousand square miles of topographical drawing were sent in, giving all the details of the country.

Besides these, numerous valuable sketches, routes, heights of passes, &c. have been added to the survey.

The numerous observations taken to the great Snowy mountain "Nanga Parbut" or "Dayarmur" in latitude $35^{\circ} 14' 21''$ and longitude $74^{\circ} 37' 52''$ prove that its mean height is 26,629 feet above the sea. No peak within sixty miles on any side of the general map of the Nanga Parbut comes within 9,000 feet of the same height. This pinnacle of the Himalayas is the highest point in the range between Nepal and Attock. In consequence of its isolation from all peaks of anything like an equal altitude, it naturally forms a noble object in whatever aspect it is viewed.

"The topographical detail was all sketched in the field on Plane Tables, according to the system laid down in Colonel Waugh's pamphlet of instructions on Topographical Surveying, an arduous task in such an elevated country, as it was of course necessary to visit numerous peaks and places on the ridge, in addition to the Trigonometrical stations which include the highest peak in the Pir Punjal.

"The drawing of the Field Sections expresses the ground well, that of Captains P. Lumsden, Bengal Army and Godwin Austen, H. M. Army being more specially artistic.

"The advantage of this system in a country like India, especially in the hilly and mountainous tracts, is that officers with a moderate previous knowledge of military drawing, can be readily trained to fill up the triangles and the work proceeds rapidly, producing a complete and valuable map with the topographical features accurately delineated at small expense."

But the difficulty of sketching ground of such a character may be imagined. To do so with any degree of faithfulness requires a peculiar talent, and is a gift as much as copying the human face. Stevenson, the Civil Engineer, in his evidence before Parliament on the Ordnance Survey of England stated his belief, that there were not above eight persons in England who understood how to pourtray *ground*. If difficult therefore in England, it must be still more so where the relative commands are so immense.

Colonel Waugh proceeds to observe—

"In consequence of the difficulty in obtaining Topographical Assistant Officers of the Quarter Master General's Department were at

first employed on the topography, but they were soon called away by the demands of their own department; consequently a fresh set had to be trained, involving delay and expense, which would have been avoided, if the same assistants could have been employed throughout.

“Lieut. Basevi of the Engineers made a very careful reconnoissance of many of the passes on the Pir Punjal, determined their heights, and drew up an able report of their capabilities; he also sketched a portion of the ground near the ridge, and subsequently reported on the river Vedusta or Jhelum. Lieutenant Basevi is a most energetic talented and able officer and did excellent service, as also did Mr. Bell, who is an able Surveyor.

“Captains P. Lumsden, Allgood, and Johnson, took up their work *con amore*, quickly acquired the requisite knowledge of the system, and their zeal in this arduous and harassing work deserves high praise. They completed three thousand and two hundred square miles on the half inch scale, and the Surveyor General having personally examined their plans, speaks in the highest terms of the same.

“Captain Godwin Austen exhibited special talent for the delineation of ground, and Lieut. Melville’s work was very good. Both of these officers proved themselves indefatigable mountaineers and have altogether exhibited so much zeal as to be deserving of high commendation. Lieut. Murray also did good service, and proved himself a useful Surveyor.

“The success attending this season’s work, the admirable manner in which Captain Austen and Lieuts. Melville and Murray acquitted themselves, induced the Surveyor General to apply to Government for five additional qualified officers, to which sanction was accorded by Government, but he has not been yet able to find any suitable persons. A great deal of floating talent does exist in the army, and qualified young officers are frequently to be met with, but the military operations consequent on the mutiny have absorbed most of the valuable officers and rendered selection difficult.

“Lieut. Elliot Brownlow of Engineers, an officer of the highest promise and beloved by all his contemporaries, volunteered for service and joined at Delhi, in eight days from Kashmir, though too late for the assault; he then proceeded to Agra and Lucknow with the Engineer’s Brigade, and was most lamentably killed at Lucknow after the

siege by an explosion of gunpowder. The mountain survey thus lost a most energetic and valuable member, unrivalled in physical power, endurance and cheerfulness under fatigue, whilst the Engineer Corps lost a talented and amiable officer.

“ Poor Elliot Brownlow’s adventures and achievements in the snowy mountains and his hardihood and endurance have been the theme of much praise and admiration amongst his brother Surveyors. He had intended to devote his rare and splendid qualities as a mountain surveyor, had he survived, to the exploration of Central Asia on rigorous principles.

“ The merits of the various assistants have been duly reported on. By means of their zealous co-operation alone, was the Surveyor able to finish this difficult piece of work. Though they have had much to contend with in such a country, besides the extremes of heat and cold, their exertions have been most praiseworthy.

“ The native establishment has from the commencement consisted of a mixture of men from the plains and from the hills. They were all not a little troubled by the impossibility of boiling or rather softening their rice, dal, &c. at such high elevations. Notwithstanding that, and the general severity of the climate, they have at all times done their work carefully and efficiently.

“ There were many difficulties peculiar to surveying in a partially independent state. The natives of the country moreover had prejudices against going up some of the high hills; but the clouds, mist and haze were always by far the worst enemies of the Surveyors.

“ During the last year the party were troubled first by cholera and secondly by a flood. The former had stuck to the valley strange to say throughout the winter when the snow was up to a man’s neck. The camp did not suffer much as it was taken up to the high Table Land. During the flood they had to take to the boats; about thirty miles by ten to fifteen were submerged.

“ In the after part of the season the triangulation of Little Thibet was finished and a good piece of Ladak, all on the other side of the Himalayas, where the rains did not interfere so much, though the clouds were troublesome.

“ The Latitude and Longitude of Skardo have been obtained, but, Leh, has not been laid down yet, though two peaks in its neighbourhood

have been fixed. It is supposed *Leh* will prove considerably to the west of the old position.

“The triangulation was commenced in 1855, and finished in 1856, with, on an average, three Assistants each year.

“The topographical work was taken up in 1856 and completed in 1857 with on an average, four Assistants each year.”

The cost of the entire survey has been only Rs. 4-5-2 per square mile, or say about 8 shillings and 8 pence, a sum believed to be trifling in comparison with the immense advantage gained, and exceedingly moderate when contrasted with similar or easier work in other countries.

The able and successful manner in which Captain Montgomerie with the aid of this small party during his first season accomplished the arduous task allotted to him has been described in full in a previous printed Report of the Survey Operations for 1855-56, and the meritorious services of the Captain and his party obtained the acknowledgments of the Right Hon'ble the Governor General in Council. The Surveyor General of India bears his professional testimony to the fact that the measure of success attained is highly honorable to Captain Montgomerie and all members of the party engaged in the work. Colonel Waugh thus expresses himself; “Considering the stupendous physical difficulties presented by the nature of the country to regular and systematic surveying, the quantity and quality of the work performed, the ability displayed in command of an unusually large party, the quantity of instructions which had to be imparted to so many new hands, the judicious character of his general arrangements combined with minute attention to the smallest details, as well as the prudent policy of his relations with the Maharajah and the people of the country—all the above marks Captain Montgomerie as an officer of no ordinary stamp.” The exertions of the party are, in the Surveyor General's opinion, well deserving of commendation and he particularly solicits that the thanks of the Government may be accorded to Captain Montgomerie, and that the services of Mr. Johnson who has been with the party from the commencement may be noticed favorably as well as those of Messrs. G. Shelverton, W. Beverley and Mr. W. H. Scott, the able Chief Draftsman of the Field Office in connection with the compilation of the map.

But neither the physical character of the country nor the constant task of training new hands formed the chief difficulty of a Survey conducted in a foreign territory, and which at no time could be expected to be agreeable to the ruler, his officials and people. To them the influx of a considerable body of Surveyors spread over the country, however orderly and well-conducted, must bear the aspect of an intrusion. The tact, delicacy and ability with which Capt. Montgomerie maintained amicable relations with the Court, a most difficult one to deal with, and preserved discipline in a large mixed establishment, is deserving of the highest praise, and stamps him as an officer of great policy and judgment.

“His difficulties were much enhanced by the military rebellion of 1857, during the whole of which excited period the party continued its peaceful labours without cessation and with only one serious interruption.

“With the old Maharajah Golab Singh, Capt. Montgomerie was on the most friendly terms and the estimation in which he is held by Maharajah Rumber Singh, can best be estimated from the acknowledgments which his Highness made to the Captain in Durbar, on the resumption of operations in 1859. Without such tact and conciliation, it would have been impossible to carry out the complete and final survey successfully.”

Although the splendid climate of Kashmir added to the special interest attaching to the country, and the unexplored tracts adjoining, made the Survey deservedly a great attraction, still the exposure of surveying in such a country is very trying to the constitution and many persons suffered greatly. The lower valleys are very hot, and the solar radiation on hill sides is very powerful. The labor of climbing to great elevations has often been noticed by explorers. The Surveyor however arriving heated by physical exertion at great elevations has to stand on ridges or peaks exposed to strong cold winds while he is observing angles or sketching the ground. The alternations of heat and cold and the laborious exertion limits success to those persons who to the requisite professional qualifications can add the physical constitution to stand the hardships which the work imposes. It is very doubtful in the opinion of the Surveyor General whether the ability to undergo the requisite amount of fatigue and

exposure which mountain surveys entail can be reckoned on for a long continuance, and he apprehends that, except in rare instances, a frequent succession of well-trained young men would be necessary in extensive mountain surveys.

This map is a first instalment of this survey. The whole mountain tract south of Kashmir Proper has been completely Triangulated and Topographically surveyed, and the map thereof is now in course of construction. Altogether the area already surveyed amounts to twenty-two thousand square miles in three years, and forty thousand square miles of Triangulation, including all little Thibet, in four years, the chief merit of which achievement is due deservedly to Captain Montgomerie. The Surveyor General has requested that this may be submitted for the opinion of the Council of the Royal Geographical Society together with the chart of the Triangulation on which it is based, as a work of accurate geography in a region hitherto imperfectly explored, and it is hoped that it may obtain for Captain Montgomerie some mark of the approbation of that learned body.

The Surveyor General hopes next year to complete the maps of the remaining Sub-Himalayan portion now in hand by the completion of which the entire tract of Mountain Frontier from the Ganges to the Cabul Territory will have been finished under his superintendence, and rendered available for incorporation into the Indian Atlas.

The party under Captain Montgomerie is now engaged in Thibet. The country is exceedingly difficult and the strength of the party much diminished. In the progress of the survey advantage has been taken of the opportunity to extend accurate geographical knowledge by fixing numerous peaks in the Karakoram and Mustag ranges. One of those already determined on the Karakoram range, along which runs the boundary between Ladakh and Yarkund, one hundred and fifty-eight miles N. E. of Srinagar, is 28,278 feet high (provisionally settled only, being liable to a small correction when the levelling operations from the sea level at Karachi, now in progress, are completed). None of the peaks in the neighbourhood of K 2 come nearly up to it though there is one fine group about sixteen miles away that is generally a little over twenty-six thousand. This is probably the second highest mountain in the world, as it exceeds Kanchingga by

122 feet, but is lower than Mount Everest by 724 feet, as measured by the Surveyor General in 1847.

It is expected that Captain Montgomerie will be able to fix points up to 36° 30' N. latitude, but it is doubted whether he will be able to get in all the Topography quite so far as that, in consequence of the wild and Yághí state of some of the people.

It has been specially recommended that the map of Kashmir be engraved or at least lithographed in England as soon as possible, in order that its results may be rendered speedily available for geological purposes as well as useful to public officers, travellers and the public generally.

The panoramic sketch exhibited, taken by Captain Montgomerie, which is a fair specimen of Calcutta Lithography, will give some idea of the peaks, if the observer supposes himself to be in any way near the Takt-i-súlmán close to the city. The sketch begins on the left about south-east and goes round nearly to north-west.

The first long low bit without snow, starting from the left, is where the Banhal road crosses. About $13\frac{1}{10}$ inches from the left the peak looking over the Peer is one of the principal stations, by means of which the triangulation was brought over the Pir Panjal range. At about eighteen inches come in the craggy Koserin Kútúr peaks described as the three Bs.

The Pir Panjal pass is not visible, it is believed the range is about twenty-seven inches from the left. The highest peak of all is, Tattakúti with a very steep precipice to its right, it is about thirty-two inches from the left. The Baramoula gap is three inches from the right. If the sketch is held over the map the connection will be seen and the cliffs will be made out, coloured burnt sienna on the map, that separate the lower from the upper level ground.

During the present season the snow is very low down and the work is nearly all in high ground, which is very inconvenient. It may be difficult for a Calcutta resident to imagine snow inconvenient, but campaigning on the top of it soon undeceives one.

The party has now gone into Ladakh and hope to fix Leh and some places beyond. The small index plan shews roughly the extent of country embraced by the trigonometrical and topographical operations in the Himalayas tinted yellow up to the parallel of 36° N.

latitude. The Punjab Proper tinted pink having been completed by the Revenue Survey operations, the upper portion of the Derajat alone remaining.

The above information is chiefly taken from the reports of Colonel Waugh, Surveyor General of India and Captain Montgomerie, I am also indebted for assistance to Mr. J. O. N. James, Chief Draftsman of the Surveyor General's Office, who has for some years been employed in the survey of the adjoining districts.

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*The Cartilaginous Fishes of Lower Bengal.*—By EDWARD BLYTH.

The following does not profess to be a complete catalogue of the cartilaginous fishes that inhabit the *embouchure* of the Ganges, but merely of those which I have personally obtained in the fresh state, chiefly in the Calcutta fish-bazars; and having lately had occasion to look them over, and paid some attention to the group, it may be useful to give an enumeration of the species observed, especially as in the genus *TRYGON* it appears that several permanently distinct races or species have been confounded under *TR. UARNAK*, (Forskal).

The cartilaginous fishes which I have obtained in Calcutta are as follow:—

1. *STEGOSTOMA FASCIATUM*, Müller and Henle: uniformly spotted variety, figured and described as *St. carinatum* in *J. A. S. XVI, 725*. One specimen only, procured at the Sandheads. Another, like it, is in the museum of the Calcutta Medical College.

2. *SQUALUS (SCOLIODON) LATICAUDUS*, M. and H. A small species, occasionally brought to the bazar. I have not seen it more than  $1\frac{1}{2}$  ft. in length.

3. *sq. (CARCHARINUS) MILBERTI*, (? Val.). One specimen obtained,  $2\frac{1}{2}$  ft. long. A skull from the Bay, of an individual probably about 7 ft. long, has the largest upper teeth measuring  $\frac{1}{2}$  in. and upwards along their lateral margins: other teeth, of apparently the same species, from the Indian Ocean, have a lateral margin of  $1\frac{2}{3}$  in., and extreme breadth at base of  $1\frac{5}{8}$  in.;\* they more nearly resemble the

\* Even these are small, however, in comparison with the huge fossil teeth of the *CARCHARIAS MEGALODON* and others figured by Agassiz, and those by Dr. Gibbes in the 'Journal of the Academy of Natural Sciences of Philadelphia,' for July, 1848.