

craft. The fact that he is always ready to learn from those of greater experience gives good reason for the belief that he will develop into a guide of the very first rank.

My last expedition with Daniel Maquignaz ended as described above. There is little that one can add to the admirable summary of that great mountaineer's qualities which Captain Farrar and Sir Edward Davidson have written for the *JOURNAL*. I take it that it is in most cases by his mental qualities that a guide of the highest class is raised above his confrères, and there can be no doubt that this was peculiarly the case with Daniel. I remember that Tyndall spoke of Joseph Maquignaz as a man of high boiling-point. This is a description that would have applied equally well to the nephew Daniel.

One can never hope again to travel with a finer guide or more amiable companion, and some of my happiest days, and most glorious expeditions on the beautiful peaks of the Saas-grat will always be associated with recollections of the inspiring leadership of that magnificent mountaineer.

H.R.H. THE DUKE OF THE ABRUZZI'S EXPEDITION TO THE
KARAKORAM.

By DR. F. DE FILIPPI.

(Read before the Alpine Club, November 1, 1910.)

IT has given me great pleasure to be able (by permission of H.R.H. the Duke of the Abruzzi) to accept your invitation to read a paper upon his expedition in the Karakoram. As a whole year has passed since the expedition took place, and as the *ALPINE JOURNAL* has published the chief results, I fear that there is little left for me to relate that will be new to you. I will endeavour, however, to give a brief description of our experiences, and I feel sure that you will be interested in Vittorio Sella's slides. While serving to illustrate a region still so little known in detail, they may give you a conception of the unsurpassed grandeur of its ranges. At the same time this occasion gives a new chance to discuss the possibility of ascending the highest peaks in the world. Since the first ascent of Mont Blanc towards the end of the eighteenth century, up till the present day, we have obtained a total gain of about 9000 feet altitude. The progress has been slow but continuous; nor is there any sign to indicate that we are approaching an

insuperable limit. We must bear in mind that, so far, nearly all expeditions have aimed rather at the exploration of those remote and little-known regions where the highest ranges occur, than at the attainment of high altitudes. Up till now, the most serious barriers to the attainment of great heights have consisted in insufficiency of equipment owing to distance from the base of supplies, and to difficulty of transport, lowering of physical condition through preceding hardships, technical difficulties in the actual climbing, short seasons, and unfavourable climate—all these causes have weighed far more than mere reduction of pressure. The Duke hoped to contribute to the solution of this vexed question by undertaking an expedition specially equipped and prepared to meet these conditions. For this purpose he selected K2, the second highest peak in the world (28,250 feet), only 750 feet lower than Mount Everest. K2 stands in the midst of a glacier basin commanded by peaks at least ten of which rise above 26,000 feet. There seemed every reason to hope that in case of failure on the highest peak it would be possible to make a more fortunate attempt on one of its neighbours. No other region of the Himalaya seemed to offer such a combination of favourable conditions.

Never was Central Africa so hopelessly closed to the European explorer by its wild beasts and savage tribes as is Nepal at the present day by the force of political expediency. And Nepal, alas, contains Mount Everest and several of the highest peaks of the Himalaya. In Sikkim, Kinchinjunga has been explored all round by Mr. Freshfield, from whose account the mountain seems to be extremely difficult, besides which it is well known that the climatic conditions of the region are a serious obstacle to alpine work. The expedition of Mummery and Collie (which ended in so tragic a manner) has shown Nanga Parbat, the highest peak of the Punjab Himalaya, to be almost inaccessible owing to its precipitous walls and dangerous glaciers.

The Baltoro glacier basin, in which K2 is situated, had been seldom approached, and by very few explorers, owing to its vast distance from the plains of India, lying as it does beyond Cashmere, beyond the Punjab Himalayas, and upon the very furthest limits of Baltistan. I may briefly mention that the Baltoro glacier was first discovered, and explored in its lower course, by Colonel Godwin Austen in his memorable topographical campaign of 1860–61. The glacier was explored for the first time in its whole length by Sir Martin Conway in the

well-known expedition which he led in 1892 over the three great glaciers of the Karakoram. Sir Martin Conway went up the S.-W. branch of the Baltoro to the foot of the Golden Throne, of which he climbed one peak. The N. branch, however, known as the Godwin Austen glacier, and flowing by the base of K2, had remained unexplored until 1902, when an expedition consisting of three Englishmen, Messrs. Eckenstein, Crowley, and Knowles, two Austrians, Messrs. Wessely and Pfannl, and one Swiss, Dr. J. Guillardmod, encamped for some forty days at the very foot of the great mountain. Guillardmod, who wrote the account of this expedition, is evidently of opinion that the ascent of K2 might be attempted with a reasonable chance of success.

I may remind you that the Duke of the Abruzzi prepared his expedition in the early months of 1909; that he took with him his A.-D.-C., Marchese Negrotto (Lieut. in the R.I.N.), Cav. Vittorio Sella, and myself. Three guides and four porters were selected in Courmayeur. The Petigaxs, father and son, had already been in the western Karakoram with Dr. and Mrs. Workman; the Brocherel brothers had been with Dr. Longstaff on his expeditions of 1905 and 1907 in the Kumaon and Gurhwal Himalaya. Sella had also brought his usual photographic assistant.

In addition to the very complete alpine equipment, the Duke was well provided with instruments for meteorology and topography, among which were four mercurial barometers, hypsometers, Paganini's photogrammetric camera, a theodolite, etc. This was the first time that Paganini's method of survey had been used on an alpine exploring expedition, and the experiment proved very satisfactory.

The expedition sailed from Europe on March 26, and on April 15 reached Srinagar, the capital of Cashmere. Here we spent a week waiting for the luggage to arrive from Rawal Pindi and completing the last details of the equipment. The Duke is indebted to Sir Francis Younghusband, then British Resident in Cashmere, not only for the courteous hospitality with which he and Lady Younghusband entertained him during his stay in Srinagar, but also for the invaluable help which he extended to the expedition, in which he showed the greatest interest. I may here remind you that Sir Francis Younghusband is the only European who ever crossed the northern buttress of the Baltoro by the Mustagh Pass.

On April 23 the Duke's expedition started from Srinagar. Let me point out to you on the map the two routes which

lead from Cashmere to the Karakoram, across Baltistan and the Indus valley. The shorter of the two crosses the Kishen Ganga valley and the Deosai plains, descending thence to Skardo. This route is impassable for expeditions until July, owing to the heavy winter and spring snowfalls. The second route is longer but is open all the year. It passes up the Sind valley and over the Zoji-La, 11,230 feet high. This is the lowest pass in the whole Punjab Himalaya. The route then descends the valley of the Dras down to its confluence with the Indus, which it then follows to Skardo. Here it leaves the Indus to ascend the Shigar valley and then the Braldo valley as far as Askoley, the last inhabited spot, after which you enter the region of glaciers. The last part of this route can be considerably shortened in summer by crossing the Skoro-La, a pass between Askoley and Shigar, 16,700 feet. Owing to the early season the expedition had to follow the longer route on the way out, but returned by the short cut over the Skoro-La and by the Deosai plains. We ascended the Sind valley in four short stages. The upper part of the valley was very like Alpine scenery in winter. On April 28 the big caravan crossed the Zoji-La quite successfully. The pass was under masses of snow on both slopes.

A more striking contrast cannot be imagined than that offered by the blossoming gardens of the valley of Cashmere and the parched slopes and wild valleys of Baltistan. With marvellous industry the Baltis have turned to account every drop of water that flows down the gullies and ravines, and through irrigation canals, carried out on a truly grand scale, have succeeded in creating round their poor villages small oases of green meadows, and groves of willow, poplar, and apricot. The latter at this season were one mass of grey-pink blossom. Outside of these oases stretches a stony desert where scarcely a plant grows. But the landscape has a grandeur of its own, owing to the vast dimensions of the valleys and of the slopes, to the height of the precipices and buttresses, and to the huge ruin of the rocks by weather disintegration, which is on such a scale as to change their aspect and form every few years.

The travel was full of incident and amusement. The Baltis are in many respects a most interesting people, and would well repay a deeper study. At the principal villages the small local Rajahs welcomed the Duke with a ceremonious reception, and got up exciting games of polo in his honour.

On May 8 we reached Skardo, the capital of Baltistan, where

the valley spreads out into a considerable plain. Here we crossed the Indus in big barges, and proceeded up the Shigar valley, which is wide and nearly level and far more fertile and widely cultivated, at least in its lower half, than the Indus valley. The Shigar river is formed by the confluence of the Basha and the Braldo. The former issues from the Chogo Lungma, and other minor glaciers south of the Hispar glacier, while the Braldo is fed by the Biafo and the Baltoro glaciers. Here the bridle-path came to an end, and, from this point on, coolies were our only means of transport. We soon encountered our first rope bridge. We found it less trying than we had been led to expect. It is only fair to say that it was in very good condition. Askoley, the last village of this valley, lies near the end of the Biafo glacier at a height of 10,013 feet. We had now covered about 300 miles in 21 stages. At Askoley a store of flour had been deposited with which to feed our coolies in the high mountains, and 100 extra men laden with this were here added to our caravan, bringing up the total number to 360.

About four miles above Askoley, the huge Biafo glacier breaks into the Braldo valley from our left and flows across it, in a stream of ice, black with moraine detritus, 300 feet high and two miles wide, to the foot of the Mango Gusor, a fine rocky peak (20,630 feet) on the opposite side.

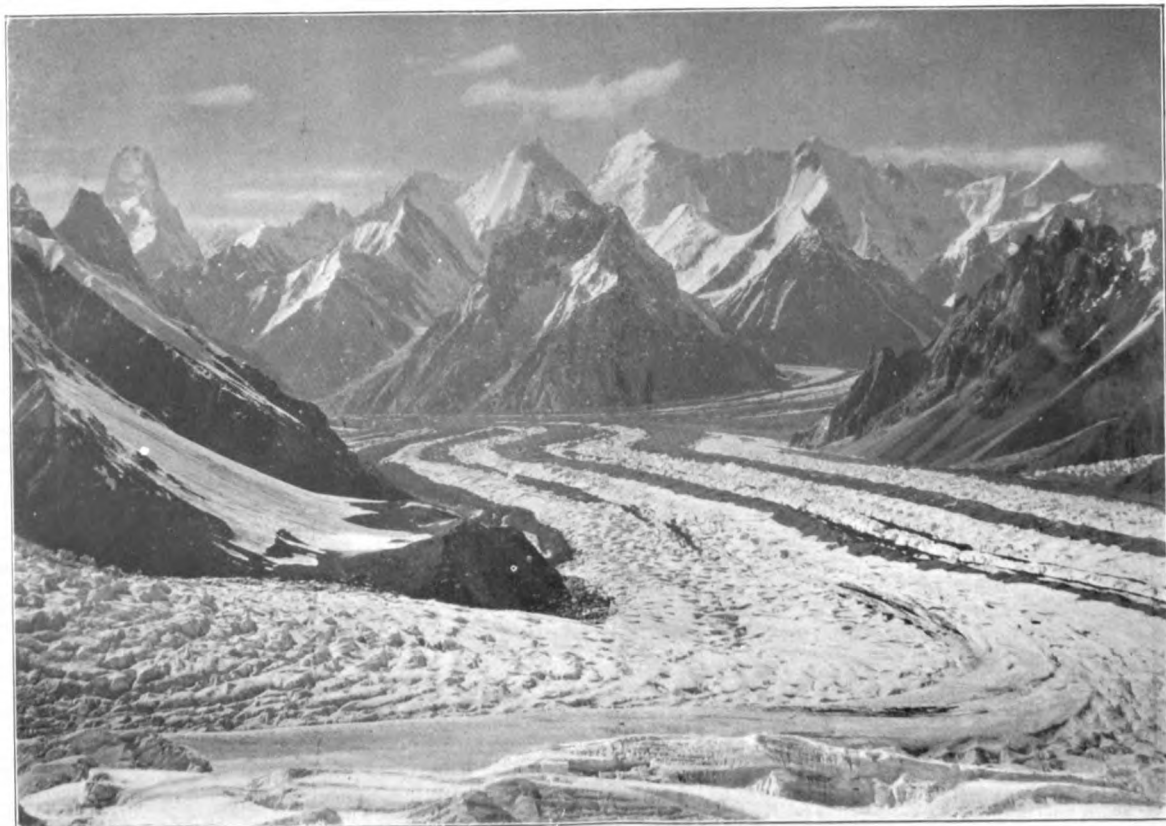
Over this dyke we had to climb in order to proceed up the valley. The surface of the glacier is extremely broken, and it took two hours to cross with numerous zigzags. The next obstacle was the Punmah, a torrent flowing down into the main valley from our left. The summer melting of the ice had not yet begun, so we were able to ford it, instead of going up the lateral valley as far as the rope-bridge. Thus in only two stages from Askoley we reached Paiju, which is a little oasis of willows, junipers, and rose-bushes in a small grassy plain.

Only a few hundred yards further up stands the steep slope of ice which is the snout of the Baltoro glacier covered with unstable blocks and moraine detritus and divided into two halves by the lofty cavern from which issues the raging torrent. The true left side of the glacier terminates in a wider tongue of ice, which projects down the valley nearly half a mile further than the right side. There is no sign of frontal moraine. The appearance of the glacier snout still corresponds in every respect with the description given by Conway in 1892. It may possibly be stationary, but certainly shows no sign of shrinking.

On May 18 we climbed on to the Baltoro, which we were not to leave for over two months. The tributary glaciers from the north—all of which appear to be on the increase—reach out a long way on top of the Baltoro, whose surface they strew with broken séracs. We were therefore obliged to follow the southern, or left, side. The whole glacier is covered by a layer of moraine composed of gneiss, granite, slate, and limestone of every variety and colour. Higher up, where the moraines are still distinct from one another, the different species of rock form characteristic streaks of various colours on the surface of the glacier. The general slope of the valley is very slight; notwithstanding which the surface of the glacier is extremely uneven. At this early season, however, it had not yet become such a wild and confused labyrinth of ridges and humps and hollows as we were to find on our return two months later when the summer thaw, and perhaps the increased rapidity of motion, had wrought an extraordinary change in its surface.

The lower part of the Baltoro is flanked on the north by a series of rock peaks forming aiguilles, towers, and pinnacles of marvellously bold outline and structure. About ten miles from the snout of the glacier, the valley turns eastward in a wide curve, sweeping round an advanced spur of the southern flank. On this spur lies a grassy slope known as Rdokass (13,205 feet), which forms an excellent camping ground. A low shrub which grows in profusion supplies abundant fuel, while our coolies found comfortable shelter in the hollows formed under the big boulders which strewed the ground. Here the Duke established his base-camp, as the Anglo-Austrian expedition had already done before him, and left it in charge of Mr. Baines, an Englishman, whom Sir Francis Younghusband had kindly engaged to assist the expedition with his experience and local knowledge, which proved invaluable. Some twenty coolies were sufficient for the regular service of supplies between the base camp and the upper camps. Ten more (subsequently increased to fifteen) were selected among the strongest and were provided with woollen stockings, alpine boots, puttees, snow-glasses, sleeping-bags, gloves, and tents. These accompanied the expedition to the high camps. A heavy snowfall kept us three days at Rdokass. This time the Duke spent in re-arranging the equipment and establishing a meteorological station, where he left one of the Fortin barometers. Mr. Baines undertook to make three readings daily, synchronising with the readings which the Duke had previously arranged to have taken at the observatories of Srinagar, Leh, Skardo, and

*Mustagh
Tower.*



V. Sella, photo.

Swan Electric Engraving Co., Ltd.

BALTORO GLACIER. MUSTAGH TOWER ON THE LEFT.

Gilgit. Thus all the necessary data were collected for altimetric calculations based upon observations of pressure.

Beyond the promontory of Rdokass, the high valley of the Baltoro becomes visible for fifteen miles of its length like a vast frozen river of almost uniform width to the foot of the Broad Peak and Gasherbrum range. Here the Baltoro divides into two branches, the Godwin Austen glacier and the upper Baltoro, or branch of the Golden Throne. As we ascend, the uniform grey of the detritus separates little by little into individual stripes of moraine—some white with limestone, others black with slate, others of the greys of different species of granite and gneiss, parted one from another by intervals of bare ice. One by one the marvellous peaks which tower over the valley are discovered to us—on the S. flank rises the magnificent Gasherbrum (25,660 feet) down whose walls flow vast glaciers of the purest white. On the opposite side of the valley the Mustagh Tower soars up to a height of over 24,000 feet, but from this point does not yet exhibit the extraordinary majesty of outline which we shall admire later on from the foot of the Golden Throne. The W. Gasherbrum (26,000 feet) shows us the whole of its W. wall—a sheer precipice nearly 10,000 feet high. The portal of the great Concordia basin is flanked by two bold peaks which terminate the N. and S. buttresses of the valley; the one to the N. is pure white—an *aille* of marble rising from a base of black slate, behind which the huge mass of the Broad Peak rears its mighty head. On the S. side stands the Mitre Peak, whose strange outline can be better understood by seeing the slide than by any description. Even a fugitive vision of these slides must have partly conveyed to you that sense of immense difficulty—of all but inaccessibility—which these mountains produced upon us. No region of the Alps, none of the chains known to us previously, afforded any standard of comparison, by which to judge of the marvellous new spectacle so far beyond the range of our experience.

On May 24, thirty-one days after leaving Srinagar, we turned the rocky spur between the Baltoro and the Godwin Austen glaciers, and at last came in sight of K2. Suddenly the unquestioned monarch of the region stood before us, a pyramid 12,000 feet high, as sharply outlined by its ridges as the Matterhorn from Valtournanche. At the first glance we all realised that it would not be easy to discover the weak point of this peak supposing such a point to exist. On the other side, southward, the upper Baltoro glacier had now come

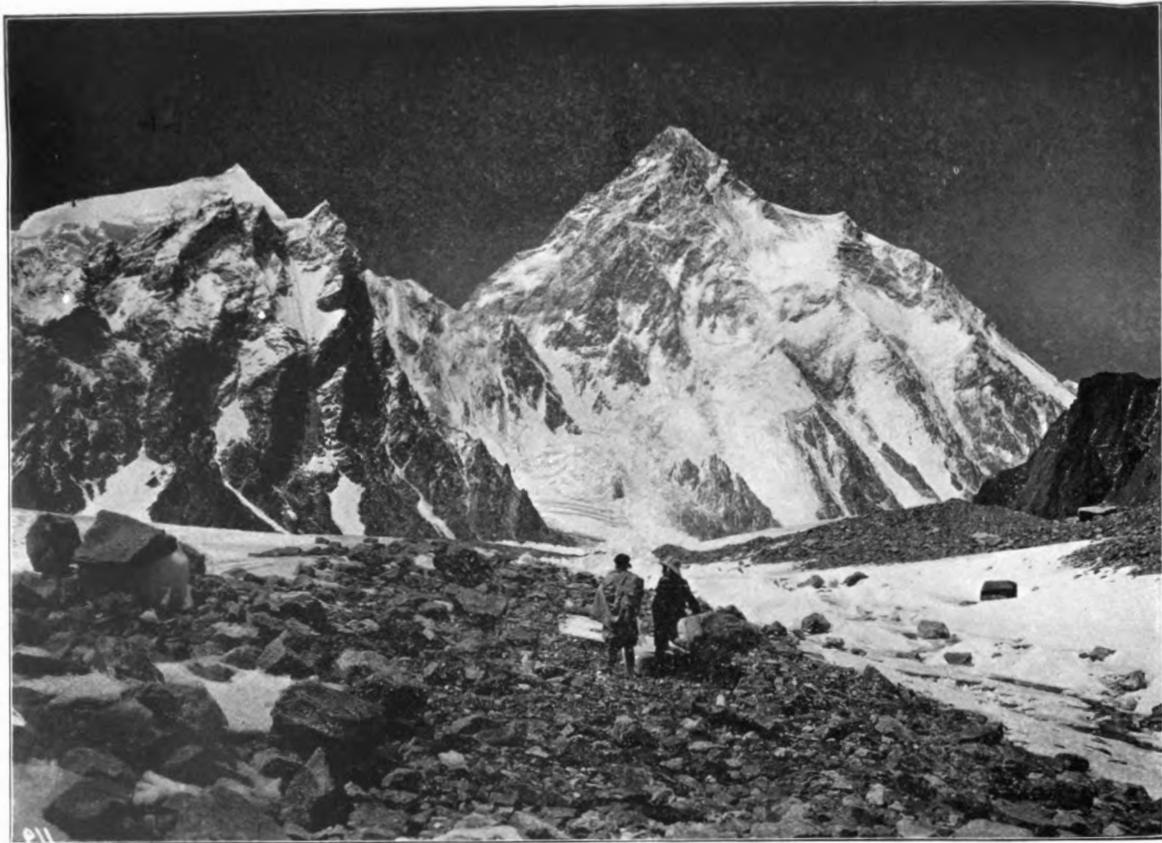
into view as far as the Golden Throne, whose likeness to Monte Rosa with its great white glaciers made it seem more familiar to us. Next to the Golden Throne came the great N. snow-slope of the Bride Peak. We were on one side of the spacious amphitheatre which Conway named Concordia. It measures about $2\frac{1}{2}$ miles average diameter, and forms a gigantic *carrefour* where the Vigne, the Godwin Austen, and the Upper Baltoro glaciers, together with those of the Gasherbrum and of the Broad Peak, like vast highways with their endless ribbons of moraine, all converge to form a huge single stream which flows down the straits of the Baltoro valley.

On the following day the Duke encamped at the foot of the S. wall of K2, at 16,512 feet. This point became a sort of upper base camp, and a point of departure for the exploration of the glaciers to the W. and E. of K2, which took us the whole month of June.

Immediately above this camp rises the S. wall of K2 cut obliquely by a glacier coming down in icefalls from the eastern snow shoulder of the mountain. The séracs of this glacier overhang the ridges and couloirs of the wall. To the west this wall is bounded by a ridge rising steep and straight to the summit from a narrow saddle of ice, which divides K2 from a sharp snow-peak whose 22,500 feet are completely dwarfed by the nearness of the colossal mountain.

May 26 and 27 were employed in explorative expeditions led by the Duke to the W. of the mountain, and up the Godwin Austen glacier to examine the E. slopes. On no side was any route to the summit obvious. The only way that appeared practicable for a certain distance at least was the long rocky ridge which descends southwards from the E. shoulder of the mountain. This ridge seemed to rise at a less forbidding angle and offered the advantage of being exposed to the rays of the sun during a great part of the day. Although the possibility of ascending the last 3000 feet from the shoulder to the summit seemed more than doubtful, still even to reach the shoulder would have been in itself an achievement of sufficient magnitude to repay the attempt.

The guides and the ten coolies worked two whole days to carry the necessary equipment up to the ridge—including high camp material, a large supply of ropes, rock spikes, petroleum stoves, and supplies for a week. The weather was bad, and a violent S.W. wind was shrouding the peaks with clouds of evil omen. The Duke left the lower camp on May 30. The



V. Sella, photo.

K 2, FROM THE SOUTH.

Swan Electric Engraving Co., Ltd.

passage from the glacier to the foot of the *orête* was easy. A little higher up, about 18,245 feet, the guides had prepared a level place sheltered from the persistent S.W. wind and large enough to hold the two Whymper tents.

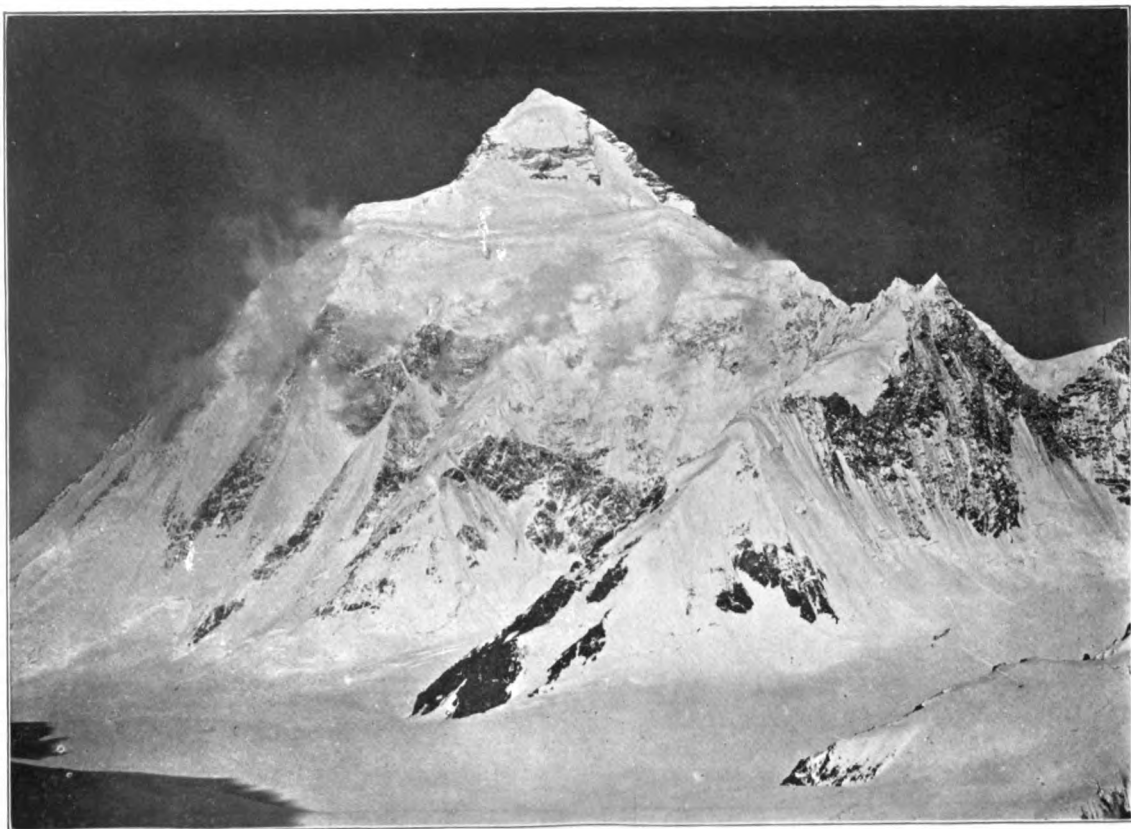
During three whole days the guides and porters made vain attempts to force a passage up from this point either by the main ridge or by a secondary ridge, to the right of the first, or up the intervening couloirs. Everywhere the rock was rotten and mixed with snow and ice. About 900 feet above the camp there is a little saddle which may be reached with relative facility although not without danger from falls of stone. Next comes a steep couloir full of pure ice with impracticable rocks on either side. About 600 feet above the base of this couloir the guides managed to get on to the rocks to the right which they ascended for some 300 feet further. On the way up they placed ropes, by the help of which they reached the same point more rapidly on the following day. At the top of the couloir they found a narrow crest of rock where there was no sure foothold and no sure handhold—everything gave way. This they followed for three hours, climbing very slowly and gaining another 900 feet of height, but at the same time it became quite clear that loaded men could never ascend this ridge unless ropes were laid along the whole way. It was, of course, absolutely out of the question to bring up the coolies.

They became reluctantly convinced that it was useless to proceed, not that they had met with any insurmountable obstacle, but because it was obviously hopeless to attempt so formidable an ascent when the difficulties from the outset were such as to render the task only just feasible for unloaded guides, while there could be no question of transport of camp material, even when reduced to the barest necessities. They had reached about 20,500 feet on the ridge. Having decided to give up this route, which offered no hope of success, the Duke led the expedition to the glacier at the W. of K2. Here a camp was brought on June 5 and 6 to a height of 18,176 feet. From this side K2 presents a formidable rock wall with vertical precipices hundreds of feet high and so steep that only a few very small glaciers have succeeded in lodging upon it.

At the head of the valley, however, there is a snow col which looked as if it could be reached without great difficulty. The N.E. ridge of K2 terminates on this col. Behind this ridge a point of attack might be found on the N. slopes of the mountain offering advantages sufficient to compensate

for the N. exposure which involved the grave obstacle of excessive cold. This plan could only be carried into effect by setting up a camp on the col. The Duke ascended the col on June 7. As in all enterprises in the Karakoram, the actual difficulties were far greater than appeared from below. It took twelve hours to reach the col (21,870 feet), eight of which were employed in cutting steps in the live ice of the terminal wall, after removing the layer of insecure snow which covered it. They found that the col was fringed to the N. by a large cornice which cut out the view of the N. slopes of K2, but they could guess that the wall beyond the col was precipitous. They were thus obliged to give up the alternative, which had occurred to the Duke, of crossing the col and exploring in detail the N. glaciers of K2. The caravan returned to camp after seventeen hours of hard work above 18,000 feet. No one had suffered from the altitude, nor had they felt greater fatigue than they would have felt in the Alps under similar conditions.

All that remained was to explore the upper basin of the Godwin Austen glacier and the E. slopes of K2. This was the work of the following fifteen days. The Godwin Austen glacier is from twelve to thirteen miles long. The lower part is almost level, mainly covered by great streaks of moraine, and rises barely 800 feet in a distance of six miles from the Concordia basin to the foot of K2. Its direction runs N. and S. Next the glacier turns N.E., and in the remaining six or seven miles rises nearly 4000 feet to Windy Gap, not in a gradual ascent, but in two steep slopes seamed with crevasses and separated by a level portion. Here an intermediate camp was made about half-way between the upper base camp and Windy Gap, on the left edge of the glacier, at the entrance to a vast amphitheatre where the N. glaciers of the Broad Peak chain flow down. This camp is just opposite the E. wall of K2 whose summit is masked by the E. shoulder, and can be seen only by ascending a few hundreds of feet higher on the rocks above the camp. From the summit of the shoulder several small ridges, spreading like a fan, run down towards the base of the mountain, giving it the appearance of a perfect cone. Even from this distance it is obvious that this side of K2 is nearly all pure ice. The snow rests on it only for a few hours after falling, and the bad weather is followed by avalanches which sweep the whole valley. Opposite K2 we see the stupendous N. wall of the Broad Peak rising in tier upon tier of glacier from which huge masses of sérac



V. Sella, photo.

Swan Electric Engraving Co., Ltd.

K 2, FROM WINDY GAP, LOOKING AT THE EAST WALL.

hurl themselves down filling the valley night and day with their roar. From this camp the Duke ascended to a col (20,207 feet high) on the left side of the Godwin Austen. Hence he overlooked the mysterious region to the east of the Gasherbrum peaks. The col was easily reached from the Godwin Austen glacier, and, judging from above, the descent of the other slope ought to offer few difficulties. Vittorio Sella ascended the same col a few days later and went a bit down the other slope and in spite of a violent wind succeeded in getting a photographic panorama of the region beyond. One mountain is here conspicuous above all the others and might possibly be identified with the *Teram Kangri* discovered and measured by Longstaff the same year (27,610).

On June 14, the first detachment of the expedition completed the ascent of the glacier and set up a camp on Windy Gap (20,450 feet). The glacier rises to the col by a gradual slope with the exception of less than a hundred feet of the last bit of the ascent. The col is wide and its outline is interrupted by a few rocks in the middle; to the N. a wide ice ridge leads in a series of huge steps to the summit of the Staircase Peak; to the south a steep crest connects it with the left buttress of the Godwin Austen glacier. To the E. of the col flows a steep and very broken glacier which might be practicable for a mountaineering party, but hardly for coolies loaded with camp material. It flows down to a great valley filled with a level glacier which falls towards the S.E. This valley is bounded to the E. by a chain of mountains between 20,000 and 22,000 feet, which, judging by its direction, seems likely to meet the N. spurs of the Staircase Peak.

Windy Gap is an excellent point from which to study the E. slopes of K2. The great N.E. snow ridge is more than two miles long, very narrow and full of teeth and sharp *aiguilles* and formidable *gendarmes*, between which on the N. side run the curves of a huge cornice which overtops the glaciers of its S. wall. Had *Guillarmod* been able to examine this ridge in profile from Windy Gap, or from a higher point, he would never have dreamed of conceiving it as a possible route to K2. The south-eastern declivity of K2 is a huge wall about 7000 feet high, at a very steep angle, swept by avalanches from the glaciers which cover the shoulders supporting the terminal cone. The desire to see a little more of the unexplored region towards the E., and possibly to the N. of the Staircase Peak and of K2, induced the Duke to start up the crest

which leads from Windy Gap to the Staircase Peak. A light camp was carried to the first of the icy steps of the ridge on June 24. From this point the Duke had perhaps the most perfect view of K2, which appeared more inaccessible than ever. On August 26 he was obliged to send back Henri Brocherel, who was ill, possibly in consequence of a violent tug from the rope when falling into a crevasse a few days previously. With only the two Petigaxs, father and son, the Duke proceeded up the crest. The cold was intense and the snow in good condition. In three hours they reached the second terrace (21,657 feet). Here two enormous bergschrunds cut off their route. They endeavoured in vain to get round them, first on one side and then on the other. At this point the Duke took a photographic panorama of the chain to the E. of Windy Gap and of the W. buttress of the Godwin Austen, behind which could be seen the peaks of the E. Gasherbrums. He also took another view of K2, whose N. face was visible in profile, as steep and rocky as the others. He could now give up the undertaking with a clear conscience, as he had spared no effort and no fatigue to assure himself of its impossibility.

I have perhaps spent too much time upon the description of the great mountain, and all its slopes; but at the present day without exhaustive details it may perhaps be difficult to bring the world of Alpine climbers to acquiesce in a verdict of inaccessibility. This judgment is naturally relative. Were K2 among our own Alps, it is quite possible that if besieged for several years it might be conquered, if its height is not in itself an insurmountable physiological obstacle. The peak might be gradually conquered, might be provided with fixed ropes, and dotted with shelters; it would in all probability demand its tale of victims before surrender! But the undertaking cannot be regarded as practicable in that remote corner of the world where K2 does actually stand, many days' march from the nearest village, in a region where the weather is permanently unstable, and in the warm summer months so continuously bad as to render high mountaineering practically impossible.

In the meantime the Duke's expedition had accomplished the exploration of the mountain and of the glaciers which surround three-quarters of its circumference. In spite of unfavourable atmospheric conditions and nearly continuous fog around the summits and high ridges, Vittorio Sella had photographed it from every side together with the surrounding

chains. Negrotto had encircled it with a net of photogrammetrical panoramas and theodolite observations.

Throughout June the weather had been very unstable, a serious obstacle to all continuous work, and especially unpropitious for ascents at a great height with an almost constant S.W. wind which grew stronger the higher you ascended. The experience of our predecessors gave us reason to suppose that July would be still worse. One of our best guides was only slowly recovering from illness and not in a condition to do any more work. The remaining six, as well as ourselves, were in excellent health owing to the perfect organisation and equipment of the expedition. I must, however, observe that the strength of everyone was a little diminished, that we had all to a certain extent grown thin and that our appetites were no longer what they had been. This very slow and very gradual wasting is undoubtedly a sign that a prolonged sojourn above 16,000 feet is injurious. It could not possibly be attributed to the diet, which was wholesome, varied, and abundant, and consisted less exclusively of tinned food than was the case in the Duke's Alaskan or Arctic expeditions, where no one had been the worse for it.

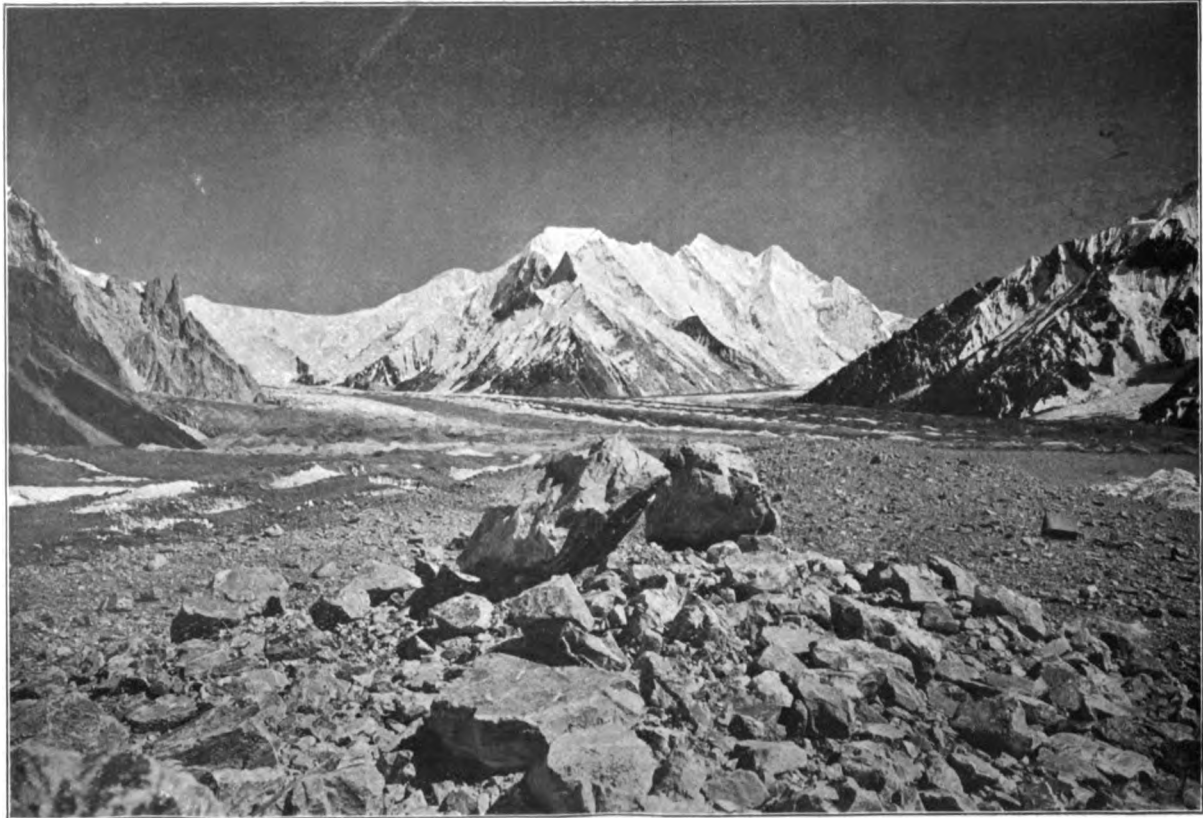
Not a single one of us twelve Europeans suffered from insomnia or headache or violent palpitations. The fifteen coolies who accompanied us and were with us the whole time, and who came from Shigar and Askoley, were perfectly well, although their diet was such as would have been wholly insufficient for men of any other race, working under similar conditions.

The Duke decided not to leave the Karakoram before making one more attempt to reach a great altitude upon some other peak of the group so as to fulfil the object of his expedition. None of the peaks of, or above, 26,000 feet immediately round the Baltoro basin seemed to promise any success. Everywhere the rocks were steep and precipitous, walls of vast height and at impossible angles, shining with live ice covered with insecure snow, menaced from above by séracs and by corniced ridges. Each peak appeared a compendium of every possible difficulty and danger of mountain-climbing.

The only two which seemed accessible were at the end of the S.E. branch of the Baltoro, the Golden Throne, and the Bride Peak. The Duke selected the latter for his attempt. It was the higher of the two and had the advantage of having been measured by triangulation by the Trigonometrical Survey

of India, which designates it by the name of Karakoram No. 8 and takes its height at 25,110 feet. Between June 28 and July 2 the expedition descended the Godwin Austen glacier, skirting the base of the Broad Peak, crossed the Concordia amphitheatre at the feet of the glaciers which flow from the western slopes of the Gasherbrum, and set up their camp at the end of the S.-E. branch of the Baltoro, at the foot of the Golden Throne, near to the spot which Conway had called Footstool Camp. The S.-E. branch of the Baltoro is more level and less irregular than the lower portion of the glacier after its confluence with the Godwin Austen. It is also covered through its entire extent with wide streaks of moraine. Those to the right and in the centre consist of beautiful polychrome marbles and conglomerates originating from Hidden Peak and Golden Throne. The streaks to the left consist of grey granites from the chains of the Bride Peak and the Mitre Peak. Hidden Peak, which is the furthest E. and the highest of the Gasherbrums, 26,470 feet, only becomes visible to the N.E. at the head of the Baltoro glacier on nearing the foot of the Golden Throne. It is an imposing mountain, but from this point no single peak of the region can vie with the Mustagh Tower, a superb monolith of colossal proportions which towers over the ranges like a sentinel watching over the whole district. The Bride Peak looked entirely different from this point. Negrotto and I remained a few days in the Concordia amphitheatre with the disabled guide in order to complete our series of photogrammetric panoramas. We thus reached the Footstool Camp later.

The Duke and Sella started at once, July 3, from this camp up the glacier which flows down in a cascade of broken séracs between Bride Peak and Golden Throne. The plan which the Duke had formed with his guides was to attempt the ascent of Bride Peak by the snowy E. ridge which runs down to the Chogolisa saddle. When he left Footstool Camp we hoped to reach the Chogolisa saddle the same day. Instead of this it took eight days. Such are the constant surprises of the Karakoram, which experience seems powerless to avoid. On the first day they climbed the cascade of séracs which had already been climbed by Conway in his ascent of Pioneer Peak. The camp was set up at about 18,000 feet. Here they were blocked for five days in their little tents by the heaviest snow-storm which they had yet experienced. This began the bad weather which was to continue through July with rare and brief interruptions only. During this time Sella came back to



V. Sella, photo.

THE BRIDE PEAK, FROM THE NORTH.

Swan Electric Engraving Co., Ltd.

Footstool Camp and soon after went back to Rdokass, stopping on the way to take a few more panoramas. On July 9 and 10, the Duke's caravan crossed the crevassed glacier between the Golden Throne and Bride Peak, and succeeded in carrying up the camp to the Chogolisa saddle, 20,784 feet. They had to wade all the way through deep soft snow. Up to this point it had been possible to use the coolies for the transport of equipment. They were excellent throughout, obedient and willing, and by this time understood perfectly the use of the rope on glaciers. The weather seemed to have mended and the Duke had an opportunity of beholding the marvellous prospect around him, comprising the Golden Throne with its series of five peaks, the Hidden Peak, the glacial basins of the high Baltoro and of the Godwin Austen, and to the S. the valley of the Kondus glacier with the important peaks, measured by the Topographical Survey, which flank it. A precipitous slope leads down to this glacier from the Chogolisa saddle.

During the nine following days the Duke never descended below 21,000 feet. On July 11, he camped at 21,673 feet and on the following day, with Joseph Petigax, and Henri and Emile Brocherel, he made a first attempt to reach the summit, but was turned back by a regular storm at 23,300 feet. They came back to the camp on the Chogolisa saddle, where they again remained for five days blocked by an uninterrupted snow-storm. On the 17th the weather seemed improved, and the camp was again carried up to the foot of the ridge higher than on the previous occasion, at 22,483 feet. On the 18th, at daybreak, the Duke again attempted the ascent with the same guides; the weather was cloudy but calm. At 6.30 A.M. they had already reached 23,000 feet. By 7.45, 23,458. They crossed a steep snow-slope in dense mist towards certain rocks which they had noticed during the preceding days at a point about two-thirds of the way up the ridge. By 11 o'clock they reached the foot of these, 24,278 feet. After a brief period of rest they proceeded to climb over the rocks up to the point where they ended. By 1.30 P.M. they had reached the point where the rocks stop and the snow begins, and the mercurial barometer gave a pressure of $12\frac{3}{8}$ inches. This reading, corrected by reference to the observations taken in Leh, Srinagar, Skardo, and Gilgit, gives a height of 24,600 feet. The mist was dense, the day mild, and the condition of the snow very bad. They were now about 500 feet from the summit. The way up lay along a snow crest with a great

cornice on one side barely visible in the mist, while on the other was the precipitous wall where the snow gave no foothold. The Duke considered that the risk of proceeding in these conditions was too great; so at 3.30, after waiting two hours in vain for a break in the mist, he ordered the descent. By 5.30 they had returned to the camp they had left in the morning, and by 8 o'clock, as night was closing in, they reached the camp on the Chogolisa saddle. During the two hours which were passed in waiting upon the ridge at the greatest altitude which has yet been reached, the Duke had leisure to assure himself that neither he nor any of his three companions noted any special symptoms due to the altitude. Their pulses were regular, scarcely above a hundred a minute. During the whole ascent, in spite of the steepness of the slope and of the mass of soft snow in which they sank up to above the knee, the speed was slow but regular, with short halts every fifteen minutes, and no one felt any excessive fatigue. The breathing was quick but not painfully so; it was only in the last bit, in climbing over the rocks, that they felt a certain degree of breathlessness.

An analysis of the rate of march gives the following results :

- from 23,000 to 23,500 feet altitude the rate was 360 feet an hour ;
- from 23,500 to 24,300 feet altitude the rate was 270 feet an hour ;
- from 24,300 to 24,600 feet altitude the rate was 160 feet only in the hour.

The last portion of the ascent, however, was up steep rocks. There can be little doubt that, had the weather permitted, three hours at most would have sufficed to climb the remaining 500 feet over snow. Had the condition of the snow been better, the ascent might have been considerably shortened.

I may finally add before leaving this topic that the Duke's experience contradicts the statement of Dr. Workman that it is almost impossible to sleep at night in camps above 20,000 feet. He and his guides always slept well by night in all the high camps, even in the one at 22,500 feet, although the whole four were crowded into two small Mummery tents. But during the prolonged sojourn at, and above, 21,000 feet, loss of appetite and even repugnance to food became very marked. I think it probable that this may be owing to a slight intoxication by products of metabolism incompletely oxidised. The effect, however, is so slight that it only began to be felt after several weeks passed above 16,000 feet.

During the last three weeks the bad weather had been practically uninterrupted. We had evidently entered the worst period of the monsoon. Our return was decided on by common consent. On July 22, the expedition reached Rdokass and on the 27th, Askoley, having crossed the Punmah on the rope-bridge. From Askoley we reached Skardo in four days by the short cut over the Skoro-La. The summer road over the Deosai plains was now followed to Cashmere, and we reached Srinagar on August 11.

The photogrammetrical survey carried out by the Marchese Negrotto made it possible to construct a map giving the complete basin of the Godwin Austen glacier and a large number of altimetical figures, among which I will merely mention that of the highest point of Broad Peak, 27,132.

The expedition was able to ascertain that the vast formation comprising the Broad Peak, the Gasherbrums, and the Golden Throne, is composed of limestone and conglomerates, which it is interesting to connect with the observations of Dr. Longstaff who noticed the same formation in the north buttress of the upper Siachen Valley. I cannot conclude my lecture better than by quoting the words with which the Duke of the Abruzzi ended his paper read before the Italian Geographical Society:—

‘On my former expeditions to Mount St. Elias and to Ruwenzori, the labours of my forerunners enabled me to achieve success; this time I hope that after-comers may reap the fruit of my work and my endeavours, and climb to the summit of the splendid Bride Peak, along the route which I have traced.’

IN MEMORIAM.

SIR MAURICE HOLZMANN, K.C.B., K.C.V.O., I.S.O.

MAURICE HOLZMANN was born in the year 1835 at Cöthen in the Duchy of Anhalt, where his father was an official in the Courts of Justice. He studied chemistry and medicine first at Leipzig, and afterwards at Heidelberg under Professor Bunsen. In 1859 he came to London, and, through a recommendation from Bunsen, obtained a post in Hofmann's laboratory. Whilst there he made the acquaintance of Monsieur Sylvain Van de Weyer, the Belgian Minister at the Court of St. James's, who induced him to become his private secretary. Holzmann only accepted this position temporarily, as he wished to be free to devote himself to scientific