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EXPLORATIONS IN THE ALPS OF DAUPHINÉ, during the month of July, 1862. By F. F. TUCKETT, F.R.G.S. Read at the meeting of the Alpine Club, June 9th, 1863.

PERHAPS no part of the mountain system of Europe has been less thoroughly explored than the lofty group bounded by the river *Durance* on the east, the *Romanche* on the north, and the *Drac* on the west and south, and occupying a portion of the modern French departments of the *Isère* and *Hautes Alpes*. The area of the entire *massif* is about 1,100 square miles, but the glacier-developing region covers little more than half this surface. The mean elevation is very considerable, as may be inferred from the narrowness of the valleys as well as from a comparison of the following classification of the principal peaks with those of the group of the *Finsteraarhorn*.

4	Peaks above 3,962 mètres (13,000 feet) and under 4,266 mètres (14,000 feet).
17	" 3,657 " (12,000 ") " 3,962 " (13,000 ").
29	" 3,353 " (11,000 ") " 3,657 " (12,000 ").

Its glaciers, including those of the second order, exceed one hundred, and are therefore little inferior in number to those of the Bernese system, though several of the latter have certainly the advantage in point of size from the greater extent of *névé* due to the less precipitous formation of the ground.

From time to time some accounts of its topography and physical features have appeared, and the writings of *Ladoucette* *M. Elie de Beaumont*, *Professor Lory*, and our own countryman, *Principal Forbes*, have called attention to many of its more

striking peculiarities. Within the last four or five years various members of the Alpine Club have penetrated still further into its recesses; and several papers in the second series of 'Peaks, Passes, and Glaciers' bear witness to their activity and enterprise. Hitherto, however, the absence of a trustworthy map, added to the really intricate relations of the principal summits and valleys, the poor fare and defective accommodation, and the fact that few of the explorers had an opportunity of intersecting the district in various directions, and studying it in detail, have rendered it difficult to arrive at a clear conception of the mutual bearings of its various parts. Under these circumstances, I ventured to think that a fresh examination by one who could avail himself of the labours of his predecessors would not be without advantage; and I therefore devoted ten or twelve days during the month of July in the past year to this special object.

It was important before getting on the ground to obtain all the preliminary information possible, and I was especially desirous of consulting such MS. maps or notes as might be available for my purpose in the *Dépôt de la Guerre* at Paris. Thanks to the kindness of my friend Principal Forbes, in furnishing me with a letter of introduction, and explaining my object to M. Elie de Beaumont, and the influence which that distinguished *savant* was good enough to exert in my favour, I met with the most courteous reception from General Blondel, director of the *Dépôt*, who gave me the freest access to maps and MSS. including the original memoranda of the officers of the E'tat Major, allowed me the utmost liberty in making notes, and, besides permitting me to have printed copies of several unfinished and of course unpublished sheets, furnished me with a manuscript one, beautifully executed by the draughtsmen of the *Bureau*, of the more important portion of the four MS. sheets of the *Feuille* Briançon on the same scale as the original. This last is partially engraved, being now, as it is termed, '*au trait*;' i.e. the rivers, roads, names of places, heights, and outlines (dotted) of mountains and glaciers are given, but no shading, nothing that represents relief. M. le Commandant Brossard, head of the engraving department, informed me that this sheet would certainly be ready for publication in six years, and very probably in five. The superintendent of the topographical department, M. le Colonel Bertrand, handed me over, after reading the general's order, to M. le Commandant Loupôt, a most pleasant, polite, and intelligent gentleman, whose kindness I shall not soon forget. He seemed as though he could not do enough to meet my wishes, and most energetically seconded all my applications to his *chef*. The four original MS. sheets, on a scale of

$\frac{1}{40000}$, which form the basis of the future *Feuille* Briançon, are the result of the following labours:—

Première Triangulation—1828-9-30	M. le Commandant Durand.
Seconde Triangulation—1851-2	M. Davoût (Capitaine ?).
La Topographie (détails)	MM. les Capitaines Viroux, Valette, Taffin, Beaudouin, Bourgeois, Smet, Vuillemot, Courier, Cousinard, Versigny, and le lieutenant Meunier.

Of these gentlemen, MM. Bourgeois, Courier, Cousinard, and Meunier executed that portion which is included in the copy supplied to me, and of which a photographic reduction has been deposited at the rooms of the Alpine Club. From the large number of lofty summits ascended by them, I was led to anticipate a degree of accuracy which subsequent minute examination on the spot completely confirmed. With Commandant Durand the survey of this group of mountains was a labour of love to which he devoted all his energies. Indeed, to such an extent did he identify himself with the successful completion of his task, that it ultimately cost him his reason. Whilst working in one of the more southerly valleys of the district, he had unpacked and set up his surveying instrument, the constant companion of his labours, when a kick from a mule threw it down and broke it irretrievably. This loss so affected his spirits that from that day he never recovered the full use of his mental powers. His successors appear, however, to have worked with equal diligence and accuracy, and the result is a map which for faithful rendering of details will almost compare with those of the Swiss survey. My photographic reduction is on a scale of about $\frac{1}{97000}$, but for purposes of comparison with the maps of General Dufour, it may be roundly estimated as $\frac{1}{100000}$, or two and a half-times less than the original, which, as already stated, is on a scale of $\frac{1}{40000}$. The *Feuille* Briançon, now partially engraved, is on a scale of $\frac{1}{80000}$, like all the other sheets of the map of the E'tat Major Français. In the photographic copy deposited at the rooms of the Alpine Club, some errors have been corrected and omissions made good by me; but these are not for the most part of much importance, and I have reason to believe that the future Briançon sheet, No. 189, will be a credit to the French engineers.*

Besides the above, I was furnished with a mountain barometer by Negretti and Zambra, an aneroid by Secrétan of Paris, two boiling-point thermometers by Casella, a theodolite by Troughton

* A reduction of this map has since been engraved for the 'Guide to the Western Alps,' where it will be found at page 62.

and Simms, kindly lent me by my friend Mr. Wm. Mathews, jun., a sleeping bag which has already been described in my paper on the Viso, a boiling apparatus by Stevenson of Edinburgh, and a supply of portable soup.

Thus much premised, I will now proceed to describe my various expeditions in Dauphiné. On the 5th of July, after descending from Monte Viso, I and my companions (Michel Auguste Croz of Chamouni, Peter Perrin of Zermatt, and Bartolomeo Peyrotte of Bobbio) took up our quarters for the night at La Chianale (5,847 feet, E.M.P. ; 5,906, W. Mathews, jun.), with the intention of crossing the Col de l'Agnello to Château Queyras and Guilestre on the following day. This pass is one of five or six which connect the head of the Val Vraita with the adjoining valleys of the Guil and Ubaye on the French side of the frontier, and, like most of them, is perfectly practicable for horses. As I can give no information from personal knowledge of the Cols Longet, La Niera (or Blanchet of the French map), St. Veran, La Ruine, and Ristolas or Soustra (the Lauze of the French map), I will not here allude to them further, especially since the recently published 'Alpine Guide' furnishes all needful particulars.

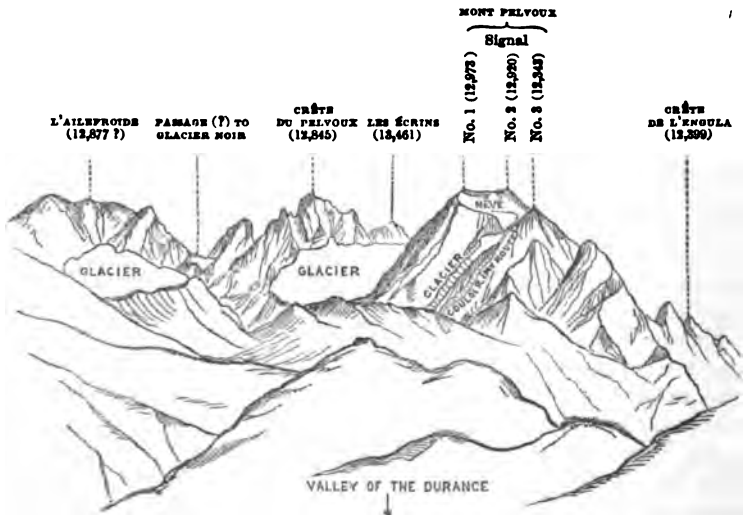
Of our quarters at La Chianale I cannot say much, but we managed to secure a good night's rest and a sufficiency of somewhat homely food, and about five on the morning of the 6th started for Guilestre. The sky was cloudless, the air fresh and pure, and all signs of the previous day's disturbance of the weather had vanished. About half an hour above the village the path turns off to the right up the Val de Soustra, at the head of which are the Cols de la Ruine and de Soustra (or Ristolas), both leading into the Vallon de Viso, as the upper portion of that branch of the valley of the Guil is called. Soon, however, turning to the left, we passed some sleeping *préposés*, zig-zagged up the hill-side through a scattered pinewood, and then following the course of a grassy upland valley, mounted the slopes at its head by a well-marked track to the actual col. Here we arrived at 7.15, but the distance might have been accomplished in less time if there had been any object in doing so. From two points before reaching the col the summit of the Viso comes into view, and from the actual crest it forms a striking object; whilst to the south the mass of the Rioburent (3,396 mètres) is seen towering up in ambitious rivalry. In the opposite direction a distant view of great magnificence burst upon us, embracing the entire group of the chief Dauphiné summits from the Ailefroide to the double-headed Aiguille d'Arves. The peculiar pointed mountain figured by Mr. Whymper at page

223 of the second volume of 'Peaks, Passes, and Glaciers' (2nd series), was very conspicuous, and I soon recognised the two principal peaks of the Pelvoux. To the right of these was a yet loftier summit which I was at the moment unable to identify, and of which, as I shall have occasion to refer to it again, I will only here say that it was in reality the E'crins, 4,103 mètres in height, and the culminating point of the *massif*. A barometer observation, by comparison with Geneva, Turin, Aosta, and the St. Bernard, gives a height of 2,730·7 mètres (8,959 feet), whilst in the unpublished *Feuille L'Arche* of the French E'tat Major I find the figures 2,699 (8,855 feet), apparently referring to the same spot.

After spending an hour very pleasantly over sketches, barometer readings, and a second breakfast, we again proceeded on our way. The descent on the French side was very gentle, and after passing a comfortable solidly-built refuge inhabited by a *préposé*, the path, which is an excellent one, follows the course of a grassy valley, the immediate scenery of which is rather monotonous, though the fine distant view of the Pelvoux and its companion peaks goes far to supply the deficiency. Two hours' walk brought us to Fongillarde, the French custom-house station, and an inspection of our baggage took place, though in the politest manner and with many apologies for giving us the trouble. Most of the *communes* in this and the neighbouring valley of St. Veran are Protestant, but many of the villages were furnished with places of worship of both creeds, and the utmost harmony appeared to prevail, the Roman Catholics speaking of their Protestant neighbours as '*de braves gens*.' Below Fongillarde there is a *char* road, and soon after quitting the village it descends rapidly to Molines, situated about three quarters of an hour farther down the valley, just below its junction with that of St. Veran. Between Molines and Villevieille (1 hour) the road is an excellent one, quite scientifically engineered, and in a gorge which is passed on the left just before the commencement of the steep descent to the valley of the Guil, there may be seen one of the finest natural pillars (similar to those of Useigne, Botzen, &c.) with which I am acquainted.

At Villevieille, whilst halting a few minutes for old Peyrotte, who had lagged behind, we entered a large inn rejoicing in the name of L'Éléphant to obtain some lunch, and judging from the appearance of the *salle*, the character of the provisions, and the hearty goodwill of the landlady, I am disposed to think that the traveller might meet with much worse quarters. Turning now sharp to the left down the main valley of the Guil, half an

hour's walk along a nearly level road (the *Grande Route* from Abriès to Montdauphin) brought us to Château Queyras, a most picturesque-looking place which the pencils of Brockedon and Lord Monson have already rendered familiar. There are two inns, neither of them brilliant specimens, and by no means seductive enough to induce me to stay for the night; but as the walk to Guilestre would be a tedious one, and, from the occurrence of a great quarterly fair at that place, every vehicle was in requisition, it appeared doubtful whether we should not have to face inevitable fleas, and possibly deeper horrors. At length, however, a *charrette* and mule were discovered, and after a pleasant chat with some of the sixty or eighty soldiers of the garrison, who find their residence in this little mountain fortress '*bien triste*,' and looked on a furtive visit to the E'léphant at Villevielle as the acme of bliss, we parted with Peyrotte, and effected a start at two. The ride was a very fine one, the road winding at first through magnificent gorge scenery, and finally reascending before it swept down by a series of well-constructed curves through the vineyards which clothe the slopes above Guilestre. From these the views of the range in front are most magnificent, as an outline taken a little above the town will to some extent show.



THE AILEFROIDE, ÉCRINS, AND PELVOUX, FROM ABOVE GUILRESTRE.

Guilestre was in a fever of excitement in the prospect of the

morrow's fair, and M. Ferrari, the polite landlord of the Hôtel des Alpes (3,320 feet, W. Mathews, jun.), was quite in despair at the numerous claims on his attention. The arrival of a foreigner was, however, an unusual event, and he exerted himself to the utmost and with entire success to make me comfortable. The house was full, but an excellent room was found for me at a neighbour's, and in a little inner *salle* a capital dinner, to which I did ample justice, was soon served. The afternoon and evening were occupied in sketching, writing letters, and watching the groups of peasantry, the freaks of unmanageable mules, horses, and cows picketed about the streets, and the wonderful performances of a Cheap Jack, who kept the *grande place* spell-bound by the sounds of his voice and drum. During the night heavy rain fell, and I began to fear that my good fortune was departing just at the critical moment, and that Dauphiné was asserting its immemorial right to be wet. A babel of tongues having, however, roused me at 4 on the morning of the 7th, I found to my delight that all traces of the storm had passed away, save a delicious freshness in the air which was most exhilarating. As the *diligence* from Gap to Briançon was not due till about one o'clock, we amused ourselves for a few hours in strolling about the little *bourg* and its neighbourhood, which owes its fertility to a somewhat elaborate system of artificial irrigation, and is quite famous in the country for its vineyards. About twelve we started down the hill in a *voiture* for a desolate-looking post station on the *grande route*, called the Plan de Fazy, at which the *diligence* changed horses. We were an hour too early, and the *diligence* was three quarters of an hour late, so we had a dismally long wait with nothing to do. At length, a little before two, the lumbering vehicle made its appearance, there was luckily room for all of us, and at 3.30 we rolled up the hill into La Bessée.

My first proceeding, after ordering some dinner, was to make the acquaintance of M. Jean Reynaud, *agent voyer* of the district, and a great friend of Messrs. Whympier and Macdonald, whom he accompanied in their successful ascent of the Pelvoux the previous year. I was fortunate in finding this gentleman at home, and shall always retain a very pleasant recollection of the few hours spent in his society. Dinner over, and various matters arranged, we started at 5.45 for Ville Vallouise, M. Reynaud most politely insisting on accompanying me for an hour. The evening was lovely, the valley well cultivated and beautifully wooded, the road excellent, and with my bright, genial, intelligent companion, the time passed very pleasantly. At length he took leave, and I pushed on rapidly after the

guides who had left us to follow our own devices. It was amusing to see the impression produced by our ice-axes, everyone evidently connecting them with the idea of mining operations, and as the natives have exalted notions of the mineral wealth of their mountains, I had to stop and allow myself to be cross-questioned as to my object in visiting their valley. I got away at last, however; and at 7.30 entered the Ville, as the modest village is somewhat pretentiously called (height 1,150 mètres E. M. F. ; 3,842 feet, W. Mathews, jun.).

We had been instructed by M. Reynaud to seek quarters *chez* Giraud, whose house stands near the bank of the stream to the left of and just across the bridge, and thither we accordingly repaired. Our host, who was at the door, gave us a very hearty reception, and ushered us into an unpretending, but by no means uncomfortable, *salle*, where we were soon joined by some of the local authorities, including a very intelligent and gentlemanly man, a namesake of the landlord, a native of the place, and a doctor by profession, who had been settled for some years at Vienna as private physician to some noble personage, and, being in delicate health, had come home to rest and recruit. He was a most enthusiastic entomologist and botanist, and gave me much interesting information. Amongst other things he stated, as the result of the latest investigations, that the red snow, or rather the colouring matter, is developed on the pollen grains of *Pinus Pumilio* (the Legföhre), which serve as a nidus. In confirmation of this, I may mention that I have often remarked early in the season, and a few weeks before the red tint makes its appearance, that footprints in the snow have a strong yellow hue, the origin of which had always been a puzzle to me, as it was too persistent to be due to any dirt or colouring matter in the boots. I have now little doubt that it may be attributed to the presence in large quantities of the *Pumilio* or other pollen grains, which are often wafted by the wind over very wide areas.

Exquisite moonlight tempted me out after supper, and it was hard to resist the attractions of a stroll; but as we were to be early risers, as usual, I did a wiser thing, and went to bed at ten. The sleeping accommodation was not luxurious, and the fleas were not unmindful of their vested rights; but on the whole we had little cause to grumble, and might have fared much worse.

We were astir soon after four on the morning of the 8th, and again the same perfect weather greeted me on looking out. The sun had just risen without a cloud, and was beginning to

tinge some of the summits that form the west boundary of the valley. I proposed to commence operations by an attack on the Pelvoux, in order to get a general notion of the topography and relations of the surrounding valleys, to obtain bearings of the principal summits, and to determine as carefully as possible the height of the Pelvoux itself. To accomplish this it was at least desirable, and at the time supposed to be essential, to bivouac somewhere on the mountains; so we determined to establish ourselves that night at the Grotte de Soureillan, or Cabane des Bergers de Provence, and assault the Pelvoux on the morrow. A supply of provisions and wine was requisite, and some time was consumed in the necessary arrangements. A sort of double sack, something like a Spanish *alforgas*, was at length provided, with store of bread, cheese, ham, eggs, and wine; and at 7.15 we started for Ailefroide, intending, if possible, to secure *en route* the services of one of the Sémionds, as neither of my companions had ascended the mountain, though Michel had two years previously been as far as the glacier in company with Messrs. Bonney and Mathews. A walk of three quarters of an hour, along an excellent path on the left bank of the Gir, brought us to the village of Claux (*patois*, Claou), rich in orchards, and pleasantly situated amidst a luxuriant growth of trees at the entrance to the defile leading to the upper valley of Ailefroide. A path ascends the slopes on the north of the village to the upland Val de l'E'chauda, and across the col of the same name at its head to Monestier. Les Claux is said to have been formerly occupied, like many other places in Dauphiné, by a band of Saracens, who are supposed to have held it as a fortified port after they were driven from the more open and accessible districts. In the name, it is added, of Les Claux (connected with the Latin *clausus* and the French *clore*), there is an allusion to its position at the entrance of the gorge which communicates with the valleys at the south-east foot of the Pelvoux. We soon found one of the Sémionds, who at first informed me that he could not accompany us, and that his brother was absent at Ailefroide. I soon saw, however, that there was something else in the background, and at last out it came. Taking me aside, he proceeded to inform me that he and Croz, who had been companions on the occasion of the unsuccessful attempt of Messrs. Mathews and Bonney in 1860, had not got on very well together, and that he was determined not to show the way to foreign guides, who would make it known to others, and thus deprive the natives of their rights by dispensing with their services. Though not at all anxious, under these circum-

stances, to have anything more to do with him, I endeavoured to point out the short-sightedness of such policy; but finding him obstinate, I did not choose to waste time in bandying words with him, and so, at 8.15, we once more proceeded on our way. The path crosses to the right bank of the Gir, or Ailefroide, immediately after quitting Les Claux, and then ascends, at first steeply, through scenes of the most varied beauty, walnuts, chestnuts, and pines occupying the foreground, whilst beyond and behind the many-peaked Pelvoux towers up most majestically in an abrupt face of rock nearly 7,000 feet in height. At 9.15 we reached the châteaux of Ailefroide, situated at the junction of the Celce-Nière, descending from the Glacier du Selé through the Combe de Sapière of Bourçet, with the Torrent de St. Pierre which has its source in the glaciers Noir and Blanc. Their height is 1,505 mètres (4,938 feet) according to the map of the E'tat Major (4,940, W. Mathews, jun.). Not admiring the genus Sémiond, we did not trouble to enquire further for the brother, but secured the services of a strong boy, who, for three francs, agreed to carry our provision-sack and guide us by the most direct route to the 'Cabane des Bergers de Provence,' or 'Grotte de Soureillan,' as it is called by the inhabitants of the Vallouise and the French engineers.

In company with our young guide, we started at 10.45, and in about two hours reached our destination by a short cut up a steep *talus* of débris, followed by a chasm scarcely wide enough to allow of the passage of a man, leading to slopes of alternate rock and turf. A bivouac is to me, I confess, one of the most delightful incidents of mountaineering, especially when, as in the present instance, there is the shelter of a great rock, water within a reasonable distance, an abundance of wood, and faultless weather. After setting up the barometer, four readings of which give a height of 2,229 mètres, or 7,312 feet (my friend, Mr. William Mathews, jun., makes the height 7,381 feet from a barometric observation in 1860), and dismissing the boy, we dispersed to collect wood and water, and soon a goodly supply of both was stored away in readiness for the cooking of the afternoon and evening, and the watchfire of the night.

The hours fled most pleasantly by, maps were consulted, pipes smoked, soup concocted, and as darkness fell we withdrew beneath the shelter of the Grotte, and having served out a plentiful supply of chocolate and replenished the fire, betook ourselves to rest about nine. As the dry juniper branches crackled in the blaze, and the bright flames leaped from twig to

twig, casting Rembrandt-like patches of colour and shadow on the roof and sides of our den, the effect was most picturesque, and would have been more agreeably so if the smoke had not at times sought to improve the *chiaroscuro* by objecting to depart by the proper channel. Gradually we all dropped off to sleep, but whether the confined air, warmth, and smoke were rather overpowering, or whether I had not yet become seasoned to Dauphiné fare, certain it is that my rest was more disturbed than I could have wished; and when at three the next morning we turned out, I found that I was by no means up to the mark. It is wonderful what may be accomplished by resolution, but it is one thing to effect one's object by sheer determination not to be balked, and another to secure any beneficial result. My aim was not so much to make the ascent of the Pelvoux as to render the expedition subservient to other purposes, and as in a state of bodily prostration the mind is alike incapable of enjoyment or accurate observation, I felt convinced from the first that the loss of a day would prove unavoidable. Still there was nothing like trying, and so at 4.15 we started; but after dragging myself wearily upwards another 1,000 feet, I found that it was useless to struggle with my indisposition, and therefore, establishing myself on a turf knoll not many hundred yards below the termination of the Glacier du Clot de l'Homme, I despatched Croz and Perrn for the articles left at Soureillan, and determined to rest and bivouac at the spot we had reached. The worst sign of all was that, for the first time in my mountaineering experience, my appetite had departed; but after a good long doze the sight and taste of food became once more attractive. From that moment I began to mend, and before evening I felt that I was myself again.

A low slab of rock, a little plot of soft turf, and some loose stones artistically arranged, combined with my bag to form a very satisfactory dormitory, and after making a hearty supper, and watching a glorious sunset on Monte Viso, I turned in at eight. A barometric observation gave for our plateau a height of 2,575 mètres, or 8,449 feet. Some hours of sound and refreshing sleep were only once broken by the novel sensation of being suddenly jumped upon by some living creature, which roused me sufficiently to perceive that the intruder was a goat, whose curiosity had proved too strong for his discretion.

At 2.20 we were up, and having made a hasty meal, and *cached* our baggage, together with a supply of provisions sufficient for another day, waited till 3.10, when there was just light enough to enable us to pick our way with care. From

various reconnaissances we determined, instead of following the route taken by Messrs. Whympers, Macdonald, and Reynaud, to make for a long *couloir* (filled at the time with snow) a few hundred feet to the east of the Glacier du Clot de l'Homme, and uniting with the latter at a point not far below its origin in the snow *plateau* above, which we hoped to attain by cutting our way through the *séracs*, and forcing a passage between them and a lower summit of the Pelvoux (No. 3, 3,762 mètres in height). Ascending diagonally the slopes of *débris* beneath the glacier, we kept to the right, or in an easterly direction, for some distance, and then, bearing suddenly away to the left, found ourselves at four at the foot of the *couloir*, just as the rising sun tinged the surrounding summits and furnished an excuse for ten minutes' halt. The slope of the *couloir* was rapid, the space often very confined, and the snow sometimes rotten, and at others more or less converted into ice; but there was no difficulty worth mentioning, and, pushing steadily upwards, we reached the point of junction with the glacier at five. The snow becoming soft, gaiters were here put on, and we then addressed ourselves to the attack of the *séracs*, which hung in threatening masses above. At first all went smoothly, slopes of snow enabling us to avoid the more formidable obstacles; but at length we were brought to bay by some cliffs of *névé* of so forbidding a character that serious doubts arose for a moment of the possibility of forcing a passage. A sort of *cheminée* was, however, discovered between the ice and the rock on our right, and though almost perpendicular, its summit seemed so near that a skilful climber might, with assistance from below, worm himself up. Perrin volunteered to make the attempt, and after some most extraordinary evolutions, consisting of wriggings on his part, and shoves *a tergo* from Croz's axe, he pronounced himself '*fest.*' Then I, with the assistance of the rope, followed, secured myself, and gave a helping hand to Croz, whilst Perrin again worked forward, and in a few minutes shouted that the plateau was won. So much ice-glaze covered the rocks, and the *cheminée* had therefore detained us so long, that it was seven o'clock before we all topped the brow, and found, to our delight, that there was nothing between us and the summit but uniform and gently inclined slopes of snow. The view was exceedingly magnificent, and as the day was before us, it was decided to indulge in a second breakfast, our morning meal in the dark having been a slight and hasty one. We were now nearly on a level with the summit No. 3 (3,762 mètres), whilst to the north-west rose the 'Signal' (the Pic de la Pyramide of Mr. Whympers), about 176 mètres above us, and

farther to the left was the highest summit of all, partially concealed by the undulations of the plateau. At 7.45 we again set forth, and at 8.15, without meeting any sort of difficulty, stood upon the topmost peak, just five hours and five minutes (one hour of which must be deducted for halts, and about half as much for the detention at the *cheminée*) after quitting our *gîte*. Here we remained for rather more than $3\frac{1}{2}$ hours, and though suffering at times severely from the cold, I was enabled to secure a series of theodolite and barometer readings which are not, I hope, without some value.

In the first place, I think I may claim to have determined, within very narrow limits of possible error, the height of this previously unmeasured peak, and before proceeding to speak of questions of topography, I will refer to the results of these measurements.

The barometer readings at 9, 11, and 11.45 A.M. give, by comparison with five inferior stations (Geneva, Turin, Grenoble, Aosta, and the Great St. Bernard) a mean height of 3,956·3 mètres (12,980 feet). Before returning to the valley, I carried an aneroid (by Secrétan) to the 'Pic de la Pyramide,' the 'Signal' of the French engineers. The corrected reading of this instrument at 12.15—476·7 millimètres—compared with that of the barometer on the highest peak at 11.45.—475·9 millimètres—the air temperature being respectively 4° and 0° C., gives a difference in altitude of 14·4 mètres, and adding this to the height of the Signal (3,937·6 mètres), already trigonometrically determined by Commandant Durand, we get for that of the principal summit 3,952 mètres. It will be seen that these figures are remarkably coincident with those of the direct barometrical determination, and for the present we will assume that the mean of the two methods—or 3,954·15 mètres—is very near the truth.

The theodolite observations, however, enable me to check this result in a very complete and satisfactory manner, as I will now proceed to show. The height of the E'crins, the culminating point of the entire group, has been trigonometrically determined by the French engineers to be 4,103 mètres; its distance from my station, according to the map of the E'tat Major, is 3,950 mètres, or 12,960 feet, and its angular altitude, as determined by me, is $2^{\circ} 8'$. From these data, and after applying the necessary correction for curvature and refraction (amounting to 1·1 mètre), it results that the difference in altitude of the E'crins and Pelvoux is 148·07 mètres, and subtracting this from 4,103 mètres the height of the former, that of the latter comes out 3,954·93 mètres, or only 0·78 mètres

more than the mean previously deduced. Again, reversing the process, and taking the height at 3,954 mètres, that of the Signal as trigonometrically determined, at 3,937·6 mètres, and the depression of the latter shown by the theodolite, at 2° 15', we get for the distance between the two stations, 417·6 mètres, whilst the map makes it 400, as nearly as it is possible to determine. Similarly, taking the height of the third or eastern summit (3,762 mètres) with a depression of 10°, we get for its distance 1,100·8 mètres against 1,100 on the map. Thus in two ways barometrically, and by three geodetical tests, the figure 3,954 mètres seems established with a high degree of accuracy.

I will now proceed to give a list of my theodolite readings, and to offer a few remarks on their results, as well as on some points in the topography of the surrounding district.

	Azimuth		Altitude	
	°	'	°	'
1 Peak due north (magnetic)	0		-1	30
2 Aiguilles d'Arve, W. peak	4	18	-1	16
3 Ditto E. peak	4	42	-1	14
4 Distant Range, NE. of Aiguilles d'Arve	13	10	-1	20
5 Mont Blanc (summit cloudy)	34	40 (?)	-	(?)
6 Mont Pourri	42	30	-0	35
7 Grande Casse	46	4	-0	19
8 Grivola	55	56	-0	25
9 Grand Paradis	59	45	-0	45
10 Pic de la Pyramide (Signal)	82	35	-2	15
11 Peak No. 3	121	17	-10	0
12 Monte Viso	129	58	-0	26
13 Highest Peak near Maurin (Aiguille de } Chambeyron?)	151	57	-0	45
14 Peak S. of Col du Selé	225	39	-2	11
15 Ditto N. ditto	238	0	-2	11
16 Peak seen above last	238	0	-2	0
17 Ailefroide	261	26	+0	4
18 Les Écrins	328	41	+2	8

In venturing to differ from my friend Mr. Whymper as to his identification of the Ailefroide, and the relative importance of the peak so designated by him, I need scarcely say that my criticisms are offered in the most friendly spirit, and with a grateful sense of my indebtedness to him as well as to others who preceded me; but as his paper in the second series of 'Peaks, Passes, and Glaciers' is one of the most important recent contributions to our knowledge of the topography of Dauphiné, and, from the absence of instrumental means of observation, I believe him to have fallen into some errors, I must be excused for stating frankly my own conclusions.

A comparison of the outline taken by me from the road a little behind Guilestre, with Mr. Whymper's vignette, at page 222 of 'Peaks, Passes, and Glaciers,' shows a very

satisfactory amount of agreement up to a certain point; but there is this important difference, that the mountain on the extreme left of the outline is not included in the engraving. Now it is precisely this left-hand mountain, and not the sharp peak in the middle of *my* sketch, and on the left of Mr. Whymper's, which is *the* Ailefroide, the summit known as such at La Bérarde, visible from the Col de Sais (see 'Peaks, Passes, and Glaciers,' page 209) rising above the east side of the Glacier de la Pilatte (the Condamine of Bourçet), and seen from the highest summit of the Pelvoux in a WSW. direction, though concealed by the latter from a spectator on the Signal. According to the theodolite observation, this peak appeared to be elevated $0^{\circ} 4'$ above my station, and the distance between them being 3,800 mètres (12,467 feet) according to the map, this would represent a difference in altitude of 5 mètres, and give 3,959.1 mètres as the height of the Ailefroide. The satisfactory results of Observations 10, 11, 12, 13, and 18 (of which more presently), justify the belief that the case of the Ailefroide is not an exception; but on the other hand I am bound to state that the French engineers assign to it a lower figure, viz. 3,925 mètres, and as the wind and cold rendered accurate reading a matter of great difficulty, not to say suffering, I do not like to insist too strongly on my correctness in the face of the evidence of the map. Be this as it may, however, Mr. Whymper's Ailefroide—the sharp peak between the Pelvoux and the true Ailefroide—has an altitude of 3,915 mètres assigned to it by the French engineers, and forms the culminating point of the 'Crête du Grand Pelvoux' of the map. If further proof be required that this last is not the true Ailefroide, nor anything more than one of the summits in the eastern offshoot from the main ridge which goes collectively under the name of the Pelvoux, I may add that it lies altogether east of the watershed, is consequently entirely invisible from the side of La Bérarde, and is quite isolated on the west by the *névé* of the south-western feeder of the Glacier Noir, from which a passage might possibly be effected to the head of the Combe de Sapenière altogether to the east of the true Ailefroide. The sketch will, I think, render this abundantly clear, and I find that those of my friends, Messrs. Mathews and Bonney, who visited the district shortly after me, entirely confirm my view, in which, I believe, both those gentlemen concur.

Next comes the question of the position of the E'crins, the real monarch of the entire group. As will be seen by the map, it lies in a north-west direction from the Pelvoux, at a distance of rather less than 4,000 mètres, and separated by the whole

width of the Glacier Noir. Its height, as has been already stated, is 4,103 mètres (a second summit a little farther to the west is 4,083, and a third north of this latter 3,980 mètres), and the angular altitude above the Pelvoux was $2^{\circ} 8'$. Of its superior altitude there can therefore be no question, and I have little doubt that it was in reality the peak seen by Messrs. Whymper and Macdonald, and erroneously identified by them with the lancet-shaped mountain of the Guilestre sketch, whilst it is certain that it corresponds with that seen by M. Durand from the Signal, whence neither the true Ailefroide nor the summit so designated by Mr. Whymper is visible. It appears to be a three-sided pyramid with precipitous faces of rock in the direction of the Glacier Noir and La Bérarde, and a more rounded form covered with immense masses of *névé* and *séracs* in that of the Glacier Blanc. Further, it is the identical summit figured by Forbes ('Excursions in Dauphiné') under the name of Montagne d'Oursine, his drawing being taken from the same direction as my outline at page 168. There is no Montagne d'Oursine, or rather, the names Montagne d'Oursine, Pointe d'Arsines, and Pointe, Pic, or 'Barre' des E'crins or Escrins, all refer to one and the same mountain, which rises immediately behind and nearly due east of La Bérarde. Lastly, with respect to M. de Beaumont's outline (see 'Annales des Mines,' 3me série, t. v., and 'Peaks, Passes, and Glaciers,' page 227), there is such a striking similarity between it and my outline of the E'crins from the Col du Glacier Blanc at page 176, that it seems at first clear that his remarks refer to the E'crins, and that the serrated ridge to the left is either the 'Crête de l'Encula,' or a portion of the rocky barrier connecting the E'crins with the Ailefroide, called by the French engineers the 'Crête de la Bérarde,' and by Bourçet the 'Pointe des Verges.' But we are met at once with this difficulty, that as seen from the neighbourhood of Guilestre—where M. de Beaumont's sketch is stated to have been taken—the E'crins lies to the left or west of the Pelvoux by which it is partially concealed. If, on the other hand, as I cannot but believe, M. de Beaumont's drawing refers to the Pelvoux, and the serrated ridge to the left is intended to represent the summit figured by Mr. Whymper as the Ailefroide, I am bound to say that it conveys a very inaccurate idea of the originals. In either case, much of Mr. Whymper's criticism of both De Beaumont and Forbes is materially affected by his mistake as to the identity of the Ailefroide and his confusion of this summit with the E'crins. The passage in M. de Beaumont's paper quoted by Mr. Whymper (page 227, 'Peaks, Passes, and Glaciers') would seem, from the allusion to the 'Montagne

d'Oursine' (which I have already stated to be a synonym for the E'crins) as a different peak from that of his outline (*a*), to show that the latter is really meant for the Pelvoux, and indeed this *must* be the case if Guilestre was the point of view.

The conclusions just stated were not all come to as the result of my observations on the Pelvoux, the entire isolation of the pseudo-Ailefroide from the main chain having only been demonstrated when the ridge was seen in reverse a few days later from the Glacier Blanc, while the final identification of the true Ailefroide was reserved for my expedition from La Bérarde to Ville Vallouise by the Glaciers de la Pilatte and du Selé. For convenience sake, however, I have thought it best to dispose of the whole subject at once.

As regards the other theodolite bearings, I have already spoken of the excellent results given by 10, 11, and 18, in connection with the determination of the height of the Pelvoux. Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9, I have not yet worked out, as in some, identification is difficult, and in others, it is not easy to determine the distances of the points observed. Taking into account the great difficulty of getting accurate readings for such distances, the following comparison of the results of the remaining observations (Nos. 12 and 13) with previous determinations is, on the whole, as favourable as I had ventured to expect:—

	Distance		Height	
	Mètres	Feet	Mètres	
12 Monte Viso	62,100	196,854	3,875·4	3,850·2 Bar.
13 Aiguille de Chambeyron	54,500	178,809	3,391·5	3,400· Δ

A few words as to the view, and I will proceed with my narration. In the immediate neighbourhood, it embraced almost all the principal peaks of the Alps of Dauphiné, with perhaps the exception of the Aiguille du Midi de la Grave, La Grande Ruine, and La Roche-Faurio, which were, I believe, hidden by the eastern arête of the E'crins. The list of theodolite bearings will supply the principal details, and I will only add that our position commanded the Glaciers Blanc and du Selé, whilst at our feet lay an immense chasm separating us from the Crête de l'Encula, the E'crins, and the Crête de la Bérarde (the 'Pointe des Verges' of Bourçet), and filled by the great mass of the Glacier Noir, up which lies the route of the Col de la Tempe to La Bérarde described by Mr. Nichols in 'Peaks, Passes, and Glaciers.' The distant view was superb, though soon after our arrival clouds began to form over portions of it. Beginning in a northerly direction, and sweeping round to the east, I recognised the Rocher des Fys, the Buet, and the chain of Mont Blanc

from the Aiguille de Berenger to the Jorasses; then came successively the Pourri, Grande Casse, Weisshorn, Dent Blanche, Matterhorn, Dom, Täschhorn, Grivola, Grand Paradis, Breithorn, Zwillinge, and Lyskamm (Monte Rosa was hidden by an intervening summit), followed by the range of the Cottians, with Monte Viso towering over them all. No trace of the sea could be distinguished, and a dull haze resting on the plains to the south-west concealed all details.

At length my hands and feet had become so benumbed by exposure and continued inactivity, that further observations were impossible; so, packing up the instruments and casting once more a rapid glance around, we quitted the peak at 11.50, and proceeded to the Signal, which we reached in about a quarter of an hour. The cairn was in an excellent state of repair, and was provided with a long wooden staff considerably out of the perpendicular, to which I attached a broken wine gourd as a memorial of our visit. In the MS. notes of M. le Commandant Durand which I examined at the Dépôt de la Guerre, he says, 'Le Pelvoux est formé de trois sommets. Le Signal a été placé sur la pointe E., qui est moins élevée que la pointe W. Cette dernière est toujours couverte de neige.' It was the absence of stones on the latter, and their abundance on the former summit which influenced the selection of the less elevated station; but from the foregoing statement I infer that he must have visited both, and, indeed, apart from this it is scarcely credible that he should have spent two or three days on the Signal without proceeding to the higher or west point, easily reached in little more than a quarter of an hour. In a chink of the cairn I deposited one of Casella's mercurial minimum thermometers, and this done, we decided, as our present position was comparatively sheltered, to dispose of our remaining provisions. Half an hour thus passed rapidly away, and I should have liked to linger longer; but the weather began to assume a threatening appearance, the sun retired at intervals, and though the sky immediately above us remained clear, great masses of cloud of inky blackness, piled up and urged on by a furious westerly wind, were assaulting the southern spurs of the Cottians, and hurling themselves like the waves of an angry sea against their rocky buttresses. So at 12.45 we reluctantly set forth on our return.

Fearing that the descent of the *cheminée* would be almost impracticable, we decided to force a passage through the *séracs*, and by caution, great skill on the part of the guides, and keeping at first well to the right, we succeeded in reaching, without any mishap, the more uniform portion of the glacier. Our progress

thence to the foot of the *couloir*, which we reached at 2.30, was alike devoid of incident or difficulty, and after removing gaiters we proceeded down the slopes of *débris* by our track of the morning, reaching our *gîte* at 3.15. The descent, including the *détour* to the Signal, had thus occupied two hours and three quarters, and had the weather continued fine we might have spent six or seven hours instead of four hours and a quarter on the two summits. In looking back, I am vexed to think how many observations of interest might have been made which were neglected, partly from want of time, and still more from laziness, arising principally from the penetrating effects of the cold; but these regrets will now avail nothing, and I can only hope that some one will ere long make good my deficiencies.

I had planned to pass the night at Soureillan, and make an attempt the next day to effect a passage to La Bérarde by the Glacier du Selé; but I now changed my mind, and determined, as the descent to the valley would be difficult in the early morning light, and the nature of the work before us was so uncertain, to proceed at once to the Combe de Sapenière and establish myself in a third *gîte* as near to its head and the foot of the glacier as possible, so as to be on the ice at an early hour the following morning. On proceeding to collect the few articles left at our last camping-place, a small *sac* of Perrn's was not to be found, but after long and careful search it was discovered at the foot of a precipice below our plateau. At first we imagined that some wandering *berger* had been meddling with our *cache*, but the sight of the tails of my macintosh, which had been consigned to its keeping, protruding in a remarkably torn and mangled condition, showed that our friends the goats had been amusing themselves in our absence and at our expense.

From our ignorance of the ground, and its precipitous nature, much time was wasted in the descent, and two hours elapsed before we reached the level of the valley at 6.30. After searching for a stream or spring of pure water, which it is always desirable to have near at hand when bivouacking, we at length established ourselves beneath a rock, collected wood, and lighted a fire, over which some portable soup was soon simmering in my *casserole*. But alas! when we unpacked the provision sack, we discovered, to our intense disgust, that the goats, not content with tumbling it over the rocks, had abstracted and eaten the one remaining loaf set aside for the evening meal, the morning breakfast, and the midday lunch. This was exceedingly annoying, as it seriously affected our plans; but there was no help for it, and so we had to be content with the soup

and a morsel of cheese, and at 8.30 stretched our hungry selves on some dwarf juniper bushes, which formed an elastic though rather prickly couch.

On rising next morning (the 11th) at 3.30, we found that *brouillard* enveloped the glacier and surrounding peaks, and therefore decided to wait a little before setting out. Some more soup was made, and at five we broke up our camp; but after reaching the head of the Combe at 5.30, as the weather became worse, we determined to abandon the expedition for that day and return to Ville Vallouise for a fresh supply of provisions. We lingered a little at our bivouac, still hoping against hope, but at 6.35 started for Ailefroide, which we reached at 7.40. Here, as well as at Les Claux, we made tolerably long halts, and I learnt that at the latter place quarters may be obtained, *chez* Joseph Barneout, whose wife was most hospitable, insisting on my partaking freely of her cherries and currants. Owing to these delays, it was 10.30 before we arrived at the Ville. Here I remained quietly till the afternoon, and was agreeably surprised by the arrival of a very pleasant French gentleman and lady, who had come up from La Bessée to see the Vallouise on their way from Briançon to Gap.

At 5.15, furnished with a fresh supply of provisions, we once more started for the upper valley, reaching Les Claux at 6.10 and Ailefroide at 7.10. Some first-rate chocolate was at once brewed, and then, whilst Perrn and Croz climbed up to the rafters of a *châlet* under the amiable delusion that by so doing they would secure immunity from the fleas, and there roosted like two gigantic fowls, I betook myself with my bag to a neighbouring grassy hillock, and with the addition of a few loose stones scientifically combined with a couple of erratic blocks, soon constructed for myself one of the most delicious bivouacs that can be imagined. As I crept into my bag, the moon rose above the southern ridge and bathed the whole valley in its soft light. Never was any effect more enchanting, and amid so much beauty, in such solitude and silence, broken only by the subdued roar of the torrent or the tinkle of a cow-bell, sleep at first seemed impossible. When I did at last drop off, it was only to wake once and again to have one more look, though, under the circumstances, sound slumber was perhaps of more importance.

My intention was to gain the upper plateau of the Glacier Blanc, thence attack the *E'crins* on its north-eastern face, and return to Ville Vallouise to sleep; and not knowing how much time might be required, it had been decided to get off very

early. We therefore rose at two on the 12th, and were fairly *en route* at three.

The path, which is a mere track, traverses the torrent of St. Pierre to its left bank by a bridge close to the village, and then ascends the flat surface of the valley, consisting of mingled stones and turf, for three-quarters of an hour. A little before four, we reached a mass of *débris* called Le Banc, probably an ancient moraine, stretching across from side to side, through which on our left the stream had forced a passage and came foaming down in a series of rapids. Arrived at its summit, the Glaciers Noir and Blanc at once came into view at the further end of a large plain covered with *débris*, and apparently at some former period the bed of a lake formed by the waters of the retreating glaciers dammed up by the moraine. This desolate tract goes under the name of the *Pré de Madame Carle*, though what that unknown lady could have done to bring such utter destruction on her property I cannot conjecture. Doubtless there is some fearful legend in existence which would explain the doom, but I regret to say I cannot clear up the mystery.

Not knowing on which side of the Glacier Blanc the ascent to its *névé* would be most easy, we decided not to cross the torrent, but keep on its east or left bank till we reached the ice, and then make our selection. Our progress over the rolling and water-worn pebbles of Madame Carle's domain was necessarily slow, but at 4.45 the glacier was reached (height 1,851 mètres, or 6,073 feet), and as there appeared to be traces of a path up the slopes on the right, we at once commenced the ascent. The mass of the Glacier Blanc is exquisitely pure, presenting, as its name implies, a strong contrast to its neighbour, the Glacier Noir, disfigured by enormous masses of *débris*, and looking like the dirty snout of some unclean animal. At the same time the summits of the Pelvoux, Ailefroide, Crête de la Bérarde, or Pointe des Verges, E'crins, and Crête de l'Encula, in which it is framed, offer some of the finest and most striking combinations of wildness and grandeur that I ever saw. After about half an hour's climb, the grassy slopes gave place to rocks, and in these we soon became almost hopelessly involved. That there was some key to the labyrinth we were convinced, but being ignorant of it much time was lost in endeavouring to force a passage, and after all we were unsuccessful. It was at length decided to return, cross the torrent, and try the opposite bank, and at 5.45 we found ourselves once more at the foot of the glacier.

The passage of the torrent was not an easy matter, but was

accomplished without mishap, Perrn insisting on taking me upon his back, as he said the extra weight steadied him. Traversing the northern lateral moraine of the Glacier Noir for a short distance, we then struck off to our right, up the terminal slope of the Crête de l'Encula, and at 6.45, having attained a considerable altitude, halted for breakfast. Starting again at 7.25, and still ascending rapidly, we reached at eight the west bank of the first plateau of the glacier, immediately above the steep descent down which it pours its wildly-contorted masses into the valley below. The rocks farther up on our side looked ugly, whilst the ice above us was so fearfully rent by the sudden turn which the glacier makes round the eastern foot of the Encula that the practicability of further progress in that direction seemed doubtful, and our morning's experience having taught us caution, it was decided to traverse diagonally the gently inclined middle portion of the ice-stream to the opposite or eastern bank, and then gain the *névé* above by a wide *détour*. The decision proved to be a wise one, we met with no difficulty, and having effected the passage and climbed the slopes beyond for a short distance in a direction parallel to the glacier, we halted at 8.45 to look about us and rest. At nine we again started, reaching at 9.15 the foot of some snow-slopes leading to the second plateau or *névé*, which we reached at 9.45. Up to this point the course of the glacier is from NNW. to SSE., but here it makes an extraordinary curve, running from SW. to NE., and bounded on the south by the E'crins (4,103 mètres) and Encula (3,779 mètres), and on the north by the Roche-Faurio (3,716 mètres), and a range of nameless peaks from which a series of glaciers of the second order descend to swell the trunk stream. It is over this range, which I propose to call the Crête du Glacier Blanc, that I effected a passage a few days later, descending by the Glacier d'Arcines to Villar d'Arène and La Grave.

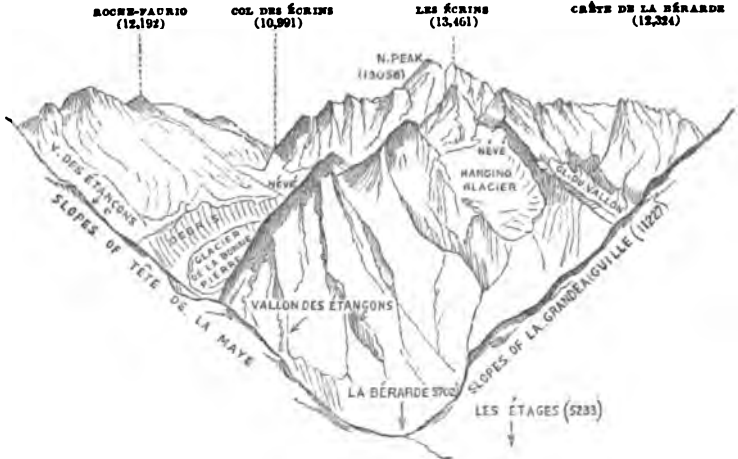
Arrived on the plateau, a most striking view of the E'crins burst upon us, and a hasty inspection encouraged us to hope that its ascent would be practicable. On the sides of La Bérarde and the Glacier Noir it presents, as has been already stated, the most precipitous and inaccessible faces that can well be conceived, but in the direction of the Glacier de l'Encula, as the upper plateau of the Glacier Blanc is named on the French map, the slopes are less rapid, and immense masses of *névé* and *séracs* cover it nearly to the summit.

The snow was in very bad order, and as we sank at each step above the knee, it soon became evident that our prospects of success were extremely doubtful. A nearer approach, too,

disclosed traces of fresh avalanches, and after much deliberation and a careful examination through the telescope, it was decided that the chances in our favour were too small to render it desirable to waste time in the attempt. I am perfectly satisfied that this decision was a right one, and the subsequent experience of Messrs. Mathews and Bonney, who were forced to beat a retreat after attaining a height of 12,936 feet, quite confirms the prudence of our course. At the same time it was a sore disappointment, and I mentally resolved to try again soon. Meanwhile, as we had come so far, I determined to push on at least to the head of the glacier, the surface of which is very gently inclined; and accordingly at 11.30 we found ourselves standing in a narrow rocky gap, the lowest point of the ridge connecting the E'crins and Roche-Faurio, and bounding the glacier on the west. The height, according to my barometer reading compared with five inferior stations, comes out 3,415.5 mètres (11,206 feet), but as the figures 3,350 mètres (10,991 feet) occur on the French map at a point which appears to correspond with our position, they may probably be more exact. Mr. Bonney's corrected aneroid observation on the 26th August comes out 3,358 mètres, or 11,017 feet.

While the barometer was settling we took some lunch, and I examined the map, from which I at once perceived that the glacier seen through the gap to the west at a great depth below must be that of La Bonne Pierre, and if a descent to its head was practicable, a passage might probably be effected to La Bérarde. On suggesting to Croz and Perrn that, though baffled by the state of the snow on the E'crins, we might still achieve something of interest and importance by discovering a new col, they both heartily assented, and in a few minutes Perrn was over the edge and cutting his way down the rather formidable *couloir*, which, though it looked doubtful from above, offered the only means of attaining our object. It was just one o'clock when, Perrn having cut steps down the most precipitous part of the slope and effected a lodgement on one of the rocks at the side, Croz and I followed cautiously in his track, and the snow being in excellent order, we all reached the *névé* of the Glacier de la Bonne Pierre at 1.45 without any serious difficulty. Later in the season, however, the absence of snow or its conversion into ice might render the pass less easy. We now halted for a few minutes on a rock (height 3,001 mètres, or 9,845 feet) to examine the topography of the glacier basin, and admire at leisure the grandeur of the huge and riven cliffs of the E'crins, which towered up to the S.E. nearly 4,000 feet above us, in the most rugged and fantastic

forms. Of the scenery some idea may be formed from my outline from Les E'tages, and the coloured illustration from the



THE COL AND POINTE DES ÉCRINS SEEN FROM THE SLOPES NW. OF LES ÉTAGES.

same point of view in Forbes' 'Journals of Excursions in Dauphiné,' appended to his admirable work on 'Norway and its Glaciers.' The position of the col may there be clearly recognised at the lowest point of the depression to the left of the E'crins, or 'Montagne d'Oursine.'

Leisurely descending the centre of the glacier till the increasing slope and the greater width and frequency of crevasses rendered further progress difficult, we took to the right lateral moraine and followed it to the valley below, where the Torrent des E'tançons, from the glacier of the same name which covers the south foot of the Aiguille du Midi de la Grave, joins that of the Bonne Pierre. It was now four o'clock, and we were close to La Bélarde; but here a considerable delay took place as we could discover no bridge, and neither stream was easy to pass. After reconnoitring the banks of the Torrent de Bonne Pierre for some distance, a point was at length selected for crossing, and Perrn again volunteered to ferry me over. Remembering the success of a similar proposal in the morning, I assented, and away we went. The slope, however, was much greater, and the current consequently much more powerful, whilst the large rolling stones in its bed rendered the footing very insecure. We got on very well till the middle of the stream was reached, when suddenly Perrn plunged into a hole and immediately subsided into the water, which reached

nearly to his neck. I was for getting off and wading to shore on my own account, but this he would not hear of, and with shouts of '*Halten Sie fest, Herr!*' grasped my dripping legs in his vigorous clutch. Still there we stuck completely waterlogged, and no efforts of my gallant steed enabled him to recover his legs and proceed with his burden. Our appearance must have been irresistibly ludicrous, and I could hear Croz shrieking with laughter on the bank, but at length I induced Perrn to leave me to my own devices, and free of one another we were soon on dry land, though in a most dripping condition. At five we set off again, after wringing our wet clothes, and in another quarter of an hour entered the house of the Rodiers at La Bérarde, where we proposed to remain for two nights, as the following day was Sunday. The time occupied from Ailefroide had been $14\frac{1}{2}$ hours, from which about $4\frac{3}{4}$ must be deducted for halts, &c., whilst $1\frac{3}{4}$ should be added if Ville Vallouise be the starting-point.

Old Rodier and his son, the well-known chasseur-guides, and their respective wives, received us with every civility, allotted a *grange*, filled with *fresh* hay (the luxury of which every mountaineer will know how to appreciate, especially in such vermin-haunted districts as Dauphiné), for our sleeping quarters, allowed us the use of their fire for cooking, and their room for sitting in, and supplied us with bread, wine, milk, butter, &c., on very reasonable terms.

The 13th was spent quietly at La Bérarde, Perrn and young Rodier going down the valley to attend mass at St. Christophe, whilst I strolled no farther than to Les E'tages (height 1,595 mètres). I have since regretted that I did not walk up the Vallon des E'tançons and examine the glacier at its head, and the southern face of the Aiguille du Midi. The scenery must be very grand, and a reconnaissance of the Meije from this side could not fail to be interesting. I hope, therefore, that my omission will be repaired by any of our mountaineers who find themselves in this neighbourhood during the present or succeeding years. I would also direct their attention to the extensive glacier plateau, called the Glacier du Mont de Lans, stretching away nearly two leagues in length to the west of the Aiguille du Midi, and seen in places from the valley of the Romanche between La Grave and Bourg d'Oysans. Two aneroid observations (corrected) give for the height of La Bérarde 1,765.2 mètres (5,791 feet), whilst the French engineers state it as 1,738 mètres (5,702 feet), Forbes at 5,500 feet, and my friend Mr. Mathews at 5,669 feet. I had much pleasant chat with old Rodier, who mentioned, amongst other things, that there is a passage connecting La Bérarde with

Villar d'Arène by the Vallon des E'tançons, and thence over the ridge between the Grande Ruine and Aiguille du Midi de la Grave (La Meije), descending on the east by the Glacier du Clot des Cavales and joining the route of the Col d'Arcines (from Villar d'Arène to Monestier), near the châteaux de l'Alpe. This pass, which is alluded to by Forbes and Ladoucette, is called the Col des Cavales, and may be about 3,128 mètres (10,263 feet) in height, as these figures are found in the French map at the lowest point of the ridge in question. Rodier had, I believe, only once crossed it, and said that the time occupied was from 10 to 12 hours, but added that it was seldom or never used now.*

As, encouraged by Mr. Bonney's favourable report of the chances of success, we proposed attempting to reach Ville Val-louise on the 14th, by the glaciers at the head of the valley of La Bérarde, and had decided to start very early, we soon retired to our hay, and secured some hours of refreshing sleep.

It was just two when we awoke, and at 2.30 we set off up the valley (the Val des Ençons of Bourçet) in most brilliant moonlight. At three o'clock we passed on our right the entrance to the valley (the Clochâtel of Bourçet), at whose head is the Glacier du Chardon of the French map, called by Rodier the Baverja. Over this glacier lies the old route to the Col de Sais; but Messrs. Forbes and Heath, as well as my friends Messrs. Bonney and Hawkshaw, reached the summit of the ridge dividing the valleys of La Bérarde and Godémar at a point further to the east, by ascending the main or east branch of the valley (the Conte Faviel of Bourçet). This latter, up which our route too lay, is closed by the fine Glacier de la Pilatte, the Condamine of Bourçet); and keeping on the right or east bank of the torrent, and crossing numerous streams from the secondary glaciers on our left, we reached the foot of the ice at 4.20, just as the sun struck the fine range of snowy peaks to the south-west. We then ascended the eastern moraine beneath the rocky buttresses of the Ailefroide (the Grand Pelvoux of Forbes, whose error was, I believe, first pointed out by my friend the Rev. T. G. Bonney), and at 4.30 took to the ice, which was here gently inclined, but slightly crevassed, and very free from dirt or débris. At five, we found ourselves at the foot of two ice-falls, and in the midst of the most magnificent scenery. A halt was called to examine the map and reconnoitre the ground

* In August 1863, those indefatigable explorers of Dauphiné, Messrs. Mathews and Bonney, repaired my neglect by traversing the great glacier plateau, crossing the Col des Cavales, and investigating the recesses of the Glacier de la Plate des Agneaux. See page 198.

carefully, before finally deciding on the direction to be followed. It appeared evident that the arm of the glacier on our right was that leading to the Col de Sais, and traversed by Forbes and others; so with it we had clearly nothing to do. This point settled, we resolved to make for the upper portion of the more easterly branch, and, turning the ice-fall by its left or west bank, we found ourselves at 5.20 on the plateau above. A sort of corridor opened out on our right, and it appeared to me probable that a passage might be effected over its head into the Val Godémar. On the eastern side it would present no difficulty, but I cannot say what might be the nature of the reverse slope. On our left the ice was still much crevassed, and we had to make a considerable détour to the right, but at 6.15 the foot of the final slope was reached, and before attacking it we decided to breakfast, and study carefully the proper direction, about which there was much uncertainty. This important question being at length settled, after much discussion, and the meal disposed of, we took to the east boundary of the glacier at 6.45, making straight up the snow and *névé* for a low ridge of rocks, which seemed to occupy the lowest point, and form the watershed in this direction. The inclination was considerable, but by no means extreme, and one hour over snow followed by a short scramble up the rocks, which in places were difficult, sufficed to place us on the crest. Here we at once found to our delight that we had hit the lowest point of the ridge to within ten yards, and that we were standing just where we wished to be, on the summit level of the Glacier du Selé. It was not yet eight o'clock, and the most doubtful part of the expedition was already accomplished.

The view to the south-west and west of the basin of the Pilatte Glacier was superb, but to the north and north-east a precipitous rock cut off the Ailefroide and Pelvoux, and it was necessary to descend a short distance on the eastern side of the pass before these came into sight. My barometer had unfortunately been broken during the descent of the moraine of the Glacier de la Bonne Pierre, and the boiling point was at the moment the only method available for determining the height of our position. The mean of the readings of two thermometers (corrected), compared with five inferior stations, gives an altitude of 3,302.1 mètres (10,834 feet), which cannot, I think, be far from the truth, though possibly slightly in excess of it. On the French map, indeed, the figures 2,983 mètres occur at a point which appears to correspond very nearly with the col, but I am satisfied that this is either a typographical blunder or the result of an error in calculation.

Before quitting this subject, I would call attention to the relative elevation of the *névés* of the glaciers on the east and west sides of the watershed, as illustrated by the Cols du Selé and des E'crins. In the case of the Glaciers Blanc and du Selé, gently inclined snow-fields extend up to the crest of the ridge, whilst on the side of La Bérarde this is separated by an almost precipitous slope 800 to 1,200 feet in height, from the upper portions of the Glaciers de la Bonne Pierre and Pilatte. So, too, as will be seen in the course of my narrative, there is a difference of level of at least 1,000 feet, between the *névé* of the Glacier Blanc on the side of the Vallouise, and that of the Glacier d'Arcines below the Col du Glacier Blanc in the direction of Villar d'Arène. This fact has not escaped the notice of M. Elie de Beaumont, as may be remembered by those who know his interesting paper on Dauphiné ('Annales des Mines,' 3me série, tom. v.), which has been so often referred to by later travellers.

At 9.10 we quitted the col, after christening it the Col du Selé in honour of the glacier which descends from it into the head of the Combe de Sapenière, and kept away to the right beneath the rocks of the Crête des Bœufs Rouges to avoid the crevasses which furrowed the middle of the stream. Having gained a point commanding a most glorious view of the Ailefroide and Pelvoux, I halted for nearly half an hour to sketch, and thus had a further opportunity of studying at leisure the relation of those summits to one another, and the question of the identification of Mr. Whymper's Ailefroide to which I have already referred. I will only add that my previous suppositions were here finally demonstrated to be correct. The pseudo-Ailefroide at once assumed its due rank as one of the many summits of the Pelvoux, whilst its more southerly neighbour, dominating at once the Glaciers du Selé and de la Pilatte, and occupying the actual watershed, completely justified its title to the disputed name. From its south-east flank two magnificent streams of ice, riven and dislocated to an extraordinary extent, descend to the main feeder on which we stood, the three together forming lower down the trunk stream of the Selé Glacier. This is not of great length, and we soon reached the lower and more level portion, down the centre of which we kept till the crevasses increased in numbers and width, and then took for a short time to the left-hand moraine just above the final ice-fall.

At 10.40 we quitted the ice, and made our way over a grassy shoulder and down some rocks on the left to the summit of one of the most extraordinary *clapiers* or slopes of débris that I

think I ever saw. The stones were all of moderate size, and in positions of the most unstable equilibrium, so that we lost our footing at every other step, and were not sorry to find ourselves at the bottom and on the level surface of the valley at 11.30. An hour was here devoted to lunch and rest, and then pushing forward at a rapid pace, we reached Ailefroide at 1.45, halted there for three-quarters of an hour, and at 3.20 arrived at Les Claux. Here for an hour we indulged largely in currants and cherries *chez* Barneout, and at 5.15 reached Ville Vallouise, where I found M. Reynaud and a party of his friends, who were anxious at our prolonged absence, having, of course, expected us back two days before. The time occupied between La Béarde and the Ville had been $14\frac{1}{2}$ hours, from which $5\frac{1}{2}$ must be deducted for halts.

My holiday was drawing to a close, and I had now to select a homeward route, in which I purposed to include a visit to Grenoble, and an excursion thence to the Grande Chartreuse. My intention had been to proceed to Briançon, and thence cross the Lautaret to La Grave and Bourg d'Oysans; but as after reaching Ville Vallouise the weather appeared propitious, the idea of making one more attempt on the E'crins became perfectly irresistible, and a study of the map having led me to hope that it might afterwards be possible to reach Villar d'Arène by the ridge north of the Glacier Blanc, I resolved that the trial should be made. The change of plans necessitated various arrangements—the writing of letters, preparation of provisions, &c. &c.; so it was nearly noon on the 15th before we got away, with the intention of bivouacking that night on the bank of the Glacier Blanc above the final ice-fall, and assaulting the E'crins and effecting the new col on the morrow.

Two hours' easy walking brought us to the now familiar plain on which the Ailefroide châteaux are situated just in time to take shelter from a smart storm of rain, the first that had fallen, except at night, since the 27th June, during our descent of the Grivola. At 2.15 we again set out, and as our track for some hours was precisely the same as that followed on the 12th, with the exception of another point being selected for fording the torrent, I will not particularise further than to say that we reached the foot of the ice at 4.0, and the right or west bank of the first plateau or central portion of the Glacier Blanc just above the final ice-fall at 5.5. Here another storm overtook us, and not wishing to have to pass the night in wet clothes, we sought refuge under an erratic block, whilst I took advantage of the halt to secure a sketch of the outline of the various summits of the Pelvoux, whose rugged forms, as seen

from this direction, are among the grandest I ever beheld. At 6.10 the rain ceased, and we at once took to the glacier, reaching the eastern bank in a quarter of an hour at the same point at which we had on the previous occasion quitted the ice. Here the mountains recede a little, so as to form an elevated and rather stony *alp*, frequented by a few goats during the summer months; and as nothing but ice and bare rock were to be met with higher up, whilst for all practical purposes we had already attained a sufficient altitude, it was decided to encamp at once.

For the information of future travellers, I should state that I have no doubt that this spot may be reached by way of the slopes on the east bank of the glacier along tracks known to the goatherds; but as on the former occasion we had, from want of local knowledge, been turned back, we did not think it worth while to run the risk of failure again. Of course, if a route exists which would save the crossing of the stream and the re-crossing of the glacier, time would, no doubt, be saved.

Ascending the mountain side for a few minutes, we soon reached a little plateau of bright green elastic turf, and depositing our baggage, proceeded to make arrangements for supper and sleeping. The mean of three aneroid readings (corrected) gives for our station by comparison with four inferior ones a height of 2,579 mètres (8,461 feet), and an observation made some weeks later with a similar instrument (uncorrected) by my friend the Rev. T. G. Bonney produces an almost identical result, 2,578 mètres (8,458 feet), whilst a simultaneous reading of the mercurial barometer by his companion, Mr. W. Mathews, reduces it to 2,550 mètres or 8,366 feet.

The sky was still overcast, mists shrouded the mountain tops, and altogether the atmosphere wore an unsatisfactory appearance, which led me to fear an uncomfortable bivouac, and possibly a disappointment on the morrow. Now and then warning drops of rain came plashing down, warm currents of air swept in fitful gusts from all points of the compass in succession, the clouds, lit up by the setting sun, reflected a coppery glow, and everything indicated the approach of wild weather. Spite of the success of my bag on Monte Viso, I had no desire to expose myself unnecessarily, and still less did I wish that my more imperfectly protected companions should suffer; so, without more ado, we all set out in search of some sort of shelter. It was not long before this was found, for only 100 yards above us a most judicious rock had toppled down so as to protect with its overhanging roof a

space large enough to contain at a pinch three persons. Plenty of loose stones lay about, and with these a rough wall was soon constructed round the exposed side, and a very satisfactory *gîte* was the result.

The view of the range of the Pelvoux and Ailefroide to the south-west was grand in the extreme; whilst to the west, separated from us by the beautiful Glacier Blanc, a mass of pinnacles and crags, constituting the east buttress of the Crête de l'Encula, towered up into the sky.

Our simple meal disposed of, Perrn and Croz announced their preference of the soft, springy turf outside to the hard floor of our *gîte*, as, if rain came on in the night, they could at once retire to the rock for shelter. I, on the other hand, being by this time rather used to a granite mattress, and not caring to find myself suddenly compelled by soaking rain to bundle out of my bag and seek protection in utter darkness, determined to patronise the auberge. Thither we all first repaired for a glass of hot wine, and then, wishing my companions good night, I crept into my bag at 8.15. Pleasant slumbers, only occasionally broken by the uncompromising nature of sundry granitic splinters which formed the floor of my dormitory, were my lot till 2.45 on the morning of the 16th, when I roused to find a dense, wetting *brouillard* concealing everything. After prolonged shouting, Croz and Perrn made their appearance, and as the fog began to turn into a steady rain, whilst the thunder pealed forth at intervals, it was resolved to wait till after sunrise before either attempting to proceed or deciding to abandon the expedition.

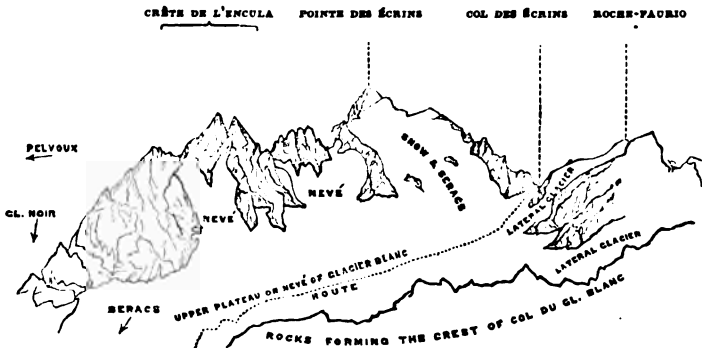
Time passed by, and still there was so little improvement that we at length were forced to admit the necessity of giving up, at any rate, the attempt on the E'crins, for which a favourable state of the snow, such as a warm, foggy night must be fatal to, was absolutely essential. This might not be the case on the pass, however, and want of time to make the détour by Briançon was another reason for persevering in the endeavour to reach La Grave by this route. So, at 5.45, we started off up the rocks and débris on the east bank of the glacier, taking to the snow at 6.20, and reaching the eastern or lower extremity of l'Encula—the upper plateau of the Glacier Blanc—at 6.45. Instead of proceeding up this last, we now turned off to the right in a northerly direction, ascending the rocks just where the first of a series of lateral glaciers comes down to join the main stream, and finally taking to the ice itself. This was for the most part covered with snow, and its state proved the wisdom of our course in turning our

backs upon the E'crins, which, at every upward step we took, rose in increasing majesty behind us, displaying its great rolls of *névé*, and at times disengaging its summit from the clouds which a furious wind was doing its best to break up and disperse.

At 7.30 the crest of the ridge was gained, and we found ourselves looking down upon a vast seething cauldron of vapour, through which it was impossible to distinguish anything more than that the descent was apparently extremely precipitous, and anything but inviting under the circumstances. To proceed without having first had a chance of reconnoitring the ground would have been foolish, so we ensconced ourselves behind some splintered crags, over which the wind sang and sighed discordantly, at times half blinded when a reflex blast would catch us in our sheltered nook, and spitefully discharge a *mitraille* of snowy particles right in our faces.

The mean of two aneroid observations (corrected) at 7.30 and 8.30 gives for the height of the pass, which I have called the Col du Glacier Blanc, 3,308 mètres (10,854 feet). Mr. Bonney's result, calculated from an uncorrected aneroid reading, is 3,314 mètres (10,873 feet), whilst a simultaneous observation with a mercurial barometer, by Mr. Mathews, reduces it to 3,281 mètres (10,766 feet). The position of the col is between the summits marked on the French map as 'Pic de Neige' (3,615 mètres) and 'Pic Signalé' (3,355 mètres), and somewhat nearer to the latter.

During the lulls and clearings which occasionally occurred,



THE POINTS DES ÉCRINS, COL AND NÉVÉ OF GLACIER BLANC FROM COL DU GLACIER BLANC.

I secured a careful outline of the E'crins, and when the mist in front lifted for a few moments at intervals, we all three peered

eagerly down, to see what hope there was of accomplishing the descent. Little by little we made out a glacier far below, which I concluded from the map (correctly, as it turned out) to be the Arcines, and it was therefore pretty certain that, if we could once reach it, our object would be gained. The Aiguille du Midi de la Grave must be a remarkably fine feature of the view from the col, but we only obtained occasional glimpses of its towering form, and of the other fine summits to the NW. and W.

At length, about nine, we decided to attempt the descent, and when fairly committed to the rocks, got on better than we had expected. The loose stones, indeed, required great care, and caused much delay, but no mishap occurred, and at 9.45 we reached the upper snow-slopes leading to the glacier, getting off the rocks without trouble, though later in the year Messrs. Mathews and Bonney, accompanied by my guide Michel Croz and his brother Jean, encountered considerable difficulty at this point. Steep slopes, in places considerably crevassed, now alone separated us from the level portion of the glacier beneath, but several détours were necessary, and twenty minutes more were consumed before the latter was reached.

The Glacier d'Arcines is short, but very broad, resembling rather one of the second order. Its upper part is remarkably clean and pure, but débris crop forth plentifully in its central portion, and its lower extremity is buried under immense moraines.

A little after ten we halted for lunch, and at the same time took the opportunity of examining the wall of crags we had just quitted. It then appeared that we had most fortunately hit the ridge at the one point from which alone a descent could have been attempted with a reasonable chance of success, and considering our total ignorance of the nature of the ground, and the obstacle opposed by the *brouillard*, we felt we had reason to congratulate ourselves on such a fortunate bit of intuition.

Keeping away to the left, we crossed three beautifully defined lateral moraines, quitting the last at 10.30, when another halt was called to remove gaiters, adjust knapsacks, and examine the map. Proceeding again at eleven, we descended a steep slope of rock and débris on the left or west of the terminal mass of the glacier, and in another ten minutes found ourselves on the turf at its foot, not far from the point where the path from Monestier to Villar d'Arène comes in from the east, after traversing the low grassy Col d'Arcines (2,368 mètres, or 7,769 feet).

The Glacier d'Arcines has one peculiarity which I have not elsewhere noticed, though I am aware that the same phenomenon

is occasionally to be seen. It occupies and flows along the watershed dividing the valleys of the Romanche and Durance, into each of which it discharges a portion of its drainage from separate ice-vaults. This, it will be seen, is quite a different case from that of the respective fields of ice and snow on either side of a ridge from which they are derived, as the movement of the ice is here parallel to and along the crest, instead of being at right angles to it.

We soon came upon numerous groups of cows, dotted over the grassy slopes which extend to a considerable height on either side of the valley, but no other signs of inhabitants appeared for about half an hour, when we reached the brow of a sort of descent or step in the valley, at the foot of which were seen the *châlets de l'Alpe*, a collection of miserable hovels tenanted by women and boys scarcely less wretched in appearance.

At this point a lateral valley opens on the left, down which come the united streams of the *Glaciers de la Plate des Agneaux* and *Clot des Cavales*, over the head of the latter of which lies the pass to *La Bérarde*, already referred to under the name of the *Col des Cavales*. In the background rose the most easterly summit of the *Grande Ruine*, and rarely have I seen a grander mass of rock or a more imposing outline. I much regretted that the time at my disposal did not admit of my exploring these glaciers and making the pass to *La Bérarde*, as it must lie through scenery of the highest order; but I would strongly urge our members to turn their attention to this and the numerous other fine expeditions which await their enterprise in Dauphiné.*

We spent an hour and a half at the *châlets*, which are situated at a height of 2,118 mètres (6,949 feet), and after procuring some milk, though not without difficulty, proceeded at 12.45 down the valley to *Villar d'Arène*. We had been told at *L'Alpe* that 2 hours would be requisite to reach that place, and 1 more between it and *La Grave*, whilst by the *Col d'Arcines Monestier* was distant only 3. We were also informed that later in the summer this route was much frequented, and many travellers, especially botanists, traversed it in search of plants, in which the district is particularly rich.

Walking at a steady pace, we reached *Villar d'Arène* at 2.10, and *La Grave* at 2.25, less than 2 hours after leaving *L'Alpe*, but in ascending the valley $2\frac{1}{2}$ hours should be allowed between *La Grave* and the *châlets*, and $\frac{1}{2}$ hour more to the

* See notes at page 198.

foot of the glacier. The time from Ville Vallouise to our bivouac may be reckoned at 5 to 5½ hours, exclusive of stop-pages, and thence to La Grave, 8¼ hours, from which 3 must be deducted for halts.

Twenty minutes after quitting L'Alpe, we came to the edge of a very precipitous descent, down which the path zigzags for some time. About midway the stream forms a pretty cascade, and on the left a lovely glacier comes creaming down from one of the lofty peaks to the east of the Aiguille du Midi de la Grave. A long, narrow, torrent-ravaged flat was next traversed for twenty minutes, and a track reached at its further end, which led almost directly into the old Lautaret road, and soon afterwards into the magnificent new 'Route Impériale' from Grenoble to Briançon, a quarter of an hour above Villar d'Arène.

As a full description of the topography and scenery may be met with in Ladoucette, Brockedon, Lord Monson, Murray, Mr. Ball's 'Guide to the Western Alps,' Joanne's 'Itinéraire du Dauphiné,' and other well-known works, I will only add that at La Grave we procured a *charrette*, and taking leave of Perrn, who was engaged to meet Mr. Whympet at La Bessée, Croz and I, at 4.30, rattled off merrily down the magnificent Combe de Malaval to Bourg d'Oysans, which we reached in 3 hours. A good dinner at the Hôtel de Milan was most acceptable, as, with the exception of my dinner at Guilestre and occasional supplies of remarkably greasy ham at Ville Vallouise, I had been a stranger to meat since quitting La Tour in the Val Pellice, more than a fortnight before. A little before midnight we left in the diligence for Grenoble, arriving at five the following morning, quite refreshed by sound slumber in such unusually luxurious quarters.

A delightful expedition to the Grande Chartreuse, in weather which still was everything that could be desired, and an ascent the next day of the Grand Som (6,670 feet), a lofty limestone summit in the neighbourhood, commanding a glorious view of the Pennine, Cottian, and Dauphiné Alps, the plains of France, &c., brought my campaign to an agreeable termination. Good quarters, good fare, and civilisation, were none the less attractive by contrast with the absence of all three, which I had almost uninterruptedly enjoyed since quitting Turin.

RESULTS AND DETAILS OF OBSERVATIONS WITH A MERCURIAL
BAROMETER BY NEGRETTI & ZAMBRA.

Place	1862 Day	Hour	Baro- meter reduced	Air	Height, mètres	Height, feet	Remarks
1. Grand Pelvoux (highest peak) . Geneva Observa- tory, 408 mètres Turin Academy, } 285·24 mètres } Grenoble, 215 mètr., chez Demarchi . Aosta, M. Carrell's Observatory, 600 mètres . . . St. Bernard, 2,478·3 mètres . . . Mean . . .	July		Milli- mètres.	C.			
	10	9, 11, & 11.45 a.m.	476·3	0·3	30 observations. 3,952 mètres by comparison with the Signal, viz., 3,937·6 (Δ E. M. F.), + 14·4 (dif- ference). Mean of both 3,954.
	"	Ditto	726·91	24·8	3,954·3	12,974	
	"	{ 9 a.m. & 12 noon. Pelvoux at noon.	736·93 475·9	26·7 0·	3,959·7	12,991	
	"	12 noon	742·45	29·0	3,973·6	13,037	
	"	9 a.m. & 12 noon	709·88	25·5	3,951·9	12,966	
"	9, 11 & 11.45 a.m.	569·46	12·8	3,942·1	12,934		
					3,956·3	12,980	
2. Col des Écrins . . . Geneva . . . Turin . . . Grenoble . . . Aosta . . . St. Bernard . . . Mean . . .	12	12 noon	506·4	5·5	1 observation. 3,350 mètr. (Δ) État Major Fran- çais; 3,358 m. (Aneroid cor- rected) Rev. T. G. Bonney.
	"	12 noon	724·17	20·2	3,411·8	11,194	
	"	12 noon	734·67	23·8	3,431·2	11,257	
	"	12 noon	739·4	25·0	3,422·7	11,230	
	"	12 noon	707·07	23·5	3,420·7	11,223	
	"	12 noon	565·69	10·9	3,391·3	11,127	
	"					3,415·5	

RESULTS AND DETAILS OF OBSERVATIONS WITH AN ANEROID
BAROMETER BY SÉCRÉTAN (CORRECTED).

Place	Day	Hour	Aneroid	Air	Mètres	Feet	Remarks
1. Grand Pelvoux (Signal) . . . Do., highest peak (3,956·3) . . .	July						
	10	12 noon	476·7	4·0	1 observation. 3,937·6 Δ État Major Français.
"	12 noon	475·9	0·	3,941·9 (3956·3 -14·4)	12,933		
2. Col du Glacier Blanc . . . Geneva . . . Turin . . . Aosta . . . St. Bernard . . . Mean . . .	16	7.30 & 8.30 a.m.	509·8	0·7	2 observations. 10,873 (aneroid uncorrected) Rev. T. G. Bonney; 10,766 (Bar.) W. Mathews, jun.
	"	Ditto	724·78	15·6	3,309·7	10,859	
	"	9 a.m.	731·45	25·0	3,316·8	10,882	
	"	9 a.m.	705·82	20·3	3,307·4	10,851	
	"	7.30 & 8.30 a.m.	564·31	5·2	3,298·7	10,823	
	"					3,308·1	

OBSERVATION WITH TWO BOILING-POINT THERMOMETERS BY CASELLA, CORRECTED BY NUMEROUS COMPARISONS.

Place	Day	Hour	Pressure equivalent to boiling point	Air	Mètres	Feet	Remarks	
	July	[Boiling point 193°·65 Fahr. = 89°·8 C.]						
1 Col du Salé	14	8.30 a.m.	517·75	7·5	· · ·	· · ·	1 observation, mean of two thermometers.	
Geneva	"	8.30 a.m.	729·52	18·7	3,290·1	10,793		
Turin	"	9 a.m.	738·99	25·0	3,311·5	10,865		
Grenoble	"	12 noon	743·06	28·0	3,305·4	10,845		
Aosta	"	9 a.m.	712·66	24·7	3,316·2	10,880		
St. Bernard	"	9 a.m.	570·9	10·9	3,287·3	10,786		
Mean	"	· ·	· ·	·	3,302·1	10,834		

The barometer employed was of Newman's construction, and since furnished with Negretti & Zambra's improved cistern. It was carefully compared at Geneva, the St. Bernard, Aosta, Cogne, and Turin.

The aneroid was by Secrétan of Paris, and graduated from 340 to 800 millimètres. It was compared at all the above stations, as well as at Grenoble, and a second time at Geneva; besides which its errors were further corrected by upwards of 80 simultaneous readings with my barometer up to a height of 13,000 feet.

The two boiling point thermometers by Casella, graduated respectively to 0°·1 and 0°·2 Fahrenheit, were compared at Geneva, Turin, and the St. Bernard, as well as about twenty times with my barometer up to a height of 13,000 feet.

The boiling-point observations are converted into terms of the atmospheric pressure by the tables of Regnault revised by Moritz, as given in Guyot's 'Meteorological Collections,' whilst the heights, as in the case of the mercurial and aneroid barometers, are calculated from the tables of Delcros given in the same volume.

HEIGHTS OF THE PRINCIPAL PEAKS AND PASSES IN THE DAUPHINÉ ALPS. (E. M. F. = État Major Français; T. G. B. = Rev. T. G. Bonney; W. M. = W. Mathews, jun.; F. F. T. = F. F. Tuckett.)

Name	Height in mètres	Height in feet	Position	Authority	Method
PEAKS.					
1 Pointe des Écrins, E. peak	4,103	13,462	E. of La Bérarde	E. M. F.	Δ
Centre peak	4,083	13,396	W. of highest peak	"	"
NW. peak	3,980	13,058	NW. of centre peak	"	"

HEIGHTS OF THE PRINCIPAL PEAKS AND PASSES

Name	Height in mètres	Height in feet	Position	Authority	Method
2 La Meije (Aiguille du Midi de la Grave) .	3,987	13,081	S. of La Grave, N. of La Bérarde	E. M. F.	△
E. Peak	3,911	12,832	ESE. of highest peak	"	"
3* Grand Pelvoux	3,954	12,973	NW. of Ville Vallouise	F. F. T.	Bar.
*Signal (Pic de la Pyramide)	3,938	12,920	E. of highest peak	E. M. F.	△
Crête du Pelvoux	3,915	12,845	SW. ditto	"	"
Ditto	3,854	12,645	SW. ditto	"	"
*Ditto, Signal	3,588	11,772	SW. ditto, between the two preceding	"	"
E. peak above Ailefroide	3,762	12,343	ESE. ditto	"	"
4 L'Ailefroide	3,925?	12,878?	WSW. ditto, between Glaciers Noir, Du Selé and La Pilatte	"	"
N. peak	3,805	12,484	NNE. of principal Peak	"	"
5 Peak ESE. of La Meije	3,880	12,730	SSE. of La Grave	"	"
6 Peak W. of No. 5 and between it and La Meije	3,831	12,569	S. of La Grave	"	"
7 Crête de l'Encula	3,779	12,399	E. of Écrins, W. of Glacier Blanc	"	"
8 Le Rateau	3,770	12,369	SSW. of La Grave, W. of La Meije	"	"
NW. peak	3,754	12,316	NW. of highest peak	"	"
9 Crête de la Bérarde	3,756	12,323	S. of Écrins, between Glaciers Noir and Tempe	"	"
10 La Grande Ruine	3,754	12,316	S. of Glacier du Clot des Cavales	"	"
11 St. de Roche-Faurio	3,716	12,192	N. of Écrins, between Glaciers de la Bonne Pierre, Blanc, and Plate des Agneaux	"	"
12* Crête du Glacier Blanc ('Signal')	3,660	12,008	WSW. of Monestier, between Glacier Blanc and Glacier d'Arcines	"	"
W. peak	3,615	11,860	Ditto	"	"
E. peak	3,602	11,818	Ditto	"	"
Centre peak	3,499	11,480	Ditto	"	"
* 'Pic Signalé'	3,355	11,007	Ditto	"	"
13 Mont Bans, or Baus	3,651	11,979	S. of Glacier de la Pilatte (La Condaminé)	"	"
14* Pic de la Grave ('Sig- nalé' ?)	3,649	11,972	SW. of La Grave, W. of Le Rateau	"	"
15 St. des Rouies	3,634	11,923	S. of Les Étages, W. of Col de Sais	"	"
16 Aiguille du Plat	3,602	11,818	NW. of Étages, E. of St. Chris- tophe	"	"
17* Jocelme (Signal)	3,585	11,762	N. of Col du Sellar, or Célar	"	"
18 Pic d'Olan	3,578	11,739	N. of La Chapelle (Val Go- démar)	"	"
19 Montagne de Clochâtel	3,575	11,729	S. of Le Bérarde	"	"
SW. peak	3,564	11,693	Ditto	"	"
20 Tête de l'Être	3,563	11,690	S. of Les Étages	"	"
21 Rocher de l'Encula	3,538	11,608	S. of La Bérarde	"	"
22 Pic des Opillons	3,506	11,503	N. of Col du Sellar or Célar	"	"
23* Pic Bonvoisin (Signal)	3,506	11,503	SE. ditto	"	"
24 Pic N. of Col de Sais	3,472	11,391	"	"
25 Tête des Fétoules	3,465	11,368	SSW. of Les Étages	"	"
26 Roche de la Muzelle	3,459	11,349	WSW. of St. Christophe, E. of Col de la Muzelle	"	"

IN THE DAUPHINÉ ALPS—continued.

Name	Height in mètres	Height in feet	Position	Authority	Method
27 Crête des Bœufs-Rouges W. peak	3,454	11,332	WNW. of Entraignes, S. of Glaciers de la Pilatte and du Selé	E. M. F.	Δ
E. peak	3,431	11,257	Ditto	"	"
Middle peak	3,367	11,047	Ditto	"	"
28 Tête de Charrières	3,442	11,293	W. of Glacier de la Plate des Agneaux	"	"
29 Pic Jocelme	3,437	11,276	S. of Col du Sellar, or Célar	"	"
30* Goléon (Signal)	3,429	11,250	N. of La Grave	"	"
31 La Grande Aiguille	3,422	11,227	SW. of La Bérarde	"	"
32 Cime du Vallon	3,418	11,214	Between Pic d'Olan and Col de la Muande	"	"
33 Aiguille des Arias	3,401	11,158	S. of St. Christophe	"	"
34 Tête de Lorancoure	3,341	10,961	E. of Roche de la Muzelle	"	"
35 Aiguille d'entre Pierroux	3,293	10,804	SE. of Aiguille des Arias	"	"
36 Aiguille du Canard	3,270	10,729	NE. ditto and S. of St. Christophe	"	"
PASSES.					
1 Col des Écrins	{ 3,415 3,358 3,350?	{ 11,204 11,017 10,991?	N. of Écrins, S. of Roche-Fanrio. Ville Vallouise to La Bé- rarde by Glaciers Blanc and de la Bonne Pierre	{ F. F. T. T. G. B. E. M. F.	{ Bar. Aneroid Δ
2 Col de la Tempe	3,319?	10,889?	Vallouise to La Bérarde, be- tween Écrins and Ailefroide, and by Glaciers Noir and de la Tempe	Berghaus ?	Bar. ?
3 Col du Glacier Blanc	{ 3,308 3,314 3,281	{ 10,853 10,873 10,766	Vallouise to La Grave by Glaciers Blanc and d'Arcines	{ F. F. T. T. G. B. W. M.	{ " Bar. Aneroid Bar.
4 Col du Selé	3,302	10,834	Vallouise to La Bérarde by Glaciers Blanc and d'Arcines Selé, and de la Pilatte, S. of l'Ailefroide	F. F. T.	Boiling point.
5 Col des Cavales	3,128?	10,263?	N. of Grande Ruine. La Bé- rarde to Villar d'Arène by Val des Étançons and Glacier du Clot des Cavales	E. M. F.	Δ
6 Col du Loup	3,112?	10,210?	S. of Pic Bonvoisin Vallouise to Val Godémar	"	"
7 Col de Sais (1 W. Col) (2 E. Col)	3,092 3,116	10,145 10,224	La Bérarde to Val Godémar by Glacier du Chardon	"	"
8 Col du Sellar (or Célar)	3,076	10,092	Ditto by Glacier de la Pilatte Vallouise to Val Godémar	Forbes. E. M. F.	Bar. Δ
9 Col de la Muande	3,059?	10,036?	St. Christophe to Val Godémar	"	"
10 Col des Infernets	3,048?	10,000?	La Grave to St. Jean de Mau- rienne	Forbes.	Esti- mate.
11 Col de Chabrières	2,954	9,692	Val de Réalon to Chorges	Guerin.	?
12 Col d'Arcines	2,368	7,769	Monestier to La Grave	E. M. F.	Δ
Col de la Selle	?		La Grave to St. Christophe		
Col de la Muzelle	?		Venose to La Chapelle		