4. THE ALPS OF THE TARENTAISE.

NARRATIVE OF EXPLORATIONS IN 1859 AND 1860.

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INTRODUCTORY REMARKS.

Immediately to the S. of Mont Blanc, where the crest of the great Alpine chain which encircles northern Italy bends nearly at right angles, and sweeps towards the Mediterranean, lies the group of lofty mountains known as the Graian Alps. They extend southwards from the Col de la Seigne as far as the Levanna, the first peak of the Cottians, while from W. to E. they reach from the junction of the Arc and Isère at Chamousset in Savoy to the plain of Piedmont at Ivrea.

In subdividing this important cluster of mountains, we at once encounter a difficulty which meets us in every attempt to classify the component elements of the alpine chain. Political and ethnographical divisions generally follow mountain ridges and inclose valleys, whereas the only rational method of grouping mountains physically, is to take valleys as the boundary lines. In the present instance nothing would be easier than to divide the Graians into two halves, by the crest of the main chain, which connects the Col de la Seigne with the Levanna, and separates Italy from Savoy. But then the question immediately arises, what is to be done with the peaks which lie along the line of watershed? and as no satisfactory

answer can be given to it, some other method must evidently be pursued. I propose to adopt the following subordinate groups:—

I. *The Central Graians.*—This group consists of the range between the Col de la Seigne and the Levanna. Its summit ridge is a portion of the watershed which separates Savoy from Italy, and the drainage of the Rhone from that of the Po. It is bounded by the Val de Tignes, the Val d'Aosta above Villeneuve, and the Val Savaranche. Its eastern flanks are in Piedmont, and its western in the Tarentaise, a province of Savoy, which is occupied by the basin of the *Haute Isère* and its numerous tributary valleys.

II. *The Western Graians.*—These lie to the west of the former, between the Isère and the Arc. They are entirely in Savoy, about three-fourths of their area belonging to the Tarentaise, and the remainder to the Maurienne.

III. *The Eastern Graians or Mountains of Cogne.*—This noble cluster of peaks, of which the Grand Paradis and the Grivola are the culminating points, is situated to the east of group 1, and to the south of the city of Aosta. It is inclosed by the Val Savaranche, Val d'Aosta, and Val di Locana, and is entirely in Piedmont.

Few parts of the Alps can boast more conspicuous and attractive mountains than those of the Graian chain. Seen from every one of the numberless points of view between Mont Blanc and Monte Rosa, they form a magnificent feature in the southern panorama; and they lie close to two main lines of communication from France to Italy, by the Mont Cenis and the Little St. Bernard. It is nevertheless scarcely too much to say, that up to a very recent period their physical geography was as little known as that of the interior of Africa, although the district has been elaborately mapped by the Sardinian Government, and although many of its principal peaks may be seen almost within a stone's throw from the roof of the observatory at Turin. Within the last five years, however,

the Graians have claimed a share of the attention of alpine explorers, and I may mention the names of M. le Chanoine Carrel of Aosta, M. Chamonin the curé of Cogne, the Rev. S. W. King, and Messrs. Tuckett, Ormsby, and Cowell, as especially deserving of honourable mention for their discoveries in the eastern division of the chain. The central and western sections have been far less investigated, and I therefore venture to introduce them to public notice, under the general title of the *Alps of the Tarentaise.*

AUTHORITIES FOR THE GEOGRAPHY OF THE DISTRICT.

As it will be necessary to make frequent references to works bearing upon the subject of this paper, it will be convenient to give a short summary of the more important maps and other geographical publications, in which the Graian Alps have been delineated or described, particularly as many of them are very imperfectly known to English readers.

During the time that Savoy and Northern Italy formed part of the French empire under Napoleon, a trigonometrical survey was made of both those countries, and a network of triangles was determined, which extended on each side nearly to the foot of the Alps. The triangulation of North Italy was the joint work of French and Italian Geographical Engineers, while that of Savoy was executed entirely by the former. Among the officers attached to the French staff was M. Corabœuf, who probably had the direction of a considerable portion of the work, and availed himself of the opportunity to determine trigonometrically the height of several important peaks. The results of his admeasurements were communicated to the Société de Géographie de Paris, and have been printed in the "Recueil de Voyages et de Mémoires," published by that body, tome deuxième, Paris, 1825. For reasons which will shortly appear, I had long been desirous of obtaining access to M. Corabœuf's memoir, and have recently done so through the kindness of my friend Mr. F. E. Blackstone of the British Museum, who fortunately discovered the "Recueil" in

the Museum Library. The paper in question will be found in vol. ii. p. 32 and is entitled,—

"Notice sur une Mesure Géometrique de la Hauteur au-dessus de la Mer de quelques Sommités des Alpes, par M. Corabœuf, Chef d'Escadron au Corps Royal des Ingénieurs Géographes."

To this title is appended the following foot note: —

"Cette notice a été redigée et communiquée, à la Société de Géographie long-temps avant la publication de l'ouvrage du Baron von Welden sur le Mont Rosa." *

M. Corabœuf commences by saying:

"Les opérations géodésiques auxquelles j'ai coopéré dans la Savoie en 1803 et 1804, et en Italie pendant les années 1806, 1809, et 1811, m'ont donné les moyens de déterminer avec une précision suffisante la hauteur de quelques sommités remarquables des Alpes, telles que le Mont Blanc, le Mont Rose, et le Mont Viso."

The paper is a very short one, and consists merely of a diagram of the triangles of the first order in Savoy and Italy, with tables of the magnitudes of their component sides and angles, followed by calculations of the heights of the various summits. Those connected with the triangles of Savoy, are the Buet, Mont Blanc, "l'Aiguille de la Sassière" and "l'Aiguille de la Vanoise," and with the triangles of Italy, Monte Rosa, "Mont Iseran" and Monte Viso. Of these mountains we are here concerned with three only; of the heights of which M. Corabœuf has made the following determinations:

Mont Iseran . .	4045 metres	=	13,271 English feet.
Aiguille de la Vanoise	3863 „	=	12,674 „
Aiguille de la Sassière	3763 „	=	12,346 „

It thus appears that although these results were not published until 1825, the observations were made not later than 1811, and they must therefore be considered as the earliest contributions to our knowledge of the Graian Alps.

The first map in which the district is delineated with any pretension to accuracy, is that of Raymond, published in Paris in 1820. It is entitled —

"Carte Topographique Militaire des Alpes, comprenant le

* Von Welden's work was published in Vienna in 1824.

Piémont, la Savoye, le Comté de Nice, le Vallais, le Duché de Gênes et le Milanais, et Partie des États limitrophes. Dressée à l'Echelle d'un mètre pour 200,000 mètres, par J. B. S. Raymond, Capitaine au Corps Royal des Ingénieurs Géographes Militaires."

In this map the Graians are shown nearly as correctly as in any subsequent production, and it probably embodies the results of the previously described triangulations.

Of the network of triangles which had been constructed in Italy, a considerable portion extended along the Parallel of Latitude of 45°, from Fiume on the Adriatic, to Rivoli near Turin, and when the Italian work was finished, in 1811, the French Government directed the measurement of another arc of the same parallel, from the coast line near Bordeaux, to the frontiers of Savoy. This triangulation was completed in 1818, and Savoy having then been restored to its ancient owners, it was proposed by the French to the Sardinian Government, in the year 1820, that the latter should undertake a triangulation across the chain of Alps, and thus unite the two arcs of the parallel. Upon this the Austrians, who had pushed their survey across Croatia and Sclavonia, as far as Orsova in the Banat, volunteered their co-operation, and on the 27th of July, 1821, a convocation was signed at Turin, between the Sardinian and Austrian Governments, in virtue of which, a mixed commission, consisting of officers of the engineering staffs of the two nations, with the addition of M. Plana of Turin and M. Carlini of Milan, as astronomers, was appointed to undertake the work. The enterprise was prosecuted with vigour, the field-work was completed in 1823, and the triangles connected with the French System by Colonel Brousseaud and M. Nicollet. In 1824 the commission met in Milan to prepare their materials for the press, and in 1825 the results were given to the world in the publication entitled —

"Opérations Géodésiques et Astronomiques pour la Mesure d'un Arc du Parallèle moyen, exécutées en Piémont et en Savoie, par une Commission composée d'Officiers de l'État Major Général et d'Astronomes Piémontais et Autrichiens, en 1821, 1822, 1823. À Milan, de l'Imprimerie Impériale et Royale. 1825."

This important work consists of two quarto volumes of text, and an atlas, and gives a full account of the labours of the commission, with a record of all their observations. The chain of

triangles was constructed a little to the north of the parallel; it extended from Turin, over the Cenis, to Mont Colombier beyond Chambéry, and contained eighteen angular points, of which the larger number were upon a series of peaks on either side of the valley of Susa, and of the Maurienne.

The triangulation is laid down upon an excellent map, on a scale of $\frac{1}{500,000}$ comprising the whole of the Graian Alps; and there are also 16 smaller maps, on a scale of $\frac{1}{100,000}$, of the immediate vicinity of each of the trigonometrical stations, four of which belong to the Tarentaise. The Atlas also contains six panoramic views, engraved from drawings made by the camera lucida, from the stations which commanded the widest horizon. The maps just described, particularly those upon the larger scale, are deserving of the highest commendation, and far exceed in accuracy any other work which has been issued under the auspices of the Sardinian Government.

The next publications which have to be mentioned are the Government maps of Piedmont and Savoy. Of these the first is that usually known as the Six-Sheet Sardinian map, the "Carta degli Stati di sua Maestà Sarda in Terraferma, Opera del Real Corpo di Stato Maggiore generale, incisa e publicata l' anno 1841." Its scale is $\frac{1}{250,000}$, and it professes to be an exact reduction from a larger map of the Real Corpo in 96 sheets, on a scale of $\frac{1}{50,000}$. It has probably been improved from time to time, as one of the sheets of a copy in the possession of my friend Mr. Tuckett contains a table of the population in 1846, and on another is a note to the effect that it was reproduced by electrotype in 1859.

The large map on the scale of $\frac{1}{50,000}$, now in course of publication, cannot be the same as the one just referred to, inasmuch as the key to it shows only 91 sheets instead of 96, and as sheet 37 bears upon it the following memorandum:—"Riconosciuto sul terreno nell' anno 1853, publicato nell' anno 1858." It is by far the most elaborate and pretentious map of the Sardinian territory hitherto produced, and it contains the whole of the Graians except the lower part of the Val de Tignes, included in sheet 29, which is not yet published.

There is also another Government map on a scale of $\frac{1}{150,000}$, not, I believe, sold to the public, and of which I do not know the date. I am indebted to the Rev. S. W. King for the loan of one of the sheets, but there is nothing in it which calls for remark.

In each of the three maps here described the Alpine portions are most inaccurate and unsatisfactory.

In 1845 appeared a portion of a work entitled "Le Alpi che cingono l' Italia, considerate militarmente." It was to have consisted of five parts; the first geographical and descriptive,—the second, third, and fourth, historical, with particular reference to battles,—and the fifth to contain a map and plates explanatory of the geographical section. The first and fifth parts are the only ones in my possession, the others I believe have never been published. The work appears to have been edited or written by Count Annibale di Saluzzo (whose name is appended to the dedication to Charles Albert), from materials collected by the Real corpo di Stato Maggiore. Part I. consists of an account of the whole Alpine chain, from the Mediterranean to the Adriatic, under several tables, called "Quadri." The first quadro contains a description of the minerals in the Alps,—the second, of the woods and forests,—the third, of the roads,—the fourth, of the valleys, — the fifth, of the lakes,—and the sixth, of the canals. But what is more interesting, the seventh quadro is a very extensive table of heights, including the latitude and longitude of the points measured, the name of the authority, and the method of determination. The fifth part of the work comprises a map upon a scale of $\frac{1}{600,000}$ of the whole chain described in Part I., and some panoramic profiles of no great interest. In the list of heights the determinations of Corabœuf, quoted previously, are ascribed to "Ingegneri Francesi," and both the Pic de Grivola and Grand Paradis are omitted, although the latter is mentioned in another part of the book.

METHOD EMPLOYED IN MEASURING HEIGHTS.

I visited the Tarentaise in 1859, 1860, and 1861, having with me on the first occasion a sympiesometer, by Adie, which proved perfectly useless. The glycerine column, in falling, always separated into numerous portions, with wide gaps between, so that it was impossible to determine its length. In 1860 and 1861, I carried one of Casella's mountain barometers, on Fortin's principle, with an ivory point, and I have great pleasure in bearing testimony to the excellence of the instrument. In the former year, indeed, the tube was broken during my homeward journey,

but in 1861 it was carried about the mountains for several weeks without the smallest mishap.

The mercurial barometer is by far the most trustworthy instrument for hypsometrical purposes, most others being merely indirect contrivances for ascertaining the atmospheric pressure in height of mercurial column. From its length, it is at first rather awkward to carry, but one very soon gets used to it, and every mountaineer, travelling in an unexplored district, should make it his constant companion. In using it for the measurement of heights, it is necessary to select beforehand the stations for comparison, in order that the observations may be made as nearly as possible simultaneously with those at the lower level. For the Graian Alps, the observatory at Geneva, the St. Bernard Hospice, and the Turin Academy are the best bases, and to these may be added Aosta, where the barometer is observed daily by M. Carrel. At the Turin Academy, the meteorological observations are made at 9 A.M., noon, and 3 P.M., and the same hours are adopted by M. Carrel. At Geneva and St. Bernard the records are far more complete, the instruments being read every even hour, from 6 in the morning until 10 at night. It may be useful to add, that the heights above the sea of barometer cisterns at Turin, Geneva, and St. Bernard, are 284, 408, and 2478·3 metres respectively.

The next step to be taken is to compare the mountain barometer with the fixed instruments at the lower stations, in order to ascertain the differences in their index errors. In 1860 I neglected to do this at the commencement of the journey, and the comparison was made at Turin after I had left the Alps. On August 23rd my barometer stood 1·5 millimètres lower than the Academy instrument, a discrepancy much greater than it ought to have been. In 1861 I took the precaution of making a comparison at Geneva, before the barometer was subjected to the rough usage of the mountains. The instrument and its attached thermometer are graduated both in French and English measures, and the two scales have not necessarily the same index error. On August 3rd, by a mean of two comparisons it stood ·49 mm. and ·027 inches below the observatory standard. On the 27th it was compared at Turin, when the mean of three comparisons gave a depression of 1·46 mm. and ·06 inches below the Academy instrument, a difference nearly identical with that of the previous year. On a final comparison with Mr. Casella's standard made on my

return to London, it was found that the error had increased ·74 mm. and ·029 inches during the alpine journey. This was annoying, as it invalidates the results to a certain extent; the alteration in the error was perhaps due to the great fluctuations in the length of the column causing the unboiled mercury in the cistern to mix with the boiled mercury in the tube, and so carrying up a minute quantity of air. Previously to every observation, I tilted the tube, so that the mercury struck against the top, but I never detected any dullness in the click. It thus appears desirable to make comparisons not only at the beginning and end of a journey, but at intermediate times, and as frequently as possible. The increase in the index error will not account for the whole discrepancy at Turin, and it is probable that the indications of the Academy barometer are somewhat too high. The barometer at St. Bernard is kept constantly *en rapport* with that at Geneva, so that any mountaineer who has compared his instrument at the latter place can avail himself of the St. Bernard observations. The Index errors here described are not included in the barometer readings, as given in this paper, but have been added to them before making the calculations.

Throughout the journeys of 1860 and 1861 I invariably read the barometer and attached thermometer in duplicate, making the record both in French and English measures, and reducing the height of the column to the freezing point independently in the two scales. By comparing the results, any error in the original reading or in the process of reduction could at once be detected. The air temperature was taken by one of Mr. Casella's centigrade thermometers, tied on to the shady side of an alpenstock about five feet above the ground. The altitudes were calculated by tables based on La Place's formula, which contains corrections for temperature, latitude, and decrease of gravity in a vertical line. The tables employed, which are the best and simplest for the purpose, are those of Delcros in French measures, and of Guyot in English; they will be found in the "Physical and Meteorological Tables" of the Smithsonian Institute of Washington, edited by Guyot, an admirable work, the most complete collection of meteorological information that has ever issued from the press. In 1860 I made the calculations in French measures only, but in 1861 both in French and English, taking the mean of the results, and going through the figures a second time whenever the difference was great enough to indicate the probability of an arithmetical

error. In 1861, when comparisons were made with the three bases of Turin, Geneva, and St. Bernard, each observation thus involved six distinct sets of calculations.

I gladly avail myself of this opportunity of acknowledging my obligations to Signor Cantu of the Turin Academy, and to M. Plantamour, Professor of Astronomy at Geneva. I am deeply indebted to both these gentlemen, not only for the facilities they afforded me for the comparison of my barometer, but also for their kindness in furnishing me with the necessary extracts from their meteorological registers. I have also to thank M. Plantamour for his valuable suggestion of a very simple method of extemporising a moist bulb thermometer. After taking the air temperature, nothing more is necessary than to cover the bulb of the thermometer with a small piece of paper either dipped in the nearest stream or merely moistened in the mouth. The process is so simple, that it is always worth while to include a moist bulb reading with the other observations. I have not, however, availed myself of this additional element to make use of Plantamour's tables based on Bessel's formula, which contains a correction depending upon the humidity of the air; partly because they are far more complicated than those of Delcros, and the calculations involved more time than I had at my disposal; and partly because it was necessary to compare the results with those from St. Bernard and Turin, where the moist bulb thermometer is not observed.

It will be observed that the St. Bernard results are generally lower than the others. This is not the place to enter into a discussion of the causes of this phenomenon, they are fully explained in a masterly memoir by M. Plantamour, entitled "Mesures Hypsométriques dans les Alpes," Genève, 1860. The difference varies with the time of year, and hour of the day, and is a maximum in the month of July, and from 12 to 2 P.M. If the observations had been made at night, the St. Bernard results would have been the highest.

NARRATIVE OF EXPLORATIONS IN 1859 AND 1860.

It was in the year 1859 that I was first enabled to indulge a long-cherished desire of forming some practical acquaintance with the Graian Alps. I had been travelling

with my brother, Mr. G. S. Mathews, and after many delightful excursions in the Bernese Oberland, and the neighbourhood of Zermatt, we arrived, towards the end of August, at Chamounix, and began to think of turning our faces homewards. A few days previously we had met Messrs. Ormsby and Bruce at Aosta, and fired by their success upon the Grivola, we resolved to conclude our mountain work by making a rapid march from Chamounix to Turin by way of the Col d'Iseran. Mont Iseran, the supposed monarch of the Graian chain, is placed by the Sardinian surveyors just on the east of the Col, and occupies a most prominent position upon sheet 37 of the large Government survey, with Corabœuf's determination of 4045 metres upon its summit. We intended to subject the peak to a thorough examination, and if it looked easy to try to climb it. Success was too doubtful to make it worth while to take on our guides; we, consequently, dismissed them, and quitting Chamounix on Tuesday the 30th, we shouldered our knapsacks, and crossed the Forclaz to St. Gervais. On the 31st the fine season of 1859 fairly broke, and was succeeded by a period of wet and cloudy weather. On the first rainy day for nearly five weeks, we walked from St. Gervais over the Col du Bonhomme to Bourg St. Maurice in the Tarentaise, where we found comfortable but rather expensive quarters at the Hotel des Voyageurs.

On Sept. 1st we left Bourg at 7.30 A.M. by the route of the Little St. Bernard, which follows the course of the Isère as far as the village of Scez. Above this place, where the road and river separate, the latter bending suddenly to the S.E., the Isère valley is called the Val de Tignes. Quitting the main road, we struck into a mule path on the right bank of the river, and in about two hours from starting reached St. Foi, situated in the midst of verdant

sloping meadows and shadowy groves of walnut. Above St. Foi is La Thuile, and then Brévières, where the valley opens out into a little plain, and then contracts and mounts again, only to widen somewhat farther on into the plain of Tignes. We arrived at this village at 1 P.M., and entered the auberge de St. Roch, *chez* Florentin Revial, just behind the church. The morning had been too cloudy for distant views, and the mist unhappily entirely obscured the mountain S.W. of St. Foi, which I was very anxious to catch sight of. It is called in Murray, the Chaffe Quarre, but its proper name is the Mont Pourri. The valley we had passed through was, nevertheless, extremely picturesque; at times the path led us through glades of pine forest, at times through pleasant meadows, flat or steeply sloping, at times through trees again, interrupted by massive crags, and with glimpses of waterfalls and glaciers.

I know few spots surrounded by such beautiful scenery as Tignes, and certainly there is none so convenient as head-quarters for the exploration of the Tarentaise. It stands on the banks of the swift Isère, on a grassy plain, about a mile long by half a mile wide; just across the river, on the E., the stream from the Lac de la Sassière cascades over the cliffs, and on the opposite side of the village a torrent rushes down from the Lac de Tignes, a charming sheet of water, in the very bosom of the mountains, and producing excellent trout. The Aiguille de la Sassière, the culminating point of the central Graians, rises above the first-named lake; many other lofty peaks are close at hand, and passes radiate from Tignes to nearly every part of the Graian Alps. Of these I may mention the Col Vaudet into the Val Grisanche; the Col de Gailletta into the Val de Rhêmes, and thence to Villeneuve and Aosta; the Col de Galèse into the Val Locana; the Cols of

Iseran, Larossor, and La Leisse into the Maurienne; the Col du Palet to Moutiers Tarentaise, and the Col de la Sache into the Val Peisey.

Decent food and lodging alone are wanting to complete the attractiveness of Tignes, and how far these are at present supplied will immediately appear. On entering the inn we were greeted by an old woman, who spoke a hideous patois, and who conducted us through the kitchen into a den behind called by a playful metaphor the *salle à manger*. In answer to our demand for dinner, she produced, after a long delay, soup composed of bad grease and vermicelli, an omelette, and an unlimited supply of *salé*. The later delicacy was winter-dried mutton, to be eaten uncooked. Those of my readers, to whom it is not familiar, may form a tolerable idea of it by cutting a rudely triangular piece out of a mahogany board, slicing it into thin shreds with a very blunt knife, and then endeavouring to eat it.

We found a peasant in the inn, and tried to get some information from him as to the time it would take us to cross the Col d'Iseran to Bonneval. He had crossed it some years before, and told us it was a six hours' journey, whereas our hostess assured us we could do it in four. Not being quite certain about the way, and having had moreover quite enough of our knapsacks in the morning, I asked her to try to find us a guide, and suggested five francs as an adequate remuneration. After an absence of half an hour, she reappeared, accompanied by a short broad-shouldered man, with scoundrel written on his countenance. The new comer informed us that it was eight hours to Bonneval, and that his terms were twenty francs, saying that the guides had to risk their lives on these mountain expeditions, and that they ought to be well paid. Knowing there was a mule path all the way, of course we demurred

to this extortionate demand, but after a long negotiation I was weak enough to agree to give him twelve. So much time had been lost by this unpleasant discussion, that it was 3.15 P.M. before we left the inn. We were so disgusted at the conduct of the guide that we resolved to punish him, and as we were both in first-rate condition, and had really not a moment to lose to save the daylight, we walked very fast. He struggled hard to keep up with us, but did not find it easy, and scarcely left off muttering imprecations all the way up to the Col. I discovered the following year that this rascal, whom our hostess had taken half an hour to find, was no other than her husband, the landlord of the inn.

Above Tignes, the valley narrows into a picturesque defile, and opens out again into the plain of Laval, where it turns sharply to the E. Laval itself, a nest of squalid habitations, is a fitting portal to the highest reach of the Isère valley, a dreary track of treeless rocks and pastures. The source of the river is at the glacier of Galèse, over which lies the pass of the same name to Ceresole. We, however, were bound to another point, and soon after leaving Laval, zigzagged up the slopes on our right, until we came in sight of a line of stone pyramids, which mark the route across the Col d'Iseran, in place of the fir poles usually employed in similar cases. These pyramids are substantial erections, with niches at the bottom large enough to hold several persons, and well adapted for shelter in bad weather. Ever since leaving Laval I had been straining my eyes in vain to catch a glimpse of the Mont Iseran, and on gaining the summit of the pass, I exclaimed to the guide: "Here is the Col, but where is the Mont Iseran?"—"*C'est ici, Monsieur*," was the reply. "I don't mean the Col but the great mountain," I rejoined. "*Eh bien, Monsieur, c'est ici.*" "*Mais, où est le pic de neige*

qu'on appelle le Mont Iseran?"—"*Il n'y a pas de pic de neige, Monsieur; c'est toujours un sentier à mulet.*"

I thought at first that the guide was only stupid, although I had observed that the country people never spoke of the pass as the Col, but always as the Mont Iseran. "*Vous allez passer le Mont Iseran, Monsieur, n'est-ce pas?*" had frequently been asked us. On looking eastward, however, towards the actual spot which the mountain occupies, according to nearly all the maps, I could see positively nothing but a line of low cliffs and overhanging glacier. Still it was quite possible that the peak might be concealed by clouds or intervening mountain ridges of lower elevation. Evening drew in rapidly as we descended towards the valley of the Arc, and it was dark when we arrived at Bonneval. It may be useful to future travellers to state the time occupied in walking from Tignes which we left at 3.15. We reached Laval at 4.15, the Col at 6, and Bonneval at 7.30. Time from Tignes to Bonneval four hours and a half, from Bourg St. Maurice to Bonneval, exclusive of halt, nine hours and three-quarters, but we walked very quickly.

Our guide led us to one of the largest buildings in the village, and on the door being opened we were admitted into what appeared to be a cowhouse. From this we passed into a large barn half full of hay, and thence into the living room of the family. Our host, on being informed that we required supper and lodging, brought us out of doors again, and conducted as by an outside flight of steps into a small upper room. We enjoined him to give us the best supper he could put upon the table, and in due time he reappeared with soup, eggs, and a dish containing apparently two roasted cricket-balls. On a closer investigation these were found to be marmots' heads, but we could discover nothing edible on the exterior,

and our first attempts to get inside were not attended with success. At length I split them open with a knife and a geological hammer, but finding no more inside than we had found outside, we handed them over to our guide, who worked away at them with immense energy and satisfaction. Our host having succeeded in discovering milk, we brewed some chocolate and so made a tolerable supper. Our sleeping apartment opened out of the barn, and contained a couple of rough but clean beds.

The existence of any Mont Iseran other than the mule-track being stoutly denied at Bonneval, and the weather continuing very unpropitious, we determined to push on at once to Turin. We started again at six on the morning of the 2nd, hoping to get a better breakfast by walking for it to Lans-le-bourg, and passing down a valley only equalled in dreariness by the upper part of the Val Isère, we arrived at 9 at Lans-le-Villard, a few hundred yards from the zigzags of the great road. Here we discovered that Lans-le-Bourg was three miles lower down, and not being anxious to add an unnecessary six miles to our day's walk, we turned at once into an inn and ordered breakfast. We found the commissariat resources of Lans-le-Villard decidedly inferior to those of Bonneval, the village being far enough from civilisation to be out of the reach of meat, and not high enough in the mountains to be supplied with milk and butter. According to Murray, the inhabitants of this place salt their donkeys for food, a practice which he says is common in the Tarentaise. As the donkeys would certainly not be put into pickle until they had reached a ripe old age, we have here an obvious explanation of the extraordinary toughness of the dried mutton presented to the traveller in these parts of the Alps. We left Lans-le-Villard at 10, walked over the Cenis to Susa, and took the train to Turin, where we

thoroughly enjoyed the comfort and luxury of the excellent Hôtel de l'Europe.

At one of the first meetings of the Alpine Club held after my return to England, I brought forward the subject of the Mont Iseran, desiring to know whether the mountain had a real or only a mythical existence. None of the members present had ever seen it, although several had travelled in the district, and one had even crossed the Col de Galèse, and looked for it in vain. It was suggested by Mr. Ball that the Aiguille de la Sassière had been mistaken for it, and by the Rev. S. W. King that it was the Vanoise which had been measured in its stead. One thing only appeared perfectly certain, and that was that the Graian Alps required thorough investigation.

The principal object of my Alpine wanderings in 1860 was to explore the neighbourhood of the Grand Pelvoux and Monte Viso, and to attempt the ascent of both those peaks. The Rev. T. G. Bonney and Mr. J. C. Hawkshaw having turned their thoughts in the same direction, we agreed to unite our forces, but as they could not start until the 11th of August and I wanted to leave on the 1st, I resolved to have a preliminary run in the Tarentaise, and promised to meet my friends at La Bérarde on August the 14th.

My old guide, Jean Baptiste Croz, having accepted another engagement, I secured the services of his brother Michel, whom I found to be a first-rate mountaineer, and, wishing to render myself entirely independent of the natives of the Tarentaise, I directed him to bring a porter from Chamounix, and to meet me at Moutiers on the evening of Thursday the 2nd of August. I quitted London on the morning of the preceding day, reached Paris just in time to catch the night train to Macon, and left the

Victor Emmanuel railway at Chamousset at noon on the 2nd, by the diligence for Moutiers. We entered the town at 6 P.M., and drove up to the door of the Hôtel de la Couronne, where I found Michel Croz and the porter awaiting my arrival. Thus the journey from London to the heart of the Tarentaise can be effected in thirty-five hours!

On Friday the 3rd of August I started at 5.30 A.M., intending to devote my first day among the mountains to walking up the valley of the Doron, and crossing the Col du Palet to Tignes, which I flattered myself would be an easy day's work. There is a carriage road as far as the pretty little village of Bride-les-Bains, about an hour from Moutiers, a spot of some resort as a watering-place, and containing a pension of so comfortable an appearance, that I regretted I had not pushed on here the preceding evening instead of staying at Moutiers, where the inns are but indifferent. Another hour's walk brought us to Bozel, and at 8.50 we arrived at Champagny, where the valley forks, the main branch ascending southwards by Pralognan to the mountains overhanging Modane in the Maurienne, and the other continuing in an easterly direction towards the Col du Palet. The intervening angle is occupied by a very important range of mountains, of which I shall speak presently. I was greatly charmed with the lower part of the valley of the Doron, through which I had just passed. Numbers of small enclosures with overshadowing walnuts bounded the river on either side, above them sloping meadows shot up like tongues of brilliant green among the sombre pines, which were broken again still higher up by massive juts of crag and silvery streaks of water. Owing to the inclement season, the corn in the inclosures was still green, and the flowers far more brilliant than I had ever seen them at this time of year. *Lathyrus tuberosus*, with

its elegant clusters of pink flowers, waved among the corn, and the road sides were ornamented with the deep purple bells of *Specularia speculum*. We stayed an hour at Champagny, where we lunched on eggs and uncooked ham, and, as we were all perfectly ignorant of the country, I made some inquiries about the route. We were directed to keep to the track by the river-side until we came to the "Grand Châlet," and then to bear up to the left on the northern slope of the valley to the pasturage of "*La grande Plagne, une bien grande montagne*," where they kept 300 cows. Soon after starting it began to rain heavily, and the great mountain range on our right was entirely obscured by clouds. On arriving at a point where the track forked, we concluded we were at the Grand Châlet, although no building was visible, and climbing up the rocks on the left, we landed in the thick fog on an upland grassy plain, with no path to be discerned. In this emergency I despatched Croz in the direction of some distant cow-bells to obtain information. After a long delay he returned, having ascertained the position of the col, and a brisk walk brought us up to a man and his wife, natives of these parts, who were also bound to Tignes, but who had never crossed the col before. They had, however, been already upon it, and having turned too sharply to the right, had descended the valley again by the river-side, and had arrived at the grand châlet several hours after they had quitted the same spot. As we ascended towards the col the rain turned to snow; I gathered, nevertheless, some interesting Alpine plants; on the rocks below the pastures were *Saxifraga cuneifolia*, and *Woodsia ilvensis*; a boggy flat above them was covered with a Gagea in full bloom, I think *G. Liottardi*; the slopes beyond produced *Saponaria ocymoides*, a lovely plant with brilliant crimson flowers; and on what I imagined was the

col itself, I found *Astragalus alpinus*, *Ranunculus pyrenæus*, and *Gregoria vitelliana*.

We arrived at the top of the col at 3.15, and held council on the route. I knew that the heads of two valleys converged on the further side,—that of the Val Peisey, which descends towards the N. and joins the Val Isère below Bourg St. Maurice, and that of the Lac de Tignes, which takes an easterly direction. Our way lying along the latter, I insisted upon keeping to the right, whereas our new acquaintances as strongly urged going to the left, saying that the way I proposed was the one they had taken in the morning, which had brought them back to their starting-point. The fog was so thick that we could see nothing, and thinking that our two companions knew more of the country than we did, we yielded to them and let them lead the way. After a descent of about two hours a temporary lull in the snow-storm revealed a lake and some cow châlets, and I sent Croz forward to confer with the berger. He soon returned with the intelligence that we were, as I suspected, in the Val Peisey, at the spot called Autre Lai, and that if we would reach our destination that night we must clamber over the mountain-ridge which divided us from the Val de Tignes. As it was now nearly 6, not a moment was to be lost, and we faced our work in earnest. The ground proving very rough, and the snow coming down with even greater energy than before, the lady and gentleman retreated, I know not whither. At last we gained the crest of the ridge at a point called the Col de la Sache, and descended into a lateral valley which joins the Val de Tignes at Brévières. Walking ankle-deep in snow, and bearing to the right as much as possible, we reached Tignes at 9, and entered the inn I had dined at the year before on my way to the Col d'Iseran. I had thus commenced Alpine

work after two days and a night of hard travelling, with a walk of fifteen hours and a half, and when we gained our quarters, I had eaten nothing for eleven hours, and was hungry, tired, and wet to the skin.

The Auberge de St. Roch had not improved since my last visit. In consequence of the annexation of Savoy to France, the frontier line now ran along the mountain-ridge on the E. of the Val de Tignes, and fourteen Sardinian and two French douaniers were quartered in the valley, ready to pounce upon unwary travellers. There were but two spare bed-rooms in the house, one entered through the other, and the two French douaniers had engaged the inner one. The outer room contained three beds; one was occupied by a Sardinian douanier, I took possession of the second, and Croz and the porter of the third. Our supper consisted of vermicelli soup, and an omelette, which was followed by vermicelli plain boiled. The wine was very fair, as indeed it is generally throughout the Tarentaise; it is grown in the neighbourhood of Montmeillan. I was so thoroughly knocked up, that, notwithstanding my long fast, I could eat no supper; so I drank a couple of glasses of wine, and went off to bed.

Saturday was cloudy, with rain at intervals, so that it was impossible to put in hand any serious work, and I was not sorry to have a day's rest. At 11.20 A.M., I read the barometer; the height deduced from a comparison with Turin is 5405 feet, while the Schlagintweits give 5426 feet for the level of the Isère.*

I spent the afternoon in strolling up to the Lac de Tignes, an hour's walk from the village. There was far too much cloud for distant views, but the scene was charming, notwithstanding. The water is as clear as crystal, and the

* "Neue Untersuchungen über die Alpen," p. 55.

lake is surrounded by wide pastures covered with beautiful flowers. A man had been drowned in it the day before; having been seized with a fit while fishing, he overturned the boat in which he was sitting, and sank immediately. The body had not been recovered, although I was told it could be clearly seen at the bottom. I made the tour of the lake, and examined the remarkable mountain of gypsum, marked Tuf de la Thouvière on the large Government map; it is crowned by a mass of tufa like breccia, and deeply furrowed by watercourses. Heavy rain coming on again, we were driven back to the inn. Our dinner was an exact counterpart of the previous evening's supper; indeed, the only way in which a meal can be varied at Tignes is by differences in the cooking of the eggs. They may be taken as omelettes, fried, boiled, or eaten "*comme ça*," which is French for raw, in the Tarentaise. We were promised a better dinner on the morrow, as a sheep had just been killed in honour of the Sunday, and we gave strict injunctions for a part of it to be cooked that night, in order that we might have meat to take with us in the event of the morning being fine enough for an excursion. My intention was to make the ascent of the Sassière my first expedition, and to see if I could discover the Mont Iseran from its summit.

It was 5.30 on the morning of the 5th of August before I awoke, and on looking out the, sky gave promise of a brilliant day. In Alpine travel, to seize upon fine weather the instant it presents itself, is the first condition of success, and a single sunshiny day not turned to account may bring a whole journey to disaster. I roused my guides, gave the order for an attack upon the Sassière, and bade them make the necessary preparations with all practicable despatch. I was nearly driven mad by the miserable imbecility and inertness of the people in

the inn. It was an hour before we could get breakfast; and it then appeared that they had cooked no meat the night before, so that there would be another long detention before the provision knapsack could be packed. At 7.20, I started off with the porter, telling Croz to stay behind to see to the provisions, and to follow us as fast as possible.

Crossing the Isère close to the village, we began to mount immediately on the southern side of the cascade, and on gaining the summit of the cliff, we passed by a wooden bridge across the torrent, where it thunders at the bottom of a narrow gorge. We had now before us an upland valley, with the Sassière on our left hand, and on our right the ridge dividing us from the upper reach of the Val de Tignes above Laval. In the centre of the valley, surrounded by a pleasant pasture, lay the Lac de la Sassière, fed by glacier streams, and beyond it was a great glacier, over which is the pass of the Col de Gailletta into the Val de Rhêmes. The Sassière itself as seen from this position is a very steep escarpment of rock, standing E. and W., and composed of schistose beds, stratified nearly horizontally, and showing their edges along the face of the escarpment. It is crowned by a thick cornice of snow, which rises into a dome at the further extremity, so that the mountain cannot with any approach to accuracy be termed an *aiguille*. It is supported on the side of Tignes by a huge buttress of rock, rising immediately from the Isère, the upper part of which is connected with the cornice by a steep arête of snow. Turning in the opposite direction to the col, we looked across the Lac de Tignes to a snow-peak of most graceful contour, which has been by some miscalled the Aiguille de la Vanoise; it is really a mountain rising from the Col de la Leisse, immediately on the W. of that pass, and is named on the large Government map

the Aiguille de la Grande Motte. Considerably to the right of it was the massive frame of the Mont Pourri, terminated by two peaks, of which that on the left overhanging the Col de la Sache, which we had crossed from the Val Peisey, appeared scarcely less elevated than the other. This, however, was a deceptive effect of perspective, the northern, or right hand peak, which was much more distant, being about a thousand feet higher. Rocks and flowers and mountain streams sparkled in the sunshine, and the sky was one unbroken vault of glorious Alpine blue, except where bonnet clouds rested on the summit of the Sassière, and upon the peaks of the Mont Pourri. These were elegant white wreaths, which, in their upper outlines, followed the curvature of the mountain brow, and on their under side faded away gradually before they actually touched it.

After examining the face of the Sassière, we at first decided on ascending to the Col de Gailletta and then scaling the final peak which appeared close to it, an error from which we were happily saved by a conference with a herdsman, who induced us to select the summit of the western buttress, or rather a notch in the ridge to its right, as our first point of attack. This we reached without difficulty, and found ourselves at the bottom of the snow arête which divides the valley out of which we had ascended from another leading down to Brévières. On gaining the top we landed on the cornice, the southern termination of a gently sloping surface of snow, which has an outlet towards the S. in the Val de Tignes. We walked as close to the edge of the cornice as we could without risk of falling through, zigzagged up the final dome, and reached the summit at 1.15 P.M., after a walk of six hours all but five minutes, including a halt of half an hour for refreshment. An indisputable proof that we were not the first

arrival immediately presented itself. A few feet below the summit, on the side of Tignes, where the stony skeleton of the mountain just peered through the snow, were the relics of an ancient cairn, with boards and fragments of pine-wood sticking up in wild disorder. My disappointment at having been anticipated in the ascent was somewhat appeased by the means thus afforded of fixing a minimum thermometer, which would not otherwise have been possible. Having set up the barometer and left it for the mercury to become steady, I proceeded to examine the different parts of the wonderful panorama that lay stretched out around us.

We are standing in the centre of the Graian Alps, almost every peak of which is visible, while beyond them, on the one side, are the savage ramparts of the Pelvoux, and on the other the Pennine chain from Mont Blanc to Monte Rosa. The latter range is of course the most prominent feature in the prospect. Let us look at it a little more in detail. The mass of Mont Blanc appears to commence with a very steep and narrow aiguille, which Croz says is just above Mottet; it is probably the Aiguille du Glacier; to the right of this are the Aiguilles of Miage and of Bionnassay, the Dome and the Calotte, and then the well-known form of the Aiguille du Géant beautifully sharp and distinct; the Aiguille Verte and other peaks beyond it are crowded and confused; I am unable certainly to decipher them. To the right of the break in the chain, where lie the Col Ferret and the Great St. Bernard, are my old friends the Vélan and the Combin, succeeded by the Dent Blanche, the Dent d'Erin, and the Matterhorn, and those again by the Breithorn, the Lyskamm, and the many-peaked ridge of Monte Rosa. In examining the Graians, I first look to the westward down upon the Lac de Tignes; beyond it are two high moun-

tains, one the Grande Motte, snow-coated from base to summit, the other to the right of it, and far higher, presenting a nearly vertical wall of rock, crowned by two peaks, and overhanging the valley above Champagny, along which we had walked towards the Col du Palet. Turning a little to the right we have before us the striking mass of the Mont Pourri, rising nearly opposite to us beyond the Val de Tignes, down which we can look almost to Bourg St. Maurice. Due N. extends the ridge which divides Piedmont from the Tarentaise, and connects the Sassière with the little St. Bernard and Col de la Seigne; it is broken into many peaks, with intervening glaciers, but there is no part of it which is not hundreds of feet below our position. On the side of Piedmont we look along the valleys of Grisanche and Rhêmes into the Val d'Aoste, and across the Val Savaranche to an enormous chain of rock, culminating at its two extremities in the black peak of the Grivola and the snow-topped Grand Paradis, S. of which is the comparatively insignificant Levanna. We now look southwards, where we ought to see at a distance of only eight miles the mighty peak of the Iseran, upwards of 13,000 feet in height; but nothing of the sort is visible. I am unable indeed to make out the exact position of the col of the same name, owing partly to the village of Laval and the valley above it being hidden by intervening mountains, and partly to the large tracts of unmelted snow, which were not in existence when I crossed to Bonneval the previous year, and which make it difficult to distinguish between mere snow-covered slopes and glaciers. There is, however, in view one excellent landmark, the Lac d'Ouglietta, situated in an upland plain just S. of Laval. A glance at sheet 37 of the Large Survey will show that a line drawn from this lake to the Levanna, passes straight through the summit of Mont Iseran, whereas I can detect

no peak of the smallest importance between these two points.

Having carefully noted the form and position of the surrounding mountains, the next proceeding was to compare their heights with that of the Sassière, and a pocket-level was mounted for this purpose. We were of course overtopped by most of the peaks of the Pennine chain, and by some of those of the Pelvoux. Four only of the Graians lifted their heads above us, two in Piedmont, and two in the Tarentaise. The former were the Pic de Grivola and the Grand Paradis, both of which appeared considerably higher than the Sassière. Some of the Graians of Cogne may also be more elevated, but, being intercepted by the Paradis, were not included in our range of view. The two peaks of the Tarentaise were the dark mountain beyond the Lac de Tignes, and the Mont Pourri, apparently nearly the same height, and at most three or four hundred feet above us. The height of the Mont Pourri was a great surprise; I had no idea that it was so lofty a mountain.

At 2.30 P.M. I observed the barometer, and the readings were as under:—

Barometer reduced	483·06 mill.
Air temperature	−1·0 Cent.

A comparison with the observation at Turin at 3 P.M. on the same day gives an altitude of 12,306 feet, that determined by Corabœuf being 12,346, 40 feet greater.

During the whole time we were upon the summit there was a very high wind, which blew from every point of the compass in succession, and which vitiated an observation for solar radiation, which I attempted to make with a black bulb thermometer.

The only duty now remaining to be performed was to

fix a minimum thermometer. Selecting the strongest board from the ruins of the signal, we placed it with its breadth vertical and length horizontal on the site of the old cairn, and fixed it firmly with large pieces of rock, so that its face was directly opposite to the Lac de Tignes. Having carefully adjusted the index of the minimum marked A C, No. 302, which stood exactly at zero, I hung the instrument on two copper nails I had driven into the board, and well secured it with brass wire.

Having spent two hours of supreme enjoyment, notwithstanding a high wind and a thermometer at freezing, it was time to think of returning, and at 3.15 we left the summit. At 4 we reached the base of the arête where it unites with the great buttress, and this being a very sunny position, with plentiful supplies of snow and water, we reclined upon the rocks and turned our attention to dinner. Another hour soon sped away in the agreeable process of restoring exhausted nature and lazily looking at the sky and mountains, and it was 5 before we resumed the descent. Some alluring snow-slopes on our right tempted me to try a new route to Tignes by the valley leading to Brévières, and five or six delightful glissades in quick succession soon landed us upon the pastures. Thence bearing well to the left we gained the face of the buttress overlooking the plain of Tignes, and, cautioning the porter to follow quietly for fear of injury to the barometer which he was carrying, I raced Croz down the slopes, crossed the Isère by the bridge at the lower end of the plain, and entered the inn at 6.20 P.M., having descended the 7000 feet in two hours and five minutes, exclusive of the halt for dinner.

The inquiries made of Revial relative to the erection of the signal on the Sassière elicited no satisfactory reply; all that he could tell me was that it was "*des siècles*" ago.

I was more successful the next morning, in questioning a herdsman who occupied a châlet on the side of the Lac de Tignes. I learnt from him that the first ascent was made and the signal erected by Bertrand Chaudant, an inhabitant of Tignes, who is now dead, but has two sons living. How long ago he could not tell; it was certainly more than fifty years.

Intending to make a push for Pralognan on the morrow by the Cols of La Leisse and Vanoise, and anticipating a long day's walk, I retired early to rest, and had not been in bed half an hour before the eating-room below, which was only separated from our chamber by a thin flooring, of course unceiled, began to fill with guests. A number of the natives of Tignes had come to conclude their sabbath observances with a carouse, and for three-fourths of the night they turned the house into a pandemonium. They drank, they clinked their glasses, they sang songs, they shouted, they stamped the floor, they struck the tables with their fists, they swore, they quarrelled, and they howled, and each man as he left the inn stood for some minutes before the door and yelled and shrieked like a maniac. As if this were not enough, the douaniers were continually passing backwards and forwards through my bed-room, and when the natives retired at about 2 A.M., they continued the performance for a couple of hours more, and then it was time for us to get up. Not willingly would I endure such another night; to be thoroughly tired and drowsy, and to be kept awake from moment to moment while on the point of sleeping, is a most painful sensation.

"*Ah, Monsieur,*" exclaimed the porter as we turned out of bed at day-break, "*je ne puis plus marcher.*" In our rapid descent of the Sassière he had contrived to twist his knee; it was now badly swollen, and he limped fearfully. I told him to take a mule to Bourg and get surgical treat-

ment, and then return at once to Chamounix. This was an unfortunate occurrence, and one which seriously inconvenienced me in subsequent excursions, as it was as much as Michel could do to carry the baggage and instruments, without counting provisions. I regret to say that the lameness of the porter (who, by the way, had been in the Sardinian army and made the campaign in the Crimea, of which he was never weary of talking) was more feigned than real. When Michel and I met again in 1861, I inquired if he had quite recovered from his accident. "*Il se guérit bientôt*," was the reply, "*il n'aimait pas marcher si fort, vous concevez.*" We managed to get away at 5.30, and Croz having shouldered all the packages, he and I were once more on the road to the Lac de Tignes, each of us with a large piece of bread and cheese, our only provisions for the day, in his pockets. I was not sorry to turn my back upon the Auberge de St. Roch, where I had found the host and his family lethargic and unobliging, the food detestable, the charges disgracefully extortionate, and the entire absence of privacy excessively annoying.

The morning was cloudless, and from the shores of the lake we had beautiful views of the Grande Motte and the Sassière. From the châlets at its head, the direct path leads to the Col du Palet, that to the Col de La Leisse turning sharply to the left and entering a gorge on the S., where it is joined higher up by another track from Laval. It was not long before the weather changed, and we walked through rain up to the col, which we reached at 9.30, and which was then covered with snow, extending some distance down on either side. There is a boss of rock on the summit fifteen or twenty feet high, surmounted by an iron cross. The Grande Motte rises in graceful sweeps of snow, unbroken by a particle of rock, immediately on the W. of the col, above which it did not appear to be elevated

more than 2,000 feet. We could easily have climbed it, and should certainly have done so had the weather been at all encouraging. I now looked out for the Aiguille de la Vanoise, which is placed by all the English maps S. of the col of the same name in the range westward of Entre deux Eaux. In this, the six-sheet Sardinian Survey, where the range just mentioned is called Ghiacciaja della Vanoise, is probably followed. I scrutinised attentively the district in question through a break in the clouds, but could detect no peak which at all realised my expectations, and I began to suspect that the Iseran farce was about to be repeated.

A barometer observation, compared with Turin, gives an altitude of 9068 feet for the Col de La Leisse, the Etat Major Piémontais ("Le Alpi," &c.) making it 9186.

After a halt of half an hour, I began to descend the extensive snow-slopes which occupy the upper portion of the Vallon de La Leisse, and while walking behind Croz, my attention was attracted to the colour of his footsteps. Upon the untrodden surface there was nothing at first distinguishable, but the snow when compressed by the foot was of a dull brick-red colour. I had often heard of red snow, but never noticed it, and had taken up the notion that it was brilliant carmine. On looking carefully at the untrodden snow, I could detect in it a number of red particles sparingly scattered through the mass, as if brick-dust had been mingled with the snow when falling; and I could then perceive that a large extent of it was faintly tinged with red. I filled two test-tubes with the snow, which on melting gave a copious red precipitate; this I filtered upon a piece of blotting paper, and stowed away in a pocket-book. On my return home I placed a small portion of the powder under the microscope, and immediately recognised the indisputable spherules of *Protococcus nivalis*. Having once familiarised myself with the look of red snow, there was no

chance of mistaking it for the future, and I found immense tracts of it almost daily during the remaining period I spent among the mountains.

For dreariness and desolation the Vallon de La Leisse has no rival in the Graians. It is walled in by steep slopes of crumbling black shale, without a house, without a tree, almost without a blade of grass, to relieve its dismal monotony, while below, hidden at intervals by shapeless lumps of dirt-stained snow, rolls the river, foul with mud from the disintegrated mountains. We walked down the valley until we came in sight of the river Vanoise, which, rising near the col of the same name, flows in a south-easterly direction along an elevated valley, and plunges over a cliff to join La Leisse about a mile above Entre deux Eaux.

The valley of the Vanoise has very little fall, and the river expands at intervals into a series of lakes, or rather irregular ponds of shallow water. Its sides are composed of the same black shale, and it has as dreary an aspect as the neighbouring Vallon de La Leisse. The poles were a great assistance, as we could just see from one to another through the thick mist, which prevented any inspection of the adjoining mountains. In a moment the rain ceased, a gust of wind rolled away the vapour, and I found myself at the base of a noble snow-peak, evidently the one we had seen the dark side of from the top of the Sassière. On the left was a range of snow-topped cliffs of much less elevation, and between the two a beautiful pyramid of rock, something like the Riffelhorn, but sharper and more picturesque. It was now 1.50 P.M., and we were standing upon the Col de la Vanoise. It is possible to get down to Pralognan on the southern side of the rocky pyramid, but the poles wound round it on the N. We followed the way thus indicated, descended a rough path down the side of an old moraine, crossed the sandy bed of an empty lake,

and emerged into a sunny and verdant valley, brighter by contrast with the scenes of desolation we had left behind. In the centre of the pastures was a cluster of châlets, called La Glière de Pralognan, to distinguish them from another La Glière in the adjoining valley of Champagny. They were tenanted by a pleasant-looking woman and a group of dogs and children, and Croz and I were soon reclining on the roof of one of the buildings, drinking cream out of large wooden bowls, and discussing and admiring the landscape. Seldom has a fairer scene gladdened the heart of a traveller. At our feet lies the Vallon de la Glière; at first stretching out in pleasant sweeps of pasture dotted over with cattle, whose bells make sweet music as they wander to and fro; then, narrowing into a steep and pine-clad gorge, rugged with huge fragments of lichen-stained rock, and opening out below into the wider vale of Pralognan. The valley is walled in on the left by nearly vertical precipices rising high above the pines, broken here and there into clefts filled with steep glaciers, above which the eye seeks in vain the long-expected Aiguille de la Vanoise. We turn round and look along the path by which we have just descended; the mountain we passed as we crossed the col forms a fitting termination to the valley. It is crowned by two white peaks, connected by a graceful curve of snow, and glistens in the sunshine with a splendour almost dazzling. "*Comment appelle-t-on cette grande montagne là-haut?*" I inquired of the bergère. With her, of course, a *montagne* was a pasture, and she replied—"*On l'appelle la Sablière, Monsieur; c'est la plus haute montagne de la vallée.*" "*Je ne parle pas du pâturage mais du grand pic de neige.*" "*Ah, Monsieur! c'est autre chose! je ne saurais vous dire cela!*"

Unable to get any geographical information, I ques-

tioned her upon the hotel accommodation at Pralognan. She told us there were two auberges, one near the church and another in a separate cluster of houses above it, which was kept by her father. The latter, she said, had an advantage over the other in the possession of two mattresses, upon which travellers might be bedded. An hour's walk from La Glière brought us to the village, and at 4.30 P.M. we stepped into the auberge of Marie Joseph Favre, ordered dinner, and inspected the sleeping apartment. This was a good-sized room, approached by an outside staircase, with a dirty floor and two large four-posters, smelling, like many bed-rooms in the Alps, as if it had been built in the time of Adam and been kept shut up ever since. I immediately put both door and windows wide open, Madame Favre in the meantime looking on with consternation. The people of the inn were extremely civil and obliging; and although I had to share my bed-room with Croz, I had an eating-room to myself, and was thankful for the privacy. The *cuisine*, too, was a trifle superior to that at Tignes; the bill of fare included salad, and a dish which looked like pigs' puddings. The latter were not attractive; but as I failed to pierce the cuticle with the cutlery at my disposal, I am unable further to report upon them.

I did not awake until after 11 A.M. on Tuesday, the 2nd of August, and happily lost no time by this, as it was a dull and rainy day. After breakfast, the first step was to summon Etienne Favre, the best chasseur of Pralognan — a man somewhat *passé*, but well acquainted with the neighbourhood. Acording to him, the great snow-mountain between the Col de la Vanoise and the valley of Champagny was La Grande Casse, and the range on the opposite side La Rechasse. He knew of no peak called l'Aiguille de la Vanoise, unless it were the pyramid of

rock, which he declared was at Pralognan called "l'Aiguille" simply. I next questioned him about the passes into the Maurienne. Besides the mule-track of the Col de la Vanoise to Thermignon, there were, he said, two routes diverging from La Motte, the highest châlets in the valley of the Doron; one by the Col de Rosoire, descending upon the forts of Aussois, the other by the Col de Chavière, leading directly to Modane. Both these cols, he added, were much higher than the Vanoise, but the Rosoire was the easier of the two, and had less snow on it than the other.

Having engaged Favre's services at the moderate sum of five francs to assist in an attack upon the Grande Casse on the morrow, I strolled out to examine Pralognan, one of the most picturesque spots in the Graians. It stands just at the point where the valley of La Glière opens at right angles into that of the Doron, and where the river making a sharp elbow incloses a small plain of beautiful meadows and carefully-tended plots of cultivation, embosomed in far-stretching forests of pine, over which rise the noble precipices of the Rechasse. Below the church, two remarkable domes of rock, furrowed, scratched, and polished from base to summit, bear witness to the ancient extension of ice in this region of the Alps. The height of the village by a barometer observation at 6 P.M. on the 6th, compared with Turin, is 4700 English feet.

On Wednesday the 8th, I left the inn at 3.55, accompanied by Croz and Favre, and retraced my steps up the valley of La Glière towards the Col de la Vanoise. The sky, which was clear at starting, quickly became clouded, but in an hour's time the mists all rolled away, and the morning brightened gradually into a brilliant day. We gained the col at 6.35, having walked very slowly; for I had bruised the Achilles tendon of my right foot in my last day's walk, and it was

extremely painful. Favre's heart now began to fail him as we gazed upwards at the glittering peaks of the Grande Casse, and he suggested that it would be a safer game to aim at the Rechasse. His advice is scornfully rejected, and the great mountain for the first time in its existence feels the pressure of a human foot. A short climb up the rocks brings us on to some easy snow-slopes by the side of a glacier descending on our right; we soon reach the higher snows beyond, and zigzag steadily up them until we arrive, without difficulty, at the foot of a very steep and lofty slope of snow, terminated upwards by a hollow between the two culminating peaks which stand right and left before us. Thinking it wiser to be unattached, we leave the rope and all the heavy baggage, except the barometer, behind us, and for the first time in the day Croz brings his axe into play. To climb to the top of the slope, which was ascertained by the clinometer to have an inclination of 45° in its steepest part, costs us 1,100 steps, 800 of which are axe-cut, the remainder punched in with the toes. This obstacle surmounted, what appeared a hollow from below turns into a level corridor crossing the main range of the mountain; on our right is an easy dome of snow; on our left the wall of the corridor, rising into a snow arête, with a very sharp peak at its extremity. We are soon on the top of the dome, looking down upon the Grande Motte; but the other, or western peak, being evidently the higher, we run back into the corridor, and climb to the crest of the arête. This is disagreeably sharp, and rises precipitously on its further side from a valley, along which there is probably a glacier pass from the Col de la Vanoise to La Glière de Champagny. Keeping well on the eastern face of the arête, we advance cautiously towards the peak until we are clear of the corridor, and have now nothing on our right but the valley of

Champagny, 6,000 feet below. A few paces more and the highest point of all is about five feet above Croz's head; but now a single step forward cannot be taken without grave imprudence, and the piece still unclimbed is rather too big to knock off. It is not easy to observe when all the faculties of the mind have to be concentrated upon preserving one's balance, so, retreating a short distance, I flatten a halting-place about thirty feet below the summit, and set up the barometer.

Time, 11·45 A.M., barometer reduced .	477·89 mill.
Air temperature	2·0 Cent.
Altitude from comparison with Turin .	12,813 English feet.

The height given by Corabœuf for the Aiguille de la Vanoise is 12,674 English feet. It is quite certain, as I shall show in the sequel, that this measurement applies to the Grande Casse, and as it is considerably below that obtained by a comparison of my barometer observation with Turin, it is desirable that this should also be compared with Geneva and St. Bernard. Assuming that the index error of my barometer was the same as when I compared it at Geneva in 1861 (a somewhat hazardous hypothesis, as the instrument had a new tube in the interval),— we obtain

Geneva	12,824 English feet.
St. Bernard	12,615
Mean of Geneva, St. Bernard, and Turin .	12,751

Adding 29 feet to the latter for the height of the summit above the spot where the reading was taken, we get 12,780 feet for the altitude of the mountain, which may be provisionally adopted until it is corrected by future observations.

The view from our standing-place, excepting where it was provokingly intercepted by the final peak, was similar in its general features to that from the Sassière, but was

more extensive towards the S. and W. Immediately below us, and much less elevated, lay the Rechasse, a nearly level plateau of snow and ice of immense extent, with a rocky peak at its farther extremity, overhanging the Maurienne. This was the Dent Parassée, the third highest mountain in the western Graians, with the Viso and the Alps of Dauphiné on either side of it in the far horizon. On mounting the level, it swept over every peak of the central and western Graians, except the Mont Pourri, the top of which was exactly intersected by the optic axis. The two mountains being eight and a half miles distant, it would follow that the Pourri is slightly the higher; but an observation with a theodolite made in 1861 from a point near the summit of the Grivola, leads me to an opposite conclusion. The difference is certainly very small, and it yet remains to be proved which of these two peaks is entitled to the supremacy of the Tarentaise.

We commenced the descent at 12.30, and soon arrived at the steep snow-slope below the corridor, which required extreme caution, and I found it essential to throw aside my veil. This was annoying, as the mid-day sun shone directly upon the slope, and was reflected into my eyes by the myriad facets of the snow crystals, dark spectacles notwithstanding. I knew well enough what would come of this, but, snow-blindness being preferable to a broken neck, it had to be endured. I was at any rate better off than Favre, for mountaineering being a novelty in these parts, he had no spectacles, and indeed walked with an unspiked pole. At length we trusted to a glissade, dashed swiftly down the slopes, and at 2 were on the rocks again. Here we rested half an hour in full view of the beautiful "Aiguille," speculating whether it could be climbed or not, and at 3.30 regained the col, where I set up the barometer.

The resulting altitude, from a comparison with Turin, is 8190 feet, that determined by the "Etat Major Piémontais" ("Le Alpi," &c.) being 8271. At 5 o'clock we reached Pralognan; giving Favre instructions to be ready on the morrow for the passage to Modane, I wandered among the meadows in search of a bath, returned to the inn to supper, and then turned into bed.

"Snow-blindness," which, by the way, is not blindness at all, but merely a painful affection of the eyes, comes on with curious suddenness. I had hitherto felt no uneasiness; but on putting up the barometer in the bed-room to get a second determination of the height of Pralognan, I was surprised to find I could not read the vernier, and in a few minutes the malady attacked me with all its fierceness. It generally commences just as it becomes dusk, and sometimes lasts for several days. The eyelids are burning hot, and open and shut convulsively with showers of scalding tears, the eyeballs smart, and light is unendurable. It is one of the few unpleasant effects of mountain travel, and every precaution should be taken against it.

As may easily be imagined, I slept very little on the night of the 8th, and on rising in the morning I found at the inn, not the chasseur, but his wife, who had come to tell me that her husband had a "*mal aux yeux affreux*," and could not leave the house. I would gladly have stayed indoors myself, but I knew I should be very hard pushed to keep my appointment at La Bérarde. I gave the chasseur's wife ten francs, as her husband's pay for the previous day's expedition, which elicited the most profuse expressions of gratitude, and, engaging a son of the landlord as porter, I put on spectacles and veil, and started at 6.45 for Modane.

Crossing the Doron to the opposite bank, we walked up

the plain of Pralognan until the path reached the rocky slopes on the western side of the valley, from which we had a noble view of the Grande Casse and the head of the Val de la Glière,—a scene I would have sketched, had I been able to look at the mountain for more than a few seconds. The path then keeps along the river-side until the last châlets are reached, about a mile above La Motte. Here we had before us some fine sweeps of snow, ending upwards in the Col de Chavière, which was guarded by a striking peak on the right. We ought to have crossed by this col and climbed the peak *en route*, but I dreaded walking on the snow; and being assured by young Favre that there was less upon the other col, and that it was quite as short a way to Modane, both of which statements were untrue, we struck into a track on the left, which wound up some grassy slopes on the eastern side of the valley. From time to time we turned to look back along the vale of Pralognan; its bounding ranges inclosed, as in a frame, the jagged aiguilles and shining snows of Mont Blanc, which looked far more beautiful than when seen in a panorama—the highest among a thousand other peaks. Had we been crossing the Chavière we might have had a still finer view from the col itself; but we soon lost sight of the picture, and were scrambling over ridges of rock and slopes of débris, varied by wide patches of snow. While climbing up the rocks, I came upon some fine specimens of *Primula viscosa*, and transferred several of them to a folio. Favre looked on in amazement. Were they good for tisane? he asked. Not that I know of, was the reply; he did not believe me, however, and stuffed his pockets full of them. After making several mistakes in the way, of which he appeared to have no very accurate knowledge, we at last reached the summit level exactly at noon. We were standing near the southern extremity

of the great snow-field we had looked down upon from the Grande Casse; on the one side the rocky peak called the Pointe de Massa divided us from the Col de Chavière, and on the other the Dent Parassée and the Roche Chévrière were probably visible; but I was too blind to make an accurate survey.* With considerable difficulty I succeeded in reading the barometer vernier, and by a comparison with Turin the height comes out 9,628 feet (Time, 12.20 P.M.) Even at this elevation phænogamous vegetation was not wanting; all the crannies of the rocks were filled with the green cushions of the pretty *Androsace glacialis*, studded with white star-like flowers. The descent on the side of the Maurienne was down a most picturesque valley, consisting of a succession of plains, looking like the sites of ancient lakes, now pasture-covered and browsed by cattle, and separated from one another by steep slopes of pine-clad rocks. We soon gained the summit of the last slope, and looked down upon the forts of Aussois and the great road of the Cenis; here I believe we might have made a far more direct cut to Modane by keeping well to the right, but I did not like to risk it, as I was fearful of not being able to get across the Arc. We therefore bore down upon Aussois, and after threading the almost interminable zigzags of the forts arrived in the Cenis road. A quiet walk brought us to Modane; exactly at 5 I entered the comfortable Lion d'Or, and got the first real dinner I had eaten for a week.

Modane is now well known from its contiguity to the Savoy end of the tunnel by which the Victor Emmanuel

* The Roche Chévrière was one of the trigonometrical stations in the survey of the Arc of the Mean Parallel, and the mountains in the vicinity, including the Cols of Rosoire and Chavière, are admirably delineated in one of the small maps. One of the panoramic views was also taken from this station. The Col de Rosoire is called also Col de Rosué, de Rosou, and d'Aussois.

railway is being carried through the Alps, and which is usually called the Cenis tunnel, in consequence, I suppose, of its great distance from that pass. I spent the morning of the 10th in examining the works, which are but a few minutes' walk from the inn, and in the afternoon took a carriage to St. Jean de Maurienne. The following day I went to Frenet on the road from Bourg d'Oysans to Briançon by way of St. Jean d'Arves and the Col du Pré Nouveau, and two days subsequently I joined my friends at La Bérarde.

My short ramble among the Savoy Graians, though on the whole a pleasurable and interesting one, had been sadly marred by the fearful accommodation that the traveller has to put up with in these parts. The want of wholesome food, and especially of good meat, had produced a state of digestive disorganisation, which I did not get over for weeks, and which was of course accompanied by a corresponding diminution of muscular force. Let me, however, not be unjust to the valleys of the Tarentaise. They contrast most favourably with the unfrequented parts of Dauphiné, where there are some of the foulest dens in the whole range of Alps.

Before passing on to the excursions of 1861, I may mention here that Mr. J. J. Cowell travelled in the Graians in September 1860, and that in crossing the Col d'Iseran he was just as unable as I was to discern the faintest traces of the mountain of the same name. To him belongs the honour of having, in a paper contributed to Mr. Galton's "Vacation Tourists," first directed public attention to this extraordinary fiction.

NARRATIVE OF EXPLORATIONS IN 1861.

In the year 1861, when the Alpine season was approaching, an irresistible impulse urged me to the Graians. I felt the strongest desire to visit the Grivola and other peaks of the eastern section, and also to endeavour to clear up some of the points which were unsolved by my previous year's journey. Among these the most important was the relative altitude of the Grande Casse and the Mont Pourri; in a case of such nicety I felt convinced a pocket-level would be useless, and I therefore carried with me a theodolite by Messrs Troughton and Simms, especially adapted for work upon the mountains, with the intention of commencing the campaign by climbing the Pourri, and levelling accurately from it to the summit of its rival.

After former experiences, it may readily be imagined that I was anxious to spend as few nights as possible in the valleys of the Tarentaise, and I thought I could not possibly do better than select as head-quarters the Hotel du Mont Blanc at Aosta, kept by Jean Tairraz, the most genial and obliging of landlords, where the lodging and *cuisine* are alike irreproachable. The natural course would have been to leave the railway at Chamousset, as in the previous year, drive to Bourg St. Maurice, attempt the Pourri from the Val Peisey, and then cross the Little St. Bernard to Aosta. But I was under the necessity of going, in the first instance, to Geneva in order to compare my barometer; and as I was rather over-burdened with instruments, I determined upon crossing the Great instead of the Little St. Bernard,

and leaving the baggage at Aosta before entering the Graians. I was the less disinclined to take this route as it would enable me to go into the Tarentaise over the top of the Ruitor, a mountain I had long wished to examine, and I fancied that the Pourri expedition would not be prejudiced by shifting the point of attack from Peisey to St. Foi.

I accordingly instructed my old guides, Jean Baptiste and Michel Croz, to be in attendance at Martigny on the 4th of August. My friend Mr. F. W. Jacomb being also desirous of exploring the Graians, we agreed to attack them in concert, and leaving London by the tidal train on August the 1st we reached Geneva on the 3rd. On the evening of the 4th we arrived at Martigny, and found our guides awaiting us, and on the following day we took a carriage up the Val d'Entremont as far as St. Pierre. A ramble to the S. of the Combin by the Combe de Valsorey was the means of rectifying a geographical misconception I had fallen into in my previous journeys in this district, but it brought with it at the same time the disagreeable consciousness that I was far from well, and should be unfit for mountaineering for several days to come. On the morrow, therefore, I simply walked over the St. Bernard, while Jacomb, taking the guides, went by way of the Col de Sonadon and Ollomont to Aosta,—a very interesting expedition, which forms the subject of a previous paper in this work.

We entered the Hotel du Mont Blanc nearly together on the evening of the 7th, I, destined to spend three or four days of enforced idleness, but deeply thankful that I had alighted upon so agreeable a resting-place. Jacomb in the meantime, with great good nature, abstained from advancing into the Tarentaise, and occupied himself and the guides in raids upon the Becca di Nona and the Mont

Gelé. The weather was absolute perfection, and the snowy peaks of the Ruitor, by far the most beautiful feature in the mountain views from Aosta, glistened from morn to sunset with the most dazzling brightness. On the second day after our arrival my friend, Mr. George Barnard, so well known as an artist by his beautiful representations of Alpine scenery, drove up to the hotel. I at once asked him to make me a drawing of the Ruitor; he obligingly

THE RUITOR, FROM AOSTA.

consented, and stayed at Aosta two days for the purpose. In his agreeable society I felt less acutely the pangs of inaction, and we strolled together about the outskirts of the city searching for the best point of view. After several unsuccessful trials, a thoroughly satisfactory

position was at length discovered, and the sketch was made from the summit of a vine-covered eminence on the N. side of the Chatillon road, a few minutes' walk beyond the Roman bridge. A woodcut from a portion of Mr. Barnard's drawing is on the preceding page.

The Ruitor is a portion of the range of the central Graians included between the little St. Bernard and the lower part of the Val Grisanche, the snowy face of the mountain as seen in the woodcut belonging to the western flank of that valley. Of the peaks in view, the one on the extreme right, after a lengthened examination, was pronounced to be the highest, and selected as the point towards which our steps should first be directed. It was not until Monday, the 12th, that I felt sufficiently recovered to commence climbing, and at 9.15 on the morning of that day, accompanied by our two guides, we left the Hôtel du Mont Blanc in a carriage and pair, and drove to Ivrogne, a village beautifully situated at the junction of the Val Grisanche with the Val d'Aosta. On our way to this place we passed in succession on our left hand the entrances of the valleys of Cogne, Savaranche, and Rhêmes, and had a charming glimpse of the snow arête of the Grivola from the town of St. Pierre. We reached Ivrogne at 10.45 and went to a tolerable inn, where we made a very substantial lunch, and where I engaged the services of Charles Alexis Luboz at five francs a day, for the express purpose of carrying the theodolite. Although this man was ignorant of the district we were about to visit, and unused to mountain work, I am happy to be able to speak of him in terms of unmixed commendation; and I have no doubt he is now perfectly competent to act as guide to any of the peaks or passes of the central Graians.

Having laid in provisions for two days, we left Ivrogne at 12.45, and entered the Val Grisanche. The lower part

of the valley is thickly wooded—the dark green foliage of the chestnut and walnut contrasting with the greyer tints of the poplar and willow. On quitting the forest, we traversed a defile, with a glacier stream below us on the left; on the opposite side of it rose a lofty and precipitous rock, crowned by an ancient castle, which appeared to occupy the centre of the valley, and to have a river on both sides of it. We had now reached a part of the valley where there was not an atom of shade, and the heat was almost insupportable. Thousands of lizards, racing along the burning soil close to us, seemed thoroughly to enjoy it; what would have become of us I know not, had we not discerned in the distance an overhanging rock with a plashing stream beside it. We struggled up to it, threw ourselves down under the refreshing shade, and thrust our hands and heads into the delicious water. Beyond here the heat was less oppressive, as the path ran alongside the river, which imparted a grateful coolness to the air as it cascaded by moss-covered boulders, with a thick intergrowth of bilberries laden with luscious fruit. Farther on appeared another crag, with a square tower on its summit; we wound round its base, steadily mounting, and on reaching the top of the ascent the character of the valley changed in an instant. We crossed the river, which we now discovered was not the main stream of the valley, but a tributary from the Ruitor, and at once stepped on to a long, narrow, and monotonous plain, which extended to a great distance before us, while Planaval, the first village of the Val Grisanche, lay in an opening on the right. The route usually followed to St. Foi ascends the valley to Fornel, a village much farther up, and then turns the main chain immediately to the S. of the Ruitor by the Col du Mont, descending directly upon St. Foi. We, however, being anxious to pass straight over the top of the mountain,

sent our guides to ascertain the position of the highest sleeping-place, and they were directed to some châlets high up behind the village, about two hours distant. A climb along a very zigzag path brought us on to a steep tract of open pastures; we mounted up them to a summit ridge, and, descending a short distance on the farther side, entered a sequestered valley, with a group of châlets in the centre, which we reached at 6.30.

The ridge which we had crossed may be seen in the woodcut, where it appears in front of the mountain on the right hand side. The head of the valley behind it is occupied by a large glacier, the main outlet for the snow-slopes seen so conspicuously from Aosta, which give rise to the river, along which we had mounted the Val Grisanche below Planaval. Our arrival gave no little surprise to the berger in charge of the "Alp," as it was the first time he had ever entertained travellers: so far removed indeed is this settlement from the ordinary haunts of men, that it is called simply "*les châlets du Glacier*," the glacier itself being nameless.

After a tolerable night in a hay-loft, we sallied forth at 5 on the morning of the 13th, and a walk of three quarters of an hour brought us to the glacier, a very fine, regularly developed one, deeply crevassed in parts. Mounting up, we made our first halt where the curving ridge above mentioned strikes out of the mass of the Ruitor, a point which commands the valley of Aosta, nearly as far down as Chatillon. The sun shone beneath a sable cloud, and the wide waters of the Doire flashed with golden light as they rolled along the far-stretching valley. We now turned our faces towards what we supposed to be the terminal peaks of the mountain, and after several détours to avoid crevasses, we arrived at the foot of the right hand, or northern one, at 8.15. Finding some convenient rocks

and a stream of running water, we rested an hour for breakfast; at 9.15 we were off again, and climbing partly up precipitous rocks and partly up steep snow-slopes, gained the summit without difficulty at 9.40.

The architecture of the Ruitor proved very different from what we had expected. We were standing upon the most northerly tooth of a long serrated ridge, separated from a second similar and parallel ridge in front of us by an immense field of snow, the upper part of the great glacier of the Ruitor, which flowed down on our right towards La Thuile on the Little St. Bernard. The peak we had climbed was, as we had supposed, higher than the next one on the S., but on levelling along the ridge we found that another peak still more to the S., and quite invisible from Aosta, overtopped us. We were, however, higher than any of the serratures of the opposite ridge, one of which presented an evidence of a previous visit, in a stone man on its summit.

Just as the Cramont on the southern side of Mont Blanc corresponds as a point of view to the Brevent on the northern, so may the Ruitor be said to answer to the Buet. From our standing-point we looked straight over the Cramont to the Italian face of Mont Blanc, the whole range of which was extended before us from the Col de la Seigne to the Col Ferret. For the only time throughout our journey of 1861 the weather was not perfect, and the chain was provokingly obscured by clouds; but we saw, nevertheless quite enough to convince us that the Ruitor is one of the finest points of view for the southern side of the mountain.

At 10 A.M. the instruments were observed, and the readings were as follow:—

Barometer reduced	510·80 mill.	20·113 inches.
Air temperature	10·6 Cent.	Moist bulb, 6·0 Cent

From which we have —

Turin	11,359 English feet.
Geneva	11,348
St. Bernard	11,309
Mean	11,339

Taking into account the difference of level between the point where this observation was made and the highest peak, we may, I think, put the height of the latter at 11,400 feet. Ziegler in his "Hypsométrie" gives 10,945 English feet for the Ruitor, on the authority of Bartolomeis, method not stated. This is certainly erroneous.

We left the summit at 10.20, and descending on to the Ruitor glacier, we crossed once more on to the eastern face of the mountain overlooking Aosta, by a narrow opening between the two peaks, and rested a quarter of an hour by the side of a charming glacier lake, with a number of miniature icebergs floating on its surface. Passing again on to the western side, we advanced up the Ruitor glacier until we arrived at the summit level, beyond which it descends to the S., and has evidently a second outlet in the branch of the Val Grisanche, which leads from Fornel to the Col du Mont. The highest peak flanks the summit plateau upon the east: we intended at first to climb it, but reluctantly abandoned it for want of time. Our next efforts were directed to effecting a descent upon the Col du Mont; but all our attempts being suddenly checked by formidable cliffs of snow, we retraced our steps to the plateau and descended the glacier in the opposite direction, scanning every opening to the westward. On reaching the foot of the cairn-crowned rock immediately opposite the peak we had climbed in the morning, a deep valley opened out to the left. Snow-slopes of fearful steepness circled round its head, and a yawning bergschrund separated them from the more level glacier, beyond which there was a

glimpse of distant pastures. A great deal of step-cutting brought us by a long détour to a place where the crevasse was passable; once across it we trusted to a glissade, and quickly landed on the more gently-sloping ice. At 3 P.M. we reached an old moraine near the extremity of the glacier on its left bank, rested an hour for dinner, and then descended on to a beautiful Alp called La Sassière de St. Foi.

There is a little village of châlets on this Alp, and our arrival appeared to cause as much surprise as had been displayed at the Châlets du Glacier on the preceding evening. We were asked if we had come from the Val Grisanche, and on our answering in the affirmative, were told that we had altogether missed the way, and had made a great détour. On inquiring the nearest road to St. Foi, we were directed into a path which joins one from La Thuile a little below the village, and we descended one of the loveliest valleys in the Tarentaise, where pasture, rock, and pine-forest are grouped together in exhaustless variety, and where the magnificent peak of the Mont Pourri, rising beyond the Val de Tignes, forms a noble background to each successive picture.

We were walking swiftly along the footpath, and had arrived at a group of houses in the outskirts of St. Foi, when the fact of Savoy being in France was forced upon us with disagreeable prominence, by a douanier placing himself before us and summoning us into an adjoining building. Here we were accosted by a superior officer, who "visited" our baggage with excessive strictness, carefully inspecting the barometer and theodolite, which seemed to puzzle him not a little, and examining every single article in every knapsack. He apologised for the trouble he was giving us, saying that he had received especial orders from Paris to make a diligent search for

pamphlets, a number of which, "calculated to excite hatred against the government," had been passed across the frontier. He told us that his station was "*bien triste*," and that we were the first travellers he had captured that year. After a disagreeable detention of nearly half an hour we were allowed to proceed on our journey, and we entered St. Foi at 6.30 P.M., when we went to the Hotel du Mont Blanc.

This auberge smacks strongly of the Tarentaise, but is many degrees superior to the inns of Tignes, and we got a tolerable supper. Jacomb and I slept in a large double-bedded room, and in the middle of the night I awoke out of a sound sleep, and saw my companion, with a lighted candle at his side, sitting bolt upright, and tearing wildly at the bed-clothes. Happily I was either less susceptible or less tormented, and I soon dropt asleep again. On the morning of the 14th we made some inquiries about the Pourri, which of course elicited the universal answer, that it was utterly inaccessible both on the St. Foi side and on that of Peisey. Wishing to get some more trustworthy information, I sent Jean and Michel up to La Thuile*, the next village in the valley, to try to engage Ruet (a chasseur spoken of in Murray as well acquainted with the mountains), or some other guide. While they were away, Jacomb and I strolled out to the meadows and lay upon the grass under the shade of the walnuts, eagerly examining the peak. For once I was disposed to agree with the natives, as I really could not detect any practicable route to the summit. It was not long before our two guides returned with the intelligence that all the chasseurs in La Thuile were "*à la chasse*," but they were informed that the

* This La Thuile must not be confounded with a previously mentioned village of the same name on the road of the Little St. Bernard, above Pré St. Didier.

only probable way of climbing the mountain was to attack it from the Lac de Tignes. This statement I knew must involve some great misconception, as between the Pourri and the Lac de Tignes the chain is divided by the deep ravine, along which lies the route of the Col de la Sache from the Val Peisey to Brévières. We therefore decided upon ascending the Val de Tignes to the last-named village, and there seeking further information.

Having supplied ourselves with provisions for two days we packed them on the back of a mule, along with all our other baggage, and leaving St. Foi at 2.25 commenced the ascent of the Val de Tignes. The weather was much finer than when I had last passed along the same track in 1859, and I thought I had rarely rambled among more beautiful scenery. We passed through La Thuile at 3, where there is an inn of promising exterior, called the Hotel des Voyageurs. At 4.45 we passed on the left a thundering cascade, which issues from one of the principal glaciers of the Sassière, at present quite unexplored, and at 5.10 we entered Brévières. Here we found the curé and several villagers playing at bowls; we engaged in conversation with them on the subject of the Pourri, when one of the natives, a man of loud voice and unpleasant volubility, said he had been within a few steps of the summit, and volunteered to conduct us. With considerable difficulty we struck a bargain with him, and after resting at Brévières till 6.20, we placed ourselves under his direction, crossed the Isère, and at once began to mount through a pine forest towards the châlets of Marai, where he said it would be necessary to pass the night. When we arrived at the open pastures, the Pourri came into view on our right, and we thought we could see to the summit. We now called upon our new guide to point out the spot he had reached, upon which he indicated a part of the mountain

about four hours below the top, and beyond which the route was apparently impracticable. We at once pronounced him a humbug, and as his garrulousness had become perfectly insufferable, we gave him a small gratuity and sent him about his business, to his great disgust. A few minutes brought us to the châlets, which we reached at 7.30, just as it was getting dusk.

The Alp of Marai is situated on a mountain-spur which intervenes between the Lac de Tignes and the valley of La Sache, and is one of the most delightful spots in the vicinity of Tignes. From an elevated grassy knoll in front of the châlets, we looked down the Isère towards St. Foi, beyond which the chain of Mont Blanc, from the Col du Bonhomme to the Aiguille du Géant, was inclosed as in a picture by the bounding ranges of the valley. It formed a scene of exquisite beauty with its cold snows and jagged aiguilles projected against the evening sky; but soon after sunset, when illuminated by the moon nearly at the full, it seemed more like a vision of the realms of Faëry than a stern reality of the Alps. Removed as these châlets are from the ordinary tracks of tourists, they are not entirely unknown to English travellers, having been visited by Mr. and Mrs. King on the way from St. Foi to the Lac de Tignes.

We found them excellent mountain quarters, and we hastened to gratify our appetites with the many luxuries which unlimited milk places within the reach of the mountaineer. Foremost among these is the seductive product named fleurette, brousse, or niedl, so well known to Alpine travellers, and the praises of which have been sung by Mr. Tuckett in his paper on the Valpelline. After an excellent supper, which included several bowls-full of this delicious article of diet, we retired to rest on a great heap of hay in a corner of the châlet.

On the morning of the 15th we started at 4, and commenced our expedition by the distasteful but necessary process of descending into the ravine which separated us from the Pourri, and which is connected with the Col de la Sache. The mountain rises immediately from the base of the ravine, and presents on this side a very steep amphitheatre of rocks, encircling a small glacier with a moraine by the side of it. At the base of the mountain, the rocks and pastures were bright with Alpine flowers; among others we found a large quantity of *Artemisia mutellina*, "*le vrai génépy*," a plant held in great estimation by the peasants, who extract from it a sudorific medicine. We climbed up the moraine and then took to the rocks, aiming at the point we had considered the summit when we had examined the mountain on the ascent from Brévières. We found them exceedingly difficult, as they consisted entirely of shattery quartzite, breaking away at every step beneath our hands and feet. I suppose this structure has been the origin of the name Mont Pourri, which we may translate into English as Rottenberg, and which certainly is most appropriate. On gaining the point we were making for, it turned out to be no summit at all, but merely a part of one of the ridges of the mountain; but now a snow-peak appeared in view in the direction of the Val Peisey. We turned our faces towards it, and after carefully cutting our way along a succession of difficult snow arêtes, we landed on a nearly level snow plateau, the reservoir supplying the numerous glaciers which seam the face of the Pourri on the side of Val de Tignes. Here we found to our horror that we had entirely overshot the mark, and made what Michel Croz called "*une grande bêtise.*" There was the snow-peak plain enough before us almost close at hand, and with an easy slope to its summit; but much farther off, and nearer to St. Foi,

the true terminal peak of the mountain shot out of the snow, and presented itself as an apparently inaccessible pyramid of black rock. Under these circumstances we resolved to ascend the lower peak, and at 11.10 we stood upon its summit. The ascent had thus cost us seven hours and ten minutes, of which, however, only six had been actual walking.

The point we had reached is the extreme south-western extremity of the snow-plateau of the Pourri, overhanging the head of the Val Peisey on the one side, and the ravine of La Sache on the other. It was, in fact, the lower of the two peaks I had examined the previous year from the Sassière. We looked around upon a cloudless horizon, surmounted by a dome of the deepest blue, but the view being of the same general character as from most of the summits of the Tarentaise, it is unnecessary to describe it in detail. Mont Blanc, Monte Rosa, the Viso, and the Pelvoux stood at the four corners of the mountain panorama, and within them rose a multitudinous array of peaks, the Grande Casse, which presented to us its dark precipitous side, being the most striking. I could now make out distinctly the position of the Col d'Iseran, and I received renewed evidence, if such were wanting, that the Mont Iseran is an imposture.

Exactly at noon the following observations were taken:

Barometer reduced	501·27 mill.	19·742 inches.
Air temperature	8·3 Cent.	Moist bulb, 3·5 Cent.

From which we have —

Turin	11,787 Eng.feet.
Geneva	11,755
St. Bernard	11,766
Mean	11,769

It thus appears that we were considerably lower

than the Sassière, and indeed, on levelling, it was clearly several hundred feet above us. After reading the barometer, I tried to ascertain the boiling-point with an instrument constructed by Mr. Casella; but although all the spirit was burnt away, the water would not boil, and the flame of the lamp was invisible. It was too late in the day to justify a closer examination of the final peak, which still elevated itself about a thousand feet above us, even had it looked more encouraging than it did; and having satisfied ourselves that the Val Peisey was the proper side from which to attack it, at 12.50 we turned to descend. We reached the highest pastures at 3.30, rested half an hour, and regained the châlets at 4.45.

Here we debated where we should direct our steps on the morrow, and I believe a descent into the Val Peisey and a renewed attack upon the Pourri was suggested. Both Jacomb and I, however, longed to get back to our luxurious quarters, *chez* Jean Tairraz, and it did not require many minutes to decide that we should make a push for Aosta by way of the Col de Gailletta. Unhappily, this necessitated passing the night at Tignes; I had no wish to renew my acquaintance with Revial, and by the advice of a native whom we met in the châlet, we determined to give a trial to the auberge of Constant Arnaud. Before descending to the village we made a détour to the Lac, and having indulged in the luxury of a bathe, we strolled quietly down to Tignes and entered the auberge at dusk.

Arnaud's *cuisine* was certainly a trifle better than that at the other inn, and the host did his best to make us comfortable. Of the sleeping arrangements the less said the better; Jacomb had a bed in the room we had supped in, and I passed the night in a dirty den adjoining.

Unhappily, I was afflicted by a severe attack of snow-blindness, which would have prevented sleep even had it otherwise been possible. Before retiring I had impressed upon Jacomb the importance of starting not later than 4, as we had a very long walk before us, but when I entered his room in the morning of the 16th long after that hour, I found that he, like myself, had been severely preyed upon, and had passed a sleepless night. He begged hard to be permitted to lie another hour, and ultimately it was not until 7.30 A. M. that we turned our backs on Tignes. My eyes were still extremely painful, and I was obliged to walk nearly all day in spectacles and veil.

Crossing the Isère, we climbed up by the side of the cascade, as I had done the preceding year, to the grassy valley under the Sassière; which we now followed on its northern side until we came to the lake, which is not clear and sparkling like the Lac de Tignes, but of a dull green colour, the glacial mud carried down by the streams that feed it being held in suspension by its waters. Beyond here our route lay up slopes of mingled rocks and pastures, when suddenly a very fine glacier appeared in view before us, with a striking snow-peak on the right, which bears on the large Government Map the extraordinary name of Le Grand Apparei, and which cannot be much less than 12,000 feet in height. We kept along the rocks on the northern side of the glacier until we were well past its most broken part, and then taking to the ice we threaded our way among a number of really difficult crevasses to an extensive snow-plateau on the summit level, which proved much more distant than we had expected. We arrived here at 1.10 P.M., having been five hours and forty minutes in ascending from Tignes, including halts of forty-five minutes; but we walked very slowly, as we both were half knocked up by want of rest the night before.

The pass, which is called the Col de Gailletta, is one of the finest in the Graians, and both in its foreground scenery and in the extent and interest of its distant views may indeed bear comparison with some of the more celebrated cols of the Pennine or Oberland Alps. The summit of the col is far in advance of the Sassière; as we faced the Val de Rhêmes we had upon our left hand tracts of snow of immense extent, stretching towards the head of the Val Grisanche. On our right was Le Grand Apparei, and immediately in advance of it a most peculiar peak, consisting of a tower of dark rock, capped by a cone of snow. On the side of Savoy, beyond the Lac de Tignes, rose the graceful snow-peak of the Grande Motte, and the frowning precipices of the Casse; while on that of Piedmont we looked over the Val Savaranche to the magnificent masses of the Grand Paradis and the Grivola, and straight down the Val de Rhêmes to a section of the Pennine chain, of which the Grand Combin formed the central summit. By the help of Jacomb's eyes, a hypsometrical observation was secured: at 1.30 P.M. the readings were as under: —

Barometer reduced .	. 529·97 mill.	20·874 inches.
Air temperature .	. 9·7 Cent.	Moist bulb, 6·8 Cent.

Whence we have —

Turin	10,179 English feet.
Geneva	10,120
St. Bernard	10,149
Mean	10,149

We started again at 1.45 and commenced the descent into the Val de Rhêmes. The head of this valley consists of an immense amphitheatre, containing not less than four or five distinct glaciers, all most imperfectly shown on the maps. It is divided into two bays by a projecting promontory,

of which the remarkable tower-like peak above described forms the terminal point, and which is a most striking feature in all the views from the upper part of the valley. We descended close to it keeping it on the right, and after a rather difficult scramble down some rough rocks alighted at 3 P.M. upon a spacious alp, where we rested for dinner. Owing to the late hour at which we had quitted Tignes, I had all along looked upon reaching Aosta that day as something too absurd to be thought of, and had anticipated passing the night either at a châlet or at Notre Dame de Rhêmes, the highest village of importance. Now, however, Jacomb suggested that if we put on a spurt we might after all get to Aosta, and when we had finished our dinner at 3.45 we at once struck into a pace of about five miles an hour. It was rather a pity to walk so fast, as the scenery in the upper part of the valley is of striking grandeur, and is in itself well worthy of a visit; lower down, however, it is tame and monotonous, and the walk would have been uninteresting, had not the bounding ranges exactly isolated the glorious peak of the Combin, which was visible during the greater part of the descent. At 5.15 we reached Notre Dame, which contains a capacious parsonage, where I believe travellers are entertained, but which did not look attractive, and at 7 we passed St. George, a nest of squalid châlets. Just beyond here the mule-track crosses the river and mounts upon the left bank, and on gaining the summit of the ascent we looked down upon the Val d'Aosta. Here I was seized with a slight attack of palpitation of the heart, and had to rest a few minutes; and while Jacomb, Jean Croz, and Luboz pushed on to Villeneuve to get a carriage ready, Michel and I followed more leisurely. It was soon quite dark, but we managed nevertheless to get safely down to Introd; a little below this village we struck into the *grande*

route, and entered Villeneuve at 8.30. Here we found Jacomb in a cabaret, who gave me the agreeable intelligence that no carriage was to be had for love or money; he had been in the first instance to the principal hotel in the town; but the landlord refusing to give him anything to eat or drink until he had engaged a bed-room, he had left the place in disgust. While we were discussing in a very animated manner whether we should sleep at Villeneuve, walk on at once to Aosta, or go there at about three miles an hour in a cart that was offered us at a most extortionate price, a carriage drove up from Courmayeur, with a Piedmontese lady and gentleman inside. They obligingly gave us a seat, and at 10 o'clock we were once more under the hospitable shelter of the Hotel du Mont Blanc.

Leaving Aosta, we crossed the Col des Jumeaux to Zermatt, and then proceeded southwards to Turin, whence we made the first ascent of Monte Viso—two interesting expeditions which are elsewhere recorded in this work. Our paths now diverged, Jacomb taking Jean Croz with him and hurrying off to Mont Blanc, while I retained Michel, intending to move by easy stages homewards. My Alpine wanderings of 1861 were concluded by an excursion on the northern side of the Maurienne, a brief description of which will contribute some additional materials for the physical geography of the Graian Alps.

After an agreeable rest of two days at Turin, I moved up to Susa on the evening of the 2nd of September, and the following day, in order to avoid the uninteresting monotony of the Cenis, I crossed the Col de Clapier, or de Savine, from Giaglione to Bramans, and walked down the great road from the latter place to Modane. Here, as before, I found very fair accommodation at the Lion d'Or, although the resources of the establishment were severely

taxed by the presence in the town of a large body of geologists, about forty in number, including some of the greatest celebrities of France, Switzerland, and Piedmont, who were holding an "extraordinary session," and who had their head-quarters at the hotel. My principal object in staying at Modane was to ascertain the rate of progress being made in the tunnel, and to visit the Col de Chavière and the peak to the W. of it, which I had left unexplored in the previous year. Immediately to the N. of the town a deep ravine leads directly up to the col, and on its eastern side is an alp and a small settlement, called the châlets of Poleset (pronounced Polsett), and reported to be two hours distant. The morning of the 4th was spent in inspecting the works in the tunnel, and at 4 in the afternoon Michel and I started for Poleset. The path at first zigzags upwards considerably on the E. of the ravine, through a fine pine forest, broken in many places by lofty precipitous crags, and then turning sharply to the westward, emerges on the open alp above. Although we walked very leisurely, we arrived at the principal châlet at 5.30, where we found comfortable quarters, including an excellent hay-loft. A barometer observation at 6 P.M. gives the following results: —

Turin	5,968 English feet.
Geneva	6,048
St. Bernard	6,005
Mean	6,014

We left the châlet at 5.30 on the morning of the 5th, and continued the ascent of the valley, which is far wilder in its scenery than the neighbouring route of the Col de Rosoire. Passing on the left a nearly vertical cliff, the face of which was seamed with waterfalls from a large glacier on its summit, we mounted a succession of barren rock-strewn slopes, and at 8 we reached the Col de

Chavière, now entirely devoid of snow. I immediately set up the barometer, and at 8.15 took the following readings: —

Bar. reduced	548·89 mill. 21·645 inches.
Air temperature 5·0 Cent.	Moist bulb 0·8 Cent.

whence we have: —

Turin	9100 English feet.
Geneva	9161
St. Bernard	9171
Mean	9144

This col is therefore nearly five hundred feet lower than its neighbour, and as the descent to Modane can be made in two hours and a half of tolerably quick walking, there is no question that it affords by far the shortest route from Pralognan, of which indeed a mere glance at the map is quite sufficient evidence. As a point of view, it is well worthy of a visit, as it commands the chain of Mont Blanc on the one side and Monte Viso on the other: the Dauphiné Alps are, however, intercepted by the range on the S. of the Maurienne.

We left the col at 9.15, and climbed some rocks on the W. of it to an extensive glacier plateau above: crossing this, we arrived at the foot of a steep peak of rock, which we scaled without difficulty, and gained its summit at 11.45. It was not, as I expected, a single peak, but one of the teeth of a knotted system of serrated ridges, sending out a number of spurs to the northward, which divide from one another the numerous valleys radiating from Moutiers Tarentaise. Several of the serratures of the ridge next to us on the W. clearly overtopped our position. Exactly at noon I observed the instruments, and the readings were as under: —

Bar. reduced	505·14 mill. 19,897 inches.
Air temperature . . .	4·5. Moist bulb 2·3.

Whence we find:—

Turin	11,461 English feet
Geneva	11,484
St. Bernard	11,457
Mean	11,467

The weather was, as usual, perfect, and the view, as from every other of the Graians, of immense extent and interest. We were now far above the range on the southern side of the Maurienne, and we looked straight over it to the Alps of Dauphiné, which presented an array of peaks and glaciers even more numerous and striking than the opposite chain of Mont Blanc. Of the peaks in the immediate foreground the Dent Parassée was the most prominent. After my previous failures I had not thought it worth while to drag up the theodolite, but I took a sight at this mountain with a pocket-level, and the optic axis hit the peak much below the summit. This, as far as it goes, is confirmatory of Von Welden's trigonometrical determination of 12,137 feet (Der Monte Rosa, p. 30). I have no doubt that the Dent Parassée could be climbed without difficulty, and that its ascent would be as full of interest as that of any other mountain in the Graian Alps. While looking round upon the prospect, the Mont Pourri was not forgotten; Michel and I carefully scrutinised the face it presented to us, which was the one flanking the Val Peisey, and as far as we could judge at so great a distance, it gave good hopes of success.

We left the summit at 12.30, and descended directly towards the valley without returning to the col, reaching the edge of the snow-field at 1.30, resting there an hour, and regaining Poleset at 4. We made another halt at the châlet to drink milk, and finally, at about 5.30, we were back at the Lion d'Or. Here I joined the *savans* at dinner, and spent a very pleasant evening with them.

I had noticed during the day's excursion that there was a marked distinction between the rocks on the two sides of the valley leading to the Col de Chavière, those on the eastern side being quartzite, and those on the western schistose beds of a greenish-grey. It appears that the valley of Poleset coincides with the line of a great fault, where strata of carboniferous age, on the western side, are brought up against beds of later date, perhaps triassic, on the eastern.

I would gladly have stayed another week in the western Graians for the purpose of climbing the Dent Parassée, and making a second attempt upon the Pourri; but I had already consumed the time that I could conveniently spare from business, and was obliged to hurry away, after seeing eight-and-twenty geologists start for Bardonèche, on as many horses and mules, one of the drollest sights I ever witnessed. I went by diligence to St. Jean de Maurienne, whence I took the night train to Paris, and in a few hours arrived at home.

Before parting from Michel Croz at Chamousset, I urged him to try the Pourri from Peisey, and endeavour to discover the proper line of attack; for, however pleasant it may be to make the first ascent of an important peak, it is none the less annoying to drag about a number of heavy instruments, and in consequence of imperfect knowledge to fail in getting them to the top. I am happy to say that Michel acted upon the instructions, and that his efforts were crowned with success. He climbed the peak on the 4th of October, "*par un trajet bien difficile*," starting at 4 A.M. from the châlets of "Entre deux Eaux" in the Val Peisey, and reaching the summit at noon.

CONCLUSION.

It is impossible to travel in the Graians without being struck by the extraordinary discrepancies between the actual structure of the country and the way in which it is represented in maps, — especially in those recently executed under the authority of the Sardinian Government. I shall conclude with a few remarks on some of the errors which have hitherto obscured our knowledge of the geography of this portion of the Alps,—the more important of which I am happily able to elucidate.

On referring to Corabœuf's memoir, to ascertain what he measured as the Aiguille de la Vanoise, we find that the heights of it and the Sassière were determined by triangles upon the same base, the two extremities of which were at Belleface and La Magdeleine, in Savoy. I have constructed the Vanoise triangle, and am satisfied that Corabœuf's peak is the Grand Casse. The latitude and longitude which he gives exactly agree with the position of the last-named mountain; and, moreover, in the map of Raymond, and in those attached to the Measure of the Parallel, and to "Le Alpi," the words Aiguille de la Vanoise indicate a peak on the northern side of the col. In the six-sheet map the peak has disappeared, and in the larger map it is called Pic des Grands Couloirs, —a fabricated title, printed across a quantity of shading, which has not the faintest similarity to the actual structure of the chain.

The blunders in the case of the Mont Iseran are still more astonishing. The mountain to which Corabœuf attaches this name was measured from Piedmont, the two

extremities of his base line being at the Superga and Saluzzo. The Grand Paradis is the only peak of the Graians the height of which is at all near that ascribed to the Iseran, and it is very conspicuous from the above stations. I had long suspected that it had been mistaken for it, and on laying down Corabœuf's triangle on the map in "Le Alpi," my suspicions were at once confirmed. The two sides converged exactly upon the Paradis, and not upon Mont Iseran, although the latter peak is shown in its usual position. My friend Mr. Tuckett has performed the same operation on the six-sheet map, but he cannot make the triangle agree with either of the two peaks, and there is no doubt that the map is incorrect. Again, Von Welden, in his list of heights, p. 30, gives "Der Iseran in Savoyen, N.B.," 13,265 English feet; the letters N.B. denoting that he made the determination himself. In the records of Zumstein's ascents of Monte Rosa, contained in a later part of the volume, the Iseran is mentioned, p. 118, as one of the most striking peaks visible from the great Plateau; and I know by actual inspection from the very same position that the Grand Paradis is the mountain in view. Lastly, Mr. Tuckett, to whom I am indebted for calling my attention to the passages in Von Welden, has, by an observation of the boiling-point, determined the height of the Paradis as 13,300 English feet. These figures agree so closely with the two independent trigonometrical measurements of the Iseran, which are 13,271 and 13,265 feet respectively, that the identity of the mountains may be considered conclusively established.

The origin of the blunder is easily explained. Throughout the Alps the word *Mont* is applied to the highest point of a road as frequently as to a mountain. The Mont Cenis, Mont Génèvre, Mont St. Bernard, Mont St. Gotthard, are familiar instances, and many others might be

mentioned. The Mont Iseran is a case of the same kind; it is a col and not a peak. A number of engineers, knowing that there is something in the Graians called by that name, and seeing a high snow-peak in the supposed direction, immediately identify the two; whereupon the Sardinian surveyors perform the astounding feat of moving the mountain bodily out of Piedmont into Savoy, a distance of fifteen miles, and erect it on the side of the col where no such thing exists. They subsequently become alive to the fact that a mountain called the Grand Paradis forms part of the range on the north of the Val di Locana, and in order that nothing may be wanting to complete the confusion, they affix the words Gran Paradiso to two different peaks of this range widely distant from one another.

The way in which the Iseran fiction has penetrated our whole Alpine literature is the most marvellous thing in the history of the Alps. Scarcely one of the many writers who have described any part of the chain from the Pennines to the Mediterranean has failed to mention the Mont Iseran, and the descriptions of it are sometimes exceedingly amusing. The most ludicrous instance of the kind may be found in the geographical introduction to Joanne's excellent "*Itinéraire de la Savoie*," where the author informs us that although the Iseran is not much lower than Mont Blanc, it is so shut in by other mountains that it is scarcely visible from the valleys which open at its base.

The map attached to the measure of the arc of the mean parallel enjoys the honourable distinction of being the only production of the Sardinian Government in which the Mont Iseran is not represented as a peak. The Government surveyors in their subsequent publications appear to have deliberately ignored that admirable work.

One among numerous instances of this is the case of the Dent Parassée, which, although represented in the vignette map of the Roche Chévrière, and shown in the panorama taken from that peak, is omitted both in the six-sheet and the ninety-one-sheet maps.

The recent Government surveys, and, especially the large map now in course of publication, appear to be correct as far as the plains and larger valleys are concerned, but when the traveller who uses them arrives among the mountains he is utterly lost. It is evident that the higher Alpine ridges have not been surveyed, and although parts of them may have been roughly sketched in on the ground, it is impossible to resist the conclusion that by far the larger portion have been invented in the office, and laid down upon paper so as to form tolerably picturesque groups. Nor is this all: the nomenclature is frightfully inaccurate, and has probably been partly fabricated, and partly taken down from the lips of the inhabitants by persons ignorant of French. The shortcomings of the Sardinian maps are all the more striking when they are compared with the faultless and beautiful work of the Swiss Federal engineers. I make these observations with the greatest regret, as I would not willingly be thought forgetful of the brilliant services the Piedmontese have rendered to Italy, or of the courtesy and kindly feeling with which they always welcome English travellers. But it is necessary to the progress of Alpine geography that the truth should be candidly stated, and the simple fact is that the recent mountain cartography of the Sardinian Government is a gigantic imposture, and a disgrace to its engineers and surveyors which it will take years of earnest labour to wipe away.