inspires the aged in this recital, though verging near the tomb. The mothers, on their side, like true Spartans or Thespians, animate their children with that degree of emulation and courage so necessary to support, in case of urgency, their happiness and independence.

Leaving this kind of Thermopylæ, with my soul full of tenderness and admiration, I directed my course towards the east; and, after four miles easy ascent, reached the village of Ober-gestelin; and thence proceeded to Ober-weld, three miles further. This last, which is one of the highest, in point of situation, of any in the Upper Vallais, is extremely gloomy or melancholy, the atmosphere so rare, and the winters so long, that on all sides nothing but immense pastures for the grazing of cows and sheep are seen, without a single tree, except some few stunted firs and larch, with here and there a bush of holly.

The whole soil from Arnen, the capital of the lower district, to Ober-weld, an extent of a dozen miles at least, is tolerably regular, having no considerable ascent, and apparently composed of fragments belonging to the primitive mountains, pebbles, and sand, covered by a stratum of vegetable earth of about six inches thick.

I have therefore not the least doubt, from every appearance, that the whole of this part of the Vallais owes its origin, and the present level of its surface, to the successive sediments of the sea, as likewise to its last retreat, which was slow and gradual, or, in other words, since the formation of the great valley of the Rhône, as mentioned when speaking of the formation of the Lake of Geneva: for it is necessary to observe, that the opinion I have suggested on this subject must not be forgotten; viz. that, from the observations I have made, I am led to suppose that this valley, as well as that of the Arve, both of which seem to have originated from the sudden fall of the vaulted roof of some extensive caverns, occasioned by internal commotions of the earth, have, in process of time, become the principal channels in this part of the Alps for the draining of the sea at the epoch of its retreat, but that it doubtless remained there a length of time after the total drying-up of the greatest part of our continents.

On the other side of Ober-weld I began to ascend a narrow valley, at the bottom of which the Rhône flows with great rapidity. The hills which border this valley and river are mostly schistus, containing a large quantity of thin lamellated mica, of different colours, which are all nearly vertical. Between the schisti are veins of a species of white granulated quartz, mixed with a kind of brown mica, which is, as it were,

cemented with the other grains of the rock, resembling the *quartzum granulatum cohærens* of Wallerius, spec. 105. Then, continuing along the same valley, for the space of five English miles, by a rugged stony path, tending in a direction from north to south, I unexpectedly gained a *plateau*, or elevated flat piece of ground, which commanded both the valley and the source of the Rhône: here I could easily discern, through a wood of larch, which covers the *plateau*, and shelters it from the north wind, the extensive glacier of La Fourche, or Furca, called also Glacier du Rhône, from its being supposed that a part of that great river issues from beneath the glacier,—which may in some degree be the case, though it certainly is not the entire or real source of the Rhône.

The prospect from hence is beautifully grand, and one of the most noble of the kind I ever saw,—a description of which I shall endeavour to attempt, though difficult; for the objects, in general, appeared of much greater magnitude than even those of the Glacier des Bois, near Chamounie, and the adjacent mountains considerably more lofty and majestic than those which surround the glacier of Grindelweld, in the canton of Berne.

In the drawing N° XXIV. I have given as exact a representation as possible of this astonishing *tableau*, from the outlines taken by myself on the spot, and which are such, I may venture to assert, as they really appeared to an eye which is desirous of letting nothing escape that deserves attention. I may therefore add, that this superb glacier, of which a stranger can form no idea, and of the magnitude of which, as well as the surrounding rocks, I am sorry to add, my drawing gives but an inadequate conception, may be compared to an extensive amphitheatre of ice, whose steps are more than three hundred feet in height, forming so many stupendous transparent pyramids of crystal, reflecting on all sides the beams of the sun.

These pyramids, or spiry peaks, are likewise arranged and piled, as it were, with so much art and exactness, one above another, raising their lofty summits towards the clouds, that their appearance is beyond conception. This glacier is situated at the eastern extremity of the Vallais, and is nearly surrounded by a long chain of stupendous mountains, that meet or join above this sea of ice, as if to form, by their junction, the Mont St. Gothard, whose basis is in part covered not only by this glacier, but also by others of nearly the same extent. Its north-eastern side may be said to be supported by the Furca, a mountain so called from the form of its summit, which terminates in

two spiry needles, or prongs, not unlike a fork: it is also nearly every-where of granite, and serves as a limit to the states of Berne, Uri, and the Vallais, forming part of the chain of the St. Gothard.

The glacier rests its north-western side against the Grimsel, another lofty mountain, whose height is so considerable, that its summit is covered with permanent snow; yet there has been a road made, passable three months in the year, for mules and foot-travelers, from the Vallais to Berne. There is also an hospital nearly contiguous to its summit, free of access, similar to that already described; but the severity of the weather obliges the friars to quit their dwelling at the approach of winter, when the chief, or *hospitalier*, previous to his departure, takes care to leave a certain quantity of wood and provisions, in case some unfortunate traveler may still be on the pass, and need assistance.

The Grimsel, which is also a limit to the states of Berne, is rich in crystals, and is totally of granite, exhibiting, opposite or next to the glacier, bare or uncovered masses, as if imbricated the one in the other, like the leaves of an artichoke.

The celebrated Haller, who has favoured the public with a description of this mountain, in his valuable work on the Alps, mentions having seen a crystal taken from one of the caverns, formed between these immense blocks of granite, that weighed upwards of six hundred and ninety-five pounds. As for myself, though I cannot say so much, I have indeed seen several at Munster which were beautiful, weighing about twelve pounds and a half; and one in particular, which appeared to be extremely curious and valuable, of eight pounds weight, of a violet colour, one point only, and of hexagonal form, not unlike the *crystallus hexagona rubescens* of Wallerius, spec. 110.

The basis of this mountain becomes still more interesting from its contrast, throwing additional beauty and whiteness on the glacier itself; for, though its summit be covered with snow, yet, from its sides and basis being wooded, the trees form, by their dark foliage, an admirable and pleasing contrast to the transparency and brightness of the pyramidical spires; besides, the number of natural cascades that fall from its summit, whose limpid and silvery streams are seen precipitating from rock to rock, though reduced to vapour, among the tufts of firs and larch, ere they reach the bottom, wonderfully increase the beauty of the landscape.

On the sides and basis of the glacier above described are extensive moraines, or accumulations of decomposed granite, mixed with other fragments detached from the

stupendous rocks that screen its northern part. These accumulations, which insensibly increase, seem, in a great measure, to owe their origin to the small degree of melting, or thawing, which the surface of those frozen pyramids experiences during two months in the year, at which time the water that drains from thence carries with it the many small detached fragments that lie scattered on their sides, and deposits them at the foot of the glacier.

Nevertheless, as they gradually rise, and even extend to the neighbouring valleys, it appears reasonable to suppose that glaciers in general, instead of diminishing, on the contrary imperceptibly increase,—an opinion I have long encouraged, and which indeed seems to be forcibly strengthened by the number of passages in various parts of the Alps, formerly frequented, but now entirely filled with ice, as the one which originally led from Chamounie in Savoy, to Cormajeur in the Valley of Aösta, &c. But the question which remains to be determined, Whether glaciers increase in height, or extend in basis? is of too material consequence to geology to allow of any premature decision either in the negative or affirmative; for which reason, I shall at present defer hazarding my opinion on that subject, but reserve it for another work.

These accumulations appear to be in general formed of a whitish sand, containing mica, quartz, and feldspath; finally, decomposed granite, mixed with solid fragments of primitive rock.

In the one nearest to the icy vault from whence issues a part of the Rhône, I picked up a rare and curious piece of feldspath, not unlike mother-of-pearl, and, by its weight and structure, resembling the stone called by naturalists *Labrador*.

The current which flows from this vault (whose height is, at times, eighty feet, and length two hundred) mingles its waters with those of a small rivulet at two hundred and fifty yards distance, conceived with great reason, by monsieur de Saussure, to be the real source of the Rhône.

This transparent stream is formed by the junction of three springs, which flow from the basis of Mont Sasberg, at six hundred paces from the above vault, a mountain which forms a part of the Grimsel, before mentioned. The elevation of the valley, where the junction of these rivulets takes place, is accounted four thousand feet above the level of the sea, and two thousand four hundred and fourteen higher than the Lake of Geneva. It is certain that the general opinion entertained by many, that the source of the Rhône flows from beneath the glacier, arises in great measure from the idea, that

the foul current which issues from thence, being a much larger body than the rivulet itself, was naturally supposed to be, on that account, the source of so formidable a river. Be this, however, as it may, that opinion is at present pretty generally refuted by the inhabitants of the country; and besides, the difference that exists is so trifling, that I shall not further enlarge on the subject; but observe, that the water that issues from beneath this icy region raises Réaumur's thermometer two degrees and a half only above the freezing point; whereas the other, contiguous to the three clear and sparkling springs, raises it to fourteen.

Having so far completed my observations, and taken some refreshment in a wretched miserable cottage, of which there are two (Vide N° XXIV), close to the vault, in the bottom of the valley, I returned to Ober-gestelin, where, owing to my poor beast's having lamed itself during my morning's excursion, I was detained till the following day,—a circumstance which had like to have been unpleasant; for, it being Sunday, it was with the greatest difficulty I could procure either guide or mule to accompany me, the Vallaisans being, as before noticed, extremely strict and religious. Having however staid till public service was over, seconded by the influence of the *curé* (an influence not to be despised in any country, much less in one where it exerts itself with so much power), I soon obtained both, and continued, for the space of two or three English miles, the same road I had pursued the preceding evening; then, crossing the Rhône on a stone bridge, supported on two rocky peaks, the road begins to be at once steep, stony, and contracted, following at times a narrow valley, and at others the abrupt sides of a chain of lofty mountains, mostly composed of different species of schistus, very like horn-stone, as also of a kind of lamellated rock, which, by the structure and quantity of feldspath, hornblende, and quartz, contained in it, does not in the least differ from the spiry needles on the Great St. Bernard, its component parts having apparently the whole of the principles which compose the generality of those peaks. But here the road changes rather suddenly, and takes an eastern direction; whereas, hitherto, it had tended from north to south. The rocks, likewise, exhibit different forms and structure; for those which sheltered the contracted valley I was then climbing, instead of walking, were at first of a bluish schistus, and brittle, with wide and irregular strata, to which succeeded, for the space of nearly two miles, a kind of red slate, striated with quartz; in fine, after three hours' great labour, ascending rapidly the whole way, we reached a small plain, on which a few sheep were grazing round a