

is at a considerable height above its lower termination, the frontal dip inwards is 19° ; and immediately above the vault of the torrent, the inward dip of the structure is only 5° . The four sections on the lithographed plan fully illustrate, it is hoped, the geometrical structure of this glacier, together with the superimposed one. It will be found to agree most accurately with what I have described as the normal type of glacier structure, and especially with the description given of the Glacier of the Rhone, which that of La Brenva very much resembles in some respects, in my earliest paper on the subject, reprinted in the Appendix.

The alternation of bluish-green and greenish-white bands, which compose this structure, gives to this glacier a most beautiful appearance, as seen from the mule road. An attempt has been made in Plate V. to give some idea of this most characteristic display, and which is better seen here than in any other glacier whatever with which I am acquainted. The sketch was taken by myself from the point marked *k* in the map, in July 1842.

When the ice of the glacier abuts against the foot of Mont Chetif, at the promontory marked *i* on the map, it is violently forced forward, as if it would make its way up the face of the hill. Here the contact of the ice and soil is very well seen; and my friend M. le Chanoine Carrel of Aoste, with whom I walked several times in this neighbourhood, and who took an interest in such questions, discovered a point of contact between the limestone and a protuberant mass of ice which admitted of easy removal, thus showing the immediate action of the ice and rock. Having taken a man furnished with a strong axe, we proceeded together to the spot. The soil near the ice appeared to have been but recently exposed by the summer's melting of the ice. It was chiefly composed of clayey debris from the blue limestone. At the point marked by M. Carrel a piece of fixed rock opposed the ice, and was still partly covered by a protuberance of the glacier, which we speedily but gently cut away with the hatchet. The ice removed, a layer of fine mud covered the rock, not composed, however, alone of the clayey limestone mud, but of sharp sand, derived from the granitic moraines of the glacier, and brought down with it from the opposite

side of the valley. Upon examining the face of the ice removed from contact with the rock, we found it *set* all over with sharp angular fragments, from the size of grains of sand to that of a cherry, or larger, of the same species of rock, and which were so firmly fixed in the ice as to demonstrate the impossibility of such a surface being forcibly urged forward without sawing and tearing any comparatively soft body which might be below it. Accordingly, it was not difficult to discover in the limestone the very grooves and scratches which were in the act of being made at the time by the pressure of the ice and its contained fragments of stone. By washing the surface of the limestone we found it delicately smoothed, and at the same time furrowed in the direction in which the glacier was moving, that is, against the slope of the hill. We succeeded in detaching some fragments of the rock with hammers, having even the sharp sand adhering to it, which I afterwards secured with gum-water, in order to illustrate the exact condition of a rock subjected to glacier action. It would be impossible to catch nature more completely in the fact than in the observation just stated. I afterwards returned with a skilful mason, who, with much labour, succeeded in detaching several specimens of the striated and polished surface.* Not only was the limestone friable, but the cleavage being perpendicular to the surface, rendered it impossible to obtain a slab of any extent.

On the path leading to Courmayeur—a few minutes walk below where the glacier now ends—are some admirable specimens of ancient polished and striated surfaces of the same limestone, which it seems impossible to doubt were produced by the ice at a former period.

So far as we can judge from the view which De Saussure has given † of the Glacier of La Brenva, and which he states was drawn in 1767, we must infer that the glacier was then greatly less extensive than at present. It seems almost certain that at that time the Doire did not pass *under* the glacier at all, but in front of it. He likewise mentions

* One of these specimens is deposited in the museum of the Royal Society of Edinburgh.

† *Voyages*, Tom. ii., Plate III.