

south-east side of the cone, and not far above the Casa Inglese; but the fresh snow had already nearly filled up the new opening, so that it had only the appearance of the mouth of a grotto. I do not, however, question the accuracy of the conclusion of Signor Gemmellaro, who, being well acquainted with all the appearances of drift snow in the fissures and cavities of Etna, had recognized, even before the late excavations, the peculiarity of the position of the ice in this locality. We may suppose that, at the commencement of the eruption, a deep mass of drift snow had been covered by volcanic sand showered down upon it before the descent of the lava. A dense stratum of this fine dust mixed with scoriæ is well known to be an extremely bad conductor of heat; and the shepherds in the higher regions of Etna are accustomed to provide water for their flocks during summer, by strewing a layer of volcanic sand a few inches thick over the snow, which effectually prevents the heat of the sun from penetrating.

Suppose the mass of snow to have been preserved from liquefaction until the lower part of the lava had consolidated, we may then readily conceive that a glacier thus protected, at the height of ten thousand feet above the level of the sea, would endure as long as the snows of Mont Blanc, unless melted by volcanic heat from below. When I visited the great crater in the beginning of winter (December 1st, 1828), I found the crevices in the interior encrusted with thick ice, and in some cases hot vapours were actually streaming out between masses of ice and the rugged and steep walls of the crater.\*

After the discovery of Signor Gemmellaro, it would not be surprising to find in the cones of the Icelandic volcanos, which are covered for the most part with perpetual snow, repeated alternations of lava-streams and glaciers. We have, indeed, Lieutenant Kendall's authority for the fact that Deception Island, in New South Shetland, lat. 62° 55' S., is principally composed of alternate layers of volcanic ashes and ice.†

*Origin of the Val del Bove.* — It is recorded, as will be stated in the history of earthquakes (Ch. XXX.), that in the year 1772 a great subsidence took place on Papandayang, the largest volcano in the island of Java; an extent of ground *fifteen miles in length and six in breadth*, covered by no less than forty villages, was engulfed, and the cone lost 4000 feet of its height. In like manner the summit of Carguairazo, one of the loftiest of the Andes of Quito, fell in on the 19th July, 1698; and another mountain of still greater altitude in the

\* Mr. Nasmyth, the inventor of the steam-hammer, has lately illustrated, by a very striking experiment, the non-conductibility of a thin layer of dry sand and clay. Into a caldron of iron one-fourth of an inch thick, lined with sand and clay five-eighths of an inch thick, he poured eight tons of melted iron at a white heat. After the fused metal had been twenty minutes in the caldron,

the palm of the hand could be applied to the outside without inconvenience, and after forty minutes there was not heat enough to singe writing paper. This fact may help us to explain how strata in contact with dikes, or beds of fused matter, have sometimes escaped without perceptible alteration by heat.

† Journ. of Roy. Geograph. Soc. vol. i. p. 64.