

and strays, such as fragments of coal, bits of glass, and the like, that show its recent formation. At the present moment as I write I have before me a fragment of a medicine bottle firmly imbedded in matrix that cannot be distinguished from that on the upper and lower jaws of *Rhinoceros Etruscus* found *in situ*, in the Forest-bed of Lowestoft, which are lying by its side. If, therefore, the matrix prove that the Mammoth remains in question were derived from the Forest-bed, it must also establish the fact that glass bottles were used before the deposition of the Boulder-clay. It is clear, therefore, that the peroxidated matrix is no certain guide to the geological horizon. Ever since the Red Crag was saturated with peroxide of iron it must have been the source from which the later deposits in the eastern counties derived their ferruginous character; not only the Forest-bed, but also all other strata deposited by water, that flowed through the Crag area. Since, therefore, the ferruginous matrix is not characteristic of the Forest-bed, as Dr. Falconer supposed, his argument in favour of the Pre-glacial age of the Mammoth falls to the ground. In the present state of our knowledge we must then fall back on M. Lartet's theory of 1858, and view the animal as characteristic of *Post-glacial* times, and as affording a means of differentiating the *Pre-glacial* from the *Post-glacial* deposits. It invaded Western Europe along with the Tichorhine Rhinoceros, the Musk Sheep, the Reindeer, and other animals fitted to endure the severity of an arctic winter, occupying the same position in the *Post-glacial* fauna as *Elephas meridionalis* occupied in that of the *Pliocene*.

NOTICES OF MEMOIRS.

MR. LOBLEY'S LECTURE ON VESUVIUS.

At a meeting of the Geologists' Association of London (May 1st) a descriptive account of Mount Vesuvius was given by J. L. Lobley, Esq., F.G.S., who had lately paid a visit to the district and made the ascent of the Crater.

The subject was treated under four heads—1st, the geographical description of Vesuvius; 2nd, the history of the volcano; 3rd, the geology; and 4th, the ascent to the Crater, with a notice of the phenomena observed during the eruption of the present year.

After an allusion to the situation of Vesuvius with reference to the city and bay of Naples, and to the beautiful scenery of the neighbourhood, to which this bold and picturesque mountain largely contributes, a description of the outline and form of the mountain was given.

Unlike many volcanos Vesuvius is not a simple cone, but a double-peaked mountain, with a widely-spreading, almost circular, base of nearly thirty miles in circumference. One of these peaks forms the highest point of a semi-circular ridge rising on the north and east, and half encircling the modern cone, which towers above the rest of the mountain. The semicircular ridge is called Monte Somma, and is separated from the cone by a deep flat-bottomed

valley, to which the name of the *Atrio del Cavallo* is given. A description of the various parts of the mountain followed, and reference was made to the populousness of the numerous towns and villages lying around the base of the volcano.

The history of Vesuvius is extremely interesting, as it was an active volcano in prehistoric times; then an apparently extinct one, and now, in our own times, it has been, and is still, one of the most active volcanos known.

The eruptions, too, have been attended with the most disastrous results; and, situated as Vesuvius is, near one of the principal cities of Europe, and on the attractive and accessible coast of Italy, they have excited the greatest attention among mankind. The eruption of the year 79 of our era, was the first of which we have any record, for during the whole of the historic period previous to that date, Vesuvius was dormant.

At this period the mountain was a single truncated cone, of great width and comparatively low elevation, with a very large and deep crater.

Strabo was the first to notice that this crater was walled in by rocks, which were igneous and volcanic in character, and he, followed by other early observers, concluded the mountain to be of volcanic origin. The earliest eruption of the historic period, that of 79, resulted in half of the enclosing wall of the great crater being blown away, leaving merely the semi-circular ridge, now called *Monte Somma*, and a small elevation on the opposite side of the cone, to which the Italians give the name of "*La Pedamentina*." This terrible outbreak destroyed, as is well known, the three cities of *Pompeii*, *Herculaneum*, and *Stabia*, and quite altered the appearance of the mountain. The death of *Pliny the elder*, and the account given of the eruption by his nephew, *Pliny the younger*, in the two celebrated letters to *Tacitus*, tend also to make this fearful catastrophe a most memorable event in the history of the world. The modern great cone of Vesuvius then began to be formed around the vent of the volcano, and subsequent eruptions accumulated material upon it, until it at length attained a greater elevation than the old summit of the mountain.

Many eruptions, no fewer than fifty-eight, have been recorded since the volcano renewed its activity, all more or less remarkable, but those of 1036, 1631, 1793-4, and 1822, are especially worthy of notice. Of the historic eruptions, those which occurred previous to 1036 do not appear to have produced any fluid lava, and were merely eruptions of ashes, stones, lapilli, and mud, attended with discharges of vapours. In 1036, however, a stream of lava is said to have flowed down the sides of the mountain, and to have reached the sea. The eruption of 1631 is remarkable for the extraordinary quantity of lava which Vesuvius emitted, no fewer than seven great rivers of the fiery fluid having poured down its sides. For several centuries previous to the great outbreak of 1631, the eruptions of the volcano were of little violence, and were separated by long intervals of repose. During this period of comparative rest on the part of

Vesuvius, Monte Nuovo, on the shore of the Bay of Naples, was thrown up. This event took place in 1538, and the phenomenon was of so remarkable a character, that a hill 440 feet high, and more than a mile and a half in circumference, was formed by the accumulation of erupted matter in three days! During the eruption of 1793-4, which lasted upwards of a year, the stream of lava emitted was not even arrested at the sea line, but actually flowed into the sea to a distance of 362 feet, forming a promontory. It was calculated by Breislack that this stream contained upwards of 46,000,000 cubic feet of lava. The eruption of 1822 was by far the greatest outbreak which has occurred during the present century. The modification of the shape of the volcano caused by this eruption was very considerable, since no less than 800 feet of the summit of the cone was blown away, and an immense crater produced, which penetrated to a depth of not less than a thousand feet into the heart of the mountain.

Considering Vesuvius geologically, we find the lower portion of the volcano as far up as the Crocelle, or the ridge on which stands the Observatory, to be of one age, Monte Somma of another, and the great cone more modern than either of the other two portions of the mountain. The formation of the great cone of Vesuvius, as we have seen, dates from A.D. 79, before which time it had no existence. This very interesting part of the volcano is simply the accumulation of the ejectionments thrown out during the various eruptions of modern times, with interbedded layers of lava, and is consequently made up of a series of beds, or coats, having a quaquaversal dip from a central axis, which is the vent of the volcano, and the mouth of which forms the crater or cup-shaped hollow at the apex of the cone. These beds were found to have a dip of from 26° to 30° , but the exterior slope of the cone has an inclination of 40° . The great eruption of 1822 left so wide and deep a crater that the internal structure of the cone was exposed, and it was then found that dykes of compact basalt crossed the beds of lava and scoriæ, and rose more or less vertically to various heights. These walls of hard rock have doubtless been produced by the filling up of old lava channels and cracks in the cone with liquid lava which has afterwards solidified, and they act as so many ribs, greatly strengthening the structure of the cone. The crater varies in size and shape with almost every eruption, as the greater paroxysmal eruptions tear away the sides of the mouth of the volcano, and leave a very large and deep abyss. This is afterwards rapidly filled up by the accumulation of the lava, ashes, cinders, and lapilli discharged during the minor eruptions which follow, until we find a new cone growing up above the former summit of the mountain, and this has at its apex only a small crater, as is the case at the present time. The central vent is then almost choked, and so it remains until another paroxysmal eruption occurs, when the new cone is blown away, and a great crater again produced.

Monte Somma we find to be a semicircular ridge of about two miles in length, with the face opposite to the cone, forming an almost perpendicular escarpment. This, being a portion of the enclosing

wall of the great crater which existed previous to the renewal of the activity of the volcano in 79, is composed entirely of volcanic products. It is not, however, like the walls of the craters of the Phlegreæan fields, made up of tuff; but is formed, like the modern cone of Vesuvius, of a series of beds of lava alternating with layers of scoriæ and ashes, and traversed by dykes of compact dolerite. The lavas of the Pre-historic volcano differ considerably from those of modern times, the latter containing little free leucite, and not more than six or seven other minerals; while the lavas of Somma contain a great abundance of leucite, in fine trapezohedral crystals, as well as a large number of associated minerals. The beds of lava and scoriæ composing Monte Somma, overlies the rock of which the whole of the lower portion of the mountain is composed, and which is a soft, straw-coloured, volcanic tuff, similar to the rock so much exposed about the city of Naples, and through which is excavated the great grotto of Posilipo. This is evidently the oldest product of the volcano, and has, doubtless, in part at least, been deposited under water, from the fact of several species of marine Mollusca having been found in the tuff of this neighbourhood. The fundamental rock of the district is the Apennine limestone, which is of Cretaceous age, and on this the whole mountain reposes.

Resina, one of the populous towns at the foot of the mountain, and on the shore of the bay, is the usual starting place when the ascent of the mountain is made. This town is built upon the lava of 1631, which overlies the bed of tuff in which Herculaneum is entombed. After leaving Resina, the path traverses highly cultivated and very fertile vineyards and gardens, in which the famous wine "Lachryma Christi" is produced. The land owes its great fertility to the felspathic matter derived from the decomposition of the underlying lavas. After ascending gradually for about two miles, the lava of 1858 is reached, and the scene is entirely changed; for from this point to the summit there is not a trace of vegetation.

The appearance of the surface is very extraordinary, from the grotesque and varied forms the lava has assumed in cooling. The colour of the recent lavas is, in some places, black; in others, a dark brown; and the surface is exceedingly rough and difficult to walk over. The ridge of the Crocelle rises out of this sea of lava, and on its summit stand the Hermitage and Observatory.

From the Crocelle the observer looks over that part of the mountain down which the red hot lava flowed during the recent eruption. The lava of this year, it appears, issued from the top of the old cone, and descended its side for some time in a splendid fiery stream; but this stream becoming covered, by cooling, with a crust of hardened lava, the fluid was not seen until it had reached the base of the cone, when it came to the surface, issuing in small streams at various points. These streams run slowly and noiselessly along, losing their brightness very quickly, soon becoming covered with scoriæ, and, after flowing about a hundred yards, losing their fluidity and breaking up into cindery masses, which form ridges not unlike unfinished railway embankments. After passing

the Hermitage and Observatory and traversing the Crocelle, the path enters the Atrio del Cavallo, from which the ascent of the cone is made. As the inclination of the sides of the cone is 40° , and the surface covered with loose masses of scorïæ of all sizes, this is the most difficult and laborious part of the whole ascent. Perseverance, however, lands the traveller at length on the top of the old cone, where he finds himself on a narrow terrace surrounding the base of the small cone, formed during the recent eruption. This new cone is found to be about two hundred feet high, with sides comparatively smooth, the upper part being covered with beautifully and variously coloured incrustations, the sublimates of the volcano. Sulphur was very abundant, and sulphate of copper, from its bright blue colour, very conspicuous. Great quantities of vapour rise from the surface of the new cone, and these fumes become so dense at the summit as almost to conceal the edge of the crater. At the time of the lecturer's visit, in March, 1868, scorïæ and ashes were being shot forth to a great height from the crater, with loud explosions and rattling subterranean noises. The interior of the crater had a very wild and extraordinary aspect, and formed a striking contrast to the bright and peaceful scene presented to the eye when turned in the opposite direction; for, from the summit of Vesuvius, a grand panoramic view is obtained of the scenery around the world-famed Bay of Naples, which, once seen, is never to be forgotten.

REVIEWS.

I.—**MAN'S ORIGIN AND DESTINY SKETCHED FROM THE PLATFORM OF THE SCIENCES** (being a course of Lectures delivered before the Lowell Institute in Boston, 1865-6). By J. P. LESLEY, Memb. National Acad. U.S., and Sec. American Phil. Soc. 8vo. pp. 384. London: N. Trübner and Co. 1868.

THIS course of lectures, though not entirely, or even largely, geological, yet contains many references to the method of geological investigation, and many descriptions of geological facts bearing on the question of the Origin of Man. These features we gladly seize upon, and invest with perhaps too great importance, as an excuse for reviewing, in a purely geological publication, a book so calculated to interest every intelligent man.

Mr. Lesley adopts the safe plan of giving his hearers some preliminary knowledge of "the sciences," from whose "platform" he intends to sketch "Man's Origin and Destiny;" and to avoid an evil of great importance and very common occurrence, viz., giving undue weight to one particular branch of knowledge at the expense of others, he exhibits a classification of the sciences in a scheme designed to show their individual scope and mutual relations. As this scheme is in some respects peculiar we subjoin it for our readers' consideration.

CLASSIFICATION OF THE SCIENCES.

I. GENERAL SCIENCES:—1. Philosophy. 2. Bibliography.
II. MATHEMATICAL SCIENCES:—1. Mathematics. 2. Astronomy. 3. Meteorology. 4. Géodesy. 5. Geography. 6. Physics, leading to the