7. When there is a pause in the respiratory phrases it always occurs in inspiration.

8. In all insects vigorous enough to furnish suitable curves (such as the large Coleoptera) one finds that the inspiration is usually slower than the expiration, and that the latter is often sudden (confirming an observation by Sorg in 1805).

9. In most insects expiration is alone active, inspiration being passive, and due to elasticity of the teguments and the tracheal walls. (This confirms previous observations.)

10. Nearly all insects possess only expiratory muscles. M. Plateau has found muscles aiding inspiration not only in Hymenoptera and Acridians (Rathke, Graber), but in Phryganeidæ.

11. The superior and inferior diaphragms of Hymenoptera have not the *rôle* Wolff attributes to them (a confirmation of objections by Graber).

12. Many insects, perhaps all, perform, with their abdomen, general movements, sometimes small, sometimes very ample, which do not coincide with respiratory movements, properly so called, and must be distinguished from them.

13. The respiratory movements of insects are purely reflex, persisting in the decapitated animal, and even in the isolated abdomen in forms whose nervous system is not condensed. In the latter case these movements are excited or retarded by the same causes which excite or retard them in the intact insect (a confirmation of previous observations).

14. The metathoracic ganglions are not, as Faivre supposed, special respiratory centres (a confirmation of the views of Barlow and Baudelot on Libellulæ).

15. The abolition of respiratory movements by destruction of the metathoracic ganglions in Dytiscidæ and other Coleoptera, results from the condensed state of their nervous system, in which a certain number of abdominal ganglions are fused with those of the metathorax.

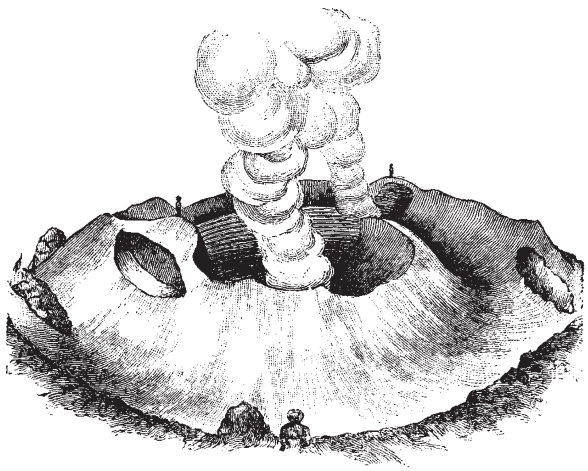
16. In insects with a condensed nervous system the excitation or partial destruction of a complex nervous mass resulting from the union of successive ganglionary centres always affects all the centres entering into the constitution of this mass.

DIARY OF VESUVIUS, JANUARY 1 *TO JULY* 16, 1882

IN the account given in NATURE, vol. xxv. p. 294, the eruption that has been going on in December was described up to the last day of 1881. As the height of the lava column had been diminished by the lateral outlets, the surface was consequently some considerable distance below the lip of the crater, its level on ordinary occasions being only a few metres below.

Under ordinary conditions the ejectamenta consist of masses of fluid lava blown out as the spray from an effervescing liquid. They form the so-called lava cakes, being flattened out by their fall, while still plastic. They are usually very spongy, or scoriaceous, and rapidly disintegrate. In the present instance, however, as the vapours quitted the lava at some considerable depth, these plastic masses could not reach the surface. This rapid escape of vapour through the narrow tube between the lava surface and the crater lip, was under analogous conditions to the powder gas in a fire-arm. If, for instance, we imagine a cannon, whose bore is composed of materials easily broken up, we have a rough illustration of what takes place. The lava-cakes were replaced by ejectamenta derived from the components of the sides of the chimney, such as compact lava fragments, lapilli, old scoria cakes, all more or less altered and decomposed by the hot acid vapours, to which they had been exposed for considerable periods.

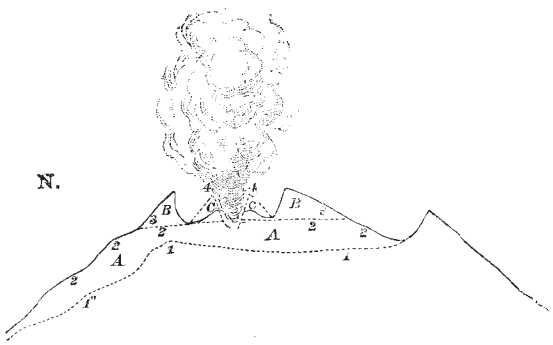
Such a condition of things naturally results in the straight-tube or chimney assuming the form of a funnel, or conical hollow whose apex will be at or near the lava level, that is to say, at the point where the gaseous products quit the fluid magma. We have, in fact, two conditions upon which the size and depth of a crater depend, namely, height of lava column, and amount and force of vapour escaping. Naturally the effect would be modified by local causes, and also the difference of com-



Sketch after Nature on July 16, 1882, 9.30 a.m. View from the north of the cones and craters of December, 1881, and January to July 16, 1882. The outer rim is broken away over the old fissure to the left or east. The smaller bocca is beneath the little figure, there is probably the remnants of another beneath the middle, or left figure.

ponent materials. The ejectamenta which in this manner were very different from that of ordinary occasions, were deposited simultaneously in a rim-like manner around the new crater.

Thus we see how a nearly perfect cone of eruption, such as existed in the beginning of December, composed as it was of alternate beds of lava and scoria cakes, with a chimney, but without a crater, may be converted into a low truncated cone, whose base is of an area considerably larger than that of the original, but whose height is much



1, Outline profile of apex of cone after eruption of 1872; 2, outline on December 31, 1881; 3, outline section on April 23, 1882 (*i.e.* the continuous line); 4, cone and crater formed between April 23 and July 16, 1882; A, materials, lava, and scoriæ since 1872; B, ditto, since December 31, 1881; C, ditto, since April 23, 1882.

less. The interior now occupied by a crater proportionally large. The whole of these changes occurring without the addition or abstraction of any materials, except an ash blown away by the wind.

On January 1, Vesuvius had become quiet, and the feeble ejections consequent thereon could no longer hoist the materials over the new crater edge, but were instead building up a new cone of eruption around the vent at the bottom of the craterial hollow.

Till January 14 no glimmer even was visible from Naples. On that evening, however, there was a slight red reflection, which continued till the 24th, when much vapour was escaping. The next day it became quiet.

February 2, slight glimmer visible again.

From February 19 to April 23, the mountain remained very quiet; only the slightest glimmer visible at night. That day I visited the crater.

The crater and its rim of December and January occupies about one-third of the plain of lava filling the 1872 crater. The former overlaps the latter in a north-east direction, and is not therefore concentric. As we cautiously mount its northern edge to avoid the falling scoria cakes, it is seen that the craterial hollow has very steep sides, about 40 metres deep, and 150 metres in diameter. It showed the usual interlamination of lava and its fragmentary products. Rising from its floor was a small cone of eruption, that had been building up since the beginning of the year, its centre, of course, occupied by the vent, but no crater. The fissure mentioned in my last report was gradually filling up by the crumbling in of its sides; there was still oozing a small stream of lava from its lower extremity. This gentle flow of fluid rock had been going on without interruption since December, and during that period had been thrown out to a considerable amount, which, however, from slow exit soon cooled and had not enough impetus to travel far, chiefly piling itself up at the toe of the cone, and spreading a short distance over the Atrio and Valle dell' Inferno.

On May 13, became slightly more active, which continued till the 17th, the day of the eclipse of the sun. On that evening the reflection was very brilliant from a much increased flow of lava on the same side. From May 18 till June 6, gradually diminishing activity, especially during the last week. During the 4th and 5th, Prof. Palmieri recorded a continued uneasiness, as shown by the Vesuvian Observatory and University seismographs. That disturbance was the forerunner of a sharp earthquake shock, which occurred at 4·47 a.m. at Isernia and Vinchiaturo in the Appenines. At 8 a.m., when I scanned the crater with a glass, there seemed to be an increased volume of vapour from the fumaroles, and the main column was much more bulky and dense. In the evening the explosions reached a considerable height, and were very brilliant. On the 7th the same, but on the 8th quieter.

We have here a small but good example of seismic energy exhibiting its focus of intensity in a mountain range, yet at the same time setting up sympathetic activity in the neighbouring volcano. In fact, I believe that if more accurate and regular observations were carried on of earth tremors and the phases of volcanic activity, at many points scattered over such a country as Italy, much might be learned of the internal anatomy and physiology, so to speak, of such an area.

I say Italy in particular, for many reasons. The principal, however, are its simple structure, thus avoiding the various complications that must necessarily arise if its geology were very intricate. Again, the history of many of its principal seismic events are far more complete and extend farther back than that of any other country. In fact, we may look forward to the time when seismology and vulcanology will be placed on much the same basis as meteorology, and probably with equally important results.

The mountain from the last date to the 29th remained tranquil, no reflection being discernible at night. That evening, however, the ejections were to be seen distinctly. The following day it was the same, but on July 1 the activity had increased, and the lava that had now been arrested for weeks burst forth again at its old exit.

The mountain now took on somewhat an intermittent phase. On the third it was quieter, 4th the same, 5th, 6th, and 7th more active, 8th, 9th and 10th quieter, 11th and 12th more active, 13th, 14th, and 15th quiet.

On July 16 I made a minute examination of the crater. Owing to a favourable wind, and with a muffle over the face, the edge of the innermost one could be reached. This, on which we were standing, was the cone of eruption that was commenced to be formed, in the bottom of the December crater, and whose growth had been going on up to June 29, when the increased activity of that and the following days, converted the top of the chimney into a small crater, at the same time scattering the materials on its outer flanks and increasing the size of the cone. The cavity, of an irregular conical form, was about 45 metres deep, and its apex could have been but little above the level of the outflow of lava that was still proceeding from the old lateral fissure. At the bottom of the crater was the bocca or mouth. Its position was slightly excentric, and irregular in form, being about 2×3 metres. It was apparently undercut by the lava that could be distinguished boiling up at a short distance from its edge, the issue of the ordinary column of vapours, carrying with each explosion a few fragments of the plastic mass, thus commencing a fourth cone within the inner crater. Part of the southern wall had crumbled away, showing well the stratification of the beds.

Between the inner cone of 1882 and that of 1881, that is to say, in the fosse-like excavation separating the two, and towards the south-west (below smallest figure in sketch), another bocca had opened. From 9 to 10 o'clock a.m., during which my examination had been carried on, only an abundant column of vapour had been emitted. When standing quite close to it, however, it suddenly started into increased activity, emitting a column of ash and lapilli, perpendicularly to some height, reminding one in form of the great geyser column of Iceland. This was due to the slipping of a part of the outer wall, which exhibited the stratification of the December cone. A continual play was maintained for about one hour and a half, when tranquility was restored. Mixed with the stones and lapilli that were being ejected were a few fragments of molten lava, demonstrating the opening to be in direct communication with the principal mass. Although one could approach the edge of the opening nothing could be seen, for the amount of vapour issuing. On that occasion the usual hydrochloric acid smell was strong but mixed with a little sulphurous, and I fancy I could detect a distinct odour of hydrofluoric acid, which is the first time. Of course it is known to exist in small quantities always.

The old lava forming the plain within the 1872 crater, and from which rise the two small cones above described, is much decomposed and covered by fumaroles, in a direction extending due south-west, that is to say, scattered along the same radius as the crateret above mentioned. It would seem from this to be the external evidence of a dyke which has extended in that direction. We might therefore infer that if any lateral opening should soon form it would be somewhere on the south-west of the cone.

H. J. JOHNSTON-LAVIS

THE HUNGARIAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

BUDAPEST, *August* 28

THE twenty-second meeting of the Hungarian Association for the Advancement of Science has just been concluded. It was held at Debreczin a town of 52,000 inhabitants, and the capital of the great Hungarian Plain. Two hundred and eighty members were present, and of these 132 joined the Medical Section, while the remainder were divided pretty evenly between the Physical and Economic Sections. The Physical Section includes Chemistry, Mathematics, and Astronomy; and the Economic Section includes matters relating to Social Science and Agriculture. Unfortunately the Association does not represent Hungarian science. There is a