

calculating the volume of the water that may be drawn from them is not an easy one. Nor is it rendered more easy by the spirit evinced by the Boer farmer witnesses.

Three of the honoured name of Erasmus (two brothers and the son of one of them) refused to recognise any difference between the ownership of water flowing under his ground and of metals found there. Pressed again and again to see the difference between picking up a diamond found on his lands and pumping away the water drawn in from the lands of others, the reply of one of the farmers was quite clear:—"I consider that it is a bad principle when a man owning land under a properly registered title in any country cannot take full advantage of the profit he is able to make."

Not only did these farmers claim the right to use all the water they could suck into their pumps and employ in irrigating their own lands, but they also insisted on their right to sell to their neighbours the water they did not require themselves.

It might happen, then, that the owner of a small pump large enough for his own fields might find his water supply cut off by a larger pump in his neighbour's farm, and he might have to buy from the owner of this large pump the water that had hitherto been his own.

The situation is evidently a difficult one. If such a case were to occur in India it would probably be ruled that a very careful scientific survey should be made of all the subterranean channels with the view of finding exactly how the waters flow, and that until this point was cleared up farmers should have a restriction put on the area of their lands which they were allowed to irrigate. Probably no one would be wronged if they were each limited to irrigating two-thirds of their farms. But this would require a stronger Government than is ever likely to rule in the Transvaal. Probably the commissioners are right in the recommendations they make, and they know that none more drastic would have a chance of being adopted.

These recommendations, after providing for the wants of towns and of mine owners, are to the effect that farmers should be allowed to pump freely for their own use for watering cattle or for irrigation.

"That traffic in underground water should be prohibited, and that an owner should not be allowed to sell or barter underground water which he does not require for his own use." "That it is unnecessary to prove that water in the dolomite formation flows in channels . . . and that if the Judge thinks that the facts establish a connection between the pumping and the diminution of the water in a stream he can prevent the pumping to such an extent as he thinks fit."

This last recommendation is a most important one. Will the Transvaal judges have the courage to carry it into effect?

Since the above was written, an interesting notice has appeared in *NATURE* of March 1 (p. 426). From this it seems that the subject of underground waters has been occupying attention in the United States. The law there seems to favour the view of the Boer farmer, viz., that the owner of the surface of the land is equally owner of all that lies directly below that surface, whether it be rock, stagnant water or running water. This law is, however, receiving severe shocks from the advance of geological knowledge, and as means have now been found of measuring the flow of subterranean water it is probable that the law may be conformed to what is clearly only justice, and a landowner will not be permitted to take more than his due share of the water that passes under his soil.

THE FORTHCOMING MEETING OF THE BRITISH ASSOCIATION AT YORK.

THE fourth meeting of the British Association in York will be held in that city on August 1-8, the date being fixed earlier than usual to enable members and their hosts to combine attendance at the meeting with a subsequent tour abroad or a visit to the northern moors for the shooting season. The association was founded in York in 1831, and had for its first president the Earl Fitzwilliam, F.R.S. It celebrated its jubilee there in 1881, under the presidency of Lord Avebury, then Sir John Lubbock, and it now meets again, after three-quarters of a century, in the city of its birth.

At the inaugural meeting on Wednesday, August 1, Prof. E. Ray Lankester, F.R.S., president-elect, will assume the presidency and deliver an address. On Thursday, August 2, there will be a soirée; on Friday, August 3, a discourse on "Volcanoes" will be delivered by Dr. Tempest Anderson; on Monday, August 6, a discourse on "The Electrical Signs of Life, and their Abolition by Chloroform," will be delivered by Dr. A. D. Waller, F.R.S.; on Tuesday, August 7, there will be a soirée; and on Wednesday, August 8, the concluding meeting will be held.

The sections and their presidents are as follows:—(A) *Mathematical and Physical Science*, Principal E. H. Griffiths, F.R.S.; (B) *Chemistry*, Prof. Wyndham Dunstan, F.R.S.; (C) *Geology*, Mr. G. W. Lamplugh, F.R.S.; (D) *Zoology*, Mr. J. J. Lister, F.R.S.; (E) *Geography*, Sir G. D. Taubman Goldie, K.C.M.G., F.R.S.; (F) *Economic Science and Statistics*, Mr. A. L. Bowley; (G) *Engineering*, Dr. J. A. Ewing, F.R.S.; (H) *Anthropology*, Mr. E. Sidnev Hartland; (I) *Physiology*, Prof. Francis Gotch, F.R.S.; (K) *Botany*, Prof. F. W. Oliver, F.R.S.; (L) *Educational Science*, Prof. M. E. Sadler.

To the antiquarian York has preeminent attractions, its Roman remains, its mediæval bars and walls, which still encircle the greater part of the city, its Norman castle and noble minster, being each objects of special interest. The city also contains several manufactories interesting to scientific men; opportunities will be given for visiting these under skilled guidance in the afternoons, after the meetings of the sections. Excursions will be organised to several places of interest.

The neighbourhood of York, though flat, presents many objects of geological and archæological interest, many of which are reached by good level roads; cyclists are therefore recommended to bring their machines with them to the meeting.

It is hoped that it may be possible to arrange for an exhibition of photographs taken by the members in South Africa, for which the reception room affords ample accommodation.

York enjoys exceptional railway facilities, being under four hours from London, five hours from Edinburgh. The various railway companies will issue return tickets, at a single fare and a quarter, from the principal stations in the United Kingdom to York. These tickets, which will be available from July 31 to August 14, may be obtained by members and associates attending the meeting on presentation of a certificate signed by one of the local secretaries. The North-Eastern Railway Company will also issue periodical tickets to members and associates, at cheap rates, for going and returning as often as desired during the time of the meeting between York and the chief places in the district.

An attempt may be made, provided sufficient support is forthcoming, to arrange at the end of the meeting a yachting excursion, lasting two or three weeks, to

Norway or other interesting district, limited to association ticket-holders.

A handbook dealing with the natural history and archaeology of the York district has been specially written for the occasion, and a copy will be presented to each member of the association.

It is anticipated that there will be a large amount of private hospitality, and as so many members were unable to visit South Africa last year it is expected that there will be a very large meeting.

THE ERUPTION OF VESUVIUS.

THE activity of Vesuvius, incessant for some time past, has culminated in an eruption which, making every allowance for newspaper exaggeration, stands in the foremost rank of historic eruptions, even if it is not already the greatest of all. It is not yet at an end; we cannot say that it has reached its climax; but the interest excited is so great that some forecast of the future, so far as this is possible, may be attempted.

The late Prof. John Phillips pointed out that the volcanoes of the Phlegræan fields have had two periods of activity, each lasting about four hundred years, and that Etna has also had two great periods of activity, the first of which lasted about 800 years, reaching its maximum in the second century B.C., while the second, commencing about the fourteenth century, had attained its maximum about the end of the eighteenth, after which eruptions declined in violence and frequency; from this he concluded that a period of 700 or 800 years may be assigned to the periods of volcanic activity of Etna. It is probable that in all cases of volcanic activity there is some such period, in which the eruptions, spasmodic at first, increase gradually in frequency until they attain a maximum, and then die out again, the length of the period being determined by the size of the reservoir of molten rock which gives rise to the eruptions; but there is not as yet any means of determining what will be the duration of the present series of Vesuvian eruptions, or whether it has reached its maximum; all that seems certain is that there are no signs of this being passed.

Between A.D. 79, when Pompeii was destroyed, and 1631, eleven great eruptions were recorded; the seventeenth century gave four, the eighteenth twenty-three, and in the nineteenth, up to 1869, the date of Prof. Phillips's work, twenty-four were recorded. After that date there was the great eruption of 1872, and an almost continuous condition of activity ever since. It may be that we have now reached the climax, or the future may have catastrophes in store still greater than that which we are now witnessing; but, if there is any virtue in analogy or inference, centuries must elapse before the mountain resumes that condition of quiescence which existed before our era, and for prolonged periods in the centuries which followed its commencement.

The length of these periods of volcanic activity and the difference between those of neighbouring volcanic centres shows that the cause lies deep in the earth, and that the conditions are beyond our ken. Prophecy must necessarily be vague, and can do no more than indicate the future course of events in the most general and guarded terms; yet mankind will always want to peer into the future. Attempts will be made to predict the time of coming eruptions, and not wholly without justification, for extra-mundane conditions must, to some slight extent, influence the manifestations of volcanic activity. Prof. Palmieri believed that there was a distinct increase in the activity of ejection from the cone and in the abundance of the lava at the new and full moon, and it is possible

that a connection exists with cycles of variation of climate, magnetic force, or the frequency and distribution of certain solar phenomena, but the relation may be only of the nature of the proverbial last straw that broke the camel's back. On occasion it may do so, but though sometimes the camel can bear many more straws, at others he has given way before even one was added to his load; and so it is with volcanoes. The cause of their eruptions is so preponderatingly mundane that any slight effect of extra-mundane causes must be elusive, difficult to establish, and only to be detected by the study of a long series of averages. For purposes of prediction they are of little use. There is, however, some comfort for the immediate future in the reported subsidence of Pozzuoli; if real, this probably indicates that the present paroxysm has reached its climax, and will now slowly cease.

From the Press reports of the eruption, the following particulars of scientific interest have been extracted and arranged as a diary of events:—

April 5.—Vesuvius in strong activity. Great blocks of rock hurled as far as the lower station of the funicular railway.

April 6.—The new crater began to emit lava in an abundant stream. The lava has arrived within three or four miles of the village of Bosco-Trecase.

April 7.—Bosco-Trecase destroyed. After midnight loud rumblings were heard, followed by a violent earthquake shock, which shattered the windows in the town. Then lava began flowing from Ciaramella, where a fresh fissure had opened up a few days previously. From the Ciaramella crater masses of incandescent rock were ejected, and a torrent of lava swept down at a terrific speed, flowing in two streams, one 200 yards broad moving towards the centre of the town. The town had hardly been evacuated when the lava invaded the houses, several of which were burned down, and soon Bosco-Trecase seemed to be enveloped in flames. At 6 a.m. Bosco-Trecase was completely surrounded by a stream of lava. The cone on the Pompeii side of Vesuvius collapsed, and on the opposite side a new crater opened at the base of the cone in the Atrio del Cavallo and vomited lava and stones. The principal crater was in violent eruption. Explosions were unceasing. A shower of grey-black ashes fell in the streets of Naples.

April 8.—Central crater of Vesuvius was again emitting quantities of lava. Repeated explosions were followed by subterranean rumblings and by earthquake shocks, which were distinctly felt in the villages at the foot of the mountain. At 12.31 a.m. a slight shock of earthquake was felt at Naples, and a second at 2.10 a.m., both disturbances being accompanied by rumblings. A telegram from Naples at 6.30 p.m. announced that Ottajano, Poggio Marino, and Somma had been entirely abandoned. At Ottajano the lava was flowing 7 feet deep through the streets. At 8 p.m. the flow of lava seemed to be generally somewhat slackening. A shower of black dust, like iron filings, fell throughout Montenegro, covering the surface of the country to a depth of a millimetre with an iron-grey layer. Prof. Mottucci, director of the Vesuvius Observatory, made the following report:—

"The eruption of Vesuvius has assumed extraordinary proportions. Yesterday and last night the activity of the crater was terrific and ever increasing. The neighbourhood of the observatory is completely covered with lava. Incandescent rocks are thrown up by the thousand to the height of 2400 feet, and even 3000 feet, and fall back, forming a large cone. Another stream of lava has appeared from a fissure the position of which is not well defined. The noise of the explosions and of the rocks striking together is deafening. The ground is shaken by strong and continuous seismic movements. The seismic instruments threaten to break, and it will probably be necessary to abandon the observatory, which is very much exposed to electric shocks. The telegraph is interrupted, and it is believed that the funicular railway has been destroyed."

April 9.—The stream of lava in the direction of Torre Annunziata has remained stationary since yesterday evening. The dynamic action of the volcano appears to be