for example, the observations showed that molecules containing elongated chains of CH_2 groups and therefore highly unsymmetrical in shape are, optically, much more nearly *isotropic* than benzene, toluene and other compounds of the aromatic series.

These and other results stand in need of explanation, and it is the purpose of this note briefly to indicate a method of dealing with the matter which is at least a useful working hypothesis. The suggestion is that the optical anisotropy of the molecule is due, in the main, to the mutual influence of the electric doublets induced by the external field in its constituent atoms, the latter, individually, being themselves more or less completely isotropic. A similar idea has recently been used very successfully by W. L. Bragg to explain the doubly-refractive character of substances in the solid crystalline state, *e.g.* calcite and aragonite.

Following up the working hypothesis indicated, Dr. K. R. Ramanathan has, at the suggestion of the writer, calculated the degree of optical anisotropy to be expected theoretically for the molecules of a number of substances in the gaseous state and obtained most encouraging results. The fullest test of the theory will be that furnished by the series of organic vapours studied; the detailed calculations necessary for this purpose have been undertaken. Qualitatively, it is not difficult to see that the closer packing of the atoms in the benzene rings compared with that in the chain compounds would enhance their mutual influence, and that, consequently, the greater anisotropy exhibited by the compounds of the aromatic series is what we should expect on the hypothesis suggested. C. V. RAMAN.

s.s. *Kaisar-i-Hind*, near Marseilles,
June 19.

Emission of Volcanic Gases.

I TOO have been shown the effect described by Prof. Conway in NATURE of June 21, p. 891, at the Solfatara, near Naples. I was inclined to believe in its objective reality, but was not sure. I write to suggest that some scientific man who is taking his holiday in that neighbourhood should carry a camera with him, and obtain a photograph before, and another after, the torch has been applied to the vent. In that way I think it would be easy to decide objectively whether the distant vents are affected or not. RAYLEIGH.

69 Cadogan Square, S.W.1, June 21.

I WAS glad to see Prof. Conway's letter on the "Emission of Volcanic Gases" in NATURE of June 21, in which he directs attention to the remarkable phenomenon observed at the volcano of Solfatara when a lighted torch is waved over one of the vent-holes in the crater.

I was also present at Naples on the occasion mentioned, and, along with some friends, took the opportunity of visiting Solfatara, where we observed the phenomenon described by Prof. Conway.

The increase in the amount of fumes emitted was quite unmistakable. A. A. ROBB.

Cambridge, June 22.

I HAVE seen repeatedly during the last thirty-eight years the evocation of gas at Solfatara, described by Prof. Conway in NATURE of June 21, p. 891. The phenomenon is certainly not subjective, neither is it trickery. I venture to offer the hypothesis that, under the floor of the crater, deep caverns are filled with volcanic gases, the equilibrium of which is unstable to a small change in atmospheric pressure, such a change being effected when the air above a group of crevices is heated by the torch. The crevices must be connected with the deep reservoir by passages, and the gas must be generated into the reservoir at a pressure exceeding atmospheric pressure by the pressure due to the vertical column of heavy gas in the passages, added to the pressure necessary to produce the flow of the gas through their length.

Instability is due to the fact that gas drawn up to the torch is hot gas, which therefore rarefies the air more, and so draws up more and hotter gas; and further, that the torch drawing gas from the passages to the crevice must draw also gas from the deep reservoir to the passages and from the lower part of the passages to their upper part. In all cases the gas passes from deeper and therefore hotter strata to higher and therefore cooler strata—so that the whole gaseous column becomes warmer and therefore lighter than it was before. Consequently the weight of the column no longer equipoises the pressure in the deep reservoir, and this therefore forces out gas by the passages through every aperture, the uprush further heating and lightening the column, and therefore renewing itself, until a second equilibrium is reached at a lower reservoir pressure plus a more rapid upward flow of gas. Eventual slackening of this flow and reversal of the steps must be brought about by the cooling of the deep chambers producing a lower pressure of generation; this reduces the rate of flow and therefore increases the time which is passed by the column in the cooler strata. The column therefore becomes cooler and heavier and requires higher pressure in the reservoir to lift it, while the escaping gas is cooler and the rarefaction of the external air lessens. Each consequence reinforces its cause, until the *status quo ante* is reached with the external atmosphere at its original temperature and pressure.

Evidence for the existence of large unstable gaseous reservoirs has lately appeared to me to concern not only the colliery engineer, but also the biologist. It seems possible that some of H. Munro Fox's interesting lunar cycles in life-histories, especially of marine organisms,[1] might conceivably be explained by the earth-wave of spring-tides distorting the walls of subterranean caverns filled with gas, and so releasing an importantly greater quantity of carbon dioxide, etc., at the new and full moon. Thus the constitution of the sea-water in their neighbourhood would have a fortnightly and monthly chemical periodicity which would produce a physiological periodicity in inhabitants sensitive to those constituents.

GEO. P. BIDDER.

Cambridge, June 22.

PROF. CONWAY'S letter in NATURE of June 21 again directs attention to this remarkable phenomenon. Since my former visit, my daughter, Ruth Place, has visited the volcano for further investigation, and we suggest that the sudden emanation of visible gases and vapours may be the effect of ionisation started by the torch flame.

There may be another explanation. The whole system must be charged with superheated aqueous vapour, the temperature varying from 99° C. to 161° C., as observed by Prof. Mercalli, the lower temperature obviously that taken near the surface. When the organic substance, namely, resin torch, or even a bunch of brushwood, paper, etc., is burnt, it will produce water which will condense the hot aqueous vapour and form fog, and so will quickly influence the whole zone and become visible over an extensive range of ground. JOHN PLACE.

16 The Avenue, Beckenham, Kent.
June 30.

[1] At Naples *Nereis dumerilii* and *Dictyota dichotoma*, both breeding fortnightly (Proc. Roy. Soc., vol. 95, p. 544).—Note that there are effervescent hot springs known to bathers in the sea at Bagnoli, near the Solfatara.