

all the masts are distinctly visible, pronounced white flares extending skywards. The photographs were taken on a Kodak film, exposure about one twenty-fifth of a second.

On the Tuesday the wind was blowing fresh from the north-west, and on the Wednesday the wind was still fresher from the south-west.

This note and photographs are being sent with the object of directing attention to the phenomenon, and with the hope of learning whether it has been noticed by others.

ARNOLD SPILLER.

Northumberland Yacht Club, Blyth, July 5.

Anhydrous Volcanoes.

THE cumulative evidence in Dr. Albert Brun's "Recherches sur l'exhalation volcanique" leaves very little doubt but that the explosive action in volcanoes is due to decomposition of compounds of C, N, Cl, F, &c., held dissolved in the glass of the lava. All the theories about volcanic activity must be revised, as pointed out by that author; but along with the disappearance of the theory attributing the explosive action to water, there must be a disappearance also of the theory of a hot interior of the globe, as a corollary following on Dr. Brun's researches, if on no other grounds. For if a magma containing carbides, nitrides, &c., will explode with great violence if heated, then, supposing the earth's centre were hot, a single volcanic vent would allow the whole of the volcanic magma contained in the earth to swell and boil over on to the surface of the earth.

Accepting, then, Dr. Brun's conclusions, the volcanic magma below the crust must be cold, and only when heat is applied to it, through movements in the earth's crust, will the expansion take place and the volcano be formed. The gases given off from volcanoes, or expelled by heating obsidians to their melting points, are strongly reducing, and were, therefore, forced into the magma at a stage in the earth's growth (on the planetismal hypothesis) when the surface was incandescent from the infalling of meteorites, and when the atmosphere consisted of gases carried to the earth in these meteorites, principally CO, CO₂, H, N, and CH₄. The rock-silicates absorbing these gases gradually cooled down and were buried, and thus a supply of material was laid by from which the volcanoes of future ages could be formed. The absorption is more than mere occlusion, for an obsidian can be thoroughly weathered and absorb water throughout its mass, yet, when dried and then raised to fusion point, free chlorine can be given off, showing that the water cannot have had access to the storage chamber of the chlorine. Again, a granite powder may be sprayed with paraffin and heated to 1100° C. The excess of paraffin burns instantly, but a certain portion is fixed by the silicates and remains as paraffin within the rock-magma up to the explosion point, when it is expelled with explosive violence. Actual paraffin can be distilled from the pitchstone of Arran. If paraffin can be retained in a magma heated to above 1000° C., it means that it has practically entered into chemical composition with the silicates.

An obsidian retains some of the gases originally held in the magma, because it has cooled quickly; a certain time is necessary, even at fusion point, for the gases to be expelled; hence a lava will continue to give off gases as it flows down the side of the volcano, although a large proportion has escaped in the chimney, and will still be found to contain gas when it has cooled completely. The solidified lava, if left long enough, will slowly give off gases, N, Cl, CO, CO₂, CH₄, &c., but the life of a lava, before it becomes what Brun calls a "dead rock," is probably thousands of years.

There is certainly an analogy, if nothing more, between these results of Dr. Brun's researches, and the properties of radio-active substances. Helium must have existed in the earth's atmosphere when the surface was incandescent, for the same reason that it exists in the sun's atmosphere to-day, and it is possible that certain substances had the power of causing it to enter into a sort of chemical combination with them, like the paraffin in the rock silicates. Existing in the lower layers of the earth's crust near the centre, which I have given reasons to suppose is very little, if at all, above the temperature of outer space, these

substances would retain the helium frozen in them, as the chlorine, paraffin, &c., are frozen in the rock silicates, and they could retain the helium for indefinite periods. When some of these substances, however, are brought by the ordinary processes of ore-formation into the warmer regions of the outer crust, they would give off their helium. The difference between the way in which the helium is held in radio-active substances, and that in which the gases are held in rock-silicates, is shown by the fact that the rate of expulsion of helium is unaffected by temperatures available in the laboratory, whereas the gases can be all driven off from a rock-silicate at one time. There may be nothing in this, but it may reassure some who are alarmed at the rate of decay of radium and see no possible sources of replenishment.

ERNEST H. L. SCHWARZ.

Rhodes University College, Grahamstown, June 12.

The End of the *Beagle*.

WITH reference to the letter in NATURE of JUNE 1, the following particulars of what I know upon the subject may be of interest.

In the year 1863, at Hong Kong, a friend of mine purchased from the Government the dispatch gun vessel *Beagle*, which was at that time laid up, after being some years on the China Station. We had her thoroughly overhauled and repaired, and renamed her *The Stork* (a sacred bird of the Japanese). I then took her over to Japan, to the ports of Nagasaki and Yokohama, for sale. She was visited and examined by the Japanese; but no sale was effected at the time, and I took her back to Shanghai. However, she was eventually purchased by the Japanese Government, and after that I have no further knowledge of her movements.

The other *Beagle* mentioned in NATURE was an old 10-gun sailing brig, and I think there can be no doubt that she was the vessel in which Darwin made his scientific explorations. I see in the "Encyclopaedia Britannica" that Darwin made his voyage in the *Beagle* in the years 1832 to 1836, several years before the *Beagle* that I commanded was built, so I presume that settles the matter.

H. C. SHOOSMITH.

54 Billing Road, Northampton, June 23.

[The second line of the "Voyage of a Naturalist" describes the *Beagle* as a 10-gun brig. The vessel was barque-rigged, and is believed to have been about 280 tons.—ED. NATURE.]

The Osmotic Pressure of Colloidal Salts.

IN reference to the interesting letter of Dr. Hardy, published in NATURE of June 29, I should like to state that work on similar lines has been proceeding in this laboratory during the last year and a half. We have been investigating the general subject of "membrane-equilibria" and "membrane-potentials" in the case of non-dialysing electrolytes. An informal note on the principles involved in these investigations was read by me before the Physiological Society in December, 1910. Some time ago a paper dealing with the theory of these equilibria and potential-differences was sent to the *Zeitschrift für Elektrochemie*. In this paper, which is already in type, Dr. Hardy will find that I have arrived at equations expressing the membrane-potentials which are practically identical with the equation given in his letter. We propose, therefore, to continue our investigations on the subject.

F. G. DONNAN.

Muspratt Laboratory of Physical and Electro-Chemistry, University of Liverpool, July 1.

The Date of the Discovery of the Capillaries.

DR. FRASER HARRIS is quite correct in stating that Malpighi (working with Charles Fracassati) demonstrated the existence of blood capillaries with the microscope in the year 1660. The two letters to Joh. Alph. Borelli announcing the discovery were published in folio at Bononia (Bologna) in 1661. This is now a rare tract, and not usually quoted. It is, however, doubtful whether