

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 "Encyclopædia 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

Malpighi first saw capillaries in the frog's lung or in the frog's bladder—probably it was the latter. Although, of course, he was not the first to practise injection methods, we may note that Malpighi traced the course of the vessels by (a) inflating them; (b) injecting mercury; (c) injecting coloured fluids. Both Sir Michael Foster and your correspondent appear to have overlooked the fact that the expression "*Magnum certum opus oculis video*" is not Malpighi's, but a translation from Homer, and is intended, I imagine, to be translated after the Malpighian manner as: "I see with my eyes a truly great work."

F. J. COLE.

University College, Reading, July 4.

ARISING out of the letter on the above subject in *NATURE* of June 29, by Dr. D. Fraser Harris, is the true date of the momentous discovery of what is the oxygen carrier of the blood. This discovery is put down to Sir G. G. Stokes, and the date some years later than 1862.

I wish to direct attention to a fact hitherto overlooked, namely, that Dr. John Roberts, of Plas Eryr, Clwtybont, Carnarvonshire, was the first to say (and to publish it) that the colouring matter of the blood (hæmoglobin) was the oxygen carrier. This can be verified by perusal of his thesis (for M.D. Edin., published in 1860, and now lying in the archives of Edinburgh University) on "Pigment."

Dr. Roberts is still alive and well.

R. CADWALADR ROBERTS.

Heathfield, Cardigan.

THE FUR-SEAL QUESTION.

FOR some time past a conference has been sitting in Washington, in which representatives from Great Britain, or rather Canada, Russia, Japan, and the United States, have taken part, for the purpose of drawing up new regulations for the conduct of the Bering Sea seal fishery, and for the protection and restoration of the herd. *The Times* of June 28 contained an account of the findings of the conference, and in the issue of July 8 its correspondent at Washington reports that the new convention was signed on July 7. The full text of the agreement has not yet come to hand, but its main provisions, which are of great international importance, and of great interest to all naturalists, are said to be as follows. Pelagic sealing will be totally prohibited to all subjects of the participating countries for fifteen years, and measures will be taken to induce other countries to prevent its being carried on under cover of their flag; the United States and Russia, which own practically all that remain of the seal herds of the North Pacific, will pledge 30 per cent. of their catches for the purpose of paying a specified yearly dole to Canada and Japan to compensate them for abstention from the fishery, and the United States (it is said) will advance 40,000*l.* to each of the latter countries for the immediate compensation of persons engaged in the industry; the contracting Powers will admit no skins to their ports the origin of which is not properly certified; and, lastly, regulations are laid down as to the method of killing seals on land, and as to the establishment of guards upon the rookeries. These resolutions are, we suppose, still subject to ratification by the several Governments, but nevertheless we have good reason to believe, and every reason to hope, that the wise and liberal proposals thus stated may soon be adopted and carried into effect. The Washington correspondent of *The Times* reports that, so far as can be gathered, the convention will be accepted by the Senate. It will come into force on December 15.

The Bering Sea Arbitration of 1893 was an affair of such international magnitude that it is far from being forgotten. It is unnecessary and impossible to enter here into a review of that great debate, of all the causes that led to it, or of the minor questions

that arose for a few years after its close. We may simply remind our readers that its chief result was the delimitation of a zone of sixty miles around the Pribylov Islands, within which zone pelagic sealing was prohibited during the season when the herd were living and breeding upon the islands, while at the same time the use of firearms was entirely prohibited to the pelagic sealers. A few years later pelagic sealing was entirely prohibited, both by America and Russia, in the case of their own subjects. But while it is impossible to enter here into either diplomatic or commercial history, a few words upon the general aspect of the case, and especially upon the natural history of the fur seals, may be of interest at the present moment.

The true fur seals, forming the old genus *Otaria* (now broken up into subgenera), belong to the more extensive family of the *Otariidæ*, or eared seals, the various members of which differ considerably in their habits. For example, Steller's sea-lion (*Eumetopias*), a large, ungainly animal, is sparsely distributed on a multitude of coasts and islands around the North Pacific; while, on the other hand, it is characteristic of the fur seals, throughout the whole area of their distribution in the Pacific and Southern Oceans, to resort to but few local breeding-places, where, in prosperous times, they congregate in great multitudes. Naturalists are not quite agreed as to the number of species of these fur seals, but the best-known breeding-places are, or have been (besides those in the Bering Sea), Robben Island at the Cape of Good Hope, the Auckland Islands, the Falklands, South Georgia and many other islands in the Southern Ocean, Lobos Island, at the mouth of the River Plate, Guadalupe, off southern California, and the Galapagos. In the Northern Pacific by far the greatest of the rookeries are those of the Pribylov Islands, St. Paul and St. George; next in order come those of the Russian Commander Islands, Bering and Copper Islands; while in the Sea of Okhotsk there is still a small rookery on Robben Island (now ceded to Japan), and on the Kuriles a number of rookeries were formerly known but are now either extinct or very nearly so. Dr. Jordan and his American colleagues ascribe specific differences even to the seals of these comparatively neighbouring breeding-grounds, and it is highly probable, if not certain, that the Pribylov seals from the eastern part of the Bering Sea, and the Commander Island seals from its western part, form absolutely separate communities, the long southward migrations of which in winter time follow different routes, the one towards the shores of British Columbia and the other towards those of northern Japan. For an unknown period, but probably for centuries, they have been exposed to attack by expert native fishermen, spearing them at sea in the course of these winter wanderings.

During the greater part of last century the history of the seal herds, of all species and in all their various haunts, is a long record of pillage and extermination; and nowadays the extent to which they have been reduced may be measured by the simple fact that a sealskin coat is a thing we very seldom see. In a comparatively few cases, especially on the American and Russian Islands and the Uruguayan Lobos Island, the herds have long been placed under proper control while on their breeding-grounds; and, so far as we are aware, the Lobos rookery, though small (for the island is less than a mile long), and though right in the track of commerce and close to a considerable town, is still maintained in comparative prosperity. But though on the Pribylov and Commander Islands the remains of the once immense herds are still considerable, yet they represent but a