

ployed. A number of tables give some interesting details relative to the number of miners, the machinery in use, and its value, from which may be gathered some idea of the extent and importance of the several gold fields in the colony. Of these fields, that of Ballarat appears at the head of the list, showing a total number of miners employed of 13,892, the approximate value of mining plant being 516,825*l.*; 134½ square miles of auriferous ground are actually worked upon, and 189 auriferous reefs have been proved. In this district also occur the deepest shafts, two of which reach the depths of 866 ft. and 900 ft. respectively. The price of Ballarat gold varies from 3*l.* 13*s.* 6*d.* to 4*l.* 2*s.* 6*d.* per ounce, the latter appearing to be the highest price obtained for any gold in the colony. In this mining district 78,502 tons 10 cwt. of quartz were crushed during the last quarter of the year, yielding 5 dwt. 19¼ gr. of gold per ton; and the average yield in the different gold fields being very variable. But in considering the relative importance of each district, we are reminded by Mr. Brough Smyth, the Secretary for Mines, that the table relating to machinery should be examined and compared, from which it appears that it is not always the mines that show the greatest yield of gold which give the largest return to proprietors. An interesting feature in these reports is the description by Dr. F. von Mueller (Director of the Botanic Garden of Melbourne) of certain new vegetable fossils which are met with from time to time in the deep auriferous drifts of older Pliocene age. These consist of the fruits of plants which, according to Dr. Mueller rejoiced in a milder climate, and displayed forms of tropical grandeur now foreign to the spot. Five genera are described and illustrated with beautiful lithograms. Of these, among fossil genera *Phymatocaryon* comes nearest to the extinct *Cupanoides*, *Tricarpellites*, and *Wetherellia* of the London Clay. Another genus, *Trematocaryon*, bears no very close alliance with any genus among living or fossil plants. The remaining genera are *Rhytidothecca*, with some affinities to *Chloroxylon* and *Flindersia*, *Plesiocapparis*, the real affinity of which is doubtful, and *Celyphina*, which appears to belong to the order of Proteaceæ. We are glad to learn that many other fossil remains have been secured, and are now under examination by Dr. Mueller. For the collection of these fossils palæontologists are indebted to the enlightened zeal of Mr. John Lynch, mining surveyor and registrar. When one looks over the long list of surveyors and registrars employed by the Colonial Government in gathering statistics, we can only hope that some, if not all, of these gentlemen will follow Mr. Lynch's example, and thus be the means of increasing our knowledge of the "old world" of Australia.

J. G.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. No notice is taken of anonymous communications.]

The Rigidity of the Earth and the Liquidity of Lavas

I WAS glad to see the powerful argument in favour of the solidity of the earth which Sir William Thomson has deduced from its great rigidity, republished in NATURE of January 18, since, though never attacked, it has been ignored by those who hold a contrary view. In a lecture before the Royal Institution in May 1867, I appealed to it in support of the notion which I have long maintained of a globe solidified from the centre; and I remember that for that and for other heresies in my lecture I was sharply attacked in the *Geological Magazine*, and in turn defended myself as best I might in the same magazine for February 1868. I there said that "the conclusions of Hopkins from the phenomena of precession and nutation, the investigations of Archdeacon Pratt on the crushing effect of immense mountain masses like the Himalaya, and the deductions of Sir William Thomson from the phenomena of the tides, showing the great

rigidity of the earth, are so many concurrent evidences that our planet, if not actually solid to the centre, has a crust far thicker than can be accounted for by the theory of a liquid globe, covered only with a crust resulting from superficial cooling." This discussion of the subject at that time seems to have had the effect of bringing to the front the defenders of the latter theory, which, in the popular mind at least, has a mythological rather than a scientific foundation. It was, therefore, well that Sir William Thomson should repeat his argument.

Mr. Fisher has in this connection, in NATURE for January 25, referred to the distribution of fluid ignited matter within the earth, and to the relation of volcanoes to great lines of elevation, which would seem to show that the local distribution of such matter may be connected with these lines. He says, "I have suggested that this fluidity may arise from a diminished pressure beneath mountain ranges, owing to their mass being partly supported by the lateral thrust which has upraised them," and adds, "If any of your correspondents can propose another explanation of this remarkable coincidence compatible with the supposition of a rigid globe it would be interesting to know it."

My present object in writing is to call attention to the explanation proposed by me in the *Geological Magazine* for February 1870, conceiving, with Archdeacon Pratt, that the condition of things beneath a great mountain mass is one of increased rather than of diminished pressure. I there said, "Pressure, which in the first case, that of simple fusion of anhydrous materials, prevents liquefaction by preventing expansion, in the second case (that of igneo-aqueous fusion, or liquefaction at high temperatures, by the aid of a small portion of water, as maintained by Scrope, Scheerer, and Elie de Beaumont) on the contrary, favours liquefaction by promoting the solution of the water-impregnated mass." As Sorby has shown, a conversion of mechanical into chemical force appears in the increase of solubility under pressure. In other words, pressure prevents fusion, when, as in most instances, it is a process of expansion; but favours solution, which is, with few exceptions, a process of contraction.

"Now since I place the seat of volcanic action in a region where solution, rather than simple fusion, is the cause of liquidity, I am led to consider pressure as one of the efficient causes of the liquefaction of rocks, and to regard its diminution as leading to solidification." (See also *Amer. Jour. Science*, ii., l. 27).

Montreal, June 21

T. STERRY HUNT

Fouling of the Nile

THERE is an account—of which I have unfortunately lost the reference—of the Nile becoming crimson and putrid, and its fish being killed, during the historic period, seemingly by microscopic algae. If any learned contributor could tell me where I can find this fact recorded, and could give me any details of similar phenomena, he would do me an especial kindness.

Chester, July 8

C. KINGSLEY

Volcanoes of Central France

AFTER carefully reading through the two extracts from Sidonius and Avitus contained in your number of May 30, my impression was that notwithstanding some manifest improbabilities, the conclusion was inevitable that earthquakes and other volcanic phenomena had actually been witnessed at Vienne. However, after examining all the facts of the case, a theory has occurred to me by which both accounts may be consistently explained without any such phenomena having occurred there at all. It would only remain to be shown that my supposed facts are not contradicted by evidence actually on record.

First, as to the persons:—The whole matter centres in the great Gallic family of Avitus, belonging to Auvergne. The most distinguished member of this family was Marcus Mæcilius Avitus, a person of so much importance that in the year 455 he became Emperor, but so little fortunate that in October 456 he was conquered and driven from the throne. He was allowed to become Bishop of Piacenza, but fearing for his life, returned to Auvergne and took refuge in the Church of St. Julian.* We find shortly afterwards two members of this family in possession of the See of Vienne, father and son, in succession, and the latter was the author of our Homily.

It seems, therefore, highly probable that the bishopric was in the gift of the family, or in some way dependent on it. In the year 463 we first find St. Mamertus in possession of the

* According to Gibbon he died on the way; the one certain fact is that he was buried there.