Letters to the Editor.

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Early History of Gaseous Adsorption.

THE publication in a recent part of *Proc. Roy. Soc.* (A, Sept. 1) of excerpts from the memoir of 1863 by Dr. R. Angus Smith of Manchester, on "The Absorption of Gases by Charcoal—(i.)," by the initiative of Mr. S. Lenher, calls to mind Angus Smith's service in collecting, with the help of James Young of Kelly, the scattered scientific papers of his friend Thomas Graham, in 1876. No more attractive account of the history and philosophy of the atomic theory exists than the short introduction which he prefixed to that volume. Physical chemistry was then being born, and the relevant ideas about atoms and the aether were in the foreground.

The John Hunter whose paper (*Journ. Chem. Soc.*, 1865) is referred to by Mr. Lenher was, I doubt not, the assistant trained to this kind of work by Thomas Andrews at Belfast, who died young. In Andrews' address to the Chemical Section of the British Association in 1871 ("Scientific Papers," ed. Tait and Crum Brown, p. 348), which was a survey of the main recent advances, he devotes a paragraph to the work of his assistant.

"Hunter has given a great extension to the earlier experiments of Saussure on the absorptive power of charcoal for gases. Cocoanut-charcoal, according to Hunter's experiments, exceeds all other varieties of wood-charcoal in absorptive power, taking up at ordinary pressures 170 volumes of ammonia and 69 of carbonic acid. Methylic alcohol is more largely absorbed than any other vapour from 90° to 127°: but at 159° the absorption of ordinary alcohol exceeds it. Cocoanut-charcoal absorbs forty-four times its volume of the vapour of water at 127°. The absorptive power is increased by pressure."

One recalls that the late Sir James Dewar, who presented to science the technique of charcoal absorption at low temperatures, spent his earlier years at Edinburgh, where the work of Andrews would be familiar through his friends Crum Brown and Tait.

JOSEPH LARMOR.

Cambridge, October 1.

The Structure of the Continents.

IN his letter on this subject published in NATURE of September 25, Dr. Harold Jeffreys cautiously favours the possibility that "the basaltic layer below the granite may be in a glassy state, as Daly has suggested," and he goes on to add that the underlying layer may well be dunite. The evidence in favour of this view is based on:

(*a*) Earthquake records which show that compressional waves are transmitted through the upper layer with a velocity of 5·6 km./sec.; through the lower layer with a velocity of 7·8 km./sec.; and through an intermediate layer with a velocity (measurable in one case only) of 6·2 km./sec.

(*b*) The work of L. H. Adams and R. E. Gibson (*Proc. Nat. Acad. Sci.*, May 1926, p. 275), which gives the velocities calculated from the observed compressibilities and densities, at pressures corresponding to depths of about 30 km., as 6·45 km./sec. for tachylyte (basaltic glass) and 8·2 km./sec. for dunite (peridotite composed mainly of olivine). As these results refer to ordinary temperatures, those corresponding to the temperatures below the granitic crust would be a little less.

The possibility of a layer of basaltic glass between granite and dunite—both crystalline rocks—seems improbable on general grounds. If the basaltic layer be glassy, then one would expect the dunite also to be glassy, in which case the velocity of compressional waves would probably be less, instead of greater, than that within the lower layer of the continents. On the other hand, if the dunite be crystalline, then the basaltic layer should also be crystalline, particularly as its existence is referred to differentiation due to the crystallisation and sinking of olivine; for if olivine could crystallise it is difficult to imagine conditions which would inhibit the crystallisation of pyroxenes and felspars (or a high-pressure equivalent). But in this case the velocity of compressional waves would be 6·9 km./sec. or more. Evidently all that can be safely deduced from the evidence is that the basaltic layer is not mainly composed of gabbro.

There is, however, an alternative interpretation of the intermediate velocity recorded by Jeffreys which should not be overlooked. L. H. Adams and E. D. Williamson (*Journ. Franklin Inst.*, April 1923, p. 520) have calculated the corresponding velocities in syenite and granodiorite at 6·2 km./sec., and in diorite at 6·4 km./sec. If, therefore, the granite of the upper levels of the continents passes down into diorite, a reasonable explanation of the intermediate layer is forthcoming. In a recent paper (*Geol. Mag.*, July 1926, p. 317) I presented chemical and petrological evidence supporting the hypothesis that the continents were originally of granodiorite composition, and that as a result of igneous processes, mainly in pre-Cambrian time, the upper levels have become more granitic, leaving a complementary differentiate of diorite in depth. This hypothesis is in accordance with the great abundance of diorites and andesites in zones of later mountain folding, and with the absence of any widespread intrusions of post-Cambrian granites comparable in their regional extent with those that preceded them in pre-Cambrian time.

If the intermediate layer of Jeffreys be identified with diorite instead of with basaltic glass, then the basaltic layer should exist in the high-pressure crystalline facies of eclogite. Unfortunately, the compressibilities of garnets or eclogites at different pressures have not yet been determined, but it seems probable that the velocity of compressional waves in eclogite would not differ seriously from that in dunite. A layer of eclogite passing gradually down into dunite at some unknown depth would then satisfy the seismic, petrological, and isostatic evidence. In view of the great importance of testing this interpretation in the most direct possible way, I have expressed to Dr. L. H. Adams and his colleagues my hope that they will add to their work on basaltic glass and dunite a similar investigation of the elastic properties of eclogite.

A further objection to the identification of the intermediate layer with basaltic material, whether glassy or otherwise, arises from its shallowness in the crust. If, as Jeffreys suggests, it extends from a depth of 10 or 15 km. to a depth of 20 or 30 km., then it is difficult to understand how it could ever be raised to the high temperatures implied by the great extrusions of plateau basalts which from time to time in geological history have overwhelmed enormous areas in different parts of the world. This difficulty is relieved by the conception of an eclogite layer extending downwards from a depth of 20 or 30 km. into a region where the temperature is higher and heat of radioactive origin can be accumulated.

ARTHUR HOLMES.

The University, Durham, September 25.