LETTERS TO THE EDITOR.

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The Funafuti Boring.

IT was with great pleasure that I read the clear statement of Prof. J. W. Judd (NATURE, March 12) in reply to the letter of Prof. E. B. Poulton (February 26) upon this subject. Especially welcome was his definite statement that all idea of solution of calcium carbonate being the causative factor of lagoon formation was negatived by the study of the bore.

But I would direct a caution to those who might be inclined to read into Prof. Judd's letter a vindication of the correctness of Darwin's theory of atoll formation.

Suppose it is definitely proved that an atoll such as Funafuti is established upon a basis which has certainly undergone a movement of sinking. Such a finding can only establish the "validity" of a statement that a sinking basis may become the site of atoll development; it cannot establish the "validity" of a theory which demands this sinking as the *cause* of the development of the peculiarities of atoll growth; especially in the face of the definite knowledge that typical atoll growth may be established upon a basis which shows either, no evidence of sinking, or actual evidence of rising. It is upon this point that I fear the recent correspondence may mislead.

One other question arises: Has it been definitely proved that the site of Funafuti atoll has undergone a movement of sinking?

A bore made upon the extreme windward edge of an atoll some ten miles in diameter has so inherent a probability of penetrating a talus slope, that the most rigid proof should be furnished of its having penetrated anything else. This proof is, I think, not forthcoming.

The lagoon bores are not sufficiently deep to establish, beyond dispute, the supposition that there has been a movement of sinking. The statement of Prof. Judd would leave quite an opposite impression, for he says that the lagoon bore extended "to a depth of 100 ft. below the limit of growth of the reef-forming corals." The lagoon bores extended to 36 and 41 fathoms below the surface of the water. It is obvious that to make Prof. Judd's statement correct he must allow the reef-builders only $24\frac{1}{3}$ fathoms as their bathymetrical limit. But $24\frac{1}{3}$ fathoms is not the "lowest depth at which, as all naturalists agree, reef-forming corals can flourish."

It is only necessary to mention the dredgings of Basset-Smith on the Lizard and Macclesfield Banks in which twelve species of typical reef-forming corals were obtained from between 31 and 45 fathoms. On open oceanic banks, far from any shore line from which suspended matter may be carried in the water, it is possible that even this may not represent the bathymetrical limit of the true reef-builders; but it is enough that we have positive knowledge of their presence at depths exceeding that of the Funafuti lagoon bores to negative any idea that these bores can prove a downward earth movement. Atoll formations are developed in areas in which upward earth movements are evident; they are also developed in areas in which downward earth movements are evident (though the Funafuti bores cannot be accepted as proving it); and in neither case can such movement be invoked as the cause of their peculiar features. The Funafuti bores showed that "solution" was not the cause of lagoon formation; they did not show that "subsidence" was the cause. It is the study of the coral zooid and the coral colony that alone can reveal the picture of atolls caused by "sedimentation." F. WOOD-JONES.

WE are quite ready to admit that the evidence obtained at Funafuti does not prove that *all* atolls are formed by subsidence. A stationary volcanic bank, eroded down to the level at which reef-forming corals could begin to flourish, would serve as well for the basis of an atoll as a sinking island; this was well pointed out by the late Admiral Wharton. So, too, would a deeper bank which had been raised to a similar level by the raining down upon it of pelagic organisms, *if it can be shown that such action is capable of producing any considerable thicknesses of rock.* And there are other conceivable ways in which atolls may arise, as was fully admitted by Darwin in his correspondence with Semper.

We claim, however, that Funafuti proves that atolls can be formed by subsidence from the following facts. The upper part of the main boring, as well as several subsidiary borings, show the existing reef to consist of corals in their position of growth, their interstices being filled with broken fragments of coral mingled with smaller organisms. Now, right down to the extreme depth reached, the cores were of precisely similar character; they showed corals in the position of growth surrounded by detritus and small organisms. Thus the hypothesis of a talus—which, so far as I know, was only suggested after the boring was found not to reveal a substratum of foreign rock—falls to the ground.

Although species of corals belonging to genera which are reef-forming have been found at considerable depths, the luxuriant growths of coral, necessary for building up a great reef, have never been shown to take place below 20 to 25 fathoms. This was a conclusion that was certainly accepted by the late Prof. Alexander Agassiz, from the results of his wide experience, as it has been by so many other naturalists. The ingenious method employed in boring in the middle of the lagoon of Funafuti did not admit of large cores being brought up, but the borings were stopped by hard coral-masses, the fragments obtained from these indicating that they belong to reef-making forms. It is fair, therefore, to maintain that the lagoon borings at Funafuti afford valuable evidence in support of that obtained by the main boring.

J. W. JUDD.

Zoological Classification.

ZOOLOGICAL classification of the present day is unsatisfactory, and the reason is not far to seek. This condition has resulted from the unnecessary multiplication of genera.

The real object of classification is being lost sight of. The objects aimed at in a classification may be put briefly as follows:—(1) To give to each animal a name, by which it will be known internationally, and (2) to give to animals which resemble one another the same name.

The unit-group of animals bearing the same name is the genus. How large may the genus be? There are at present independent genera which have been created out of a formerly existing single genus. Has the diagnosis of the species been rendered simpler by breaking up the genus, and by giving to each subgenus a new name? Certainly not in several cases.

The subdivision of the older genus has resulted from the more detailed examination of the various species. Such investigation cannot be too minutely carried out, for it is necessary both from the morphological and the diagnostic point of view. But the mistake has