

COCOS-KEELING ATOLL.¹

THE author, who was for fifteen months medical officer to the cable station at Cocos-Keeling, presents us with an interesting book on that atoll made classical by the researches of Darwin during the voyage of the *Beagle*. The account of the formation and history of the colony is a romance vividly portrayed, but the main interest of the book lies in the author's observations on coral-life and on the processes in operation which can shape an atoll.

The true coral animal (*Madreporaria*) is a colonial sea-anemone, which continually deposits under itself carbonate of lime, thus raising its seat higher and higher above the bottom. It sits on the surface of the dried coral, such as it is commonly known to us, and in no way presents the features of an Alcyonacean, such as is represented in Fig. 6 of the book. It is

reef corals is largely due to these algæ, and their mode of growth is sympathetic to them in that the coral skeleton is deposited so as to expose the polyps to the maximum amount of light. Such appear to us the ordinary views of zoologists, but our author regards sediment as the main factor to account for the variability of corals; that it is an important subsidiary factor cannot, of course, be denied. Some corals, such as *Cœnopsammia*, have no algæ, but pigments in granules in their cells; they, of course, are unaffected by light. Yet others probably have similar pigment together with algæ, but our author does not follow out what should be a most profitable line of research.

The statement that corals know "no natural death," does not rest on observation, and is contrary to the few facts we have. No zoologist would consider the rate of growth of corals slow. The observations on



FIG. 1.—The Lagoon Shore of Pulu Tikus, to show the Sand-piling by a westerly wind. From "Coral and Atolls."

peculiarly unfortunate that this figure should have been inserted, since the skeleton of reef corals, with which the author is dealing, consists entirely of dead material. It exposes the writer to the suspicion that he is unacquainted with the real nature of the coral skeleton, and hence largely throws doubt on his really admirable observations on the growth of corals in relation to their environment. These are in no way scientific, but consist of the notes of a painstaking naturalist.

The extraordinary variability in coral skeletons is well known to zoologists, and may aptly be compared to the growth shown by our forest trees in different environments. Reef corals, too, resemble trees in that they are largely dependent for their food on chlorophyll, which is present in minute algæ, living in their digestive cavities. The coloration of most

the forms of growth of corals are not convincing, since our author does not appear to have examined the zooids to see whether he is really dealing in any genus with one or more species. He is hence not justified in stating that the distribution of atoll corals "is a distribution of types and *not of species*." The observations on the effect of silt suggest research, such as has for some years been undertaken by Wayland Vaughan at the Tortugas; they are not definitive enough to be of much value. Vaughan, by the way, found no great difficulty in transplanting corals.

The third part of the book deals with the Cocos-Keeling atoll and its problems, concluding with chapters on the formation of atolls in general. We agree with the author that "it is almost impossible to judge of the method of formation of any atoll not actually visited and examined." The lagoon of Cocos-Keeling is filling up, we are told, both by organic

¹ "Coral and Atolls." By F. Wood-Jones. Pp. xxiii+392. (London: Lovell, Reeve and Co., Ltd., 1910.) Price 24s. net.

growth within it and by material washed into it over the barrier. It may be so, but it does not justify the statement that "atoll lagoons tend, as a rule, to become smaller and shallower," and there is no attempt by reference to other atolls to justify it. Solution and material swept out by the tides are said to have nothing to do with the formation of the lagoons of atolls. The picture of a high island crumbling to pieces within the calm of an encircling barrier reef appears to our author to be contrary to all natural laws. On what view does he explain Agassiz's wonderful series of photographs of Fijian islands within barrier reefs? "In this (his own) description," he states, "it is assumed throughout that the lagoon is a slightly submerged reef"; why this assumption without evidence? The encircling reef is said to be "a mosaic inlay of coral fragments, cemented together into a solid platform," but there is no evidence that it was ever really examined. It is supposed to have grown up as a platform, and many of its constituent organisms must surely have remained in their growth-positions. A similar platform is found at 13 feet above mean tide level; it is stated that such a platform can only be formed below this

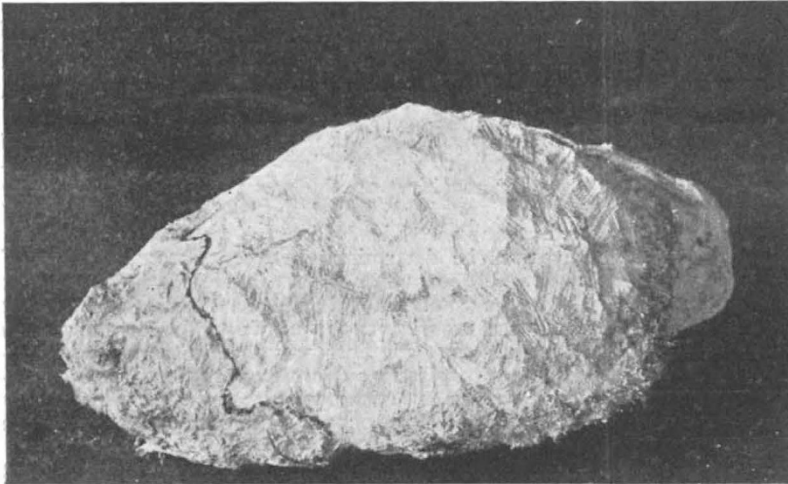


FIG. 2.—Photograph of a Boulder of Alga-covered Dead Coral-Rock, to show the bites of a fish of the genus *Scarus*. The black line marks the edge of the alga covering not bitten away by the fish. From "Coral and Atolls."

level, and its existence is explained as due to elevation.

Our author does good service in directing attention to the important effects of sedimentation. Sedimentation banks largely form the foundations of reefs, but "it matters not what the base may be so long as its platform comes within the wind-stirred area." "Any elevation which rises to this plane (the *limiting line of sedimentation*) will furnish the corals with a suitable basis." The depth of this *line* varies. It is entirely a supposititious *line*, and, so far as we can understand, may lie at any depth. Direct investigation on the processes of sedimentation in the ocean is certainly needed.

In conclusion, it cannot be said that Dr. Wood-Jones has much new to tell us. His volume is, however, a very readable one, and most suggestive of lines of research on corals, which might profitably be pursued by more precise methods. His range of investigation and reading were obviously too restricted to enable him to draw conclusions as to the formation of coral reefs in general. The account of the fauna and flora is very good, and the note on *Scarus* as a coral-feeder interesting. The illustrations of corals

and other organisms are good, but a specialist should have been consulted, so that the names of the coral genera might have been inserted. An obvious Actinian (p. 161) would not then have been labelled as an Alcyonarian.

RESEARCHES IN STELLAR PARALLAX.¹

THE Observatory of Yale College has acquired a deservedly high reputation for the zeal with which the staff has prosecuted the inquiry into stellar parallax and the standard of accuracy consistently maintained. This latest contribution to the subject cannot but enhance that reputation for accuracy, for the results sought do not aim so much at applying the method to fresh instances, as to the re-examination of previous investigations with the view of improving their trustworthiness. Of the stars, the distances of which are here discussed, two-thirds have already been the subject of inquiry at Yale or elsewhere, but on various grounds the results have been regarded with a degree of suspicion that made the repetition of the measures desirable.

The new material falls into two classes, one containing stars having a larger annual proper motion than about $0.4''$; the other, selected stars in the Pleiades the observation of which might afford evidence as to the distance of the group as a whole. As the results derived from these Pleiades stars are not regarded as conclusive, and do not enter into the final catalogue, they may be dismissed here. One star gave the value zero, indicating that the Pleiades group is at the same distance as the star; the measures of another assigned the small negative parallax of $-0.3''$, "a value that would give a possible limit of systematic error"; while the third series, resulting in the value $+0.6''$, suggests that the star does not belong to the group at all, but is nearer to our system, "and this result would seem to be fairly assured." The approximate distance of the Pleiades group still remains a matter of conjecture.

Naturally in a work so long and laborious, difficulties arose in connection with the instrumental and optical equipment, necessitating interruptions in the continuance of the sequences. The most formidable of these was a tendency for the field lens of the eyepiece to work loose, to which inconvenience it is not necessary to refer further, than to express our assurance that the skill and experience of the observers would succeed in effectually removing any traces of systematic error arising from this untoward accident. To show that this confidence is warranted, we may give the final results obtained by the three observers in the case of the Arcturus determination, a star the measures of which have been most scrupulously examined, since for a star of such brilliancy and large proper motion the earlier values of parallax were so suspiciously small, as to suggest that some inherent quality in the star itself, such as colour, or some peculiarity in the observers' method of measuring, had influenced the result. With regard to the detection of

¹ Transactions of the Astronomical Observatory of Yale University Vol. ii., part ii. Parallax Investigations on thirty-five selected stars by Frederic L. Chase, Mason F. Smith, and William L. Elkin (Director). (New Haven: Published by the University, 1910.)