

## Coral Reefs.†

Since 1874, when Darwin, that prince of natural observers, revised and published his "Coral Reefs" in a second edition, the progress of our knowledge of the distribution of the coral insect and the conditions of the formation of coral islands, reefs, etc., has proved that the observations and conclusions published by him fifteen years ago are essentially true. Criticism of, and opposition to, his theory, which has since that time been the generally accepted one among biologists and geologists, have occasionally appeared, and many new facts have been contributed

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\* *Monopolies and the People* (Questions of the Day Series). By Charles Whiting Baker. C. B. \$1.25. New York: G. P. Putnam's Sons.

† *The Structure and Distribution of Coral Reefs*. By Charles Darwin; third edition, with an appendix by Prof. T. G. Bonney. \$2. New York; D. Appleton & Co.

which throw new light on the details and less known aspects of coral formations. No doubt, if Darwin were alive he would have rewritten many pages of the work ; but the changes would have been only such as any generalization is almost inevitably subject to—namely, modifications. In bringing out a third edition of "The Structure and Distribution of Coral Reefs" it was thought best to allow the body of the edition of 1874 to remain intact, supplementing it with a review of the discoveries and opinions set forth by various authors since the publication of the second edition. Prof. T. G. Bonney, the eminent petrographer, who was chosen to undertake the latter work, has ably performed the task, and he has done it in a manner as candid and philosophical as Darwin's. The chief question has been whether the coral reefs, etc., were formed during a period of elevation or of subsidence, as Darwin believed was almost always the case. Professor Bonney has classified the literature on coral formations on this basis, giving, first, abstracts of the opinions of Murray, A. Agassiz, Guppy, and a few others whose views are adverse to those held by Darwin. These are followed by the arguments of those authors in support of Darwin's hypothesis, among whom are Crosby and that experienced observer, Professor Dana. It is found that the great weight of evidence sustains Darwin's views of the occurrence of coral formations during the subsidence of a shore, peak, or shoal, though it occasionally attends a slight elevation; that the lateral growth of a stationary reef in a "fairy ring" is comparatively small and of little importance; that the consolidation of the coral *debris* into limestone is due largely to disintegration caused after death by the animal matter of the polyps themselves, rather than by the solvent power of the water, which he finds to act only with slight effect, and that only when the coral is exposed to currents; and that the thickness of some coral beds is found to be too great to admit of elevation as a theory, which is advocated by some geologists. A simple illustration may be taken from Mr. Crosby's description of Cuba, where he finds a series of vertically walled terraces of coral formation resting against the rugged sides of the mountains in the interior of the island. The first and lowest is of recent age and is 30 feet thick; the second is 200 feet; the third, 500 feet; and the fourth about 800 feet thick. Moreover, the plateau, El Yunque, is over 1,800 feet in height, composed, apparently, of coralline limestone. The upper formations are older, as is shown by their more solid and crystalline structure. The elevation of the island and of the coral reefs, as terraces, is then obvious. But the reef-building corals do not flourish, generally speaking, in water deeper than about twenty-five fathoms. Hence the maximum thickness, even when the ocean bed is at rest, can not be over about 150 feet. The inevitable conclusion, therefore, is that the elevation of Cuba was interrupted and diversified by periods of subsidence, a phenomenon which is constantly occurring in geological history, and notably in the north of Europe during later geologic time.