

stand and are victorious, for here another power, as antagonist to the former, takes part in the contest. The organic forces separate the atoms of carbonate of lime one by one from the foaming breakers, and unite them into a symmetrical structure; myriads of architects are at work night and day, month after month, and we see their soft and gelatinous bodies through the agency of the vital laws conquering the great mechanical power of the waves of an ocean, which neither the art of man, nor the inanimate works of nature could successfully resist.*

As the coral animals require to be continually immersed in salt water, they cannot raise themselves by their own efforts above the level of the lowest tides. The manner in which the reefs are converted into islands above the level of the sea is thus described by Chamisso, a naturalist who accompanied Kotzebue in his voyages:—“When the reef,” says he, “is of such a height that it remains almost dry at low water the corals leave off building. Above this line a continuous mass of solid stone is seen composed of the shells of mollusks and echini, with their broken-off prickles and fragments of coral, united by calcareous sand, produced by the pulverization of shells. The heat of the sun often penetrates the mass of stone when it is dry, so that it splits in many places, and the force of the waves is thereby enabled to separate and lift blocks of coral, frequently six feet long and three or four in thickness, and throw them upon the reef, by which means the ridge becomes at length so high that it is covered only during some seasons of the year by the spring tides. After this the calcareous sand lies undisturbed, and offers to the seeds of trees and plants cast upon it by the waves a soil upon which they rapidly grow, to overshadow its dazzling white surface. Entire trunks of trees, which are carried by the rivers from other countries and islands, find here, at length, a resting-place after their long wanderings: with these come some small animals, such as insects and lizards, as the first inhabitants. Even before the trees form a wood, the sea-birds nestle here; stray land-birds take refuge in the bushes; and, at a much later period, when the work has been long since completed, man appears and builds his hut on the fruitful soil.”†

In the above description the solid stone is stated to consist of shell, and coral, united by sand; but masses of very compact limestone are also found even in the uppermost and newest parts of the reef, such as could only have been produced by chemical precipitation.

In these instances the carbonate of lime may have been derived from the decomposition of corals and testacea; for when the animal matter undergoes putrefaction, the calcareous residuum must be set free under circumstances very favourable to precipitation, especially when there are other calcareous substances, such as shells and corals, on which it may be deposited. Thus organic bodies may be inclosed in a solid cement, and become portions of rocky masses.‡

* Darwin's Journal, &c., pp. 547, pp. 331—333.
548., and 2d edit., of 1845, p. 460.

† Stutchbury, West of Eng. Journ.,
‡ Kotzebue's Voy., 1815-18, vol. iii. No. i. p. 50.