

2. *Animals*. — Radiolarians or Rhizopods, having siliceous shells, make Radiolarian ooze in the deeper parts of the ocean. Sponges contribute much silica in the shape of spicules and skeletons to deposits from shallow depths to the lowest. Globigerinæ with other Rhizopods make Globigerina ooze, especially between depths of 1500 and 2900 fathoms, but not in the higher latitudes. Pteropods are a characteristic of other bottom deposits between 500 and 1400 fathoms.

But besides these characteristic species there are also the solitary Corals, the Echinoderms, Mollusks, and various other abyssal species, giving variety to the fossils of the sea-bottom. There are also at the bottom the relics of the great variety of pelagic species which after death escape feeders and sink to the bottom. Murray says that, in the course of the Challenger cruise, over 600 Sharks' teeth (genera *Carcharodon*, *Oxyrhina*, and *Lamna*) and 100 ear-bones of Whales (genera *Ziphius*, *Balænoptera*, *Balæna*, *Orca*, and *Delphinus*), along with 50 fragments of other bones, were obtained in one haul of the dredge in the central Pacific. The locality was, however, not in either of the organic oozes mentioned, but in the "Red ooze"; and the phosphatic nature of bone was its protection from carbonic acid. Along the course of the Gulf Stream and of its abundant life, the bottom deposit is largely earthy or "terrigenous," and sometimes contains stones of considerable size which were distributed by the floating ice of the Glacial period.

The blue and gray muds of the sea-bottom, which are common in the Pacific, are due to the volcanic dust, cinders, and pumice with which it has been sprinkled by the ocean's aerial volcanoes, and to their decomposition; and Phillipsite (page 136) is found chiefly in the areas of the Red ooze.

## 2. Deposits from Littoral Species.

The process of limestone-making by shells and corals is essentially the same in its more important steps, and therefore only the latter is here considered.

### CORAL FORMATIONS.

Coral formations are made from the calcareous secretions of coral-making polyps, with large contributions from the shells and other relics of the littoral fauna.

Coral formations, while of one general mode of origin, are of two kinds:—

1. *Coral islands*. — Isolated coral formations in the open sea.
2. *Coral reefs*. — Banks of coral, bordering other lands or islands.

The positions of the coral-reef seas and the causes of limitation are explained on pages 46, 56, and illustrated on the chart, page 47.

The *exclusion of corals* from certain tropical coasts is owing to different causes:— (1) Cold extratropical oceanic currents, as in the case of western South America (see chart). (2) Muddy or alluvial shores, or the emptying of large rivers; for coral-polyps require clear sea water and generally a solid