for transforming a visible layer of coral skeletal material into fossil form.[28] When we break a piece of coral rock off the side of a reef, we find living organisms covering the surface of the removed piece. But when the fragment is sawed in two, fossilized skeletons are usually found only an inch or two beneath the outside surface. The fossilized skeletons found in these fragments often exhibit radical differences in texture and composition from what is observed in the unfossilized organisms at the surface.

Fossilization also occurs in the sediments which are found gradually accumulating around the base of the growing masses of coral. Cementation, which is an advanced stage of the fossilizing process, often begins at a depth of 30 centimeters (about 12 inches) in these sediments.[29] This process of cementation fossilizes and binds the shells of many small marine organisms present in the sediment, thus forming a kind of rock which shows a high percentage of very small skeletal units throughout.[30] Whether or not this cementation will progress to the point of forming hard rock depends on the amount of water currents forcing water through the pores of the sediment mass.

Just what is a fossil? Even though we frequently talk about fossils, our conception of their nature seems often to be rather vague. We can gain a better idea of their nature by considering some of the different forms in which fossils are found in reefs and other sedimentary environments. Most of these forms of fossils have been well known for several decades, and some for much longer. We will here concentrate mainly on the kinds of fossils found in reef environments.

1. Essentially unaltered skeletons or skeletal parts. This type of preservation is illustrated in some of the fossil corals found in the drillings in the Marshall Islands.[31] In this case the coral specimens were so perfectly sealed in the reef that the percolating waters did not have opportunity to appreciably alter their chemical make-up or structure.

2. Replaced skeletons. These are represented by marine shells, masses of coral skeleton, and other calcareous bodies which have had the substances of their hard parts replaced bit by bit--often molecule by molecule--by some other mineral. This leaves a skeleton identical in shape and appearance to the original one, but composed of a more permanent type of mineral. The most common minerals which replace the original shell material are silica (silicon dioxide, the main component of hard sandstone), iron pyrite, iron oxide, and calcite.[32]

3. Molds and casts. If a shell or other form of skeleton is buried in sediment and then dissolves away, leaving a cavity in the hardening sediment, the remaining imprint of the outside of the shell against the cavity wall is called an "impression" or "mold" ("external mold," in this case). Frequently such a cavity, with its impression of the shell's surface, is later filled in by fresh sediments. If these sediments harden, we then have a "natural cast." In this case