

The Drilled Stratigraphic Column at Eniwetok

We can not, in this volume, give a detailed description of the local stratigraphic column²⁰ which was elucidated by the Eniwetok drillings, but a brief description of what the drilling cores revealed will help explain why we must regard the atoll as having had a long history. (Drilling cores are sections of the stratigraphic column which have been lifted out intact by means of a special drill.) H. S. Ladd gives a detailed, stage-by-stage description of the materials brought up by the drills on Eniwetok.²¹ Of course practically all of it is limestone, with many fossils--especially corals, Foraminifera, and algae--embedded in it. Numerous, and sometimes extensive, sections of the column were composed of hard, fossilized, cemented coral skeletons. Other sections were sometimes composed of limy debris which contained high percentages of the skeletons of other types of calcium-secreting organisms. In some layers the coral fossils showed a great amount of wear (erosion), whereas in other layers much less wear.

As the test drillings were being made at Eniwetok, with the drill passing through successive layers of reef limestone, it was observed that some of the limestone layers showed marked evidence of leaching and weathering. These features can occur only as a result of long-time exposure of the limerock, either in the intertidal zone, or above the level of high tide. Such long periods of exposure represent unconformities which greatly add to the length of time required for building the reef. Three very definite, extensively weathered unconformity levels of this type were found, at depths of 300 feet, 1,000 feet, and 2,780 feet respectively.²² The fact that these particular unconformity levels represent periods of prolonged emergence is indicated not only by weathering, but also by the type of cementation found in the limestone layers which lie just beneath the unconformity. This limestone shows the typical kind of calcite cementation which occurs when limestone lies for many years just above the salt water level along a seashore.²³ In this environment much of the calcium carbonate of the limestone dissolves and is replaced by a "cement" composed of very small crystals of a more pure form of calcium carbonate called "calcite".

In addition to the evidence from these weathered unconformity levels, the fact that at least parts of the top of the atoll were exposed well above sea level for a long period is further indicated by the presence of large amounts of pollen in several of the layers of sedimentary material. During certain times, either the foundation of the atoll arose somewhat, or else the sea level fell. (We do know that the sea level was much lower than at present during some of the Pleistocene Epoch.) The prolonged exposure of the top of the reef of course resulted in the death of the corals and other lime-secreting organisms which require continuous submergence, except around the outer perimeter where the water was still present. The presence of very high counts of pollen of seed-bearing trees and shrubs in the drilling samples shows that parts of the atoll were exposed for many years--probably many centuries--giving opportunity for the growth of seed-bearing trees to become established.