

E. B. Leopold of the U. S. Geological Survey made an extensive study of the pollen of seed-bearing plants, and of the spores of some of the "lower" vascular plants found in the drilling samples taken from the Eniwetok test wells. Appreciable amounts of pollen were found at numerous depth levels of the atoll, but the zone of 2,440 to 2,510 foot depth, and the zones from 820 to 880 feet and 670 to 680 feet, yielded large amounts of pollen from the numerous drilling samples tested. Several of the samples yielded more than 10,000 pollen grains per gram of reef rock or sediment, and one sample from the 830 foot level contained 100,000 pollen grains per gram (28.3 grams = one ounce, avoirdupois weight.)²⁴ In most of these samples approximately one-half of the pollen was identified as being from various species of mangrove trees. Figure 6 shows photomicrographs of one of the kinds of fossil pollen from drilling samples taken from the 830 foot level in the Eniwetok atoll.

There are modern species of mangrove trees growing on many of the islands of the Pacific at present. They are prolific producers of pollen, but the pollen count in modern sediments taken right near where these trees grow has been found to be no greater than the count in the above described sediments from deep in the Eniwetok atoll. An abundance of pollen such as was found in these ancient sediments of course indicates that there were periods of time when many pollen-producing (seed-bearing) plants grew in the immediate vicinity, and that later the sea level changed, allowing the coral reef to continue its growth. There is no possibility that such high concentrations of pollen could have been blown or washed in from distant points.²⁵

Thus a reasonably good reconstruction of the history of the Eniwetok atoll has been made, by taking note of the rock and sediment types, the many kinds of marine fossils, the distinct unconformities, and the kinds of pollen and other remains of terrestrial life. All of these tell us that the reef has had a long and varied history, with numerous major interruptions in its development.

Other facets of this atoll's history have been established through a knowledge of the growth habits of the kinds of organisms which built it, for example, the photosynthetic nature of most of the major reef-forming organisms. Both the reef-forming corals and the various kinds of calcareous green and red algae which help build the reef require light, and therefore can flourish only at shallow depths. This tells us that a great amount of change of sea level, in relation to the atoll, had to occur during the development of such a massive and "high" structure. Very little growth of calcareous algae occurs at depths greater than 300 feet,²⁶ and corals rarely flourish at more than 100 feet. (Corals are dependent on microscopic forms of algae which grow symbiotically in their outer body walls.) Some of the changes of ocean level were undoubtedly due to the buildup and melting of glaciers at the poles of the earth.

Another factor which most likely helped in maintaining the proper water depth for reef growth was the change in elevation of