

Thickened parts of such beds are called stromatolites, which are often found in great abundance, both in ancient limestone, and in modern coastal areas where evaporative conditions have alternated with tidal flooding. Figure 25 is a photograph of an Australian coastal area which is covered with modern stromatolites. Geologists are careful not to assume that all ancient stromatolites were formed under exactly the same environmental conditions as those being formed today. However, the similarity of the modern and the ancient in this case is unmistakable, and in some ancient ones, identifiable algal filaments are preserved in the laminations.¹⁸ These, together with the many similarities of lamination patterns and of sediment particles, give more than sufficient evidence of the relationship of the modern and the ancient stromatolites.

The ancient deposits of stromatolitic limestone are both widespread and extensive in volume. They are present in carbonate rocks of all geological periods, especially in the Precambrian, Cambrian, Ordovician, and Pennsylvanian Periods. In the United States, the best known of the great beds of stromatolitic limestone which are exposed (outcropping) are in Montana, Arizona, Michigan, Vermont, New York, and Pennsylvania.¹⁹ The stromatolites and other algal-mat structures are regularly found in growth position, closely resembling the manner in which they are distributed in modern stromatolite beds.

In the Rainbow Lake area of Alberta, Canada, extensive stromatolite-containing deposits are found at depths of from 4,000 to 5,000 feet. These are found in the oil-bearing strata next to, and also cemented against, the sides of some of the better-known atoll reefs in the Rainbow oil fields. There are up to 25 feet of thickness of stromatolitic limestone found in the well cores from this particular area.²⁰

It is significant that almost all of the stromatolites in these Devonian deposits are associated with evaporative sequences. (It will be remembered from Chapter 5 that the Rainbow reefs are covered by many layers of evaporite minerals, and that some of these are in sabkha sequences.) This is in agreement with the fact that many of the stromatolites of today are formed on arid coasts where evaporative conditions exist. Another important fact concerning these Canadian stromatolites is that, while some of them are found along the sides of the cone-shaped reefs, none are found interlayered with the reef limestone. The stromatolites are found in growth position about one-half way up the sides of the atolls. The conditions under which laminated algal mats can form are not the same as those which are conducive to reef-growth. Thus a time sequence is evident, in that the reef rock was formed before the stromatolitic limestone along its sides.²¹ Then of course the entire reef structures were later covered by evaporative minerals.

All of the limestone which has been formed by algal mats, which we have been discussing, is of significance as a time indicator. No bed of limestone which contains stromatolites in growth position