

The Lack of Compaction

Still another reason why it is impossible to conclude that any significant proportion of the limestone sediments was deposited within a short time is that most limestones show that they were formed without significant amounts of compaction. (Compaction is the compressing together of sediment particles which occurs when considerable weight of sediments above presses down upon them.) The internal structure of nearly all known limestones shows that the sediments and fossils were not greatly compacted before they became lithified. (Lithification is the sum total of the processes which result in the transformation of the sediments into rock.) When samples of the limestones are examined with a petrographic microscope, the sediment grains and fossils are not packed together tightly as they are in rock which was compacted as lithification took place. In fact, the amount of pore space between the grains, plus the volume of the cement crystals which have formed in between the grains, is commonly found to total 40 to 50%.⁵ In the case of ancient limerock which now has 10% internal pore space, the amount of cement will thus be 30 to 40% of the volume of the rock. Evidently, in a given layer of sediment, a large proportion of the cement crystals was built in before any great weight of sediments was added on top of the layer.

Even the skeletons of very delicate fossilized animals are frequently found unbroken, because the cementation of the sediments immediately surrounding them protected them from the weight of heavy deposits added later. The cement crystals themselves are delicate, and are known to form only very slowly; but eventually they do provide sufficient rigidity to prevent further compaction, and to maintain the 10% porosity mentioned above, even though a mile or more of other rock layers are added on top of the limestone. Bathurst and others have calculated from known cementation rates that 80,000 to 90,000 years are often required for normal filling in of the spaces between the sediment grains in a given limestone layer.⁶ Certainly, at least 25 to 40% of this cementation had to be accomplished before thick deposits were added on top. Otherwise, what cement crystals had already formed would have been crushed, and would not be seen to be intact when examined with the petrographic microscope.

Workers Boring and Building

We have frequently referred to the fact that a great deal of the marine limestone which is found, both deep in the earth and near the surface, is in separate layers. We speak of these rock deposits as being "bedded." The divisions between layers in such deposits are caused by a number of factors, including a change in the currents on the sea bottom, and chemical changes in the environment which may bring about a cessation of the carbonate deposition process.

When one goes to a limerock quarry and pulls or pries some of the bedded layers apart, examining the upper surfaces of the layers, he sometimes finds the record of both boring and building processes. These processes formed various markings and raised areas on the