samples taken from the Superior Oil Company well have been impressed by the several sudden changes from limestone to dolostone, as one proceeds up or down this stratigraphic column. Also, within the bodies of limestone and of dolostone of the Bahama Banks there are abrupt changes to other varieties of these rock types. Any change from limestone to dolostone is highly significant, because it represents not only a change in the marine environment, but also a period of many years for converting the carbonate sediments to dolostone. This important principle will be explained in the latter part of this chapter.

We know that limestone is forming on the Banks, and on shallow sea floors in other parts of the world, by the cementing together of carbonate grains such as those described above. Whenever a particular, favorable set of environmental circumstances exists, a layer of one variety of limestone is formed from the carbonate sediments which are present. Later, a change in one or more factors of the environment results in the formation of a somewhat different variety of limestone.

A familiar example of a type of limestone which is now forming by the cementing together of carbonate sediment grains is what is called "beach rock." Beach rock sometimes forms within less than a human lifetime, on tropical and subtropical beaches, in some parts of the world. Sometimes pieces of it are found to contain man-made objects such as beer bottles.[10] However, such rapid limestone formation is unknown in other types of environments. Cementation proceeds very slowly except in an environment where the sediment mass can be exposed to rainwater at least part of the time. The process consists of a gradual forming of minute crystals of calcium carbonate mineral in between the pellets, oöids, and other types of grains of which the rock layer is formed. Figure 22 shows some of this type of crystal. Such crystals are easily observed in practically any limestone or dolostone, with a high-magnification petrographic microscope. (In order to observe the cement crystals, the piece of rock must be sawed and then ground so thin that light will pass through it.) Ancient sedimentary carbonate rocks, as well as young ones, show this cementation when examined microscopically.

The carbonate substance for the process of cementation is carried to the grains by the mineral-laden water which circulates between them. This type of cementation, if it is to occur, has to be accomplished while the proper type of water and water circulation are available. Deep burial usually cuts off the necessary type of water supply needed for cementation. This is one of the reasons why the Bahama Banks could not have been formed by any sudden or rapid piling up of sediments.

We should also mention here that geologists have found convincing evidence that some of these deep limestone layers of the Great Bahama Bank were lithified during periods of exposure. Apparently there were times when the upper surface of the Bank was even higher with respect to sea level than now, allowing exposure to rainwater.