

OKLAHOMA ROCKS!

Lesson 2: Limestone and the Arbuckle Mountains

Most limestones form in shallow marine environments, commonly in warm, tropical waters. The Arbuckle Mountains contain thick sequences of carbonate rocks that formed when seas covered the area during the Paleozoic Era. Carbonate rocks include limestone, made predominantly of the mineral calcite (calcium carbonate, CaCO_3), and dolomite or dolostone, made of the mineral dolomite [calcium-magnesium carbonate, $\text{CaMg}(\text{CO}_3)_2$].

Limestones can form by inorganic or organic precipitation of carbonate. Inorganic precipitation occurs when changes in temperature or water pressure occur. Other minerals that form by inorganic precipitation include salt (halite) and gypsum. Limestones can also form by organic precipitation, in which marine invertebrates form carbonate shells. When the invertebrates die, their shells can accumulate and form limestones. If the shells are large enough, the fossils can be observed.

Because many limestones are made of shells of invertebrate organisms, limestones can be studied to understand changes in marine environments and life through time. For example, trilobites are common in limestones of Paleozoic age. However, trilobites are not found in Mesozoic and Cenozoic limestones because they became extinct at the end of the Paleozoic Era. Any limestone containing trilobites, then, must be older than about 250 million years, the time of the end of the Paleozoic. Similarly, branching bryozoans are delicate organisms that require calm waters to exist and thrive. Thus, limestones containing branching bryozoans must have been formed in quiet, unagitated waters.



Limestone showing stromatolites which in this photo are the rows of dark material with rounded tops in the limestone. Stromatolites are clumps of microorganisms preserved by a hard layer of sand or precipitated minerals, and are among the earliest and most common fossils. They are still forming on the Earth.

Questions:

1. Where are limestones forming today? What does this suggest about the environment in Oklahoma during the Paleozoic when the limestones in the Arbuckle Mountains formed?
2. What different types of invertebrates have shells found in limestones? Which of these have gone extinct and which are still living today? For the extinct invertebrates, at what time did it go extinct, and how is this related to the geologic time scale?
3. How are carbonate rocks important economically? Are there any limestone buildings in your town? Where did the limestone come from?

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