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CLYDE H. MOORE, JR.—Biographical Sketch

Dr. Moore was born in Jacksonville, Florida. He received his B.S. in Geology from Louisiana State University and his M.S. and Ph.D. in Geology from The University of Texas at Austin. He began his working career as a Research Geologist with Shell Development in Houston in 1961. In 1966, he left Shell to join the faculty of Louisiana State University, where he is currently Professor of Geology and Director, Department of Geology, Applied Carbonate Research Group.

Dr. Moore's research interests include carbonate cementation in mixed marine-meteoric water systems, sediment budgets and distribution patterns in Holocene reef systems, trace-element geochemistry of carbonate cements, and pore-space evolution in ancient carbonate-rock sequences. Dr. Moore is a member of the American Association of Petroleum Geologists and is on tour as a Distinguished Lecturer for the AAPG.

DIAGENETIC CONTROLS OVER POROSITY DISTRIBUTION IN ANCIENT CARBONATE-ROCK SEQUENCES (Abstract)

by Dr. Clyde H. Moore, Jr.

The distribution of original porosity in carbonate-rock sequences at the time of deposition is a function of textures and fabrics controlled by processes in the depositional environment. Carbonate sequences representing high-energy environments such as beaches, marine bars, and tidal channels can be expected to have high original porosity because of their relatively coarse, well-washed textures. This relation between original depositional environment and pore-space distribution leads to a basic exploration strategy widely utilized both in quartzose clastic and carbonate provinces.

In corbonate-rock sequences, however, the ultimate nature and distribution of porosity commonly are the result of diagenetic processes that act either to occlude primary porosity or to generate secondary porosity during the postdepositional history of the sequence. Three ancient carbonate-rock sequences illustrate diagenetic controls over ultimate porosity distribution.

A localized carbonate-sand sequence in the Lower Cretaceous Edwards of west-central Texas is a well-developed beach sequence which has undergone extensive syngenetic diagenesis. The present pore system is entirely secondary, having been generated by preferential solution after the general occlusion of its primary pore system by early cementation and silicification. The final pore-space distribution of the carbonate beach is completely independent of original depositional textures.

Lower Cretaceous shelf-edge rudist-reef sequences long have been exploration targets along the northern and western Gulf margin, and much of the success has been confined to the western or Mexican part of the trend. In general terms, exploration of the Texas and central Gulf has confirmed the trend of the Stuart City rudist shelf-edge sequence, but little commercial porosity development has been found. Studies of similar sequences in exposures in central Texas and Mexico indicate that early syngenetic diagenesis acts to occlude most original porosity in rudist-reef sequences, and that exposure to fresh water prior to mineral stabilization is probably necessary for the generation of significant secondary porosity. Studies of the subsurface Stuart City trend have developed little evidence for significant freshwater influence during its burial history; this may explain its general lack of commercial secondary porosity.

The Jurassic Smackover in southern Arkansas appears to be a classic stratigraphic trap in carbonate rock with original porosity preservation, and the trapping mechanism appears to be porosity pinchout into nonporous lagoonal-mud facies. In reality, however, the Smackover porosity occlusion is by cementation, and porosity distribution is controlled by diagenetic processes rather than environmental parameters. Primary porosity is preserved preferentially in the vadose zone associated with penecontemporaneous salt tectonics.

It is clear from these examples that exploration-exploitation strategies in carbonate provinces must utilize the concept of total rock history, taking into account both depositional and diagenetic regional trends and models in any attempt to predict the distribution of potential reservoir rocks.