

# THE SEARCH FOR THE SUBTLE CLUE, CARBONATE EXPLORATION IN THE SEVENTIES

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Exploration for carbonate reservoirs in the next decade will necessitate knowledge of depositional, diagenetic, and epigenetic processes influencing porosity origins and characteristics. These processes often leave only subtle clues of their presence in the surrounding less altered non-porous sediments.

New tools and methods such as the scanning electron microscope, micro-probe, electronic data processing, and the myriad laboratory procedures will extend our analytical and perceptive ability. They will not in themselves alleviate the need for sound geologic reasoning or applied research, coupled with original exploratory thinking. The cost of such exotic tools and methods often place them beyond the range of all but the most sophisticated laboratories and universities. Their use by the general exploration fraternity is negated except under unusual circumstances. Through use of the current less expensive disciplines at our command, it is possible to search for the subtle clue which, in turn, may lead to the elusive trap in carbonate sediments.

During the past decade and continuing into the Seventies, tremendous expenditures of time and funds have expanded our knowledge of present day depositional processes. Correlation of these with fabrics in ancient rocks have shown some direct corollary between producing reservoirs and their depositional porosity origins. Much remains to be done in this basic first step in our understanding of carbonate reservoirs.

A less explored but equally vital area of investigation is the study of ancient rock sequences and the epigenetic processes, initiated by burial, uplift and structural movement, which have modified and created their present day porosity and rock fabric. These studies may be referred to as the second step in extending our exploratory effort in carbonate sediments.

Structural folding (often of *limited* magnitude) can modify or destroy pre-existing sedimentary textures in carbonate rocks and through the processes of fracturing, recrystallization and tectonic dolomitization, create a new porosity fabric which is related to and controlled by the local or regional structure. Surface studies have shown that this type of modification and alteration can affect a variety of lithic types with progressive alteration. Clues to its existence may be extremely subtle in surrounding less altered sediments.

In the subsurface the Scipio-Albion pool of Michigan is an exact corollary of such a structurally controlled reservoir porosity. A complex system of transcurrent faulting in the basement, coupled with en-echelon folding of the sedimentary section, has created localized dolomite porosity development, with major oil pool significance. This type of reservoir can be predicted through careful rock examination and correct structural interpretation.

Structurally controlled porosity through fracturing and alteration is not unique. With or without recognition of its origin, such reservoirs are and have been drilled or produced in the Hunton and Viola of the Mid-Continent Region, the Smackover and Edwards of the Gulf Coast, and in a variety of carbonate sections throughout the world. Oftentimes these producing porosities have been lumped with those of depositional origin.

In the Seventies our job will be to search for the subtle clue in potential producing areas, to separate the porosity origins in our older or semi-developed pools, and to refine our techniques of predictability based upon corroborative rock studies.