Stratigraphy, Sedimentation, and Seismology

H. M. THRALLS, Geo-Prospectors, Inc., Tulsa, Oklahoma

Many measurements of physical properties are made in bore holes which are used by geologists as geological information. These physical properties are accepted without question as aids to the application of geologic principals in the search for and development of oil fields. Seismology (and other geophysical methods) should be placed in the same category as bore-hole measurements and accepted in the same manner.

The classification of geophysics as a distinct and separate science apart from geology is extremely unfortunate even though it is understandable. The definition of geophysics as an independent science was the result of the difference in background and training between the early-day geophysicists (physicists) and members of the already established and respected geological profession. Jealousy undoubtedly was a contributiug factor. However, the time is long past when members of either one of the so-called separate professions has anything to gain by being snobbish or aloof.

The term "scientific success and commercial failure" applied to a dry test drilled on the recommendation of geophysics indicates that they have forgotten their assignment, i.e., to find oil at costs commensurate with market prices. The use of the foregoing descriptive term emphasizes that the test location was chosen without proper consideration of all the factors involved. The failure of the test to find oil can mean only that the geophysicists, the geologists, or both arrived at an improper solution, and they can derive no professional satisfaction from the dry test even though the formations were encountered in the predicted positions.

Many tests classed as geophysical failures are actually geological failures, particularly if they can be described by the false term "scientific success and commercial failure." Analysis by the exploration team in these instances placed too much weight on geophysical data and failed to include the all important background studies of stratigraphy, sedimentation, and the historical geologic movements that determine where and when oil was and is present.

Geologists must consider geophysics as a geologic tool. Geophysicists must strive to be geologists. Geophysical data must be transferred into geological solutions. Prospects must be selected that are favorable from the standpoint of stratigraphy, sedimentology, and historical deformation. A combined knowledge of all of these is the requirement for successful oil finding.

Geophysics, Geology, and Economics in Deep Fields

PAUL WEAVER, A. and M. College of Texas, College Station

O. C. Clifford last March concluded that our oil finding will pay off if directed to areas not presently producing. Morgan Davis in November stated that both old and new areas in the United States are contributing to new production. Also in November, L. F. McCollum contended the most pressing problem was economic, that of cost reduction, especially in development and lifting costs, but also in the 35% of total cost he classified as for exploration.

All of these authors seemed concerned with the drilling-in and production of fields similar to those we now have, and did not appraise separately deeper prospective production, which will be the exclusive subject of this paper.

To this end the physics of deeper rocks must be set forth, if different or distinct for production from those now exploited.

Secondly, consideration must be given to the resolving power to find deeper structures by geophysics, and subsequently the aid possible from geophysics in development. Economics of both must be improved if the greater cost of each deep well is to be offset by reducing total number of development wells if possible, as advocated by McCollum.

Methods of effecting these ends include: (1) using physical measurements of larger rock units than cores, e.g., velocity surveys; (2) figuring back in time to date the epochs of diagenesis, of folding, and of fluid migration, and (3) predicting pressure reduction effects on sediments, to preclude production losses and extra costs, such as at Wilmington, California, described last March by U. S. Grant.

This topic is a concrete phase of concurrent geologic-geophysic deductions, which seem to have been applied too meagerly in the past to development programs to assist cutting costs.

Similar applications are indicated for water production.

Oil Accumulation Related to Geologic History of Muenster Arch and Associated Basins in North Texas

H. H. BRADFIELD, Dallas, Texas

The chief geologic asset of the region is the thick sedimentary section of Ordovician and Pennsylvanian deposited on the flanks and adjacent to the Muenster arch in the Marietta and Fort Worth basins. These beds contain ample reservoir rocks and abundant source materials for petroleum and natural gas. The dominance of progressive onlap over the arch during the majority of Pennsylvanian time is the second most important feature.

A third important factor is the orogenic history. The extensive and complex faulting may be ascribed to four dominant periods of movement.

1. There was widespread block faulting of probable late Morrowan age, associated with the transformation of the Arbuckle sedimentary basin into partly separated troughs.

2. After erosion had truncated the Ordovician deeply on the Muenster arch and even on fault blocks now low in the adjacent basins, subsidence allowed the Dornick Hills (Bend) beds to overlap the fault blocks with subsequent and sometimes contemporary rejuvenation of some of the faults. (On the northeast flank and in the Gordonville trough area, normal sands were deposited on buried hills like the Sherman and Big Mineral highs and as updip pinch-outs like Sadler field. On the southwest side of the uplift in the Fort Worth basin, beds of this early transgression contained numerous lenses of conglomerate which are prospective for oil and gas in most any structural situation.)

3. Uplift of the Ouachitas, regional westward tilting, tremendous subsidence of the Marietta basin, Gordonville trough, and to less extent, the Fort Worth basin, produced foundering of grand proportions along the trough margins. The long period of progressive inundation of the Muenster arch and its final burial by detritus, chiefly derived from the Ouachita uplift on the east, was probably responsible for much of the oil accumulation in the abundant Pennsylvanian sands. Many stratigraphic traps were formed due to the lenticularity of the sands and updip porosity terminations, where structure may play only a minor role in accumulation. Some of these onlapping beds likewise seal the truncated edge of the Oil Creek (Simpson) sand on the north flank of the arch, where aided some by faulting, three commerical accumulations have been found.

4. A final period of folding and faulting took place during the late Pennsylvanian-Arbuckle compressional movement which resulted in overturning and thrusting in some places. Oil accumulation at Big Mineral and Sherman was aided considerably by this crustal movement.

Petroleum Geology of Anahuac and Frio Formations of Northeastern Mexico

LAURO A. YZAGUIRRE, Petroleos Mexicanos, Reynosa, Tamaulipas, Mexico

During the past 14 years, Petroleos Mexicanos has carried on an extensive drilling program. This has been principally concentrated along the Frio-Vicksburg trend. The Frio has been the most prolific producing formation in northeastern Mexico. Of its three facies, non-marine, brackish, and marine, the first named is the most productive.

Locally overlying the Frio, both on the surface and in the subsurface, is the Norma