ABSTRACT

Regular Evening Meeting

DELTAS, THE FAVORED HABITAT OF OIL AND GAS

Lecture by E. H. Rainwater, Tenneco Oil Company, Houston, Texas
to Houston Geological Society, March 13, 1972

Oil and gas accumulations occur in sediments which were deposited rapidly and which had abundant organic material that was preserved by rapid burial. Ancient deltas had optimem conditions for the formation and preservation of abundant petroleum source material, deposition of porous sands, and syndepositional development of stratigraphic and stratigraphic-structural traps. Sands which were deposited in other environments, such as eolian, fluviatile, true barrier islands, and shallow, stable shelf marine are generally unfavorable for the occurrence of oil and gas. Therefore, finding ancient buried deltas is a major petroleum exploration objective.

Deltas are constructed in segments of the coasts of oceans or interior seas where subsidence is faster than in adjacent segments. Many modern deltas are located over or near Tertiary deltas, at the landward margin of basins ("geosynclines") which were downwarping for long periods. Some present-day deltas, however, are far removed from any older deltas, and most of the known pre-Tertiary deltas are located in the interior of continents.

Structural movements controlled the locations, size and configuration of deltas. Therefore the tectonic activity that took place within the sedimentary basins and in the sediment-source areas should be determined as accurately as possible. Embayments of the coasts, shown by positions of ancient shorelines during transgressive periods, may have been chutes for large quantities of sediments during regressions. In large basins which subsided more or less uniformly major deltas prograded seaward and shifted laterally. Examples are in the Gulf Coast (Tertiary), Alberta Basin (Cretaceous), Illinois Basin (Late Mississippian) and northern Appalachian Basin (Late Devonian). Many ancient deltas were constructed in narrow subsiding coastal blocks, such as the Burma Basin (Tertiary) and the Cook Inlet Basin (Tertiary), where there was little lateral shift in depocenters and where there were only minor marine transgressions and regressions. Rapid deposition of sediment with abundant indigenous and transported organic debris characterized both types of deltas, and petroleum accumulations are in each type.

The lecture will describe and illustrate the occurrence of petroleum in deltaic sediments of several sedimentary basins in North and South America, West Africa, and Southeast Asia. Some characteristics of modern deltas will be discussed, as an aid in predicting the location of undiscovered ancient buried deltas.

BIOGRAPHICAL DATA

E. H. Rainwater

E. H. (Rainey) Rainwater was born in Mississippi and attended Mississippi State, Northwestern and Indiana universities, majoring in geology. He worked for Shell for many years as micropaleontologist, stratigrapher and research geologist. Since 1963 he has been world-wide geological consultant for Tenneco Oil Company. For brief periods he was professor of geology at Mississippi State University and lecturer in geology at the University of Houston and the University of Tulsa.

Rainey has published more than 40 papers on stratigraphy, sedimentation, micropaleontology, the habitat of oil and gas, and future petroleum provinces of the United States. He was Distinguished Lecturer for A.A.P.G. and, since 1966, he has been a lecturer for A.A.P.G.'s *Continuing Education Program*. He is honorary member of the Houston Geological Society and the Gulf Coast section of S.E.P.M., member of A.A.P.G. and fellow of G.S.A.