# ABSTRACT

#### Regular Evening Meeting

## GEOLOGY AND ENVIRONMENTAL FACTORS AFFECTING GIANT FIELDS

by

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At least 187 giant oil fields and 79 giant gas fields are known in the world today. Giant fields are those that contain 500 million barrels or more of recoverable oil, or 3.5 Tcf or more of recoverable gas, or an equivalent combination of gas and liquids which has a calorific value equivalent to 500 million barrels of oil. Altogether these fields contain an estimated, minimum ultimate recoverable reserve of 638.77 billion barrels of oil and 1, 180 Tcf of gas or approximately 30-40% of the total known world recoverable gas. Most giant fields (190=71%) are in the Eastern Hemisphere; only 76 (29%) are in the Western Hemisphere; 81% of those in the Eastern Hemisphere (58% of the world's total) are in a U-shaped belt 6500 miles long and 475 to 800 miles wide that extends from Algeria to the Arctic Ocean at the longitude of the Polar Urals.

Giant accumulations show a distinct preference for certain geologic environments. Platform, semiplatform (parageosyncline), and platform-margin areas contain 83% (211 fields) of all giants; only 17% (45 fields) are in other geologic environments (e.g., fold belts, actively subsiding grabens, etc.). The numerous giant fields in platform-related areas suggests that giant fields are more likely to be preserved in tectonically stable environments.

Of the reserves in giant oil fields, 58% are in sandstone and 42% are in carbonate reservoirs (an unusually large percentage of carbonate reservoirs are in the Middle East); of the reserves in giant gas fields 75% are in sandstone and only 25% in carbonate reservoirs. A total of 29% of the oil and 10% of the gas are in Tertiary strata; 63% of the oil and 65% of the gas are in Mesozoic beds; and 8% of the oil and 25% of the gas are in Paleozoic reservoirs. The abrupt increase in the number of giant fields in Mississippian and younger beds very possibly reflects the sudden proliferation during Late Devonian and Mississippian times of plant life in the terrestrial and, particularly, in marine environments. However, giant accumulations are not restricted to marine sediments. Of the 266 giant fields 6% (5 oil fields, 10 gas fields) are in rocks of nonmarine origin and 15% contain major oil and/or gas reserves of probable nonmarine origin.

Giant hydrocarbon accumulations require (1) abundant organic source materials; (2) depositional and postdepositional environments suitable for accumulating, preserving, and converting the organic materials into mobile hydrocarbons; (3) efficient carrier beds; (4) voluminous and/or high-quality reservoir rocks; and (5) a giant trap, ideally syndepositional. Unconformities, though important in some fields, are not important in most. Geothermal gradient can be of importance in controlling the types of hydrocarbons present and their degree of mobility during migration.

#### BIOGRAPHICAL DATA - Michel T. Halbouty

Michel T. Halbouty is recognized in the oil industry as one of the outstanding geologists and petroleum engineers in the United States, and is internationally known for his scientific ability in petroleum exploration. He is considered an outstanding authority on the geological and engineering problems of the Gulf Coastal Province of North America, and is rated as one of the top experts on the geology of Gulf Coast Salt Domes. He is also most active as an operator and producer -- producing and operating in many oil and gas fields in the United States and Alaska.

He is a graduate of Texas A&M University, having received his Bachelor of Science Degree in 1930 and his Master of Science Degree from that Institution in 1931 in Geology and Petroleum Engineering. In May, 1956, he received the Professional Degree in Geological Engineering from Texas A&M University (the first to be conferred by the University). In June, 1966, the Degree of Doctor of Engineering, Honoris Causa, was conferred upon him by the Montana College of Mineral Science and Technology.

In October, 1965, Halbouty received the Texas Mid-Continent Oil and Gas Association's Distinguished Service Award for 1965, presented to an independent for outstanding services and contributions to his industry and profession. In February, 1968, he was named Engineer of the Year by the Texas Society of Professional Engineers and the Engineer's Council of Houston. He was also awarded the Texas A&M University's Distinguished Alumni Award in May, 1968. In April, 1969, Mr. Halbouty was awarded Honorary Membership in the American Association of Petroleum Geologists In June, 1970, he was conferred a Honorary Life Membership in the Houston Geological Society. In 1969, the Wisdom Society for the Advancement of Knowledge, Learning and Research in Education presented Mr. Halbouty with the Wisdom Award of Honor and elected him to the Wisdom Hall of Fame. In February, 1971, he received the DeGolyer Distinguished Service Medal of the Society of Petroleum Engineers of AIME.

In the Fall of 1964 and Spring of 1965, he was a Distinguished Lecturer for the Society of Petroleum Engineers of AIME and in the Fall of 1965 and Spring of 1966 he was a Distinguished Lecturer for the American Association of Petroleum Geologists.

Halbouty is a member of many world-wide scientific and engineering societies, and has contributed over 170 papers and several books to the literature of geology and petroleum engineering. His latest book, "Salt Domes, Gulf Region, United States and Mexico", is the only such single volume on this subject in the world's scientific literature.

He served as president of the world's largest organization of earth scientists, The American Association of Petroleum Geologists, for the 1966–1967 term.