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NUCLEAR POWER AND URANIUM

Nuclear power's role in supplying U.S. electrical energy needs will grow rapidly in the next few decades, becoming the principal electricity source by the end of the century. Chief nuclear fuel during the period will be the uranium isotope 235; however, some thorium reactors will be used and plutonium will have a role later to supplement uranium in water reactors and as fuel in breeder reactors. The current oversupply of uranium and the related soft market prices are likely to be short-lived considering the several fold increase in production capacity and large additions to reserves that will be needed. The U.S. has major low-cost uranium resources compared with other countries, but they are not large compared with projected needs. The few known large uranium areas will provide a basis for continued expansion of reserves, but indications are that new uranium areas will be needed. Filling future needs will be a challenge to the raw materials industry considering the time available, finances required, current prices, decreasing exploration activity, and the indicated resource expansion. Foreign supplies will be excluded from U.S. reactors until late in the 1970s, by which time the domestic industry should be in a strong position to supply a substantial part of U.S. needs and to withstand foreign competition.

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COST-CONSCIOUS GEOLOGY

The most valuable and least expensive tool used in exploring for oil is the time of a trained, creative exploration geologist. Unfortunately there are times when a geologist's job becomes so structured that he spends less time looking for oil than he would like. Ultimately we, as a profession, will be judged on whether we can find reserves of oil at a price per barrel less than the market price. In spending geological man hours, we must be acutely aware of costs and responsibility accounting. We must adapt our thinking to a principle of "reserve centered" accounting so that each unit of exploration is held accountable for finding reserves of oil at a reasonable price. With the tremendous demand for energy that our country now faces, it is more important than ever that we search for ways and means of getting the maximum creative effort from each geologist.

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GULF COAST SUBMARINE BANKS AS POTENTIAL HYDROCARBON TRAPS

The real possibilities of a serious energy shortage in the U.S. have been emphasized recently by economic and political events affecting the petroleum industry. As a result, many explorationists are pressing for new means and approaches by which to increase domestic reserves. As one example of the latter, interest in subtle traps resulting from facies changes, erosional processes, and paleogeomorphic features is increasing in the Gulf Coast as the more obvious structural features become exhausted. A group of calcareous banks along the outer edge of the northern Gulf continental shelf represents potential paleogeomorphic traps of a type that may have been common on ancient Gulf shelves since the Oligocene Epoch. Microfaunal and lithologic facies analyses, as demonstrated on and around the existing banks, provide powerful tools by which to recognize analogous features in the subsurface.

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SHELF-EDGE SUBMARINE BANKS IN GULF OF MEXICO—THEIR PALEOECOLOGY AND BIOSTRATIGRAPHY

A series of submarine banks along the outer edge of the northern Gulf continental shelf are occupied by reefal foraminiferal assemblages. The majority of specimens at these localities are dead, but a sparse living community is present on the shallowest banks. The reefal assemblages contain many species that have not been reported previously from the Gulf of Mexico, but most are well known from shallow reefs in the Caribbean. Cores recovered from the tops of the banks reveal the paleoecologic and biostratigraphic record of sea level fluctuations during the late Quaternary. The mutual presence of large planktonic and benthonic faunules in the same core samples provides direct means for equating paleobathymetric and paleothermal changes that resulted from glacial-interglacial climatic events.

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FACTORS WHICH CONTROL PETROLEUM ACCUMULATIONS

It has been established empirically that rapid deposition of sediment with abundant organic matter is required for the formation and accumulation of petroleum. Such conditions may have existed in any part of basins during different periods, therefore the kind of basin and position within the basin may have no close relation to depositional environments of any particular stratigraphic unit. The important thing is to determine for each formation the area which had optimum conditions for the development and preservation of petroleum source material and the deposition of sealed porous strata.

Large deltas which were constructed in rapidly subsiding segments of oceans or large interior sea margins had all the requirements for oil and gas occurrence: plentiful organic remains; rapid deposition which preserved much of the organic matter; relatively slow compaction which allowed the hydrocarbons to escape from the fine-grained sediments and move into the more porous sediment bodies; many porous sands; abundant clay and silt to seal the sands laterally and vertically; and syndepositional development of local "highs." No other environment in the silicate clastic province had all of these favorable conditions.

Petroleum accumulations in carbonate rocks resulted from rapid deposition of organic-rich carbonate sediments in a fast subsiding area with shallow, restricted, marine environments that had periodic influx of fine-grained terrigenous sediments. Porous calcarenites or oolites which formed on shallow, open-sea platforms, or limestone reefs which grew far from shore and were never covered with terrigenous mud, had little organic material preserved to form petroleum.

Numerous undiscovered oil and gas accumulations are in stratigraphic and stratigraphic-structural traps in the favorable facies of terrigenous and carbonate formations. The basins or parts of the basins without the controlling factors should not be explored.

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LATE QUATERNARY CLIMATES INDICATED BY FORAMINIFERS FROM SOUTHWESTERN GULF OF MEXICO

Planktonic foraminiferal assemblages were examined in 22 deep-sea cores from the Bay of Campeche in the southwestern Gulf of Mexico. Analysis of these assemblages clearly indicates 3 distinct successive biofacies during the late Pleistocene and Holocene. The biofacies are defined by variations in the relative percentages of the *Globorotalia cultrata* group and *Turborotalia inflata*. Excellent correlation can be made between these biofacies and those found in a core from the continental shelf in the northern Gulf of Mexico. These biofacies are interpreted as representing climatic changes.

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EQUATORIAL ACCELERATION AND CONTINENTAL PATHS

A mantle weak enough for convection is also weak enough to