GEOCHEMICAL AND HYDROGEOLOGIC METHODS OF PROSPECTING FOR STRATIGRAPHIC TRAPS

A trap is of no value unless it has oil or gas in it. Prospecting, therefore, should include efforts to determine if petroleum was generated by the enclosing rocks, and if it was likely to have collected behind the barriers that constitute the trap.

Observations can be made to see if the rocks and fluids contain traces of hydrocarbon which suggests that they are source rocks. Oil seeps from breached traps around the margin of a basin commonly suggest that similar traps may contain oil downdip.

The key to stratigraphically trapped oil is the presence of barriers to fluid flow. Such barriers can be located by discontinuities in the patterns of fluid pressures. In mountainous areas, meteoric water commonly has gained access to strata which have regional continuity of permeability. Abrupt changes in water composition in these areas indicate barriers where stratigraphic factors may have preserved the petroleum.

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FUTURE CONSIDERATIONS CONCERNING GEODYNAMICS

The past decade has seen remarkable advances in ideas about the earth and the origin of its surface features. Among the most significant results of efforts during this decade is the realization that the tectonically active belts may be considered as the edges of large lithospheric plates moving relative to each other. In addition, there is evidence of lateral inhomogeneities in the mantle which may be related to the driving mechanism for these motions. It is difficult to overstate the importance of these ideas in drawing together the different disciplines which make up the earth sciences.

It is time for a second look at these ideas. The short term movements in the seismically active belts appear to be related to the long term movements preserved in the geologic record, hence, it is possible to study process as well as result. It also is apparent that there have been major movements, primarily vertical, within the lithospheric plates that are apparently unrelated to the relative horizontal movements of the plates.

The International Council of Scientific Unions has established a new Commission, the *Inter-Union Commission on Geodynamics,* to encourage research in these areas and to provide international coordination of efforts.

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NEOGENE ECHINOID ASSEMBLAGES OF CAROLINAS—THEIR PALEOECOLOGY, MORPHOLOGIC ADAPTATIONS, AND STRATIGRAPHIC RELATIONS

Echinoids have considerable potential as stratigraphic and paleoecologic guides for Neogene marine deposits. Entire individuals and fragments are present in most marine units of the Atlantic coastal plain; their calcitic exoskeletons persist where leaching has removed more abundant aragonitic mollusks, and their complexity affords potential for generic and possibly specific classification of disassociated skeletal components.

Exoskeletal size, shape, and thickness; modifications of skeletal plate systems; and the nature of internal structures of skeletal components are environmentally induced morphologic adaptations among individuals of the same species which are potential paleoecologic indicators. The present study indicates that where sedimentation rates are low and the substrate stable, relatively immobile forms are most common, and normally small, active species become large, heavily constructed, and inactive.

Echinoid assemblages studied in detail are from the Waccamaw Formation (Aftonian?) of North and South Carolina, and the Canepatch Formation (Yarmouthian?) of Horry County, South Carolina. Studies of associated biota and sediment characteristics serve as paleoecologic control.

All Waccamaw assemblages are comprised of cassiduloids, clypeasteroids, and arbacoids, whereas only the latter two groups occur in the Canepatch Formation. Populations of the clypeasteroid genera *Mellita* and *Encope* are mutually exclusive within the Canepatch Formation.

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URANIUM GEOLOGY OF COASTAL PLAIN OF SOUTH TEXAS

The principal economic deposits of uranium discovered in Texas are in the southern half of the coastal plain, close to oil-bearing structures. Host rocks are tuffaceous sandstones that range in age from late Eocene to Pliocene. Those of Eocene age are shallow-marine sandstones, overlain unconformably by Miocene continental tuffs; those younger than Eocene are fluvial tuffaceous sandstones interbedded with siltstone and clay.

The earliest exploited deposits contained shallow oxidized ores, generally spotty and out of radiometric equilibrium. The minerals were chiefly uranyl phosphates and silicates, with vanadates minor to absent. Deposits worked today are farther downdip, generally below the water table and the oxidation level, and are either rolls or irregular bodies near fault lines from which hydrogen sulfide-bearing hydrocarbons seep. Minerals are sooty pitchblende and coffinite; molybdenum and selenium are present. The ores are in near radiometric equilibrium, and the uranium is easily recovered from them. At least one deposit is in the sedimentary rock overlying sulfur-bearing salt-dome caprock.

Chief factors in the occurrence of the deposits are: (1) a source of uranium in tuffs that originated in northern Mexico or western Texas; (2) mobilization of uranium by a "built-in" solvent, alkaline carbonate pore water developed by diagenetic alteration of chemically reactive volcanic debris; (3) concentration of fluids by evaporation in an arid climate; (4) movement of fluids to reducing environments; (5) precipitation of uranium by reductants such as organic matter and/or hydrogen sulfide; and (6) preservation in a favorable structural or stratigraphic trap not susceptible to leaching.

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CARIBBEAN SEA DEEP-SEA DRILLING RESULTS

Leg XV of the *Glomar Challenger* departed December 3, 1970, from San Juan and arrived in Panama on January 26, 1971. The cruise was divided into 3 parts: (1) San Juan to Curaçao, where a hole reentry system was utilized operationally for the first time to facilitate