

southern parts of Cabo Rojo, the northern ridges being best developed. Longshore drift compartmentalization has been effected along this coast by the Blanquilla-Lobos offshore reef tract.

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THEORETICAL APPROACH TO HISTORY OF SOUTHERN UNITED STATES

The hierarchical plate hypothesis of geologic history includes the concept that the North American continental block has been circling the Pacific Basin plate in a counterclockwise sense and rotating in the same sense, with an approximate period of 10^9 years. Implications inherent in the hypothesis, for comparison with the actual history of North America during its latest 10^9 years of development, include the following.

1. *Climate*.—Continental glaciation about 10^9 years ago; warming during late Precambrian. Tropical during Paleozoic; much carbonate deposition; widespread coal in late Paleozoic. Cooling during Mesozoic and Cenozoic, climaxing in new glaciation.

2. *Appalachian Mountains*.—Left lateral movement plus compression during Paleozoic. Right lateral movement plus tension during Mesozoic and Cenozoic.

3. *Caribbean*.—Developed initially about end of Paleozoic—beginning of Mesozoic. Strike-slip margins on north and south.

4. *Gulf of Mexico*.—Tensional feature; developed initially about end of Paleozoic—beginning of Mesozoic.

5. *Sedimentation*.—Major drainage toward south (ambient coordinates), producing very large sediment volumes in Gulf of Mexico.

6. *Depocenter*.—Shifting location toward north and east, from Texas into Louisiana, due to continental rotation during post-Paleozoic.

7. *Stream patterns*.—Reorientation, due to continental rotation, through Mesozoic and Cenozoic in clockwise sense for first-order drainage, counter-clockwise for second-order drainage in mid-continent area; much piracy.

8. *Eastern and western margins*.—Lateral shrinking subsidence, and formation of north-south grabens, during post-Paleozoic.

9. *Diapirism*.—Dikes, plugs, volcanoes, and salt domes (where salt was available) along western, southern, and eastern margins, during Mesozoic and Cenozoic.

10. *Probable geosyncline*.—Short-lived, late Paleozoic age; near southern edge of continent; orientation now northeast-southwest.

These predictions compare favorably with the actual history of the continent.

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TABASCO BEACH-RIDGE PLAIN: AN ERODING COAST

The beach-ridge plain in the state of Tabasco, Mexico, is undergoing erosion today. It has not been growing for at least 50 years, and perhaps for as long as several centuries. Ten lines of evidence, including some severe limiting dates, substantiate this analysis. The numerous beach ridges, however, indicate that, prior to the present epoch, there was a long interval of growth. The area has gone through a late Holocene history having 2 main parts: (1) a littoral economy of abundance of sand, during which the beach-ridge plain was built; and (2) a littoral economy of scarcity of sand,

during which the edge of the plain has been attacked by erosion.

This history coincides with that of other beach-ridge plains in North and South America. We conclude that the equilibrium beaches of the world have undergone a shift in the last few centuries, or are now undergoing a shift, from dominant deposition to dominant erosion. The problem of essentially worldwide coastal erosion is, therefore, increasing.

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OSTRACODA OF COASTAL GROUP OF FORMATIONS OF JAMAICA

Traditionally the group of formations that crops out along the northeast, east, and southeast coasts of Jamaica, has been divided into an upper and lower part. The upper, of Pleistocene age, includes the Manchieneal Formation with the Navy Island Member, and the beds in the upper part of the Bowden section. The lower part, at least partly of Pliocene age, includes the Bowden Formation, the San San clay, the Buff Bay Formation and overlying beds in the Buff Bay section, and the August Town Formation.

Correlation of 8 different sections by means of ostracods shows some discrepancies with Blow's correlation, based on planktonic forams. Distribution of ostracods in the August Town Formation suggests that its age is older than that of the Bowden shell bed. The overlying Harbour View beds are brackish-water deposits. A new species of *Cyprideis*, with reversal of overlap and hinge, has been found.

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GEOLOGY OF FREEPORT ROCKS, OFFSHORE TEXAS

The Freeport Rocks, a linear trend of isolated, submerged rock pinnacles about 6 mi offshore from Freeport, Texas, were studied by SCUBA diving, petrographic techniques, and carbon-14 dating. They have been interpreted previously as a relict beach which developed about 30,000 years B.P.

The present study indicates the environment of deposition was an offshore bar or barrier island composed predominantly of reworked material from the underlying Beaumont Formation. Diagenetic features include cementation by low-Mg calcite (in the form of druse and blocky cement) and inversion of aragonite shells to low-Mg calcite. The diagenetic features suggest that the deposit subsequently was exposed subaerially and cemented by low-Mg calcite. Because much of the original shell material was neomorphosed during diagenesis, carbon-14 age determinations may not give the age of the deposit. Thus carbon-14 dates were interpreted in light of the neomorphism and suggest that deposition of the Freeport Rocks was less than $15,857 \pm 268$ years B.P. This information, combined with data from various eustatic sea level curves, strongly suggests that the Freeport Rocks were deposited during the stillstand of the transgressing Holocene sea between 7,500 and 8,200 years B.P.

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REGIONAL STRUCTURE, STRATIGRAPHY, AND OIL POSSIBILITIES OF SOUTH FLORIDA BASIN

The South Florida basin is part of the larger Florida-Bahama platform province, a slowly subsiding area.

The basin contains several regional positive and negative structural features. Basement consists predominantly of extrusive igneous rocks.

In the deeper part of the basin, Coahuilan carbonates and probably Jurassic rocks overlie the basement. Tertiary, Gulfian, and Comanchean strata have been penetrated by numerous deep wells. Comanchean rocks are cyclic in nature and consist of limestone, dolomite, and anhydrite.

Three units are favorable for oil production: the "brown dolomite," the Sunniland Limestone, and Unit C of the Dollar Bay Formation. Gulfian chalk is replaced by dolomite in southeast Florida where it has a low oil potential. The lower Tertiary Cedar Keys Formation, composed of dolomite and anhydrite, also has oil potential. Eocene interbedded limestone and dolomite have little potential because they are flushed by fresh water of the Floridan artesian aquifer. The upper Tertiary is thin and has no favorable characteristics or oil production.

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GULF COAST RULE OF THUMB ECONOMICS

A series of simple charts have been designed to aid the exploration geologist in prospect evaluation by "rule of thumb." The charts include example oil and gas condensate wells having typical Gulf Coast flow rates, pay thicknesses and reserves. The evaluation methods considered are: payout time, return per dollar invested, net worth, present worth, average annual rate of return, and profit-to-risk ratio. The charts make it possible for the geologist to see how a few factors control profitability. They allow direct comparison of evaluation methods. This gives the geologist a better eco-

nomic understanding and an improved perspective of how a prospect fits into an over-all exploration program.

The charts indicate: (1) average annual rate of return and present worth are good measures of profitability, but both should be related to wildcat risk; (2) profit-to-risk figures often misrepresent the actual risk; (3) large flow rates are as important as large reserves; (4) there is a need for increased flow rates where reserves are large. In lieu of increased flow rates, incentives are needed to encourage independent and major oil companies to seek larger discoveries per well. One such incentive would be larger depletion allowances for big discoveries.

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SEDIMENTARY ENVIRONMENTS AND OCCURRENCE OF MAJOR HYDROCARBON ACCUMULATIONS

Modern concepts concerning the origin of oil and gas are reviewed. Emphasis is stressed on those sedimentary environments under which conditions are most favorable for not only the origin but also the accumulation and preservation of major hydrocarbon reserves.

Over 90% of the oil and gas discovered to date has been found in 4 different sedimentary environments. The deltaic complex, in particular the delta margin environment, is probably the most favorable of these 4 environments. Second is the rapidly subsiding carbonate shelf or lagoon where carbonate and/or evaporite sedimentation keeps pace with subsidence. Third is the reef complex associated with the carbonate shelf. Fourth is the turbidite environment which includes all gravity-induced submarine flows, both arenaceous and carbonate.

WHERE THE ACTION IS



Pictured at the Canal St. dock of the S.S. *President*, which will be the scene of a Mississippi Riverboat cruise and dance during the 1971 GCAGS Convention in New Orleans, are GCAGS officers and convention officials. Left to right: PETER GRAY, treasurer; RAYMOND STEPHENS, program chairman; LEE MELTZER (seated front), president; WILLIAM KRUEGER, secretary (resigned); ROBERT JAMISON, convention vice-chairman; MARVIN DWIGHT, secretary; ROBERT WILLIAMSON, general chairman; and WILLIS TYRRELL, editor. Not pictured is DONALD BOYD, GCAGS vice-president.