properties are largely dependent on the primary properties.

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COMPOSITION OF SOME MIOCENE AND HOLOCENE PLANKTONIC FORAMINIFERAL ASSEMBLAGES

The composition of planktonic foraminiferal assemblages varies with depth in the upper few hundred feet of the present oceans. Empirical data show similar composition variations for early Miocene planktonic foraminiferal assemblages in the south Louisiana subsurface. Two variables most closely related to these changes appear to be (1) water temperature as a function of latitude and (2) water temperature as a function of bathymetry. Thus, planktonic foraminiferal assemblage compositions can be used to interpret paleobathymetry of marine strata at least as old as early Miocene.

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EPI-PALEOZOIC HYPERSALINITY AND MARINE BIOTIC EXTINCTIONS

From consideration of the volumes of halite and associated salts deposited since the Permian, one must infer that either seawater at the close of the Paleozoic was hypersaline compared with seas of today (35‰ salinity); or, although 6 million cu km or more of salt has been precipitated from the world ocean in highly varying amounts at irregular intervals since the Permian, an equal volume of salt has gone into solution. Data from analysis of sedimentary sulfur-isotope ratios strongly support the former inference. Concordant, but more speculative, support also is available from aridity indices.

A condition of hypersalinity in the oceans during the Permian Period would explain the known patterns of Permian extinctions. Evidence suggests that those marine taxa (*e.g.*, echinoderms, fusulines, coelenterates) with the lowest tolerance for salinity variability were the group within the entire Permian biota that suffered the greatest proportion of extinctions at the close of the Paleozoic. Such an explanation is more consistent with a uniformitarian earth than causes sought in cosmic radiation variability or pulses, which should have affected terrestrial organisms more strongly than marine taxa.

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GRAND ISLE—BARRIER ISLAND IN GULF OF MEXICO

Grand Isle is part of a barrier-island chain along the coast of southeastern Louisiana. It separates the estuarine environment of Barataria Bay from the marine environment of the Gulf of Mexico. The island is 7½ mi long and about ½ mi wide.

Mechanical analyses of 102 surface samples indicate that the island is composed of fine-grained terrigenous sand, silt, and clay, with a minor percentage of shell material. Median grain diameters range from 0.166 mm for beach sands to 0.005 mm for isolated clay pockets of the back-island area. Grain-size isopleth maps demonstrate a parallelism of grain-size characteristics with sedimentary features and environments such as the beach, dunes, ridges, and interridges. They also demonstrate an increase in the size of beach sand on the southwest. Beach and dune sands are well sorted. Ridge and interridge sediments contain a higher percentage of silt and clay and exhibit poorer sorting. Organic content of representative sediment samples ranges from 0.20 to 9.08%.

The high oxidation environments of the beach and dunes generally have the lowest organic content. Carbonate content in the form of shell material ranges up to 4.2% with the smaller grain-size sediments generally having a higher carbonate content.

The subsurface stratigraphy was studied using 127 soil-boring logs. All strata found by the borings (to a maximum depth of 320 ft) were Holocene sand and clay. The oxidized Pleistocene contact is interpreted to be at a depth of 400 ft as determined by deeper borings on nearby islands. Four Holocene sands are recognized in this subsurface section. The deepest sand, interpreted to be a Holocene transgressive unit, is 120–170 ft thick. The maximum thickness of 3 shallower sands is 43 ft, and the average thickness is 10–20 ft. The three upper sands are fine to very fine grained. The deepest sand is fine to coarse grained. Typical silty prodelta clays and highly plastic offshore clays are found between the sand beds.

The Grand Isle beach has an average seaward slope of 2½°. A low dune ridge runs almost continuously behind the beach. Approximately 25 sets of relict beach and dune ridges can be identified behind the active dunes. These sets trend nearly parallel with each other and with the present beach. The ridges are 35–100 ft wide and are 3 ft or less high.

The sediments to a depth of 100 ft are interpreted to be related to deltaic progradation of the ancestral Mississippi River. This deltaic progradation began about 5,600 years ago when sea level reached a stillstand. The Lafourche delta formed west of Grand Isle about 2,000 years ago. As wave action attacked the delta front, sediment was carried northeastward by littoral currents. A barrier spit was constructed in the mouth of Barataria Bay. The barrier spit was eventually breached by a narrow tidal channel. From this original nucleus island, Grand Isle has grown by beach and dune-ridge accretions.

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PALEOECOLOGY AS EXPLORATION TOOL

Paleoecology, properly interpreted and applied, can serve as a valuable tool in any exploration program. To be interpreted properly, it is of prime importance that standard criteria for paleoecologic data be used without attempting to alter the data obtained to fit preconceived ideas.

In order that the data developed may be presented uniformly and be consistent with other available information, Paleo-Data, Inc., uses the general criteria and depth zonation suggested by the Gulf Coast SEPM Committees on Paleoecology.

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DEPOSITIONAL SYSTEMS IN JACKSON GROUP OF TEXAS GULF COAST BASIN

Regional outcrop and subsurface investigation of the Jackson Group in Texas indicates development of 5 main depositional systems. Dominant element in the central and east Texas Gulf basin (bounded by Guadalupe River on the south and Neches River on the

east) is the Fayette fluvial-delta system consisting of dip-oriented, lobate wedges of sand, mud, and lignite. The vertical sequence in updip subsurface and outcrop, with gradation upward from marine mud through several delta facies and into fluvial sand and mud, reflects net regression and progradation of the system. Southwestward, transport of sand and mud from the delta system, principally by longshore drift, resulted in the South Texas strandplain-barrier bar system, made up of strike-trending sand bodies interbedded with marine and lagoonal mud. Landward of the strandplain–barrier-bar system and extending into outcrop is a complementary lagoonal–coastal-plain system consisting of mud and minor, dip-oriented sand units. Gulfward of the strike-trending strandplain system is the South Texas shelf system, formed by marine mud derived largely from the delta system on the northeast. Beneath the South Texas strandplain-barrier bar and Fayette delta systems and extending eastward into Louisiana and Mississippi is the Caddell-Yazoo shelf system consisting of marine, fossiliferous mud and minor glauconitic marl. Delineation of depositional systems, and specifically component facies of the various systems, facilitates definition of significant mineral trends (oil, gas, lignite, and uranium) that show the relation between current and potential areas of production.

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WELL-DATA FILES AND COMPUTER—EXPLORATION TOOLS FOR THE SEVENTIES

Since the development of computer-processable well-data files began in 1961, more than 600,000 wells have been included in systems covering most of the United States and Canada. These systems contain information on ownership, location, well classification and status, drilling and completion activities, tests, depths to formation tops, core descriptions, shows, and other data. Data are obtained from the most reliable and complete source for each area and are upgraded by computer editing and the feedback of missing data and corrections from file users.

Well-data files are used at various stages of the exploration process for basin evaluation, for selection of prospective stratigraphic intervals and areas for further study delineating prospects for acreage acquisition or drilling, and for building peripheral files containing proprietary, technical, and economic data. A study of the Muddy Sandstone in the Powder River basin illustrates an exploration application of computer processing a large well-data file. Prior to the discovery of Bell Creek, data from the file revealed areas in Wyoming and southeasternmost Montana with abundant hydrocarbon shows in the Muddy Sandstone. North and South Dakota and the rest of Montana had no oil shows in the Muddy Sandstone. In the area of abundant shows geologic maps based on formation tops obtained from the file indicated trends on which subsequent drilling has discovered more than 525 million bbl of reserves. Two types of depositional areas favorable for hydrocarbon occurrence were indicated. One was related to deposition around a pre-Muddy positive feature defined by Skull Creek structure and isopach residual maps of the Muddy Sandstone. The other was a channel system defined on an isopach residual map. Approximately 750 wells have been drilled in the "no show" area without discovering commercial oil.

At the time of discovery of Recluse and Bell Creek, information was available within the Rocky Mountain Well History Control System to suggest areas favorable for similar types of production from the Muddy. With addition of new well control and proprietary information, the well-data file can aid in the planning of development drilling, analysis of completion practices, and reservoir evaluation. Large well-data files and proper application of the computer to these data will become increasingly important in the discovery of oil and gas during the 70's.

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CORRELATION OF SILURIAN STRATA BETWEEN GEORGIA, ALABAMA, AND FLORIDA BASED ON CHITINOZOAN BIOSTRATIGRAPHY

Silurian chitinozoans have been described previously from 4 wells in north-central Florida. These wells also have been correlated previously with each other as well as with known Silurian sections. The youngest assemblage is of Ludlovian age; the oldest is of late Llandoverian age.

Outcrop samples were collected from the Silurian Red Mountain Formation in Alabama and Georgia. This formation has been dated as Llandoverian on the basis of megafossil evidence. Four Red Mountain Formation sections are divided into biostratigraphic zones on the basis of chitinozoan assemblages.

Attempts at correlating the well and outcrop samples on the basis of frequency of chitinozoan taxa proved unsuccessful, because only a few taxa are abundant throughout the sections. Instead, correlations are made on the first or last occurrence of certain taxa. A comparison of the assemblages in the oldest (Ludlovian) Florida well section and the youngest (late Llandoverian) Red Mountain Formation section indicates that they have only 2 taxa in common. A comparison between the other parts of the Florida and Alabama-Georgia sections was not feasible because of the great age differences.

The general aspect of the Florida assemblages is quite different from those in Georgia and Alabama. It is concluded that the sections in Georgia and Alabama are of ages different from those in Florida. The rocks are not different faunal facies of isochronous strata because chitinozoans are planktonic and are therefore not lithofacies dependent.

One problem encountered in this study was that 3 wells did not penetrate very deeply into Silurian strata. Three of the Florida wells only penetrated the Upper Silurian, and only one went as deep as the Lower Silurian. Future work in correlating the Silurian rocks from these 3 states must depend on new wells being drilled to greater depths.

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EXPLORATION GEOLOGIST IN THE SEVENTIES

The 70's promise to be a period of turmoil and change for the petroleum industry, not only in the United States, but throughout the world. These conditions will have a significant effect on explorationists.

Ecology and environment are rapidly becoming common words in our vocabulary and, as scientists, we must make our technology compatible with the environment.

The explorationist (the geologist and the geophysicist) will have to search for and locate large reserves in this country, if we are to meet the anticipated increase in domestic demand for petroleum products in