

pending on basinal position. Evidence given by paleontology (typologic studies), paleoclimate records, eustatism, and geomagnetic dating of earliest Pleistocene glacial rocks favors a Pleistocene Epoch beginning 2.5–3.0 m. y. ago within the Gauss normal epoch. This time corresponds to the extinction horizon of *Globobuccina altispira* and withdrawal of other warm-water species from the Caribbean and Gulf of Mexico. There is no reason to assume that worldwide onset of Pleistocene climate deterioration was diachronous, as would have to be postulated if the Pleistocene had begun in warm-water regions only 2.0 m.y. ago, as postulated by some workers.

A new species is described and discussed.

W. P. LEUTZE, Atlantic Richfield Co., Lafayette, La.

#### SIGNIFICANCE OF PLEISTOCENE STRATIGRAPHIC PALEONTOLOGY, GULF COAST

Major oil reserves of South Louisiana are found in Oligocene, Miocene, and Pliocene sandstone reservoir rocks. Increasing rate of sediment concentration in depocenters explains the hydrocarbon richness of the upper Miocene and Pliocene strata. This same factor led to increasing provincialism of faunas in post-Oligocene time. The paleontologists' problems in younger Tertiary strata are compounded by an apparent slowing of foraminiferal evolution. Whereas there are 20 regional Oligocene marker zones that divide about 10,000 ft of section, there are no more than five or six Pliocene zones to divide twice as thick a section. Recognition of temporal clines is vital to the stratigrapher who would subdivide an interval so nearly devoid of index species. Stratigraphic subdivision is not an end in itself, but is an indispensable step in the delineation of depocenters and depositional trends.

CHARLES F. LEVERT, JR., Occidental Petroleum Corp., Lafayette, La., and HERSHAL C. FERGUSON, JR., Cabot Corp., Lafayette, La.

#### GEOLOGY OF WEST FLOWER GARDEN BANK, NORTHWEST GULF OF MEXICO

The Flower Garden banks, the most prominent of a series of topographic highs in the northwest Gulf of Mexico, have been noted and studied for years. Most of these physiographic expressions have been related to salt uplift. Previous investigations of the Flower Garden banks, located 130 mi south-southeast of Galveston, Texas, suggest that biohermal development has contributed significantly to the overall topographic expression.

The results of this study demonstrate that biohermal development during the present interglacial period occurred in a deep water environment in the northwest Gulf of Mexico; therefore, it is possible that buried fossil reefs formed within structural and depositional environments similar to those existing today on the outer continental shelf. If there are such fossil reefs, they offer a previously unrecognized exploratory objective on known structural features.

H. L. LEVIN, D. J. ECHOLS, D. J. THOMPSON, and E. S. HUGHES, Washington Univ., St. Louis, Mo.

#### SOME COMPARISONS OF NEOGENE MICROBIOSTRATIGRAPHY IN OFFSHORE LOUISIANA AND BLAKE PLATEAU

The Neogene calcareous nannoplankton from three deep-sea cores from the Blake Plateau were studied. The ranges of the nannoplankton were given and a

tentative nannofossil zonation and correlations were suggested. We have attempted to relate the Blake Plateau nannofossil biostratigraphy to planktonic foraminiferal datum levels delimited in the course of a statistical study of foraminiferal distribution in four offshore Louisiana wells.

J. P. MANKER and G. M. GRIFFIN, Univ. South Florida, Tampa, Fla.

#### DISTRIBUTION OF SILICATE MINERALS IN FLORIDA BAY

The predominantly carbonate sediments within Florida Bay contain small percentages of insoluble silicate minerals, ranging in our samples from 1.25 to 14.91% by weight. Quartz, chlorite, and montmorillonite compose most of the silicate fraction, with very minor amounts of illite and kaolinite. Clay-mineral distribution can be described by concentration gradients based on two end-member assemblages. A chloritic assemblage dominates in the eastern part of the bay, but declines westward; a montmorillonitic assemblage dominates the western bay and declines eastward. The two clay-mineral assemblages reflect different sources—chlorite from the Atlantic province, and montmorillonite from the Gulf of Mexico province. Shallow and subaerial carbonate mud banks and intervening basins inhibit mixing waters bearing the two clay assemblages; the result is the relatively abrupt transition from one clay suite to another in the 30–40 mi span of Florida Bay. The clay mineral fractions of similar ancient carbonate reef trends would be expected to show analogous concentration gradients in the backreef area.

JOSEPH D. MARTINEZ, Professor, Environmental Engineering, and Director, Inst. for Saline Studies, Louisiana State Univ., Baton Rouge, La.

#### IMPACT OF SALT ON MAN'S ENVIRONMENT

The preservation of the quality of our environment is a major challenge to modern civilization. The saline environment is an important part of the ecologic system in which man lives and with which he interferes. This saline environment may be divided into two general categories: saline waters of the oceans and continental salt deposits.

Oceanic salt is both a boon and a bane to man. An appreciable part of the world's salt supply is produced from oceanic waters by solar evaporation. In this sense it is an asset. However, by denying the use, to man, of this great reservoir of water in its pure state, it constitutes a liability. Modern technology is developing effective techniques for desalinization. Paradoxically major advances in this field will result in unusable quantities of salt which will constitute a disposal problem.

Even though much less salt is locked up in continental deposits, the availability of major deposits are of great importance to man. Such accumulations of salt, particularly when associated with oil, gas, and sulfur, have been responsible for the development of major chemical complexes. These industrial centers provide raw materials and jobs, but also create massive pollution problems. Potassium minerals obtained from evaporite deposits serve as a major source of fertilizer. However, the exploitation of these minerals results in the accumulation of an unmanageable quantity of common salt.

Both solution mining and dry mining of salt can result in land subsidence and thus create an environmental liability. On the other hand, abandoned mines and solution cavities in salt offer a means of disposal of

particularly noxious materials such as high-level radioactive wastes.

DONALD S. MARSZALEK, Univ. Illinois, Urbana, Ill., and Inst. Marine Sci., Miami Univ., Miami, Fla., RAMIL C. WRIGHT, Beloit College, Beloit, Wisc., and WILLIAM W. HAY, Univ. Illinois, Urbana, Ill., and Inst. Marine Sci., Univ. Miami, Miami, Fla.

#### FUNCTION OF TEST IN FORAMINIFERA

Although the tests of foraminifers are used extensively by paleontologists as paleoecologic indicators, very little is known of the ecology of modern foraminifers, and virtually nothing is known of the function of the test.

Investigation of test-protoplasm relations have been hampered by lack of suitable techniques for making meaningful observations. Now the scanning electron microscope provides a means of examination of the test on a scale which permits understanding of spatial relations of the test and the living organism. Coupled with experiments and observations on specimens in laboratory culture, the information yielded by studies of test structure and of fixed, frozen and dried protoplasm suggests a general theory of test function.

1. The most primitive tests are constructed of arenaceous material to provide weight to counteract buoyancy of the protoplasm. The simplest arenaceous tests seem to serve only this function.

2. The test upon elaboration into a long tube or series of chambers separated by narrow openings, serves as an effective barrier to retard the effects of unfavorable changes in environmental chemistry.

3. Further specialization may adapt the test for growth under special physical conditions, such as a certain substrate, or for particular symbiotic conditions, such as the greenhouse function of the test of *Elphidium*.

The role of the test as a protective device against predation is not understood, but may account for some specialized forms.

The great variety of test form in the foraminifers suggests that many taxa are particularly well adapted for specialized ecologic niches. The fact that the foraminifers are among the hardiest of marine protozoa and almost unique in their ability to withstand changes in the environment indicates that they have developed a highly efficient means of controlling their immediate environment without encystment or metamorphosis; that means is the test.

B. B. MASON, Humble Oil & Refining Co., Houston, Tex.

#### POSSIBLE FUTURE PETROLEUM PROVINCES OF WESTERN GULF BASIN

A task force of industry geologists working in Region 6, Western Gulf basin, for the National Petroleum Council study, "Possible Future Petroleum Provinces of the United States," has attempted to answer whether additional significant crude oil reserves will be added in the Western Gulf basin. The potential of non-producing areas is stressed, however, possible extensions to producing trends also are analyzed from a geologic and production-controls standpoint. The thoughts and ideas from eight industry papers covering the Western Gulf basin are summarized.

J. A. MCCARTHY, Consultant, Houston, Tex.

#### MIOCENE TREND OF CALHOUN AND MATAGORDA COUNTIES, TEXAS

(No abstract submitted)

DONALD F. MCNAMEE, Union Texas Petroleum, Houston, Tex.

#### LOWER CRETACEOUS GLEN ROSE REEF COMPLEX OF EAST TEXAS AND CENTRAL LOUISIANA

The massive limestone sections of the Lower Cretaceous Glen Rose of East Texas and central Louisiana are considered to be clastic carbonate barrier reefs. A hypothesis of cause, sequence, and depositional form of a reef complex is presented and supported by examples. Basinal subsidence, a regressive pattern of deposition, and subsequent foreereef leveling during periods when the sea was restricted in front of the barrier reefs develop a typical depositional form.

At least three separate reef complexes have developed in the Lower Cretaceous of Sabine County, Texas, and Sabine Parish, Louisiana. Subsequent Tertiary regional tilting has altered original reservoir conditions but there remains great potential for hydrocarbon accumulations in stratigraphically controlled traps.

EDWARD P. MEISBURGER and DAVID B. DUANE, Geology Branch, U.S. Army Corps of Engineers, Coastal Engineering Research Center, Washington, D.C.

#### SHALLOW STRUCTURAL CHARACTERISTICS OF FLORIDA ATLANTIC SHELF AS REVEALED BY SEISMIC-REFLECTION PROFILES

A sand-resources survey off eastern Florida by the U.S. Army Corps of Engineers' Coastal Engineering Research Center (CERC) in 1965-1966 resulted in the collection of 2,600 mi of seismic-reflection profiles. With a penetration depth range of 0 to -500 ft MLW the profiles extend from nearshore (approximately 15-ft water depth) to 15 mi offshore.

The records show several prominent acoustic reflecting horizons at shallow depth which can be traced across large areas of the nearshore continental shelf off east Florida. These areally extensive reflectors indicate some shallow structural features beneath the shelf surface; some tentative stratigraphic correlations have been made with logged wells onshore.

In the section revealed by CERC reflection records the dominant structural feature is an almost universal eastward dip of strata. Below about -100 to -200 ft MLW broad low-relief undulations are common and appear to be of structural origin. Shallower subbottom strata are characterized by internal bedding features, erosional surfaces, and a generally gentler eastward dip than the deeper section. The records show little apparent evidence of faulting.

Subbottom acoustic horizons on the CERC records are judged to represent a stratigraphic range from Eocene to Holocene. Erosion surfaces and shallow-water bedform features in the uppermost section are interpreted as resulting from Pleistocene sea-level fluctuations.

JOHN D. MILLIMAN, Woods Hole Oceanographic Inst., Woods Hole, Mass.