of dissolving or precipitating waters. Evidence of compaction is common in the reservoir, but early partial cementation and migration of oil prevented excessive compaction by retarding pressure solution. The lower energy mixed-facies environment produced an unsorted calcarenite with abundant mud matrix and poor porosity; pressure solution reduced porosity even further.

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Thalassia testudinum, HABITAT AND MEANS OF DISPERSAL FOR SHALLOW-WATER BENTHONIC FORAMINIFERA

The marine grass *Thalassia testudinum* König is distributed throughout the West Indian region and the island of Bermuda. Its distribution is controlled by temperature, salinity, turbulence, and depth. It supplies a substrate for many organisms including benthonic Foraminifera. Sixty-six benthonic foraminiferal species were found living on *Thalassia* in a relatively small area in the Florida Keys. Of these only 18 species were abundant and these same species were noted living on the marine grass wherever it was examined throughout the area of its distribution. The distribution and abundance of these Foraminifera are controlled by competition with other organisms living in the same environment as well as by interspecific competition. Tropical and subtropical shallow-water benthonic foraminiferal faunas are composed essentially of the same species throughout the West Indian region. The *Thalassia* blades provide a means of dispersal for the benthonic species. When the tops of the blades die, or when complete plants are broken off by storms or strong wave action, they float and can be transported great distances by currents. The organisms living on the grass blades are carried to different areas where they can survive and reproduce if environmental conditions are favorable. Even sediment-preferring species can be transported by this means, because juvenile specimens, and even some adult specimens, are usually of such low specific gravity that they can be thrown into suspension by storm waves and may settle onto blades of *Thalassia*. In this manner a fauna of organisms as minute as the Foraminifera, which otherwise might be restricted to microenvironments, can become cosmopolitan.

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GEOCHEMISTRY, MINERALOGY, AND ABSOLUTE AGES OF CARIBBEAN SEDIMENT CORE

Chemical and mineralogic variations in a deep-sea core dated by the Io/Pa method show that during interglacial periods the content of detrital minerals (quartz and muscovite) reach a maximum, whereas clay minerals are more abundant during glacial periods. The concentration of Mn is higher during glacial periods. The data suggest that in the Caribbean area chemical weathering was at a maximum during glacial periods; during interglacial periods conditions were more arid.

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UPPER SEDIMENT COLUMN OF GULF OF MEXICO PRESENTED IN NEW TYPE OF MAP

Many types of investigations actually require information on the lithologic characteristics of the upper sediment column as well as the surface sediment characteristics.

Selected cores from the Gulf of Mexico are presented as lithologic models. A chart symbol is used to indicate gross lithology. A numerical code has been developed which expresses lithologic percentages and indicates by positional notation vertical succession or intercalation of facies.

For one area several cores were compared to demonstrate the validity of the developed technique and to show ratio changes.

This new type of sediment-distribution map is of value in studies of sediment transport and deposition, basin filling, geotechnical properties, sea-laboratory preparation, salvaging of sunken objects, acoustical measurements, interpretation of shallow continuous reflection seismic profiling, *etc.*

The sediment thickness represented on this new map is limited to the depth of penetration of the coring devices.

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GEOMETRY OF FLUVIAL AND DELTAIC SANDSTONES (PENNSYLVANIAN AND PERMIAN), NORTH-CENTRAL TEXAS[1]

Upper Pennsylvanian and Lower Permian rocks of the eastern shelf in north-central Texas are composed of 10–15 repetitive sequences including open shelf, deltaic, fluvial, and interdeltaic depositional systems. Sediments derived from the Ouachita Mountains and associated piedmont were transported westward across a narrow coastal plain. Fluvial and deltaic sandstone facies define a southwest paleoslope of about 5 mi. Sandstones are delta-front, distributary-mouth-bar, distributary- and fluvial-channel, and destructional-bar facies.

Distributary patterns represent distal deposition in the upslope area. Belt sandstones, typified by unusually thick fluvial channels, prograded far downslope. Composite patterns include distributary and belt sandstones representing complex progradational history. Rocks display ½° northwest regional dip; negative structure residuals outline a broad area within which 70% of the deltaic facies were deposited.

Elongate sandstones generally are arranged parallel with paleoslope in vertically offset patterns controlled by differential compaction of fluvial and deltaic sands and interdistributary muds. Multistory sandstone bodies were deposited along narrow, structurally unstable belts which were periodically overloaded and later reoccupied by prograding deltas. Initial Cisco deltas followed a paleosurface grain controlled by underlying bank limestones; this paleoslope orientation was maintained during deposition of 1,200 ft of Cisco strata. Each fluvial-deltaic system inherited its geometry from previous systems and, in turn, provided control for the next deltaic episode. Stratigraphic and structural mapping utilizing mud decompaction techniques confirm the roles played by compaction and structure in controlling the geometry of sandstone bodies.

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[1] Publication authorized by the Director, Bureau of Economic Geology, The University of Texas at Austin.

ISOSTATIC GRAVITY MAP OF EASTERN CARIBBEAN REGION

Thirty-nine newly reduced gravity stations are incorporated with other published and unpublished data to produce a Pratt-Hayford isostatic gravity map of the Antilles Islands and Venezuelan basin. Negative and positive isostatic anomaly belts of the West Indies island arc are delineated.

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CALCAREOUS NANNOPLANKTON AND BIOSTRATIGRAPHIC SUBDIVISION OF UPPER CRETACEOUS

Calcareous nannoplankton fossils of the Tertiary generally are well known, and their importance in stratigraphy has been amply demonstrated. Cretaceous calcareous nannofossils have been described in several papers, and many species can be recognized. Workable stratigraphic schemes for subdivision of the Upper Cretaceous have been slow to evolve because of (1) the great diversity of Upper Cretaceous assemblages, (2) the similarity of many coccolith species in this interval, and (3) the lack of continuous sections with adequate, well-preserved nannofossil floras.

Twelve zones based on calcareous nannofossils are recognized within the Cenomanian-Maastrichtian, approximating the degree of subdivision readily attainable with planktonic foraminifers. Four of the zones lie within the Cenomanian-Turonian interval, another four probably within the Coniacian-Santonian, and four within the Campanian-Maastrichtian. Many of the genera and species characteristic of the Upper Cretaceous evolved during the Cenomanian. The increase in diversity is a marked feature of Cenomanian and Turonian assemblages. Diversity remained more or less constant until the Maastrichtian, but evolution proceeded rapidly in some groups, such as *Arkhangelskiella, Kamptnerius,* and some other coccolith genera during the Coniacian-Santonian. The Campanian was a period of relative evolutionary quiescence, and is generally difficult to subdivide. The Maastrichtian is characterized by successive elimination of many species with a resulting decrease in diversity of the assemblages. The end of the Maastrichtian coincides with an abundance-diversity minimum marking a level of great change in calcareous nannoplankton fossil assemblages.

Reference sections for the zones which are recognized are in Kansas and Alabama. The section along the Alabama River between Selma and Millers Ferry is particularly valuable as one of the best exposed series of outcrops available. It also provides rich, diverse, well-preserved calcareous nannofloras at all levels.

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COMPARISON OF ELECTRICAL LOGS AND PHYSICAL PARAMETERS OF MARINE-SEDIMENT CORES

Spontaneous potential and modified point resistivity logs were made from select cores of marine sediments. The logs have been compared with cone penetrometer and vane shear measurements, shipboard pH and Eh tests, X-ray radiographs and photographs, and water content, density, carbonate content, and grain size analyses from the same cores.

Indications are that electric logs can be of value in identifying zones of interest which have subtle property differences, can be used to correlate from one core to another, and display apparent relations to other properties.

Improvements in instruments and techniques may lead to the *in-situ* quantitative application of electric logging techniques in all depths of water.

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REDEPOSITION OF PELAGIC SEDIMENT BY TURBIDITY CURRENTS; A COMMON PROCESS FOR BUILDING ABYSSAL PLAINS

Reworked pelagic detritus forms most graded beds from the upper 10-20 m of most abyssal plains. Coccoliths are by far the commonest detrital particle in many of the abyssal plains and are present with discoasters in the fine silt fraction, whereas reworked radiolaria, diatoms and planktonic Foraminifera are present in the coarse-silt and fine-sand fractions. Piston and gravity cores from the Argo and Gascoyne abyssal plains off northwest Australia contain graded beds which consist of pelagic detritus sorted into layers of either Radiolaria, diatoms or planktonic Foraminifera. These layers clearly define the basal part of many graded beds of different color shades. The source for most of the sediment must lie in the pelagic oozes of the adjacent abyssal hills and rises and not in the upper continental slope and shelf areas. There is increasing evidence that density currents commonly originate in the closer fan valleys and rises flanking the abyssal plains and uncommonly on the upper continental slope.

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LET'S IMPROVE OUR WILCOX SUCCESS RATE!

For the last three years exploratory success in the Eocene Wilcox Formation of southwestern Mississippi has averaged 6.7%, far below the success of 1951–1953 when an 11% success rate was achieved with less than a third of the wildcat wells now available for control. If we are to reverse this trend, the geologists must improve sampling and testing procedures in the field and more effectively utilize well data in the office and laboratory.

Serious errors in elevations and well locations, deviated hole problems, inadequate sampling of wildcat wells, and incomplete evaluation of oil shows have contributed to an excessive number of dry holes.

The present success rate can be improved by greater use of isopach maps to supplement structural contouring, by a better understanding of the relation of oil to regional subsidence and remigration, and by more careful evaluation of core analyses to differentiate between live oil and residual oil.

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PROBLEMS OF TECTONIC RELATIONS BETWEEN LESSER ANTILLES, VENEZUELA, AND TRINIDAD-TOBAGO

(No abstract submitted)

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