Thirty-two species of calcareous nannofossils from 20 genera have been identified from the late Pliocene and early Pleistocene strata of the Louisiana continental shelf. Of these 32 species, 2 are restricted sufficiently to be useful as stratigraphic criteria. The significant occurrences are, the extinction of *Discoaster brouweri* Tan Sin Hok and the first appearance of *Gephyrocapsa caribbeanica* Boudreaux and Hay and these 2 species may be used to define the base of the early Pleistocene marine shale in the north-central Gulf Coast. Other results include: (1) delineation of a phylogenetic series extending from *Coccolithus doronicoides* Black and Barnes in the middle Pliocene section to *Emiliania huxleyi* (Lohmann) in the Holocene, (2) recognition of the co-occurrence of *Ceratolithus cristatus* (Kamptner) and *Ceratolithus rugosus* Bukry and Bramlette in the earliest Pleistocene sediments, (3) extension of the geologic range of *Gephyrocapsa protohuxleyi* McIntyre and *Cricolithus jonesi* Cohen back to the early Pleistocene, and (4) the first reported fossil record of *Homozygosphaera wettsteini* (Kamptner) and *Calyptrosphaera oblonga* Lohmann.

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DEPOSITION OF COCCOLITHS IN COMPENSATION ZONE OF ATLANTIC OCEAN

Recent coccoliths deposited in the Atlantic Ocean undergo selective dissolution in the calcium carbonate compensation realm, resulting in an increase in the relative proportion of solution-resistant placoliths in the assemblage. Solution of the coccoliths proceeds through gradual selective removal of ultrastructural elements in a sequence characteristic for each taxonomic group.

Selective dissolution of coccoliths allows recognition of 3 zones: (1) a basal dissolution zone termed here the "Mesolytic zone," about 500 m thick, directly overlying the calcium carbonate compensation depth. Sediments in this zone lack planktonic Foraminifera, have a low $CaCO_3$ content, and contain a coccolith assemblage of low diversity and composed of solution-resistant species, chiefly placoliths. In the southern and equatorial Atlantic these sediments are bathed by Antarctic bottom waters. (2) The middle Oligolytic zone is in the region from 500 to 1,500 m above the calcium carbonate compensation depth. Sediments contain corroded and fragmental tests of planktonic foraminifers and a coccolith assemblage with abundant resistant species and some corroded, less resistant forms. (3) The upper Eolytic zone extends from about 1,500 m above the calcium carbonate-compensation depth to the calcium carbonate-saturation depth. Sediments contain normal planktonic foraminiferal assemblages and diverse, well- to moderately well-preserved coccoliths, with only a few species showing obvious signs of corrosion.

Selective dissolution with depth removes "tropical" species, so that assemblages deposited at greater depths resemble living assemblages from higher latitudes.

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MODERN WELLSITE EVALUATION OF EOCENE WILCOX IN TEXAS

Present exploration efforts in the Eocene Wilcox of Texas are being conducted in areas with varied depositional environments and associated significant changes in sedimentary facies. The facies changes that most affect quantitative log interpretation are sediment size, sorting, and composition. Variable lithologic fabric and the wide range of connate waters present in the various intervals can cause difficult and unreliable interpretation when applying conventional methods for Sw and productivity analysis.

Supplemental methods are used to (1) locate zones of interest, (2) gain an idea of whether hydrocarbon production can be expected, and (3) provide porosity and saturation information.

Zones of interest are detected by the $Rxo/_{Rt}$ Quick-Look curve as compared to the S.P. curve. Changes in connate water and/or shaliness do not affect this method. Zones so located are then analyzed by using the dual-induction data to verify productivity.

Finally, an Ro curve is obtained by positioning a density-derived formation-factor curve in water-bearing sands, aided by information gained by the $Rxo/_{Rt}$ Quick-Look curve. This permits verifying the constants needed for water-saturation evaluation. In the pay zones, both porosity and water saturation can be scaled off this overlay.

This simultaneous display for visual analysis, available on the basic resistivity log, provides a convenient way to compare the quality of the zones of interest. The interpretational aids are mutually supplemental and lead to significant improvements in formation evaluation.

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GULF COAST EARLY CRETACEOUS NANNOPLANKTON BIOSTRATIGRAPHY—REVIEW

Formal zones have now been proposed for virtually the entire stratigraphic range of nannoplankton. Those for the Late Cretaceous and Cenozoic, though in various states of standardization, are generally applicable. However, the study of Early Cretaceous nannofossils is just emerging from the descriptive state, taxa are becoming stabilized, and attention is being directed to their stratigraphic and geographic distribution patterns. Recently published zonations, based primarily on coccoliths and related forms, are reviewed and evaluated in terms of their practical utility in the subsurface of the Gulf Coast. A state of flux is indicated by the general lack of agreement among these zonal schemes, either in terms of species ranges or in the choice of species by which zones should be defined. These conflicts suggest, in part, that provincialism and perhaps homotaxis are involved. Most of these zonations have been established outside of the Gulf Coast. The practice of defining zonal boundaries by evolutionary appearances renders them difficult to apply to most subsurface samples. Consequently, none of these zonations are entirely satisfactory.

Nannoconids are an important, and someplaces the only, constituent in Gulf Coast Early Cretaceous nannofossils suites. This group represents a remarkable evolutionary lineage consisting of approximately 12 usable species. They are geographically widespread and their occurrence in varied lithofacies suggests that they were less environmentally restricted than many nannoplankton. They apparently are less susceptible to diagenetic destruction than other calcareous microfossils and consistently are recovered from the deepest wells of the region. Although nannoconids themselves do not provide the desired degree of resolution, they are indispensable as a means of establishing a basic biostratigraphic framework which can be augmented by less common occurrences of coccoliths and related nannofossils, as well as other microfossil groups. Despite

shortcomings, which reflect mostly the state of the art, calcareous nannofossils are increasingly important in Gulf Coast Early Cretaceous exploration.

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ATCHAFALAYA BAY, LOUISIANA—REGIONAL SUBSIDENCE AND CONTEMPORARY DELTA FORMATION

Approximately 30% of the lower Mississippi River presently is diverted into the Atchafalaya distributary. As a consequence, lacustrine deltas rapidly are filling Atchafalaya basin lakes, increasingly coarse-grained sediments are entering Atchafalaya Bay, and a new delta—though probably geologically short-lived—is beginning to form. Understanding the geologic and hydrologic processes giving rise to this newly born delta might provide a clearer insight into the evolution of deltas as recorded in ancient sediments.

In the initial subaqueous phase of deltaic development (between 1952 and 1962) more than 120 sq km of Atchafalaya Bay had been covered by at least 0.5 m of new sediment. Local filling near the delta apex exceeded 2 m. The following phase, an estimated 50-year period of rapid subaerial expansion and shoreline accretion, has just begun. Comparison with modern Mississippi River subdeltas suggests the Atchafalaya delta eventually will deteriorate because of subsidence, compaction, and probable abandonment of the lower river course for a more direct, higher gradient route to the sea.

Analysis of tide records from Eugene Island and other Louisiana coastal stations indicates that in the last 30 years the rate of sea-level rise in Atchafalaya Bay ranged from 0.80 to 1.32 cm/year, almost exclusively because of regional subsidence. This exceeds even the rapid glacio-eustatic sea-level rise 6,000–10,000 years ago—an estimated 0.07 cm/year. Despite deposition into this rapidly subsiding trough, the Atchafalaya delta is still prograding; its ultimate internal form will reflect an interaction of sediment supply, wave energy, and regional tectonism. Unless modified by man, the Atchafalaya delta will expand across its bay 14.2 to 16.9 sq km/year until about the year 2020, creating approximately 950 sq km of new coastal land.

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CALCAREOUS NANNOFOSSIL APPLICATIONS IN GULF OF MEXICO–CARIBBEAN REGION

Preliminary investigations of the stratigraphic utility of calcareous nannoplankton in the Gulf of Mexico–Caribbean region were begun prior to 1954. Most of the applications of these minute forms, however, have been published during the last decade. Their stratigraphic occurrences have been documented for the Late Cretaceous and younger sections of the region, but, insofar as is indicated through publication, they have not gained the status of routine application in onshore and nearshore subsurface studies.

However, the stratigraphic value of calcareous nannofossils has been demonstrated amply. They are second to no group for the rapid evaluations needed routinely in the shipboard work connected with geologic oceanographic studies. Their worldwide applications, particularly in the Joint Oceanographic Institutes Deep Sea Drilling Program, include the Caribbean and Gulf of Mexico. Late Cretaceous through Holocene species occurrences have been calibrated for the Gulf region with the planktonic foraminiferal-based zonation scheme on Leg X of the Deep Sea Drilling Project. Current work in or applicable to the Gulf of Mexico–Caribbean region is summarized in this symposium volume.

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ERRORS IN PRE-HOLOCENE CARBON-14 SCALE

Carbon-14 dates more than about 10,000 years old are subject to at least one serious error, which is (at the moment) not amenable to correction.

Wood pebbles from a single thin clay layer, in western Florida, give C-14 dates which range from 22,000 to 29,000 years, with no assurance that either of these dates is correct. C-14 dates from different wood fragments and other material in coastal zones appear to provide a data for a high stand of mean sea level during the Wisconsin at almost any time desired from 20,000 to 40,000 years ago or more. Not all of these dates can be correct, or there would have been no Wisconsin glaciation. For reasons having to do with the growth and decay mechanisms affecting continental glaciers, it is unlikely that any of these dates are correct. Regardless, there is no standard by which "good" dates can be distinguished from "bad" dates.

A suite of samples which has been dated by both C-14 and K-Ar methods yields dates which differ by 1 order of magnitude or more; either the "young" C-14 dates represent much older materials, or the "older" K-Ar dates represent much younger material. With no additional method of dating, one cannot be certain which type of date—if either—is correct. The likelihood of contamination is higher for the C-14 results, however, and therefore this suite of dates may include mid-Wisconsin numbers for mid-Pleistocene events.

Mörner has reported that a small contamination of late Wisconsin or Holocene carbon may provide mid-Wisconsin dates for pre-Wisconsin materials.

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WEST LOUISIANA CHENIER PLAIN HISTORY

The "a-b-c . . ." model, which is based on littoral transport of sand, provides a powerful method for coastal analysis. Where long-parallel beach ridges are present, however, it may not be applicable: the two-dimensional map-view model requires that dq/dx (a numerical evaluation of changes in the littoral drift load) not be zero, except at 3 sharply defined points, whereas long-parallel beach ridges were built under conditions where dq/dx was essentially zero at all points.

These parallel beach ridges, then, do not represent an important littoral-drift system. Study of many sets of such ridges shows that they were built by onshore movement of sand which came from deeper water. The equilibrium which they achieve, with the passage of time, must be considered primarily in a vertical plane, taken at right angles to the beach, rather than in the map plane. They represent a steepening, with time, of an initially very gentle slope offshore from the beach, and leading to the suggestion that the present steeper slope is closer to equilibrium than the original gentle slope.

The chenier plain of Cameron Parish, Louisiana, is composed mainly of parallel ridges. Because of the parallelism, as well as the large content of shell debris, it is thought that these cheniers were built of material which must be attributed to an offshore source. Because of local departures from parallelism, and the