shallower pool discoveries were estimated. The approximate amount of oil that eventually will be produced in the United States (the grand total of all foregoing calculations) compares favorably with conservative predictions.

For detailed study of remaining oil and gas potential in the United States, the country was divided into seven producing regions. Analysis of each region suggested the probable locales of the remaining undiscovered giant oil and gas fields. The favored producing regions in the conterminous 48 states are the Rocky Mountains, Gulf Coast province, and California offshore.

MOORE, CRAIG E., Natural Gas Pipeline of America, Houston, Tex.

Speculations on Basement Mobility in Gulf of Mexico

Since the advent of plate tectonics, we have been faced with explaining the genesis of the Gulf of Mexico. The Gulf basin is the most heavily explored basin in the world, yet concrete evidence relative to its origin has not yet surfaced. Like pieces of a puzzle, major clues in bathymetry, paleobasin margins, and shifting depocenters are coming together to form a picture of the evolution of the gulf. It is reasonable to propose that the Yucatan Peninsula was once in Texas waters. Verification of this hypothesis may vastly expand the hydrocarbon potential of the United States Gulf Coast area. As more geophysical and geologic data are collected, extrapolation of sedimentary facies and the basin axis into the Yucatan shelf and interior may move these speculations into the realm of fact.

MOORE, DAVID G., Deep Sea Drilling Project, La Jolla, Calif.

Submarine Slides

Large submarine slides have long been known to damage structures in nearshore areas where lateral movements or depth changes have abruptly occurred when triggered by earthquakes and/or by periods of rapid deposition off large river mouths. Oldest reports of deep-water sliding are in connection with breaks in submarine telegraph lines. With the introduction of seismic profiling in the early 1960s, sub-seafloor sedimentary structures interpreted as slides have been recorded in many areas. The structures in these records are commonly equivocal and, to prevent misinterpretation, the limitations of the method must be recognized. Knowledge of the environment of submarine slides is equally important. Morphology, seismicity, and sedimentary processes are important in determining the relative stability of slope environments. Superimposed on these are the effects of Pleistocene lowered sea levels which resulted in pulses of sedimentation, overloading, sliding, and erosive turbidity currents. Slides reported in the literature range from rotational slumps off mouths of large rivers, where rapid outbuilding of delta-front deposits over fine-grained impermeable sediments develops excess pore pressures, to massive (over 900 cu km) allochthonous slides of complex structure displaced from an accretionary slope above a subduction zone.

MOORE, T. C., JR., and KAREN ROMINE, Uiv. Rhode Island, Kingston, R.I.

In Search of Resolution

In 1968, when the Deep Sea Drilling Project started, our biostratigraphy was held together almost totally by a single thread—the foraminiferal zonations. In carbonate-rich sediments, these zonations provided an average age resolution of about 6 m.y. in the Cretaceous and about 1.5 m.y. in the Cenozoic. The study of calcareous nannofossils was rapidly advancing at this time and soon "challenged" the Foraminifera for high stratigraphic resolution. Perhaps the biggest impact on biostratigraphy of the material recovered by DSDP has been the development of stratigraphic zonation for the siliceous microfossils. Radiolarian stratigraphy, in particular, has grown from a rough grouping of species with which one could distinguish epochs to a detailed zonation with an average age resolution of about 2 m.y. With this rapid growth in both the number of microfossil groups used in marine stratigraphy and in the degree of stratigraphic resolution, the question arises as to the ultimate resolution that is achievable. Recent work on the upper Tertiary and Quaternary provides a guide to what might be accomplished. The use of many biostratigraphic datums increases the average age resolution to as little as a few hundred thousand years, and the coupling with magnetic and isotopic stratigraphic zonation provides a check on global synchroneity. Development of stratigraphic zonation aided by the determination of fluctuations in abundance of faunal and floral assemblages offers the promise of increasing resolution another order of magnitude; studies of how faunal distribution patterns change with time indicate where such refined techniques may be useful and where they may be misleading.

MORTON, ROBERT A., Bur. Econ. Geol., Austin, Tex.

Characteristics of Shallow Subsurface Faults on Texas Inner Shelf

Faults mapped on the Texas inner shelf from high-resolution sparker profiles show diverse densities, continuities, orientations, displacements, and degrees of recent activity. Potentially active faults either intersect or are near the seafloor at the upper limit of detection on geophysical records, whereas inactive faults are usually overlain by continuous seismic reflectors. Fault characteristics are broadly defined by geologic age, depositional history, and degree of tectonic subsidence. Faults of greatest density and lateral continuity (<27 km) are peripheral to the Rio Grande delta, an area of active Holocene deposition. Faults are equally dense and less continuous (<16 km) near the Brazos-Colorado delta, whereas presently active faults are rare between the deltas except near Corpus Christi. Faults are least continuous (<5 km) and dense along the upper coast which has remained relatively stable during the late Quaternary. Displacements at depths of 150 m range from 3 to 30 m; most displacements, however, are between 3 and 10 m when rollovers are discounted. These en echelon growth faults coincide with the regional onshore (Willimar) trend oriented subparallel with the coast. Most are down-to-basin faults, but up-to-basin faults also occur.

Some topographic highs on the seafloor apparently formed by differential erosion of zones preferentially cemented by fluids migrating along fault planes. Seafloor expression of diapiric structures with radial faults is negligible; however, surface sediments near these structures exhibit subtle changes, which suggests minor differences in slope. Quaternary sediments, specially fluvial sediments, were also locally controlled by faulting.

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Late Holocene Depositional History of Regressive Barrier Island—Kiawah Island, South Carolina

Kiawah Island is an anomaly among barriers along the United States East Coast. Whereas most barriers today are actively eroding and transgressing landward, Kiawah displays a history of seaward progradation. The island is composed of a series of parallel beach ridges, which are morphologic evidence of a period of long-term accretion.

To examine the Holocene stratigraphy of Kiawah Island, 35 core holes were drilled to an average depth of 12.9 m into underlying compact Pleistocene clays of the Talbot Formation. The Holocene stratigraphy is a regressive sequence of environments with fine-grained, rooted, trough and planar cross-bedded beach-ridge, berm, and washover sands overlying burrowed, laminated, interbedded silts and clays. Faunal analysis suggests a shoreface to continental-shelf depositional environment for the *Mulinia*-rich silts and clays that comprise the lower half of the Holocene section. Carbon-14 dates of shell, wood, and peat material indicate a history of seaward progradation and beach-ridge development over at least the past 2,500 to 3,000 years. In contrast, the most landward beach ridge consists of a very thin (3.0 to 4.5 m) Holocene section of leached, poorly sorted, fine to coarse-grained sands capped by a poorly developed soil profile suggesting that this beach ridge represents the initial or primary barrier deposited during an earlier transgressive phase of history for Kiawah Island prior to 3,000 years B.P.

Understanding the unique depositional history of regressive barrier islands is especially significant in that these barriers have the highest potential for preservation in the rock record.

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Sedimentology, Petrology, and Geotectonic Properties of Athabasca Oil Sands, Alberta

No abstract available.

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Sedimentology, Petrology, and Geotechnical Properties of Athabasca Oil Sands, Alberta

The Athabasca oil sands deposit is not only one of the largest petroleum reservoirs in the world (870 billion bbl of oil in place), it is virtually the only supergiant oil accumulation that can be examined at outcrop. Sedimentologic and petrographic knowledge, gleaned both from the outcrop and from many subsurface cores, has direct and immediate implication for surface mining and in-situ reservoir engineering.

Most of the Athabasca reserves are contained in the Lower Cretaceous McMurray Formation, a 40 to 100-m-thick sequence of uncemented quartz sandstones and associated shales, saturated with heavy oil in virtually all zones where there is significant primary porosity and permeability. Through most of the deposit region, sedimentation was dominated by fluvial and related depositional systems, culminating in the localized development of very large channels in which were deposited distinctive solitary sets of epsilon cross-strata up to 25 m thick.

Insight into the characteristic facies patterns of the McMurray Formation sediments has important applications in surface mining; for projecting high-grade trends and locating prospective mine sites; for predicting variations in reservoir grade and designing mine layout accordingly; for identifying natural discontinuities (e.g., the sloping epsilon beds) that adversely affect pit high-wall stability; and for numerous other engineering uses. In the subsurface, detailed knowledge of the reservoir facies is of critical importance: in outlining the geometry of steam- or fire-flood patterns; in selecting zones which optimally may be treated with solvents, emulsifiers, or heat in order to establish inter-well communications; in identifying permeability barriers that can be exploited to contain a given stimulation flood; and, given the current context of fledgling experimental technologies, in explaining what went wrong in specific pilot programs.

MOUNTJOY, ERIC W., McGill Univ., Montreal, Quebec

Late-Stage Subsurface Dolomites—Problems of Origin

The origins of most secondary dolomites are difficult to determine. Currently, many secondary dolomites are being interpreted as resulting from the mixing of fresh and marine waters in the phreatic zone (Dorag model), although no situations are known from the Holocene and Pleistocene, where widespread and complete dolomitization has occurred.

In some sequences, coarse, well-crystallized dolomites are the last significant diagenetic event to have occurred, postdating the main stages of cementation and lithification.

In areas where there is no evidence of evaporites of supratidal dolomites, and the geologic and diagenetic histories have been worked out in detail (as for some isolated Devonian reef complexes in Alberta), the following evidence supports an origin from compacting subsurface brines: (1) late-stage formation of dolomites and their transection of earlier burial cements and stylolites; (2) insufficient subaerial exposure during deposition and early burial for extensive Dorag-type dolomitization; (3) geochemical and isotopic data; and (4) burial by relatively impervious calcareous clays, pre-