two Texas deposits (one in Webb County, the other in Live Oak County), it is the dominant ore-stage sulfide. This ore-stage marcasite occurs as intergrowths within and overgrowths on uranium-bearing phases and in close association with ferroselite near the redox boundary. Ore-stage marcasite occurs commonly as overgrowths on pre-ore sulfides that are dominantly pyrite both in ore and in a more extensive halo around the altered tongue. In two of the Texas deposits, ore-stage marcasite is present as much as 200 m (Webb County) and 400 m (Live Oak County) downdip from the roll front. Because of the close association of marcasite and uranium mineralization, understanding the conditions that lead to marcasite precipitation enables clearer determination of the geochemical environment of ore deposition. Kinetic factors are shown to favor marcasite over pyrite and we suggest that undersaturation with "monosulfide"-type phases such as mackinaurite and greigite are a prerequisite for marcasite formation.

RICART Y MENENDEZ, FERNANDO O., Museo Nacional Historia Natural, Santo Domingo, Dominican Republic

Subaerial Diagenesis of Axial Corallite of *Acropora Cervicornis*

In the subaerial environment the axial corallite of *Acropora cervicornis* is micritized. The micritization starts in the biologically secreted aragonite; later, the pore-infilling cement (recrystallized or not) is micritized. If the micritized fibers are leached out, the nonmicritized fibers are left without support and the corallite becomes crumbly (chalky). As more fibers are micritized, the corallite may be leached out entirely. If the pores of the corallite are infilled with minerals resistant to leaching, a reticular three-dimensional frame will be left in the space occupied by the corallite. If the new voids are infilled by drusy calcite a cast of the corallite will be created. The aragonitic fossil corals located in the splash zone may be replaced by calcite crystals, with much of the texture of the original cement, septa, septothecae, and costae reappearing and being preserved as ghosts in the calcitic crystals. The spherulitic texture of septa, septothecae, and costae produced by a submarine recrystallization process is not preserved.

RICE, DUDLEY D., RICHARD B. POWERS, an EDWARD W. SCOTT, U.S. Geol. Survey, Denver, Colo.

Relation of Sedimentary History and Tectonics to Natural Gas Accumulations, Western Gulf of Mexico

The western Gulf of Mexico province, which lies offshore from the states of Louisiana and Texas, is estimated to contain large resources of natural gas in Miocene, Pliocene, and Pleistocene rocks.

Interpretation of chemical and isotopic analyses of natural gases from 47 fields suggests that the province is important as a gas-producing region for three reasons. (1) Several shallow Pleistocene accumulations are of apparent biogenic origin; this gas is characterized by enrichment of the light isotope C^{12} in methane (δC^{13} lighter than -55 parts per thousand) and by large amounts of methane ($C_1/C_{1\text{-}5} > 0.99$). (2) Many of the Miocene accumulations were generated during the early stages of thermal cracking of liquid hydrocarbons. This type of gas is wetter than biogenic gas ($C_1/C_{1\text{-}5} > 0.92$) and isotopically heavier (δC^{13} heavier than -43 parts per thousand). (3) Numerous accumulations occur in thermally immature (with respect to oil generation) rocks in which hydrocarbons, particularly gases, have migrated vertically from deeper, more mature rocks. These gases are relatively dry ($C_1/C_{1\text{-}5}$ generally > 0.90), and have a wide range of carbon isotope values.

The gas occurrences can be related to the sedimentary history and tectonics of the area. The location, areal extent, and thickness of sediments in late Tertiary and Quaternary depocenters controlled the distribution of reservoir and source rocks and the depth of the maturity level for each rock series. Movement of a thick Mesozoic salt section, in conjunction with concurrent subsidence of the Gulf basin and the influx of sediments, resulted in folding and faulting of Cenozoic rocks and the formation of structural traps. Regional growth faults, plus radial faults associated with salt diapirism, provided pathways for the migration of hydrocarbons.

RICE, G. W., M. L. BAKKER, and D. M. WEINBERG, Continental Oil Co., Ponca City, Okla.

Geoseismic Modeling—An Interactive Computer Approach to Stratigraphic and Structural Interpretation

The solution of complex structural and stratigraphic problems often requires a merging of geologic, geophysical, and computer science principles. Geoseismic modeling is one such multidisciplined approach that allows the geoscientist to test geologic concepts to see if they can be confirmed seismically. Often, many iterations are required to formulate a geologic model that adequately matches the measured seismic response. To do this effectively, the geoscientist must have easy access to accurate theoretical principles and be able to interact with the computer in a real time environment. This leads to the following important considerations in making the computer an effective tool for geoseismic interpretation: (1) the geoscientist must be able to interact with the computer using his own language and terminology; (2) good human engineering principles, including graphic input and output devices, are necessary for describing the geologic model to the computer; (3) the system must be interactive to allow the geoscientist to test various geologic configurations quickly and to adapt these to the measured seismic response, because long turnaround time associated with batch processing interrupts the thought process and usually leads to an incomplete analysis; and (4) the system must be flexible enough to describe accurately both the seismic characteristics and the geologic configuration.

RICE, G. W., and B. M. BRANDT, Continental Oil Co., Ponca City, Okla.

Wave-Form Factor Analysis—Quantitative Approach to Seismic Stratigraphy

No abstract available.

RIEDEL, WILLIAM R., Scripps Inst. Oceanography, La Jolla, Calif.

Recent and Potential Advances in DSDP Biostratigraphy

The Deep Sea Drilling Project core collection offers unique opportunities for advances in pelagic biostratigraphy because (1) it represents a rather thorough sampling of the Cenozoic column in the oceans, (2) standard lithologic descriptions and preliminary stratigraphic interpretations of the cores are published routinely, and (3) samples and guides to investigations accomplished and under way are readily available.

A few DSDP sites with long sequences of well-preserved microfossils are being investigated by many workers, thus becoming reference sections through which pelagic stratigraphy is becoming consolidated. Quantitative methods are improving both the consistence of identifications of taxa and the meaningfulness of records of their occurrence. Investigations on the distortion of assemblages by dissolution and paleoenvironmental controls on the distribution of species and subspecies are providing information essential for improved biostratigraphic correlations. Sequences of events in each microfossil group are inevitably tied to those in other groups because all are investigated in the same set of cores. Paleomagnetic and isotopic investigations (mostly on non-DSDP cores) are linking these with the absolute age scale to permit determination of rates of changes and recognition of diachronous events. The sheer volume of DSDP data is encouraging the development of new methods, such as the application of probabilistic statistics to correlation.

We can expect future emphasis on quantitative procedures as the qualitative ones become inadequate for the increasingly rigorous requirements of biostratigraphy. Concurrently, we will obtain a clearer picture of the phylogenetic changes which form the basis for natural taxonomic systems and for biostratigraphic interpretations.

RIGBY, J. KEITH, Brigham Young Univ., Provo, Utah; NORMAN D. NEWELL, Am. Mus. Nat. History, New York, N.Y., and DONALD W. BOYD, Univ. Wyoming, Laramie, Wyo.

Marine Permian Rocks of Tunisia

The only marine Permian rocks in northern Africa are exposed in the Djebel Tebaga area of southern Tunisia. Fault-duplicated sections of approximately 850 m of marine shale, limestone, and dolomite, are exposed over a distance of approximately 15 km, in the mountains 25 km northwest of Medenine.

The sections grade upward from moderately deep marine shale and carbonate rocks, through a dolomitic, shallow marine section, to interbedded red and green terrigenous clastic and minor carbonate beds deposited in a littoral environment. The upper section is red beds, at and above the Permian-Triassic boundary. The apparently conformable sequence of Permian and Triassic rocks document a quiet termination of Tethyan marine deposition and suggest that the northern margin of the African plate was not involved in significant forward motion.

Marine Permian rocks near Medenine represent reef complexes that accumulated in relatively low-energy environments, interrupted only by short high-energy pulses of deposition. Reef talus is rare. The reefs are composed principally of algae with some sponges and limited bryozoans and brachiopods. Sponges are particularly abundant around the shaly margins of the carbonate masses. Echinoderms, gastropods, brachiopods, and bivalves are relatively minor interbioherm elements and are scattered through the abundant sponges. Fusulinaceans of the *Neoschwagerina-Yabeina* assemblage occur throughout the marine part of the sequence. Post-Jurassic faulting and possible intra-Permian folding interrupt the section.

RIGGS, KARL A., Mississippi State Univ., Mississippi State, Miss.

Lignites of Tombigbee and Holly Springs National Forests, Mississippi

Individual lignite bodies have been mapped using over 2,700 water-well records, more than 100 electric logs, literature references, and unpublished well bores of the Forest Service. Petrographic, proximate, ultimate, and fusibility analyses have been determined.

The lignite occurs as scattered pods with overburden ranging from 25 to 200 ft (7 to 60 m). All of the lignite is of Tertiary age. Most of it is in the undifferentiated Wilcox Group and the rest is in the Midway Group.

The lignite bodies vary widely in their properties, but most are low grade. The average heat content is 7,849 BTU (8,280,695 J), but individual samples cover the entire range of heat values for lignite. The volatile content and ash content tend to be high. Sulfur averages 0.82% but ranges up to 3%. The fixed carbon content is low. In thin section, the samples appear to be typical lignites.

Most of the lignite pods contain less than 3 million tons in place, but three deposits range between 25 million and 50 million tons in place.

RITCHIE, SUSAN H., Koninklijke/Shell Exploratie en Produktie Laboratorium, Rijswijk, Netherlands

Facies Recognition from Well Logs to Predict Permeability of Eocene Deltaic Sandstones, Lake Maracaibo, Venezuela

Secondary oil recovery by gas and water drive is taking place in Maraven's Block V concession in Lake Maracaibo, where the Eocene sandstone reservoirs have produced 531 million bbl of oil. Geologic core studies have been undertaken to explain and quantify reservoir inhomogeneities which affect the injection of fluid and control its distribution. Core interpretations were also used to calibrate subsurface logs. The upper "C" sands were deposited in a river-dominated delta-front environment, and two cores from this unit have been divided into three principal lithofacies, which are further divisible into several subfacies based on grain size, sandstone:shale ratio, and sedimentary structures.

The large variations that occur in reservoir quality in