instability occurred during the Mississippian, Pennsylvanian, and Wolfcampian with concurrent uplift of the producing structures and subsidence of the intervening grabens. The period of instability is coincident with the period of maximum activity along the Ouachita subduction zone.

Thermal and isostatic activity related to the subduction zone may have caused the differential vertical uplift and subsidence. The stress system appears to be caused by fluid movements in the crust or subcrust. As lighter material was subduced to mantle depths there was some partial melting and diapiric rise of these lighter materials. The complete process is not fully understood.

Rigid basement blocks were tilted and uplifted along basement faults. The overlying sediments behaved plastically, and basement faults die out abruptly upward in the section. Faulting is rarely found in the borehole, but steep to overturned beds are common. Minor faulting in the producing fields appears to have served as a conduit for rising hydrothermal fluids which cause some secondary cementation and loss of porosity and permeability. This has caused some structurally well-located wells to be dry or noncommercial.

The tectonic style of the Val Verde-Delaware basin is similar to that of many foreland basins throughout the world.

FRANK, R. W., Schlumberger Well Services

FORMATION EVALUATION WITH LOGS IN DEEP ANADARKO BASIN

The complex lithology, and the nature of the "measurement environment," make the "deep Anadarko basin" one of the more difficult log-evaluation problems facing the industry anywhere today. Methods for solving this problem are adapted to various conditions of hole size, temperature, pressure, salinity, and gasified mud, as well as to the particular case of salt-saturated drilling fluid, high temperatures, and deep invasion. Log-evaluation methods include Quick-Look interpretation techniques employing the Dual Laterolog and/or the Compensated Neutron/Formation Density (Compensated) as well as the advanced computation system, CORIBAND. Evaluation systems available are capable of a highly consistent and reliable evaluation of this complex reservoir.

HENNES, M. E., Consulting Dept., Core Laboratories, Inc., Dallas, Tex.

DEPOSITIONAL ANTICLINES OF DEEP ENVIRONMENTS—PAST SUCCESS AND FUTURE EXPLORATION

As the energy quest probes deeper into the oceanic environment, enormous depositional anticlines formed by deep current action are being documented, and certain of these with favorable rock properties beckon the explorationist.

Wind-driven surface currents such as the Gulf Stream can shape these anticlines at the outer edges of detrital sedimentation, where high-velocity currents sweep the bases of continental slopes. Similarly, the "bottom" currents, which are moving at slower velocities deeper on the continental rises, will form varied anticlinal profiles characteristic of particular bottom conditions. Redistributed terrigenous materials, which in great part compose these anticlines, are carried into both current systems by spasmodic gravity sliding and turbidity currents.

A striking example of wind-driven current deposition is present in the Florida Strait where calcareous sands from the Florida reef area are swept by the Gulf Stream along a trough, thence onto a broad anticlinal rise. Examples typifying "bottom" current anticlines are numerous in the North Atlantic, and deep-water coring programs have partly documented their sediments.

A wind-driven current origin can explain plausibly the Poza Rica trend in Mexico. As the Golden Lane Reef contributed its Tamabra talus downslope into swift currents of the Chicontepec foredeep, anticlines were shaped at the base of the slope. Similar origins are suggested for other examples in the geologic record.

Significant reserves in anticlines formed by forceful currents will be found beyond the reefs and laterally away from the deltas in the deep environment where the subtle character of these features must come to be recognized. Reservoirs such as Poza Rica attest to the excellent structural and reservoir qualities which can be realized in an inspired search for such targets.

KIER, R. S., Univ. of Texas at Austin and Bur. Economic Geology, Austin, Tex.

REGIONAL DEPOSITIONAL MODEL FOR EARLY PENNSYLVANIAN OF CENTRAL TEXAS

No abstract available.

LAPLANTE, R. E., Amoco Production Co., Research Dept., Tulsa, Okla.

PETROLEUM GENERATION IN GULF COAST TERTIARY SEDIMENTS

Organic detritus in sediments is composed principally of carbon, hydrogen, oxygen, and nitrogen. At the time of deposition, only small amounts of hydrocarbons are present. However, this organic matter has the potential to generate hydrocarbons in quantities that depend largely on its hydrogen content.

Organic matter disseminated in sediments, when heated, undergoes carbonization by mechanisms very similar to the thermochemical processes responsible for coalification. Carbonization is a thermal process marked by the generation of volatiles relatively rich in oxygen and hydrogen, and the formation of a kerogen residue increasingly enriched in carbon. The most significant oxygen-rich volatile is carbon dioxide, and the most significant hydrogen-rich volatiles are hydrocarbons.

Measurement of changes in the elemental composition of the organic matter as a function of depth can determine the principal volatile products of the carbonization reactions. Data from the Gulf Coast Tertiary indicate that carbon dioxide is the principal volatile product of early carbonization, and that hydrocarbons are not significant products until the later stages. Amounts of hydrocarbons generated during carbonization are vast compared to those from any other natural source or process.

The data indicate that the rate of carbonization or, more specifically, hydrocarbon generation is a chemical process which follows the general rules of chemical kinetics. As sediment age decreases, the temperature required to reach the level of carbonization associated with hydrocarbon generation increases. For example, significant hydrocarbon generation occurs in the Oligocene at a log temperature of 170°F and above; for lower Miocene log temperature is 186°F; and for upper Miocene log temperature is 205°F. Appreciably higher temperatures are required for significant hydrocarbon generation in post-Miocene sediment.

Kerogen with relatively low hydrogen levels (*e.g.*, similar to levels found in coals) probably would generate gas rather than oil. Thus, the relatively low hydrogen level in organic matter from these wells suggests that the sections penetrated would be better sources for gas than oil.

MCGLASSON, E. H., Mobil Oil Corp., Houston, Tex.

SILURIAN-DEVONIAN OF WEST TEXAS AND SOUTHEASTERN NEW MEXICO

During the early Paleozoic, a shallow depositional basin called the Tobosa basin developed in western Texas and southeastern New Mexico. The basin was bounded on the north and east by low-lying land masses and probably opened to the south into the subsiding Ouachita-Marathon geosyncline. Throughout Silurian and Early and Middle Devonian times the

basin became deeper, but more restricted areally. During Silurian time, broad thick carbonate shelves developed around the northern, eastern, and western margins of the basin. A sediment-starved condition developed in the deeper parts of the basin where a thin sequence of micrites and green shales was deposited in Late Silurian time. By Early Devonian time much of the shelf area was exposed but the deeper parts of the basin remained submerged. During Early and Middle Devonian times deep-water cherts and siliceous limestones were deposited. The Caballos Novaculite indicates that the water depth in the Ouachita-Marathon geosyncline on the south also reached its maximum during Silurian and Devonian times. In late Middle or early Late Devonian time most of the remaining area of the Tobosa basin was exposed by mild uplift. In Late Devonian time the area was again invaded by the sea, and the dark Woodford Shale was deposited overlapping all the previous Devonian and Silurian deposits.

MCQUILLAN, M., Univ. of Oklahoma, Norman, Okla.

SUBSURFACE GEOLOGY OF BASAL ATOKAN SANDSTONE, ARKOMA BASIN, OKLAHOMA

No abstract available.

MELTON, F. A., School of Geology and Geophysics, Univ. Oklahoma, Norman, Okla., and K. S. JOHNSON, Oklahoma Geol. Survey, Norman, Okla.

STEREO AND MOSAIC AERIAL PHOTO STUDY OF CENTRAL OUACHITA MOUNTAIN SYSTEM IN OKLAHOMA AND ARKANSAS

A careful study of stereo aerial photographs of a central part of the Ouachita Mountains in Oklahoma and Arkansas, followed by a related study of photo-index sheets of a much larger area in the Ouachitas, yields the following tentative conclusions:

1. The earliest structural dislocations of field dimensions are a series of approximately parallel bedding faults in the Stanley Shale, increasing in numbers downward in the section. A slight schistosity, also nearly parallel with bedding, may likewise increase downward. Some large overthrusts may have formed at this time. The prime source of this deformation was probably an underthrusting basement moving northward.

2. The next recognizable tectonic movements were uplifts of three main anticlinoria, although these could have followed episode 3. At this time the Ouachitas began to shed much coarse and finer clastic sediments toward the west and probably in other directions.

3. The next major episode seems to be steep faulting probably involving the basement and overlying sediments, producing semi-fault-block structures with tight broken anticlines; this was followed by a collapse of the sediments into deep synclines. Most of the high synclinal and more complicated ranges have straight or gently curved bordering faults in the adjacent lowlands.

4. The Mid-Continent regional uplift which included the Ouachitas must have produced a flood of coarse clastics adjacent to the mountains. These tectonic conglomerates have been removed by subsequent deep erosion, but their distal equivalents—the Garber, Duncan-San Angelo, and Whitehorse sands—are present in the Lower and Middle Permian of western Oklahoma and the western part of north-central Texas.

5. The nearly vertical Big Cedar fault extends nearly 200 mi from near Big Cedar, Oklahoma, to Jacksonville, Arkansas, northeast of Little Rock. It probably was formed during a period of relaxation or tension in Jurassic or Cretaceous time, and roughly parallels other faults in the coastal plain in southwest Arkansas. The Big Cedar fault touches 9 or 10 separate local structures along its length.

ROWETT, C. L., and J. L. WALPER, Dept. Geology, Texas Christian Univ., Fort Worth, Tex.

PLATE TECTONICS AND NEW PROPOSED INTERCONTINENTAL RECONSTRUCTION

Published reconstructions of the pre-drift positions of North and South America have failed to take into account many geologic continuities present in the Paleozoic fold belts of southwestern United States, Mexico, Central America, and northwestern South America. The well-known Bullard "fit" terminates Mexico at about 23°N lat., but if southern Mexico and Central America are added, they overlap the Guianan shield of South America. Dietz and Holden attempted to solve this problem by postulating crustal blocks that filled the Gulf of Mexico and subsequently rotated southwestward to form part of Central America.

We propose a new reconstruction in which the Gulf of Mexico is completely closed by northern South America and where Mexico is adjacent to northern and northwestern South America. The evidence for this reconstruction is found in the similar geologic history of the Appalachian, Ouachita, Marathon, and Coahuila fold belts as well as throughout the eastern Andean Cordillera of Venezuela, Colombia, Ecuador, and Peru. We further propose that the Gulf of Mexico resulted from (1) the separation of North and South America by spreading and transform faulting, (2) the opening of a sphenochasm to produce the Mississippi embayment, and (3) great left-lateral displacements of the initially linear Paleozoic mobile belt along the Wichita, Texas, Coahuila, and other megashears.

SHIPMAN, R. L., Div. Natural Resources and Environment, Univ. Texas at Austin, Austin, Tex.

POLITICS AND THE GEOSCIENTIST IN ENVIRONMENTAL DECADE

The participation of the geoscientist in all levels of political decision making is essential to find the middle ground for natural resource utilization while insuring the quality of the environment.

STARK, P. H., Petroleum Information Corp., Denver, Colo.

FILES AND THE COMPUTER—EXPLORATION TOOLS FOR 1970s

Computer processable well-data systems in the United States and Canada contain information on more than 700,000 wells. Examples illustrate the applications of well-data files in basin evaluation, analysis of regional plays, and selection of exploratory prospects. The regional evaluation of natural gas potential and a case study of the Muddy play in the Powder River basin are emphasized. Widespread application of these computerized data applications are increasingly important in the selection of oil and gas prospects to meet today's energy demands.

VAN SICLEN, D. C., Geology Dept., Univ. Houston, Houston, Tex.

DEPOSITIONAL TOPOGRAPHY—SEDIMENTATION MODEL FOR EXPLORATIONISTS

The term "depositional topography" refers to large-scale topographic irregularities formed by the processes of deposition in and beside a body of standing water whose bottom extended below the depth of significant wind-driven wave motion. This specifically *excludes* compaction features and terrestrial landforms. Modern examples include river deltas, barrier reef-lagoon complexes, and broad continental embankments. These have three principal elements: (1) a relatively horizontal part close to sea level (shelf or undaform), (2) a more steeply sloping part (slope or clinoform), and (3) a flatter deep-water part (or fondoform).

Ancient examples of depositional topography are extensively developed in the Pennsylvanian and Permian rocks of western Texas, where frequent fluctuations in relative sea level produced many cyclic intercalations of carbonate and clastic sedi-