16. C. W. Poag: Gulf Coast submarine banks as potential hydrocarbon traps
17. C. H. Bruce: Pressured shale and related sediment deformation—mechanism for development of regional contemporaneous faults
18. W. W. Tyrrell, Jr.: Denkman Sandstone Member—important Jurassic reservoir in Mississippi, Alabama, and Florida
19. G. E. Murray: Energy and the environment

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20. W. F. Tanner: Equatorial acceleration and continental paths
21. M. T. Halbouty: Oil is found in the minds of men
22. J. A. Patterson: Nuclear power and uranium
23. W. M. McKnight, Jr.: Review of South Texas uranium geology
24. G. W. Hinds: Gulf Coast photogeologic applications
25. J. L. Walper, C. L. Rowett: Plate tectonics and origin of Caribbean Sea and Gulf of Mexico
26. L. F. Brown, Jr.: South Texas eolian system—model of coastal eolian processes

SEPM (GCS) TECHNICAL SESSIONS

THURSDAY MORNING, OCTOBER 12

1. W. F. Tanner: Negative evidence and Pleistocene history
2. E. A. Butler, H. W. Simpson: Diversity-equitability analysis as paleoecologic tool
3. E. G. Otvos, Jr.: Pre-Sangamon beach ridges along northeastern Gulf Coast—fact or fiction?

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4. A. E. Weidie, J. A. Wolleben, E. F. McBride: Late Cretaceous depositional systems in northeastern Mexico
5. A. W. Niedoroda: Waves, currents, sediments, and sand bars associated with low-energy coastal environments
6. C. W. Poag: Shelf-edge submarine banks in Gulf of Mexico—their paleoecology and biostratigraphy
7. P. A. Thayer, D. A. Textoris: Petrology and diagenesis of Tertiary aquifer carbonates, North Carolina
8. F. P. C. M. Van Morkhoven: Bathymetry of recent marine Ostracoda in northwest Gulf of Mexico
9. P. Trabant, W. R. Bryant, A. H. Bouma: High-resolution subbottom profiles and sediment characteristics of Mississippi delta
10. W. P. Leutze: Stratigraphic utility of some Miocene and younger arenaceous Foraminifera
11. B. R. Sidner, C. W. Poag: Late Quaternary climates indicated by foraminifers from southwestern Gulf of Mexico
12. N. C. Hester, J. B. Risatti: Nannoplankton biostratigraphy and sedimentary petrology of a vertical facies sequence crossing the Campanian-Maestrichtian boundary in central Alabama
13. S. W. Wise, K. R. Kelts: Inferred diagenetic history of weakly silicified deep-sea chalk
14. C. M. Johnson, A. H. Bouma, W. R. Bryant: Bottom characteristics of northern Gulf of Mexico continental shelf
15. R. C. Tresslar, C. W. Poag: Living Foraminifera of West Flower Garden Bank
16. F. M. Weaver, S. W. Wise: Chertification phenomena in Antarctic and Pacific deep-sea sediments—a scanning electron microscope and X-ray diffraction study
17. H. C. Clark: Paleomagnetism of late Pleistocene-Holocene sediments, Gulf of Mexico

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18. B. R. Jones: Use of downhole gravity data in formation evaluation
19. A. H. Bouma: Recent and ancient turbidites and contourites
20. D. M. Fitzgerald, A. H. Bouma: Consolidation studies of deltaic sediments
21. W. E. Galloway: Significance of reservoir diagenetic alteration for petroleum exploration, Gulf of Alaska Tertiary basin
22. C. W. Holmes, E. A. Slade: Distribution and isotopic composition of uranium in a lower South Texas river and estuary
23. J. H. McGowen, L. E. Garner, B. H. Wilkinson: Significance of changes in shoreline features along Texas Gulf Coast
24. B. S. Applebaum, A. H. Bouma: Geology of upper continental slope in Alaminos Canyon region
25. G. O. Winston: Dollar Bay Formation of Early Cretaceous (Fredericksburg) age in South Florida

AMORUSO, J. J., Independent Geologist, Houston, Tex.

SMACKOVER STRATIGRAPHIC TRAPS—NEW PRODUCTION IN "OLD" AREAS

Until recently, most of the Smackover exploration has been essentially a search for closed structures. This initial phase of exploration has been quite successful, and many excellent fields have been found throughout the fairway. However, in mature areas, such as southern Arkansas and northern Louisiana, this quest for structure has resulted in the drilling of most of the easily definable closures, and the future promised only prospects of ever-diminishing size and economic potential.

With increasing well control, however, stratigraphy has been recognized as an important factor in the entrapment of Smackover hydrocarbons, even in fields generally considered to be essentially structural accumulations. Awareness of the importance of stratigraphic factors in entrapment has been dramatically focused by the discovery of Walker Creek and Welcome fields, Lafayette and Columbia Counties, Arkansas. Both these fields are due to stratigraphic entrapment provided by the updip termination of porous Smackover beds across gentle structural noses. Their discovery signals the beginning of the second phase of Smackover exploration—the search for combination structural-stratigraphic and wholly stratigraphic traps, and the rebirth of exploration for large reserves in a mature segment of the Smackover fairway.

The regionally regressive depositional character of the Smackover in this area afforded an excellent setting for the formation of many stratigraphic traps. Porous carbonate zones, successively higher within the Smackover section, were deposited southward across the shelf. The updip terminus of each zone abuts an impermeable seal to form an ideal stratigraphic trap. The sinuous nature of the updip terminus commonly, but not necessarily, in conjunction with low-relief structural noses or closures entraps the hydrocarbon accumulation laterally. In addition, many variations in the regional situation, due to the local depositional patterns of individual zones, tend to complicate the simple stratigraphic trap.

Lithologically, the most characteristic reservoir rock type is an oolitic-pelletal limestone with intergranular porosity. Porosity up to 30% is not unusual, but average porosity ranges from 10 to 20%. Various degrees of porosity destruction have resulted from the infilling of the primary porosity with sparry calcite cement. Where wave action was not sufficient to winnow out carbonate muds, no primary porosity was developed.

The diverse nature of the stratigraphic traps opens unlimited exploration opportunity on acreage once considered worthless because it was not located on closed structures. The stratigraphic phase of exploration now promises to be as profitable as was the structural phase in this "old" producing area.

APPLEBAUM, B. S., and BOUMA, A. H., Dept. Oceanography, Texas A&M Univ., College Station, Tex.

GEOLOGY OF UPPER CONTINENTAL SLOPE IN ALAMINOS CANYON REGION

The surficial sediments of an area of the upper continental slope in the Alaminos Canyon area, Gulf of Mexico, indicate sand input from the ancestral Colorado-Brazos and Mississippi River systems. The clay minerals in the area were derived from indeterminate sources and were incorporated in coarse samples through resuspension of former sediment. Vermiculite, as well as tubular hallaysite, were identified in clay samples. The first mineral is unreported in the northwest Gulf, and the latter is only known from the Mississippi delta in the northwest Gulf area.

The "hummocky" nature of the bathymetry in the area resulted from salt diapirism and scouring by tractive and/or density flow. Sand-size sediment was transported to the area from river systems by longshore drift during the Holocene transgression or through channels still identifiable on the present continental shelf. The lineation of one of these features, the Outer Colorado-Brazos Channel, is probably due to salt tectonics and not the result of a barrier spit as previously reported.

BERG, R. R., Dept. Geology, Texas A&M Univ., College Station, Tex.

Oil-Column Calculations in Stratigraphic Traps

Oil columns can be calculated for simple stratigraphic traps if the rock and fluid properties are known or can be estimated. Because oil migration is prevented by capillary pressure in small pores of the trap facies, direct measurements of capillary pressure allow oil columns to be calculated, but such measurements are rare. An alternative is to determine pore size from porosity and permeability data using an empirical equation, and then to compute the capillary pressure by an estimate of fluid properties.

An example of oil-column calculation is from the Milbur field, Burleson County, Texas, a lower Wilcox stratigraphic trap. Using core analysis from a nearby well, an oil column of 40-80 ft would be expected for the trap, and this estimate agrees reasonably well with an actual oil column of 60-75 ft for the field. The most important part of such calculations is the realization that the trapping facies itself can have significant porosity and permeability and yet form an effective barrier to oil migration. The result is that the best reservoir may occur downdip from dry holes with porous water-bearing sandstone and oil shows, rather than updip at the pinchout.

BIRDSEYE, H. S., Consultant, Albuquerque, N.M.

Geothermal Power in the Southwest

In this era of great concern over the environment and the energy crisis, much attention is being directed toward geothermal power as a partial panacea for both predicaments. Of approximately 1,100 known geothermal occurrences in the United States, most of which are in and west of the Rockies, a relatively small percentage are classified as dry steam reservoirs, capable of producing hot unsaturated steam which poses minimal effluent disposal problems. Others, such as the Salton Sea field in southern California, pose critical waste brine difficulties, which will probably be solved only by reinjection. A major geothermal field, *e.g.*, the Geysers in northern California, is expected to produce steam adequate to generate from 1,000 to 2,000 megawatts of electricity, with 50-year gross revenue from steam sales on the order of $2 billion.

There are known geothermal occurrences in the southwestern states of Texas (less than a dozen), New Mexico (57), Arizona (21), Nevada (185), and southern California (about 30). It is likely that additional geothermal prospects will be developed by the use of sophisticated geologic mapping, coupled with such geophysical methods as studies of temperature-gradients, microseisms and ground noises, resistivity, and remote sensing, and chemical methodology useful in determining maximum water temperature in the system and the age of that water.

BOUMA, A. H., Dept. Oceanography, Texas A&M University, College Station, Tex.

Recent and Ancient Turbidites and Contourites

Fossil turbidites have been recognized and described from many areas all over the world. A turbidite model, comprised of a fixed succession of sedimentary structures, was established a decade ago and seems to be usable, although some changes have been suggested.

Turbidites are generally assumed to be deposited by turbidity currents, but the presence of these currents in the marine realm has not been definitely established. Submarine canyons presumably are the major, if not only, important transport route for moving "shallow" water material to "deeper" basins. Questions arise about the origin of turbidity currents when studying canyons in which gradual filling followed by sudden emptying has occurred. The material in the canyon head moves downward slowly, comparable to glaciers. Besides this slow sliding, traction currents and debris flow have been suggested. Where turbidity currents start, and if they absorb the slow moving canyon fill, are questions that cannot be answered yet. Other problems are the relation between fluxoturbidites, or gravities, and turbidites, and the use of the terms "proximal" and "distal" turbidites.

In comparing recent turbidites with ancient ones, many discrepancies appear, most of which can be eliminated by considering the influence of primary consolidation on sedimentary structures.

Studies indicate that the use of electrical logging and seismic records do not allow detailed interpretation of deposits such as turbidites. The resolution of the records is not fine enough, although their application for basin analyses and overall trends is necessary.

Recently a new genetic term, "contourites," was introduced for sediments redeposited by contour currents. Recent and ancient contourites are compared with turbidites and only minor differences exist. A combination of parameters may allow a distinction between the two types and it is possible that both can be found in the same area.

BROWN, L. F., JR., Bur. Econ. Geology, Univ. Texas at Austin, Austin, Tex.

South Texas Eolian System—Model of Coastal Eolian Processes

Few oil and gas reservoirs have been interpreted as sands deposited within eolian depositional systems. Eolian facies may, however, be more common in ancient basins than heretofore recognized. Continued documentation of Holocene eolian systems, such as the South Texas system, provides a model for reevaluating the genesis of numerous unfossiliferous, well-sorted blanket sand bodies, many of which are associated with ancient, paralic depositional systems.

Pleistocene paralic depositional systems along the South Texas coast dictate the nature and distribution of facies patterns, environments, and processes exhibited by the overlying Holocene South Texas eolian system. A dominant southeast wind, high summer temperatures, and high rainfall deficiency combine with an abundant supply of Pleistocene sand to provide the proper framework within which extensive eolian deflation and dune migration can occur.

Eolian lobes are supplied with sand from Pleistocene barrier-strandplain facies and fluvial meanderbelt deposits. Loess sheets are derived from distant lobes, as well as from deflation of local Pleistocene deltaic and fluvial facies. Deflation of thick Pleistocene fluvial-deltaic sand facies is commonly stabilized when erosion reaches the shallow groundwater table. Maximum deflation occurs on the upwind, coastward margin of the system, especially where only thin Pleistocene paralic sands are available to supply dune trains; mud deflated by strong off-