of subsidence. The initial, or shelf phase of deposition, produces deposits similar to most modern deltas, although the rates of progradation are enhanced by the cumulative effects of sedimentation and absolute sea level fall. Such deposits are relatively thin and widespread, and internally are characterized by low angle clinoform reflections. The second, or shelf margin phase, results when sea level reaches the shelf edge and deposition occurs on the upper continental slope, where steeper sea floor gradients and more rapid subsidence produce a more localized deposit.

Interpretations of over 35,000 km of single channel high-resolution seismic profiles of the continental shelf and upper continental slope of the northwest Gulf of Mexico indicate the existence of 5 late Wisconsinan shelf margin deltas, including the ancient Rio Grande and Mississippi deltas. The deltas were recognized by geomorphic pattern, high angle clinoform seismic reflections, and association with buried river systems. Isopach patterns show that the deltas range in size up to 5,000 km^2 (1,930 mi^2) and reach thicknesses of over 160 m (525 ft). The deposits are elongate parallel to depositional strike, indicating subsidence of the shelf margin as a whole, as well as reworking by marine processes. Internal reflection patterns show the deltas to be fluvially dominated. Multiple lobes can be recognized in most of the deltas studied, resulting both from short term eustatic sea level fluctuations and delta switching.

SUTER, JOHN R., SHEA PENLAND, and THOMAS F. MOSLOW, Louisiana Geol. Survey, Baton Rouge, LA

Geologic Framework of Sand Shoals on Muddy Mississippi Delta Shelf

More than 1,000 km 620 mi) of high resolution ore-Boomer and 3.5 kh_z subbottom seismic profiles correlated to seventeen 10-12 m (33-56 ft) vibracores provide the data base for analyzing the sedimentologic and stratigraphic framework of transgressive sand shoals on the Louisiana inner continental shelf. Trinity and Ship Shoals are comprised of reworked sands of the abandoned Holocene Teche and Maringouin deltas and provide a possible modern analog for some Cretaceous shelf sandstones of the Western Interior.

Ship Shoal transgressive sands lie disconformably over Maringouin deltaic muds. The sand body pinches out seaward on the erosional inner shelf and is terminated landward by a depositional surface. Maximum sand body thickness is 7 m (23 ft) in the western shoal region. Internally, the sand body is characterized by landward dipping subhorizontal reflectors. The underlying Maringouin deltaic sequence contains a series of low-angle seaward-dipping clinoforms and numerous small channels in the western shoal area. Core analysis reveals a 3-7 m (10-23 ft) thick upward-coarsening sequence of very fine to fine-grained (100-125μ) well-sorted, clean, quartzose sand. Grain size, percent sand and shell, and percent cross bedding increase upwards. The shoal sequence is capped by a 1-2 m (3-6 ft) thick deposit of horizontally laminated fine-grained (125-175μ) sand and shell. The lower two-thirds of the shoal sequence is massive in appearance with minor amounts of burrowing. The shoal sequence abruptly overlies a dark, organic rich, silty clay (prodelta?) with numerous wavy and lenticular interbeds of silt; burrowing is rare.

The Trinity Shoal sand body is 5-7 m (16-56 ft) thick and lies disconformably over Teche deltaics. Internally, the sand body is composed of a set of westward-dipping clinoform reflectors. Three levels of channeling related to sea level stands in the early Wisconsin, late Wisconsin, and Holocene (Maringouin delta) underlie and occur seaward of Trinity Shoal. Continued Atchafalaya delta sedimentation will soon encase Trinity Shoal in mud.

SWAIN, F. M., Univ. Delaware, Newark, DE

Some Ostracoda from Rodessa, Pearsall, Sligo, and Upper Hosston Formations (Lower Cretaceous) of Louisiana

A preliminary study of Ostracoda from core samples in the Rodessa Formation (lower Trinity Group), and from the Pearsall, Sligo, and upper Hosston Formations (Coahuila Series), Lower Cretaceous, of the subsurface of northern Louisiana, has yielded 52 species. Only a small fraction of the known ostracode assemblage is dealt with here.

On the basis of present limited knowledge, the Rodessa Formation contains common *Eocytheropteron, Hechticythere, Rehacythereis?*, and *Cornicythereis* suggesting an open shelf environment. The Sligo Formation contains common Schuleridea, probably representing an open shelf environment, as well as *Fabanella* and *Hutsonia*, representing brackish lagoonal or estuarine environments. The upper part of the Hosston Formation contains common Paraschuleridea (open shelf) and *Fabanella* (brackish water) and a variety of other forms that suggest a range of conditions from lagoonal and estuarine to open shelf habitats.

SWART, PETER K., and JEAN MICHEL DAWANS, Univ. Miami, Miami Beach, FL

Variations in Mg/Ca as a Control on Distribution of Strontium Concentrations and $\delta^{18}O$ in Upper Tertiary Dolomites from Bahamas

Strontium concentrations and $\delta^{18}O$ are commonly used to infer the gross composition of dolomitizing waters, yet the bases for such inferences are not firmly established. A new approach to calibrating these 2 parameters is suggested from analyses of a section of upper Tertiary dolomites from the Bahamas.

In an interval of dolomite, 120 m (394 ft) thick from a core taken on San Salvador Island, mole % $MgCO_3$ is correlated positively with $\delta^{18}O$, and negatively with strontium. Strontium substitutes mainly for calcium, thus the negative correlation with mole % $MgCO_3$. Dolomites are enriched between 3 to 7‰ in $\delta^{18}O$ as compared with coprecipitated calcite, and thus the positive correlation. These two covariations indicate the need to consider the stoichiometric coefficient of dolomites, and to normalize strontium concentrations and $\delta^{18}O$ with their respective stoichiometric coefficients before inferring their relationship with fluid composition.

SWIFT, B. ANN, and C. WYLIE POAG, U.S. Geol. Survey, Woods Hole, MA, DALE S. SAWYER, Univ. Texas at Austin, Austin, TX, and JOHN A. GROW U.S. Geol. Survey, Denver, CO

Tectonic Development of Baltimore Canyon Trough

New well data and a new gravity model across the southern end of Baltimore Canyon Trough provide a more complete history of the basin's tectonic evolution and deep crustal structure than was previously known. The basin, which formed during the separation of North America from Africa, narrows and shallows along strike, as basement depth decreases from about 18 km (59,000 ft) in the north near New York to about 4-6 km (13,123-19,685 ft) in the south near Cape Hatteras. Previous analysis of the Continental Offshore Stratigraphic Test (COST) B2 and B3 wells using "backstripping" techniques showed a seaward increase in the amount of stretching during the basin's formation. The new biostratigraphic and paleoenvironmental interpretations are from the USGS Island Beach well 1 just landward of the hinge zone in the basin. This well, along with the COST B2 and B3 data, provides a sampling of the sedimentary sections overlying continental, transitional (rift-stage), and oceanic crust. The subsidence histories derived from these data give a cross-sectional view of the basin's evolution.

A gravity model of the southern end of the basin, along USGS multichannel seismic line 28, primarily analyzes a 60-mgal shelfedge anomaly. This anomaly reflects the change in bathymetry and more important a change toward the continent in underlying crustal thickness from typical oceanic to thinned continental crust. The crustal thinning is compared to the broad thinning zone to the north. Well-defined rift structures on the landward edge of the basin are modeled as rift grabens near the hinge zone.

SZATMARI, PETER, EDISON J. MILANI, MARCOS C. LANA, and J. C. CONCEICÃO, PETROBRÁS Research Center (CENPES), Rio de Janeiro, Brazil

Rifting Mechanism of the Early South Atlantic and Its Control of Oil Reserve Distribution in Brazil

Drilling and geophysical observations in the Cretaceous coastal basins of Brazil, both onshore and offshore, coupled with published information on the African margin, have led to a better understanding of the rifting mechanism of the south Atlantic and the way it controls the distribution of oil reserves. This information is crucial at a time when high exploration cots and unstable oil process make it imperative to select

the best targets for exploration.

A modified fit between the facing margins of the South Atlantic, based on the correlation of geologic features, shows oil provinces to alternate between the two continents, indicating a segmented rather than symmetrical partition of the underlying rift sequence. Basement highs on one margin correspond to base lows on the other, filled with a rift sequence acting variously as heat conductor, source rock, and reservoir.

The breakup of Africa and South America resulted from their differential rotation. Ductile deformation at the tip of the northward propagating rift increased sharply where transversel "tough" tectonic elements held up and eventually deflected the propagating rift. In such areas, as in the Campos and Reconcavo oil provinces, continued differential rotation of the separating continents, without corresponding rates of rift propagation, created anomalous stress concentrations resulting in horizontal rotation and translation of small crustal blocks. The higher oil reserves of these areas, compared to the low averages of the South Atlantic, and their pattern of oil field distribution reflect the tectonic movement of these crustal blocks.

TANNER, JAMES C., Petroleum Information International, Houston, TX

Politics and Hydrocarbon Resources

Politics has been a major factor in many countries' development and use of hydrocarbon resources. Not generally known is that proved and potential hydrocarbon resource appraisals may be inflated or deflated because of political as well as economic considerations. For petroleum and natural gas, some producing countries have long used political means to establish "proved" reserves that may be far higher, or lower, than might be considered prudent. The case of Mexico (where oil and gas reserve estimates were inflated through political maneuvers because of that country's major borrowing needs) and others will be examined.

TEUFEL, L. W., N. R. WARPINSKI, and J. C. LORENZ, Sandia National Laboratories, Albuquerque, NM

A Model for Fracture Genesis—Application to Mesaverde Group, Piceance Creek Basin, Colorado

Natural fractures play an important role in determining gas production from the low-permeability reservoirs of the Mesaverde Group in the Piceance Creek basin, Colorado. The importance of natural fractures is evident from the number of natural fractures observed in core and from the high in-situ permeabilities measured in well tests as compared to the low permeabilities measured in core. An understanding of the natural fracture systems requires knowledge of variations in the state of stress and changes in the physical and mechanical properties of the different sedimentary layers during the evolution of the basin. Geologic processes such as burial, diagenesis, tectonics, uplift, and erosion, and their resultant effects on the overburden, pore pressure, temperature, and strain were included in an elastic-plastic model to approximate the stress history of the basin. These data, coupled with an extended von Mises failure criterion derived from laboratory experiments of the rocks in question, were used to predict the relative time and type of fracturing, and the lithologic layers in which a fracture was likely to occur. Observations of fractures in 4,200 ft (1,280 m) of core (1,200 ft, 365 m, of oriented core) from the Mesaverde Group taken from the United States Department of Energy's 3 closely spaced wells near Rifle, Colorado, have been used to document the genesis of natural fractures and substantiate the model results. Empirical information such as the present state of in-situ stress determined from hydraulic fracture stress tests and anelastic strain recovery measurements of oriented core, paleostrain directions and magnitudes determined from analysis of calcite twin lamallae, and current temperature and pore pressure provided data as well as checks on the accuracy of the model.

THOMSON, JAMES A., Sabine Production Co., Denver, CO

COGS—Computer Oriented Geological Society

The Computer Oriented Geological Society (COGS), based in Denver, Colorado, is a professional organization of geologists and geophysicists that actively encourages application of computers to natural resource exploration and development. Founded in December 1982 as a user-oriented group, COGS is a network of earth scientists who both gain and contribute ideas and information regarding geologic computer applications. Dedicated to self-help and low-cost solutions, COGS offers a forum for discussion of common problems and allows new members to benefit from others' experience.

COGS membership ranges from geologists who are merely curious about the use of computers to geologist/programmers who write and market commercial geologic software. Most members own or have access to a computer, most often a microcomputer. The rapidly growing membership consists of more than 160 geologists and geophysicists in 12 states and 2 countries.

Monthly meetings feature a technical presentation followed by discussion. COGS has heard presentations concerning computer-aided mapping, species-diversity statistics, interactive geophysical modeling, double-Fourier analysis, and telecommunications, among others. Future presentations will include expert systems, geologic data-base management, well-log analysis, trend-surface analysis, and economic analysis of oil and gas prospects.

In addition to the monthly technical meeting, COGS publishes a catalog of all known geologic software for microcomputers, a membership directory, and a monthly newsletter. It also sponsors occasional workshops addressing some aspect of geologic computer work, co-sponsors the conference "GeoTech '84: Personal Computers in Geology," and distributes a diskette of public domain programs of interest to the geologist.

The diskette features 13 programs, for generating an oil well decline curve, printing a township plat map, analyzing well logs, and others. As more programs are incorporated, it is likely that the diskette will be replaced by a collection of 3-4 diskettes providing a core of general purpose geologic programs available to all geologists.

THOR, DEVIN R., Exxon Production Research Co., Houston, TX

Eustatic and Structural Control of Submarine-Fan Sedimentation, Conception Fan, Santa Barbara Basin, California

Eustatic sea level lows provide an opportunity for submarine-fan development; topography and structure, however, can control depositional-sequence geometry. Analysis of high-resolution seismic data provides a basis to evaluate the evolution and geometry of the Pleistocene-Holocene Conception fan. The fan formed in the restricted, tectonically active Santa Barbara basin. It consists of 4 vertically stacked depositional sequences, each bounded by nondepositional unconformities. The unconformities are defined by seismic-sequence boundaries and were formed during sea-level falls that are related to Pleistocene glacio-eustatic changes. Each depositional sequence consists of lowstand, sand-rich facies (fan channel, levee, and lobe) topped by highstand, mud-rich facies. The geometry of the depositional sequences tends to be rectilinear, not arcuate, because lateral progradation is restricted by topographically high structures.

The modern fan surface and the Holocene depositional sequence provide a good analog for the older, underlying depositional sequences. The fan surface is characterized by 4 main channels, 2 of which head into submarine canyons incised into the shelf. Submarine canyons that fed the other 2 channels are now filled and have no topographic expression. In addition, numerous partially buried channel segments occur in the interchannel areas. The Holocene depositional sequence consists of lenticular and sheet-drape deposits interpreted to be channel, levee, and lobe facies. The facies geometry suggests that Mutti's topographic compensation, channel migration, and avulsion were typical processes on Conception fan.

THURWACHTER, JEFFREY E., Univ. Texas, Austin, TX

Sedimentology and Depositional History of Neogene Gravel Deposits in Lower Tornillo Creek Area of Big Bend National Park, Texas

Neogene gravel deposits in the lower Tornillo Creek area of Big Bend National Park, Texas, record the filling of a small structural basin formed during Basin and Range tectonism. Four lithofacies are recognized in the Late Miocene La Noria member (informal name): (1) a medial braided-stream lithofacies consisting of upward-fining packages