shore winds is moved into clay dune complexes and eventually carried downwind to develop loess sheets. This extensive upwind deflation of the system is accompanied by windward accreting clay-sand ridges with nuclei composed of either beach-ridge remnants of a Pleistocene barrier-strandplain system or remnants of inter-blowout areas developed during early phases of the deflation of the coastward margin of the system.

Principal source of sand and loess is, therefore, local, representing reworking of underlying, older sands. A sand source resulting from longshore convergence and inland transport from Padre Island accounts for only the minor, local infilling of Laguna Madre in the land-cut area, and is not the principal source of eolian sand throughout the system. Facies fabric within Pleistocene depositional systems provides principal control of environments, sedimentary processes, and resulting facies within the subsequent eolian system.

BRUCE, C. H., Mobil Oil Corp., Corpus Christi, Tex.

PRESSURED SHALE AND RELATED SEDIMENT DEFORMATION—MECHANISM FOR DEVELOPMENT OF REGIONAL CONTEMPORANEOUS FAULTS

Regional contemporaneous faults of the Texas coastal area are formed on the seaward flanks of deeply buried linear shale masses characterized by low bulk density and high fluid pressure. From seismic data these masses have been observed to range in size up to 25 mi wide and 10,000 ft vertically. These features, aligned subparallel with the coast are *en échelon* or branching in pattern, and represent residual masses of undercompacted sediment between sand-shale depoaxes in which greater compaction has occurred. Most regional contemporaneous fault systems in the Texas coastal area were formed during times of shoreline regression when the duration of fault development extended over short periods of geologic time, and where comparatively simple down-to-the-basin fault patterns were developed. In cross-sectional view, faults in these systems flatten and converge at depth to planes related to fluid pressure, and form the seaward flanks of underlying shale masses. Data indicate that faults formed during time of shoreline regression were developed primarily through differential compaction of adjacent sedimentary masses. These faults die out at depth near the depoaxis of the sand-shale section.

In areas where subsidence exceeded the rate of deposition, gravitational faults developed where basinward sea-floor inclination was established in the immediate area of deposition. Some of these faults became bedding plane type when the inclination of basinward-dipping beds equaled the critical slope angle for gravitational slide. Fault patterns developed in this manner are comparatively complex and consist of numerous antithetic faults and related rotational blocks.

Nondepositional (structural) faults are common on the landward flanks of deeply buried shale masses. Many of these faults dip seaward and intersect the underlying low-density shale at relatively steep angles.

Conclusions derived from these observations support the concept of regional contemporaneous fault development through sedimentary processes where thick masses of shale are present and where deep-seated tectonic effects are minimal.

BUTLER, E. A., and H. W. SIMPSON, Atlantic Richfield Co., Dallas, Tex.

DIVERSITY-EQUITABILITY ANALYSIS AS PALEOECOLOGIC TOOL

Diversity-equitability analysis of microfaunal data as used by Beerbower and Jordan shows promise of being a rapid and useful technique for mapping paleoenvironmental gradients. It may even provide a more satisfactory definition of environmental boundaries than biofacies analysis based on taxonomic composition.

Faunal diversity is calculated as Shannon's information theory average uncertainty measure. Using this diversity measure, a few equally common taxa can yield as high a diversity index as many unequally common taxa. Lloyd and Ghelardi's equitability index may be used to separate these two diversity components and refine seemingly homogeneous data.

Recent microfaunal data from Barnstable Harbor, Massachusetts, and the northern Gulf of Mexico have been subjected to diversity-equitability analysis. From Barnstable Harbor, contours based on the equitability index can be related rather clearly to tidal action within the harbor. A diversity-equitability plot of published Holocene Gulf of Mexico data reveals that some environments may be characterized by a unique D/E range. Although these results must be considered preliminary, an analysis of parts of the lower Miocene sequence in Block 24 field, High Island area, offshore Texas, shows that the technique merits further consideration and is potentially a very useful tool for both identifying and mapping ancient environments.

CLARK, H. C., Dept. Geology, Rice Univ., Houston, Tex.

PALEOMAGNETISM OF LATE PLEISTOCENE-HOLOCENE SEDIMENTS, GULF OF MEXICO

Detailed paleomagnetic studies have been made on 15 sediment cores selected along north-south lines in the eastern and western Gulf of Mexico. The piston cores were sampled at 20-cm intervals immediately upon extrusion and measurements of natural remanent magnetization (NRM) were made using a 5hZ spinner magnetometer. Excursions of the geomagnetic field are recorded at 2 levels in many cores. Extrapolation of the ZY boundary in the western Gulf indicates that the younger feature is between 13.5 and 17.5 $\times$ 10^3 years BP, and is consistent with the age determination of the Laschamp event. Dates are not available for the eastern Gulf cores, but the depth of the paleomagnetic feature correlates with the expected sedimentation rates. The older feature is less distinct and further extrapolation of the ZY boundary places it between 20.0 and 24.0 $\times$ 10^3 years BP. This age is within the range of a geomagnetic feature that is not the Laschamp.

These results show that with extreme care, paleomagnetic measurements may be used as a stratigraphic tool in the Gulf of Mexico. Several points should be considered. First, because of the high sedimentation rates, the 2 young features described herein are the only ones expected in piston cores from this region. Second, direction scatter is quite pronounced in the upper 1/2 m and lower few centimeters of several cores. Correlations at these levels are difficult. Finally, as measurement of the geomagnetic features described lasted for only a short time and did not traverse a full 180°, dense sampling is recommended to assure their definition.

CRANDALL, K. H., Consulting Geologist, Piedmont, Calif.

ECONOMIC AND OTHER FACTORS AFFECTING PETROLEUM EXPLORATION

There is today almost universal agreement that we are facing a potential energy crisis, both imminently in the U.S. and possibly worldwide after the turn of the century. All studies of energy supply and demand indicate such tremendous growth in demand that conventional sources will be hard pressed to supply it.

The short-range annual growth rate in domestic and free-world demand for petroleum is estimated at 5% and 7 1/2% respectively, resulting in 19 million and 57 million bbl/day total demand in 1975. By 1980 U.S. demand will be nearly 25 million bbl and free foreign need nearly 90 million bbl/day.

The areas which will supply this demand, especially for the U.S., are quite uncertain because of the bewildering variety of political, legal, and environmental factors—as contrasted with purely economic ones—which will be of critical influence. Therefore, it is difficult to forecast the areas and the amounts and costs of exploration and development, as well as prices and earnings.

One thing is certain, however, there will be a growing shortage of domestic crude and an increasing dependence on foreign supplies. Both the cost and dependability of the latter are questionable in view of political considerations and the policies and actions of OPEC.