

turned beds, or other commonly recognized structural attributes of intrusive masses.

Diapiric shales produce negative gravity anomalies because of low densities. Density logs show densities to be almost as low as salt. Low velocities (indicated by sonic logs) cause shale-mass structures to be mapped seismically as "lows" instead of "highs," unless correct velocity functions are used.

A common clue to subsurface diapiric masses is 0.5-ohm resistivity (IES log) caused mainly by high water content of the shale. Few correlations, if any, can be made in the diapiric mass. An abnormal microfaunal sequence is found in nearly every case, as is high-pressure shale gas. Because of their greater magnitude and distinguishable direction, mudflow dips within an extrusive mass can be recognized commonly by a dipmeter survey. Dips recorded within an intrusive shale plug or a "shale sheath" should be random in both magnitude and direction. Sidewall cores within a diapiric mass contain churned shale pellets and gas bubbles in the shale units and also bear disrupted sand-grain frameworks in the sandstone bodies.

Sandy, water-filled, gas-churned mudflows are high-porosity, low-permeability masses that serve as barriers to hydrocarbon migration. Intrusive structures must have had a timely injection in order to trap migrating hydrocarbons whereas extrusive shale masses are unusual barriers because the barrier is present before or during deposition of the adjacent beds.

Systematic recognition and delineation of extrusive shale masses in the Gulf Coast by both conventional and improved exploration methods will open new frontiers to Gulf Coast petroleum exploration.

21. LEONARD L. LIMES, Consultant, New Orleans, La.

PALEOCLIMATOLOGY: A NEW DIMENSION IN OIL EXPLORATION

As the global search for oil continues, new dimensions are needed to define areas with maximum potential for the accumulation of hydrocarbons.

Oil and gas are formed by organic material deposited under highly selective conditions. Climate affects all living organisms today, as it has throughout the geologic past. The climate at the time of deposition affects both the supply of oil-forming organisms and the associated sediments.

The climate of the earth depends on the heat received from the sun. Because the earth is nearly spherical, a temperature gradient must exist from the equator to the poles. These climatic zones control the environment of deposition and also the resulting oil accumulation.

Paleoclimatology, by revealing the distribution in space and time of its climates of the past, when correlated with known oil accumulation, provides a new dimension in oil exploration.

22. JACK MORELOCK AND WILLIAM R. BRYANT, Texas A. & M. University, College Station, Tex.

PHYSICAL PROPERTIES AND STABILITY OF CONTINENTAL-SLOPE DEPOSITS, NORTHWEST GULF OF MEXICO

Sediments from the continental slope and shelf edge in the northwest Gulf of Mexico were tested to determine their strength, stability, and consolidation characteristics. Consolidation tests for Sabine River delta samples and abyssal-plain samples were used in the interpretation of the shelf and slope samples. To ap-

proximate *in situ* conditions, a direct shear-test machine was used to measure shear strength, and an An-teus Back Pressure Consolidometer was used to determine consolidation.

The topography of this area has been attributed to local slumping of unconsolidated and unstable marine sediments. Although the Sabine River delta samples were underconsolidated, the continental-shelf and slope samples all were overconsolidated. The overconsolidation of these samples and the high values of shear strength are assumed to be the results of low deposition rates and incipient cementation of the mineral grains. Analysis of the void ratio *versus* log pressure consolidation curves indicated that the sediments were "sensitive" and, therefore, relatively undisturbed by the sampling process.

The shear strength ranged from 0.05 TSF for the upper 1 m. of sediment to more than 0.5 TSF for a simulated depth of 20 m. The shear-strength tests indicate that the slope sediments should be stable to great thicknesses on even higher slopes than exist in this area.

23. ALAN R. FERGUSON, Humble Oil and Refining Company, Houston, Tex.

FINDING ANCIENT STREAMS MEANS FINDING NEW RESERVES

(No abstract)

24. F. P. C. M. VAN MORKHOVEN, Shell Oil Company, Houston, Tex.

CONCEPT OF PALEOECOLOGY AND ITS PRACTICAL APPLICATION

Economic micropaleontology contributes to the search for hydrocarbons in two equally important ways: it provides the petroleum geologist with correlations and age determinations, and it is instrumental in the delimitation of fossil environments of deposition. This latter function involves the study of paleoecology, which deals with the relations between fossil taxa and (or) assemblages and their environments. Paleocological studies depend heavily on a thorough knowledge of the ecology of living organisms, but the methods and terminologies used in each field are distinctly different. Because erroneous paleocological information may influence seriously the geological interpretation of an area, a thorough knowledge of correct procedures and methods in paleoecology is essential, and the limitations in paleoecology also must be realized fully. These procedures are discussed and summarized briefly. Definitions are presented of a necessary set of pertinent ecological and paleocological terms, some of which are introduced here for the first time. Certain erroneous procedures and misinterpretations common in applied paleocological studies include the indiscriminate use of well cuttings, the evaluation of poor faunas, and the taxonomic misidentification of fossils.

25. GARRETT BRIGGS, Tulane University, New Orleans, La.

PRIMARY SEDIMENTARY STRUCTURES IN SEARCH FOR PETROLEUM

Several types of primary sedimentary structures have been used in determining the source and direction of transport of sediments. In the last 15 years, much attention has been given to the description and measurement of the azimuthal directions of paleocurrent features and to the preparation of paleocurrent maps to illustrate ancient current patterns. Aside from