which result cover otherwise barren soil and rock in arid and semiarid regions of the southwestern United States. The brittle, fragile mats cover hundreds of square miles in areas undisturbed by livestock and man, and represent an accretional phenomenon in an otherwise generally erosional setting.

CANFIELD, ROBERT W., Texaco Petroleum Co., Quito, Ecuador, GUIDO BONILLA, Corporación Estatal Petrolera Ecuatoriana, Quito, Ecuador, and RAYMOND K. ROBBINS, Texaco Petroleum Co., Quito, Ecuador

Sacha Field of Ecuadorian Oriente

The Sacha oil field was discovered in early 1969 about 112 mi (180 km) east-southeast of Quito, Ecuador. It lies in the present-day axial region of the sub-Andean basin which in Ecuador is filled with Upper Silurian to Holocene sediments.

Sacha field is on a low-relief, faulted anticline about 17.5 mi (28 km) long. At the principal reservoir there are approximately 41,000 acres (16,400 ha.) under a vertical closure of 200 ft (61 m).

Principal reservoirs are sandstones of the Lower Cretaceous Hollin formation and the middle to Upper Cretaceous Napp formation. The Hollin sands, the main reservoir, are marine-fluvial, whereas the Napo sandstones are largely continental deposits. The basal sandstone of the Upper Cretaceous-Paleocene Tena formation is a secondary reservoir.

Production from the field commenced in July 1972 and, at the end of September 1979, over 164,000,000 bbl of oil had been produced. Gross recoverable reserves in the field are estimated at 633,784,000 bbl. Through September 1979, 89 wells had been drilled in the field, two of which were dry holes.

CAROZZI, ALBERT V., Univ. Illinois at Urbana-Champaign, Urbana, IL, JOEL C. CASTRO, CARLOS V. BELTRAMI, et al, PETROBRAS, DEPEX, Rio de Janeiro, Brazil

Microfacies and Depositional-Diagenetic Model of Amapá Carbonate Rocks (Paleogene) of Foz do Amazonas Basin, Offshore NE Brazil

The extensive, thick Paleogene carbonate platform (Amapá Formation) of the Foz do Amazonas Basin developed next to the ancient shelf edge through four depositional cycles. This important stratigraphic-structural unit of the basin became the natural target of the search for potential hydrocarbon reservoirs.

The Amapá carbonate platform shows six environmental belts: slope, apron, coralgal platform, large foraminifer shoal, finger coral bank and restricted lagoon. These belts consist of zones of intense bioaccumulation by red algae and large foraminifers separated by transverse channels where the products of their mechanical reworking accumulated as calcarenites. At all times, a terrigenous environment consisting of fan deltas and lagoonal sediments existed immediately behind the carbonate platform. It was connected with the open ocean by transverse canyons cutting across the carbonate platform and filled with shales containing carbonate olistoliths.

Distinct reservoir conditions were generated by underground circulation systems during episodes of subaerial exposure at the end of each depositional cycle when high-stand sea level changed to low-stand conditions. Excellent porosity exists in all microfacies except for the facies of the apron and slope belts, and consists of mainly enlarged interparticle and moldic porosity with a minor contribution of intercrystalline porosity related to dolomitization by mixing of freshwater and marine waters.

The Amapá platform is unique in the geologic record and the only modern analog is the Belize shelf. However, similar conditions of underground circulation and dolomitization by mixing waters exist today at a comparable scale in Florida and Yucatan.

CASBY, SUSAN, Shell Oil Co., Houston, TX

Geologic and Geophysical Investigation of Part of Outer Continental Shelf and Upper Continental Slope, Northwest Gulf of Mexico

The continental slope in the northwest Gulf of Mexico ranges in width from 110 km (59 nmi) off the Rio Grande to 240 km (130 nmi) off Louisiana. Throughout its Cenozoic history, this continental margin has increased its limits through the progradation and aggradation of clastic sediments on a broadly downwarped and subsiding basement. Eustatic changes in sea level in response to Pleistocene climatic fluctuations have provided for the deposition of these transgressive and regressive deposits. Rapid Pleistocene sea-level changes are responsible for accelerated deposition and extension of the continental margin.

Lowering of sea level moved nearshore sedimentation to the outer edge of the continental shelf. Shelf outbuilding occurred as deltas prograded over the shelf-slope break. Growth faults cut the sediment column in response to this rapid sedimentation. Marine transgression resulted in a decreased sedimentation rate, depositing a transgressive sequence which capped the regressive clastics. The continental slope in the northwest gulf is further marked by diapiric salt uplifts of variable size.

Correlation of recent high-resolution seismic profiles with drill-core data in a selected location on the outer continental shelf and upper continental slope off the Texas Gulf coast, together with textural, micropaleontologic, and paleomagnetic information and sparker data, yield a history of the late Pleistocene to recent. Analysis of shelf-edge progradation and its relation to sedimentation and structural activity on the continental slope yield additional information with respect to the Pleistocene to recent depositional history.

CASEY, J. MICHAEL, Univ. Texas at Austin, Austin, TX

Paleogeographic Evolution of Late Paleozoic Taos Trough, Northern New Mexico

The Taos trough (or Rowe-Mora basin) of northern New Mexico was one of several tectonically active cratonic basins associated with the late Paleozoic Ancestral Rockies. As the basin and adjacent uplifts evolved, the depositional systems and paleogeography varied in conjunction with changing tectonic stability, fluctuating

sediment input, evolution and integration of sediment dispersal systems, and varying water depth.

Morrowan time was characterized by a widespread transgression by a shallow sea flanked by low-lying, muddy strand plains. At this time the surrounding uplifts were relatively low-relief features and supplied only fine-grained sediment to the basin. By Atokan time, vertical movements elevated the Uncompahgre uplift to the west of the trough, and coarse alluvial fan, braided stream, and fan-delta complexes prograded eastward into the basin. During this episode of intense diastrophism to the west, the eastern side of the trough remained fairly stable and a broad, shallow-marine shelf sloped gently off the Sierra Grande arch. Farther south, carbonates accumulated on the Pecos shelf.

This general depositional and paleogeographic pattern continued into Desmoinesian time. However, to the north the Cimarron arch had become a major positive feature by earliest Desmoinesian time and several braided stream–fan-delta systems prograded southward and southwestward into the basin. By middle Desmoinesian time an extensive coastal plain had developed along the western margin of the trough, with low-sinuosity rivers feeding lobate deltas.

A major middle to late Desmoinesian transgression inundated this coastal plain and shallow shelf conditions prevailed throughout most of late Desmoinesian time. In latest Desmoinesian time, southward prograding fluvial-deltaic systems began filling the northern part of the basin causing a net southward regression. By Early Permian time the basin was dominated by continental sedimentation with southward flowing braided streams.

CASEY, J. MICHAEL, and ALAN J. SCOTT,niv. Texas at Austin, Austin, TX

Spectrum of Deltaic Systems in Pennsylvanian Tectonically Active Cratonic Basin, North-Central New Mexico

The Pennsylvanian sedimentary fill of the Taos trough of New Mexico contains a variety of coarse-grained deltaic systems typical of tectonically active, cratonic basins. This delta spectrum reflects the interaction of a large number of variables including: water depth, substrate stability, basin energy, fluvial feeder system variations, and tectonic activity. The deltas evolve from small, coarse-grained fan-deltas into more extensive wave-modified, river-dominated, lobate deltas. This evolutionary trend results from an increase in water depth and basin energy.

During Early Pennsylvanian time, vertical movements west of the Taos trough elevated the Uncompahgre uplift and coarse-grained fan-deltas prograded eastward into the basin. When these deltas prograded into water deeper than 4 m, frontal splays spread bedload sediment on the delta slope. Continued progradation gave rise to coarsening upward sequences 4 to 15 m thick capped by coarse channel deposits. When deltas built into very shallow water (<4 m), steep delta foresets developed. If the fan deltas advanced over thick mud sequences, syndepositional deformation occurred.

As the delta complexes extended into the basin, a broad coastal plain was constructed, and the braided streams evolved into low-sinuosity, bed-load rivers. Water depth in the basin increased, and channel-mouth sand was reworked into extensive delta-front sheet sand bodies by the higher wave energy. On delta abandonment, delta-front sand was reworked into barrier islands with associated washovers, and inlets. In contrast, fan-delta abandonment is only represented by thin, bioturbated calcareous sandstone or limestone beds capping the progradational sequence.

CASEY, RICHARD E., Rice Univ., Houston, TX, and JOAN MUSSLER SPAW, Amoco Production Co., Houston, TX

Radiolarian Characteristics of Major Oceanographic Environments

Plankton samples from major oceanographic environments (mainly DUCA high-speed net tows) and evaluated by radiolarian species and microplankton-group (foraminiferan, pteropod, diatom, copepod, etc) compositions, diversities, and densities have been used to characterize the radiolarian components of these major oceanographic environments.

Eastern and western high productivity boundary currents contain high standing crops of polycystine radiolarians, with the eastern boundary current revealing a higher radiolarian standing crop and diversity than the western boundary current region. The eastern boundary current also reveals its greater upwelling by containing more deep water upwelled individuals in the surface water than does the more mesotrophic western boundary current. Open ocean oligotrophic gyres are dominated by colonial radiolarian species and other species containing algal symbionts. Some extremely eutrophic shelf regions exhibit very low diversities and densities of polycystine radiolarians although the general microplankton standing crop is extremely high. Seasonal studies of the south Texas shelf exhibit oligotrophic to eutrophic conditions (which can be characterized by the radiolarian fauna) that can be related to the seasonal physical oceanography of the area.

The evaluation of detailed vertical samples has suggested radiolarian interactions with other planktonic groups, such as a decrease in radiolarians during the blooming of solitary centric diatoms. Vertical samples also suggest interactions among different groups of radiolarians such as the situation in which polycystine radiolarians may be competitively excluded on either a large (regional) or small (patchy) scale by the presence of ancantharian radiolarians.

Several radiolarian characteristics of major oceanographic environments can be and have been used to interpret paleo-oceanographic environments.

CATHER, STEVEN M., Univ. Texas at Austin, Austin, TX, and BRUCE D. JOHNSON, Marathon Oil Co., Casper, WY

Genetic Stratigraphy and Provenance of Baca Formation of New Mexico and Eagar Formation and Mogollon Rim Gravels of Arizona

The Baca Formation of New Mexico and the Eagar