fluctuations, (2) shoreline position and physiography, (3) paleowinds and paleoclimates, and (4) sediment sources.

VISHER, GLENN S., Dept. Earth Sciences, Univ. Tulsa, Tulsa, Okla., SANDRO SAITTA-BERTONI, Texaco Maracaibo, Maracaibo, Venezuela, and RODERICK S. PHARES, Mobil Oil Corp., Tripoli, Libya

PENNSYLVANIAN DELTA PATTERNS AND OIL OCCURRENCES IN EASTERN OKLAHOMA

Data from modern deltas have made it possible to interpret the origin of the Pennsylvanian "shoestring sands" of Kansas and Oklahoma. Objective criteria from cores and outcrops are used to define specific areal and vertical depositional patterns. Criteria include: (1) vertical patterns of sedimentary structures, bedding, and grain size, (2) clay mineralogy and detrital clasts, (3) trace fossils, and (4) detailed analysis of textures.

The historic development of a delta provides the insight for interpreting the deposition patterns observed in ancient deltaic sandstone bodies. The processes of progradation and maturation are used to develop a 4-dimensional deltaic model. Six subdivisions are distinguishable: (1) lower alluvial plain, (2) upper deltaic plain, (3) lower deltaic plain, (4) subaqueous sand sheet, (5) marginal basin, and (6) marginal plain.

The lower alluvial plain is characterized by stream meandering, point bars, and unidirectional channel flow. Development of the lower deltaic plain is controlled by crevassing of natural levees, by tides, and by floods. The subaqueous sand sheet is developed by shallow-water currents, modified by progradation and commonly replaced by deltaic-plain environmental units. The marginal basin and depositional plain are produced by longshore drift, and reflect a balance between subsidence, sediment supply, and wave energy. These environmental units may be modified or replaced by other deltaic elements.

The Bluejacket-Bartlesville Sandstone of eastern Oklahoma was selected as a model because of its importance as an oil reservoir, the large amount of available subsurface data, and the simplicity of the stratigraphic and structural framework. The model is used for interpreting many other oil-productive Pennsylvanian sandstones in eastern Oklahoma.

Lower Pennsylvanian strata were deposited during an overall transgression; but, the transgression is marked by extensive regressions. These are represented by widespread sandstone sheets commonly underlain and overlain by marine shale or limestone. Particular sandstone units are distributed across thousands of square miles, but locally the sands are lenticular. Each regression is in response to the outbuilding of sediment under static sea-level conditions. The supply of sediment is related genetically to a river system, and deltaic patterns from the same river can be traced through Morrowan, Atokan, and Desmoinesian strata.

WALKER, ROGER G., Dept. Geology, McMaster Univ., Hamilton, Ont., and J. C. HARMS, Marathon Oil Co., Denver, Colo.

THIN MARINE-NONMARINE ALTERNATIONS IN UPPER DEVONIAN "CATSKILL DELTA"

Upper Devonian strata, totaling 1,000–3,000 m in Pennsylvania and New York, record the shift from marine turbidity current to alluvial-plain deposition. Few detailed descriptions of the interval of transition have been published, and there is no adequate discussion of depositional environments based on modern sedimentologic principles.

In the Susquehanna Valley, south-central Pennsylvania, the turbidite sequence is followed by several hundred meters containing numerous thin marine-nonmarine alternations. These alternations, commonly as thin as 6 m, are composed from bottom to top of (1) sharp basal surface; (2) green, bioturbate, fine sandstone with brachiopods or crinoids; (3) green-gray fissile shale; (4) red, thin-bedded to massive mudrock or very fine sandstone with root marks, cracks, and small wave ripples; and (5) red massive mudrock with root marks, and tan calcitic nodules. Cross-stratified sandstone beds a few meters thick and with erosional bases are found rarely within units 4 and 5. Above the highest band of marine fossils is a thick sequence of red alluvial-plain cycles, composed of sediments which become finer toward the top of each cycle (Catskill). These characteristics suggest that the shift from marine to nonmarine deposition was broken by many abrupt transgressions (1 and 2). Shorelines prograded mainly by mud deposition (3 to 4), implying that wave energy was slight. Because coarser sediments with channeled bases are absent in unit 3 and rare in unit 4, tidal channels and tidal fluctuations must have been absent. The large volume of mud represented by each alternation must have been supplied mainly by longshore drift or overbank flooding from large, widely spaced streams, and the alternations probably are controlled by local tectonic pulses or tectonically influenced sedimentation rates.

WALKER, ROGER G., Dept. Geology, McMaster Univ., Hamilton, Ont., and F. J. PETTIJOHN, Dept. Earth and Planetary Sciences, Johns Hopkins Univ., Baltimore, Md.

ARCHEAN TURBIDITE BASIN, NORTHWESTERN ONTARIO

The importance of the study of Archean sedimentary sequences in unraveling the early history of the earth and continental development is self-evident. To this end we made a detailed stratigraphic and sedimentologic analysis of an Archean basin typical of the many found in the Slave and Superior provinces of the Canadian shield. The sedimentary sequence chosen, probably between 5,000 and 10,000 ft thick, is exposed on the shores of East Bay of Minnitaki Lake in northwestern Ontario. The lower 4,400 ft was studied in detail.

The entire section consists of turbidites, the indigenous sediment being fine mudstone and siltstone commonly forming graded couplets 1 or 2 cm thick with distal aspect. Interbedded with this predominantly pelitic facies are proximal facies. These consist of coarse, graded graywacke and, in places, graded conglomerate, the latter with cobbles up to 40 cm in diameter. The conglomerate near the base of the section consists of quartz-porphyry debris with numerous large sedimentary intraclasts; that near the middle of the section is of "granitic" provenance and contains cobbles of "granitic" aspect.

The study demonstrates the dominant role of turbidity currents in the deposition of Archean sediments—even of coarse conglomerates—and establishes the nonvolcanic origin of these sediments and a sialic plutonic source for most of the basin fill. The strata are not intra-volcanic but are, instead, a true epiclastic sequence deposited in a turbidite basin—perhaps similar to the younger turbidite basins of southern California.