markedly dissimilar. A partial parallel in the 2 river systems is the upstream diversion of a sizable part of the Mekong's flow by the Bassac and of the Mississippi's flow by the Atchafalaya. Flood relief afforded by the Tonle Sap, a massive sump more than 200 mi upstream from the mouth of the Mekong has no counterpart in the Mississippi system. The effect of this sump in smoothing stage differences in the river downstream from the point of diversion may be one important reason for the differences between the river systems. The Tonle Sap also may affect sediment concentrations in the Mekong, concentrations which are not only lower than on the Mississippi but are also strikingly different from the standpoint of coarse-to-fine ratios. Two additional reasons for the dissimilarity in the amount and nature of sediment load reaching the sea are the marked difference in tidal variation affecting the river systems and the fact that the Mississippi essentially is confined between artificial levees. The Mekong largely is unleveed and a large proportion of its suspended fine sediments is deposited overbank before they reach the sea.

LE BLANC, R. J., Shell Oil Co., Houston, Tex.

SIGNIFICANT STUDIES OF MODERN AND ANCIENT DELTAIC SEDIMENTS

A critical analysis of the geologic literature of ancient deltaic sediments reveals that there has been a noticeable increase in the number of significant papers since 1959. During the 80-year period prior to 1959 only 8 papers on ancient deltas appeared in print. These early contributions were by Gilbert (1885, 1890), Barrell (1912), Barton (1930), Twenhofel (1932), Busch (1953), Pepper *et al.* (1954), and Nanz (1954). During a 5-year period beginning in 1959, 12 significant publications on ancient deltaic deposits of the United States, England, Scotland, and Brazil appeared in print. In the past 8 years an additional 14 papers have been published. Thus, during the 13-year period since 1959, the publication of significant delta papers has been at the rate of about 2 papers per year.

A review of the literature on the geology of modern deltas also is quite revealing. Prior to World War II only 7 papers on modern deltas of North America were published. These were: Johnson (1920, 1921) on the Fraser delta of northwest Canada; Trowbridge (1930), Russell (1936), and Russell and Russell (1939) on the Mississippi delta; and Sykes (1937) and McKee (1939) on the Colorado delta of southern California and Mexico.

Following World War II there was a steady increase in the studies of modern deltas beginning with Fisk's work on the Mississippi delta (Fisk, 1944, 1947, 1952, 1954, 1955, 1958, 1961). Other important studies of modern deltas were: Moore and Scruton (1957), Scruton (1960), and Welder (1959) on the Mississippi delta, and Kruit (1955), Van Straaten (1961), and Lajaaij and Kopstein (1964) on the Rhone delta of southern France.

Post-World War II research on the Mississippi and Rhone deltas and other studies of modern deltas provided reliable criteria for recognition of sedimentary rocks of deltaic origin and also established much needed concepts of deltaic sedimentation. The increase in the number of publications on ancient deltas since 1959 clearly reflects the extensive application of these criteria and concepts to the study of older rocks. This ability to interpret ancient deltaic sediments is one of the greatest achievements in the field of stratigraphy and sedimentology in the past several decades.

On the basis of the writer's 30 years of experience in the field of clastic sedimentology, he has selected what he considers to be the most significant contributions to our present understanding of modern deltas and ancient deltaic deposits.

MALEK-ASLANI, M., Tenneco Oil Co., Houston, Tex.

ENVIRONMENTAL MODELING—USEFUL EXPLORATION TOOL IN CARBONATE ROCKS

The areal distribution of hydrocarbon-producing fairways within any particular carbonate shelf results from the imprints left in the rocks by climate, wind, tide, and contemporaneous tectonic history. Carbonate shelves marginal to the oceanic basins are different from those which formed adjacent to the cratonic basins.

Combinations of the above factors produce a spectrum of environments which can be interrelated within the framework of an environmental model.

Holocene carbonate-depositional models such as Bahama-Florida, British Honduras, Persian Gulf, Shark Bay, and others have provided clues needed to analyze the ancient carbonates and to recognize the appropriate environmental model. The comparison of Holocene models provides a cause-and-effect relation between different factors.

During the early stages of exploration in a carbonate province one should attempt to select an appropriate environmental model from petrologic study of surface and subsurface data. Such a model can be molded to fit the tectonic framework of the basin. The resulting paleoenvironmental model is useful for extending productive fairways and for predicting new trends.

MCBRIDE, E. F., Univ. of Texas at Austin, Austin, Tex., J. A. WOLLEBEN and A. E. WEIDIE, Louisiana State Univ. at New Orleans, New Orleans, La.

DELTAIC AND ASSOCIATED FACIES OF DIFUNTA GROUP (LATE CRETACEOUS TO PALEOCENE), PARRAS AND LA POPA BASINS, COAHUILA AND NUEVO LEON, MEXICO

The Difunta Group is gray calcareous mudstone, siltstone, and sandstone that interfingers with wedge-shaped redbed units. These complexly interfingered units are divided into 13 formations and many members, tongues, and lentils; the group has a thickness of 10,000 ft.

Low-sinuosity, high-bedload streams transported volcanic and sedimentary rock debris from the Sierra Madre Oriental eastward to the ancestral Gulf of Mexico. Separate rivers fed the Parras and La Popa basins. Sediment accumulated in arcuate, wave-dominated deltas that prograded slowly into water several hundred feet deep. Some sediment was transported by marine processes to shallow delta-flank environments.

Delta-plain lake and interfluve deposits are bioturbated mudstones containing sparse leaves, charophyte oogonia, dinosaur bones, and oyster debris. Many beds were reddened by postdepositional oxidation of iron-bearing minerals. Delta-front sheet sands are 20–60 ft thick, well sorted, flat bedded, and have sparse *Ophiomorpha*. Delta-platform deposits are characterized by sequences of ball-and-pillow structure and a sparse molluscan fauna. Prodelta deposits are interbedded graded sandstone and bioturbated mudstone; the sandstone beds were deposited by turbidity currents generated at the delta front by hyperpycnal inflow.

Carbonate banks up to 1,000 ft thick developed in distal prodelta (shelf) environments on submarine