no uplift, and the comparatively short time interval between cutting and filling indicate that erosion was not effected in the subaerial environment; therefore the channel was eroded entirely in the marine environment at a depth greater than 1,500 feet.

Cores from the Rosedale Sandstone exhibit many characteristics analogous to turbidites. Turbidity currents or gravity flows of sediment caused the erosion. Downcutting was facilitated by the poor induration of the lower Fruitvale Shale.

M. N. Mayuga, Long Beach Harbor Department: Geologic Highlights—Easterly Extension of Wilmington Oil Field

An offshore seismic survey in 1954 revealed a continuous anticlinal structure extending from the presently developed area of the Wilmington oil field easterly to an undetermined area beyond the Belmont Offshore Field. A number of normal faults transverse to the axis of the anticline were recognized. In 1961, the Long Beach Harbor Department Petroleum Division estimated that an oil reserve of approximately 800 million barrels of oil can be recovered under a water-flood pressure maintenance operation in the undeveloped offshore and townlot area of the City of Long Beach. Recent core hole data from eight wells drilled in 1962 in the offshore area showed possible production from five zones (Ranger, Upper Terminal, Lower Terminal, Union Pacific, and Ford). All the stratigraphic units in the developed portion of the field are present in the undeveloped area with possibly some older sediments overlying the basement rock. Based on the core hole information, the reserve estimate was revised to a range of 1.1-billion to 1.5-billion barrels of oil recoverable under a water-flood pressure maintenance operation. A development program is under consideration to produce the townlot and offshore area under a unit plan with drill sites to be provided from four, 10-acre, manmade islands.

Richard A. Mills, Petroleos Hondurenos; K. E. Hugh, consultant, Tegucigalpa, Honduras; D. E. Feray, Texas Christian University; H. C. Swolfs, consultant, Huntington, New York: Mesozoic Stratigraphy of Honduras

The Honduras basin is an intracontinental salient of a large marginal geosyncline that borders the southern side of the geanticline which divides northern Central America. During Mesozoic and Cenozoic time, 10,000–25,000 feet of sediments were deposited in the Honduras basin. No thick evaporite deposits have been found, suggesting the geosyncline was an open communication with the Pacific and Atlantic oceans.

The Triassic and Jurassic periods are represented by 3,000 feet of deltaic, littoral clastics. The Lower Cretaceous is composed of 2,000 feet of black, shaly limestones containing oil seeps; 2,500 feet of red clastics; 2,000–6,000 feet of massive rudistid and miliolid limestones; and 2,000 feet of conglomerates and clastics derived from the lower formations.

The Laramide orogeny divided the Honduras basin into the Ulua basin on the west and the Mosquitia embayment on the east. The main trough of the marginal geosyncline shifted south, and 35,000 feet of sediments were deposited in the area of Lake Nicaragua during Upper Cretaceous and Tertiary time.

The Ulua basin received 2,000 feet of Upper Cretaceous and Eocene redbeds and limestones and then remained a positive area during the remainder of Cenozoic time. Compressive folding during the mid-Tertiary Antillean revolution, formed distinct east-west geanticlinal belts. Volcanism, beginning during this period and continuing until recent time, was responsible for the thick cover of flows and tuffs along the Pacific coast of Central America.

The Mosquitia area of northeast Honduras and northern Nicaragua became a major embayment during Upper Cretaceous and Tertiary time. Thirteen hundred feet of Upper Cretaceous limestones and shales and 15,000 feet of Tertiary flood-plain and marine clastics underlie the broad Mosquitia continental shelf and extend eastward into the Caribbean Sea 150 miles.

The Pliocene-Pleistocene Cascadian orogeny was responsible for the present-day topography of northern Central America. Wrench fault tectonics probably explain the complex structure of this region.

H. W. Oliver and D. R. Mabey, U. S. Geological Survey: Regional Gravity Anomalies in Central California

A Bouguer gravity map of central California east of the Coast Ranges has been compiled from over 11,000 observations made by the U. S. Geological Survey, the U. S. Naval Ordnance Test Station, and several oil companies. The Bouguer reductions are based on a rock density of 2.67 g/cm^3 and include terrane corrections in all mountainous areas.

Regional gravity lows in the west and south parts of the San Joaquin Valley are produced by a maximum estimated thickness of more than 30,000 feet of Upper Cretaceous and Cenozoic deposits. Gravity lows also occur over local basins south and east of the Sierra Nevada which, in conjunction with limited seismic refraction measurements, indicate the following maximum thicknesses of Cenozoic deposits: Mono Basin and Long Valley—18,000 feet; Death Valley and Cantil Valley—10,000 feet; Owens Valley—9,000 feet; Indian Wells Valley—8,000 feet; Searles Basin, Saline Valley, and Panamint Valley—3,500 feet.

Bouguer gravity values corrected for the effect of the Upper Cretaceous and Cenozoic deposits show a broad, asymmetrical gravity low centered over the eastern Sierra Nevada with the steepest gradients and greatest relief on the west side. This major anomaly disturbs the earth's gravity field from the western San Joaquin Valley to the California-Nevada border. It can be explained by isostatic compensation of the Sierra Nevada and high areas to the east plus the relatively low-density rocks of the Sierra Nevada batholith.

A gravity ridge that extends for several hundred miles along the east side of the San Joaquin Valley shows excellent correlation with a similar magnetic ridge, suggesting that both anomalies are caused by a dense, magnetic mass buried at an estimated depth of 5–10 miles. This depth approaches the approximate 12 mile thickness of the earth's crust under the valley indicated by seismic refraction measurements.

Samuel A. Patterson, Security-First National Bank: Economic Trends in California Oil Industry

This is an over-all look at our local industry, relating historical trends with current conditions and generalized forecasts of the future.

District V is no longer isolated from the rest of the United States, but is an integral part of the total international oil industry. Our competitive position in this industry is not expected to deteriorate further.

Radical changes in the make-up of our local industry will take place. Secondary recovery and well stimulation operations will become increasingly important as onshore exploration declines. Large numbers of technical people so oriented will be required.