west. The oldest channel (Laguna age) is traced to almost 330 ft (100 m) below King Island in the western Sacramento–San Joaquin delta; the youngest channel (Modesto age) is about -33 ft (-10 m) at Lodi.

Because of their depth, these ancient channels are not presently exploitable. They are, however, a gold-bearing repository, and with newer technology may be potentially tappable in the not too distant future.

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Sedimentology and Paleolimnology of Miocene Peace Valley Formation, Ridge Basin, Central Transverse Range, California

The Peace Valley Formation of Miocene age occupies the axis of an asymmetrical trough in southern California known as the Ridge basin. Sandstone tongues of the Ridge Route Formation extend across the basin and separate the Peace Valley Formation into five members: the Paradise Ranch, Osito Canyon, Cereza Peak, and Posey Canyon Shale Members and the Alamos Canyon Siltstone Member.

The Paradise Ranch shale is a relatively deep freshwater facies, which was deposited in an anoxic lake that possibly was deeper than 65 to 80 ft (20 to 25 m). This unit consists of clay shale with interbedded turbidites, which form upward-thickening depositional lobes.

The Osito Canyon and Cereza Peak shales are shallow freshwater facies. Claystone is the dominant lithology in this extensively bioturbated facies. Deltaic distributary-channel and channel-levee deposits occur in this facies. Wave ripples, ostracodes, and bioturbation suggest deposition in an oxic lake. The sediment accumulation rate for this facies is from 11.1 to 11.7 ft/1,000 years (3.1 to 3.3 m/1,000 years), which is more than twice that of the deep freshwater facies 5.1 ft/1,000 years (1.4 m/1,000 years).

The Posey Canyon Shale and Alamos Canyon Siltstone are deep, brackish-water facies. The absence of insect burrows, mammal tracks, wave ripples, and mudcrack casts suggests that the lake was deeper than wave base or seasonal exposure, which may indicate depths from 65 to 80 ft (20 to 25 m). Dolostone, analcime-rich shale, clay shale, and claystone, as well as debris-flow and turbidite deposits, occur in this facies. Ridge Basin Lake was probably chemically stratified during accumulation of the deep brackish-water facies. The change from shallow freshwater to deep brackish-water deposition probably reflects a change from a hydrologically open to a closed basin.

Vitrinite reflectance indicates that, although the vertical composite thickness of the Peace Valley Formation exceeds 5 mi (8 km), the vertical thickness never exceeded 2.5 mi (4 km) at any given location.

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Nonmarine Trace Fossils in Miocene-Pliocene Ridge Basin, Central Transverse Range, California

The trace fossils *Palaeophycus, ?Scoyenia, ?Scolicia,* and *?Chondrites* occur in lacustrine and fluvial deposits of the Miocene-Pliocene Ridge basin of southern California. *Palaeophycus* is the most common ichnofossil in the sequence. *Palaeophycus* is a curved, cylindrical burrow that rarely branches. This ichnofossil is divided by diameter into two types: type A and type B. Type A averages 2 to 6 mm and type B averages 8 to 18 mm in diameter. Subaerial burrowing by insects probably formed these traces, hence they possibly can be used as evidence of subaerial exposure of the sediment. *?Scoyenia* is morphologically similar to *Palaeophycus* except *?Scoyenia* contains meniscate packing indicating active filling of the burrow, whereas *Palaeophycus* was passively filled. *?Scoyenia* was probably formed by deposit-feeding insects. Both *Palaeophycus* and *?Scoyenia* occur in fluvial and shallow freshwater lacustrine facies.

?Scolicia was formed by grazing gastropods. These ichnofossils are ribbonlike depressions which occur both as simple, sinuous furrows and as intertwined paths. *?Scolicia* is found in delta-front and shallow nearshore lacustrine environments in the Ridge basin. The presence of this trace fossil indicates that water depths were less than a few tens of meters.

?Chondrites is found in prodelta, delta-front, and deep brackish-water lacustrine deposits. It appears as small (averaging 1.75 mm), curved, commonly branching burrows which locally are replaced by pyrite. Aquatic worms constructed this trace fossil. In the deep, brackish-water deposits, zones of unbioturbated sediment are interbedded with zones of sediment which are partially or totally bioturbated by *?Chondrites*. This probably is the result of alternating oxic and anoxic conditions in the lake's bottom waters.

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Sedimentary Facies of Nonmarine Lower Miocene Diligencia Formation, Canyon Spring Area, Orocopia Mountains, Southern California

The Diligencia Formation in the Canyon Spring area consists of a 2,950-ft (800m) section of interbedded sedimentary and volcanic rocks that accumulated in an east-west-trending intermontane valley. Sedimentary facies are alluvial fan-braided fluvial, shoreline with interfingering basalt flows, fluvial-deltaic, and lacustrine. The alluvial fan-braided fluvial facies occurs in the basal part of the formation in the Canyon Spring area. Alluvial-fan processes predominated in the lower part of this facies where coarse debris was derived from an uplifted Precambrian schistose gneiss-augen gneiss basement complex on the south. Braided-fluvial processes predominated in the upper part of the facies where alternating sequences of sand and mudcracked mud accumulated.

Basin subsidence occurred with syntectonic outpourings of basalt. Some of the flows are pillow basalts that interfingered with rippled, well-sorted, fine-grained sand of the shoreline facies. Fossils are sparse in the shoreline facies and include ostracodes, land-mammal remains, and horizontal burrows. Spring-tufa deposits are present in a laterally persistent bed. As infilling of the lake occurred, deltas formed where gravel-bearing, sandy fluvial sediments of the fluvial-deltaic facies entered the lake. These deposits interfinger with the shoreline facies, and some of the boulders are anorthosite and Lowe-type granodiorite. Offshore, thin-bedded mud and silt of the lacustrine facies interfingered with the delta deposits. Evaporite lagoon conditions and volcanic activity (ash deposits) were intermittent.

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Late Miocene Activity on San Gabriel Fault as Indicated by Paleoenvironment of Castaic Formation

The upper Miocene Castaic Formation was deposited in the Ridge basin along the east side of the San Gabriel fault. Paleoecologic analysis of the Castaic Formation furnished information about the paleotopography along the fault, and provides information about activity on the fault during the late Miocene. The northern part of the Castaic Formation was deposited in an embayment bounded on the west by land extending southward immediately west of the fault to the vicinity of Castaic. Southeastward from Castaic, this positive feature extended as a submarine sill, behind which the maximum water depth in the Castaic basin was not less than 50 fathoms. The microfauna in the mudstones deposited in this silled basin consists of diatoms, radiolaria, normal planktonic forams, and dwarfed and deformed benthic forams. The southern part of the Castaic Formation was deposited on a broad shelf open westward to the Pacific Ocean. Sediments along the southeastern margin of the basin suggest little relief and slight tectonic activity in the areas of the southern Soledad basin and the western San Gabriel Mountains, in contrast to the high relief west of the San Gabriel fault along the northwestern boundary of the Castaic basin. The Castaic Formation was deposited in a normal-marine environment. Lateral faunal variations, interpreted in the past to indicate brackish conditions, are attributed instead to variations in substrate and topography along the basin margin.

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Depositional Environment of Neogene Mehrten Formation at Its Type Section

The Mehrten Formation represents a major period of Neogene nonmarine sedimentation in east-central California. The Mehrten Formation was originally defined as andesite-rich clastic sediments deposited in the Mokelumne River drainage basin of the Sierra Nevada foothills. The unit has since been extended to include volcanogenic sandstones, mudflows, and lava flows occurring throughout the foothills and in the Sierra Nevada itself. However, the precise depositional history and chronology of the Mehrten Formation have remained largely undocumented.

Preliminary studies undertaken in the area of the type section at Camanche Lake suggest that the andesitic sediments of that region were deposited in a braided fluvial system. Upward-fining sequences of coarse-grained andesitic sands and gravels cut by channeled conglomerates reflect this depositional environment. The occurrence of clast-supported gravels and sandy matrix-supported gravels, which grade laterally and vertically to planar and trough cross-bedded sands, further suggests that the braided fluvial system was located on the distal reaches of an alluvial fan. This particular alluvial fan was shedding coarse clastic debris to the west. Alluvial-fan deposits in the Mehrten Formation are tectonically significant because they record the onset of late Tertiary vertical tectonics in the Sierra Nevada. The andesitic composition of the sediments further reflects the convergent nature of active tectonism in California at this time.

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Deep Thermal Structure of Mimbres Basin, New Mexico—Implications for Oil and Gas Potential

The Mimbres basin of south-central New Mexico is the westernmost of the deep sedimentary basins which comprise the Rio Grande rift, a tectonic province of high heat flow trending northward from northern Mexico to central Colorado. The Mimbres basin is bounded on both sides by normal faults that have been active during the Quaternary. Quaternary basalt flows are also present in the area. Heat flow values in the basin are typically 60 to 110 mWm^{-2} and shallow geothermal gradients are typically 30 to 50°C/km.

Detailed temperature logs from 17 shallow boreholes less than 120 ft (40 m) deep have been obtained from wells located within and adjacent to the Mimbres basin near the international border with Mexico. The geothermal gradients from these wells have been continued downward through a typical "basin and range" conductivity model in order to estimate the deep, steady-state thermal structure within and beneath the basin. The predicted temperatures have been checked against temperatures measured in two separate oil tests at depths of 6,624 ft (2,019 m) and 9,435 ft (2,876 m) and found to agree to better than 5°C (9°F). Temperatures within the upthrown blocks adjacent to the basin are higher than those within the basin, a phenomenon that results from thermal refraction. Within the basin, the 120°C and 150°C isotherms are encountered at depths of 13,000 ft (4,000 m) and 18,000 ft (5,500 m). In the adjacent ranges, these isotherms are encountered at depths of 11,000 ft (3,400 m) and 16,500 ft (5,000 m), respectively. These depths are substantially deeper than might be inferred on the basis of the basin's tectonic setting or on the basis of the high gradients measured in the shallow boreholes. The temperatures in the deeper parts of the basin as well as part of the underlying basement are well within the liquid window of hydrocarbon stability. The downward continuation of shallow temperature gradient data appears to be an adequate tool for resolving the deep thermal structure of the Mimbres basin.

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Precise Gravity Survey Across Newport-Inglewood Structural Zone, Long Beach, California

A major strand of the Newport-Inglewood structural zone in Long Beach, California, has an estimated vertical uplift of 490 ft (150 m) along its west side as based on a precise gravity survey conducted in October 1979. This strand has a northwest strike and underlies the vicinity of the intersection of Seventh Street and Pacific Coast Highway. This fault strand, as delineated by gravity, is in agreement with well data from the northern extension of the Seal Beach oil field which the survey line crosses. However, the geometry of the structural zone, as modeled from the survey, is in conflict with that of R. F. Yerkes.

This fault strand has an associated gravity anomaly of °2.25 mgal at the southern end of the survey. The anomaly begins at California State University, Long Beach, and continues southward, possibly through the southeast offshore extension of the Wilmington oil field. The anomaly is presumably based on vertical offset of Franciscan(?) basement schist against overlying Miocene Monterey Formation and San Onofre breccia. This offset causes an estimated density contrast of 0.2 g/cc across the fault at a depth, as projected from nearby well data, of about 9,200 ft (2,800 m).

A graphical regional-residual separation indicated a regional gradient 4.5 mgal/km which compares with the regional value of 3.0 mgal/km by L. L. Nettleton. The instrument used was a LaCoste and Romberg G model gravity meter with an elevation accuracy of ± 0.01 mgal.