ping, groundchecked along main roads, was conducted in 1957–1958 on the new Army Map Service Alturas Sheet, scale 1:250,000, in the northeast corner of California (41°–42° North Latitude, 120°–122° West Longitude). Previous maps in the area, such as Anderson's in the Medicine Lake Highland, Peacock's and Powers' in the Modoc Lava Beds Quadrangle, and R. J. Russell's in the Warner Range were incorporated, with alterations to fit State Map units, newly available topographic detail, and the authors' geologic observations.

The oldest rocks in the area occupy about 100 square miles in the southwest corner of the area, and include Triassic sedimentary and metasedimentary rocks (Modin, Brock, Hosselkus, and Pit units); Jura-Trias metavolcanic rocks (Bagley andesite); Jurassic marine sediments (Potem formation); and Eocene arkosic sandstone (Montgomery Creek formation). Miocene to Recent basaltic flow rocks cover most of the remainder of the area, with a several thousand foot thick, uplifted section of Oligocene to Pliocene agglomerates, tuff-breccias, and pumiceous tuffs in the eastern part of the map (Warner Range); and a thousand feet or more of Miocene to Pleistocene diatomaceous, ash-rich, lake-laid sediments exposed beneath near-horizontal lava cover in large lake basins and river cuts in various parts of the sheet.

Some of the units, such as Cedarville series, Warner basalt, and Alturas formation, previously assigned and widely used to designate many of these rocks, appear to be subject to redefinition and subdivision, although the present authors have not completed this project.

Structurally, the eastern part of the area is dominated by the uplifted and tilted fault block of the Warner Range, flanked on the east by the Surprise Valley graben. The remainder of the area is mainly a dissected volcanic terrain of the Modoc Plateau, with many north-northwest-trending faults of slight displacement. Many basaltic shield volcanoes and cinder cones occur along the southern edge and in the northwestern corner of the area.

(12) Post-Miocene Sedimentation and Possibilities of Oil and Saline Minerals in Newberry Basin, Mojave Desert

E. A. Danehy, Southern Pacific Company

The name Newberry Basin is given to an area east of Barstow underlain by a large thickness of relatively unconsolidated continental sedimentary rocks which lie upon Miocene or older rocks. The areal limits of the basin are roughly those given by Buwalda (1914) as that for Lake Manix and represent a present-day tectonically negative area. The mountain ranges bordering the basin have been structurally positive since at least the post-Miocene orogeny. Very large thicknesses of extrusive volcanic and continental sedimentary rocks overlying pre-Tertiary "basement rocks" compose most of the mountain masses.

The post-Miocene sedimentary rocks filling the upper part of the basin are given the name Newberry formation and several facies of the formation can be recognized. The prominently exposed Lake Manix green clay represents deposition in a relatively long-lived Pleistocene desert lake. Coyote Lake, a present-day playa, had a short-lived period of Pleistocene pluvial sedimentation. A widespread sand unit is newly recognized as a deltaic facies of Lake Manix. The marginal facies deposited on the flanks of the basin are represented by fan deposits. Lateral gradations of all these facies can be seen in outcrop. Underlying this upper unit of Lake Manix time are older fluviatile and fan deposits.

The unit proposed as the Yermo formation by McCulloh (in press) composes the lower part of the Newberry Basin fill. Only the marginal facies (sand and gravel) of the Yermo formation are exposed for certain in outcrop; however, fine-grained facies are suspected to exist in the basin subsurface. Additional information from well data allows an interpretation of continual filling of the basin with sediments since possibly Pliocene time. Early recognition of the nature of Newberry Basin sedimentation was made by Thompson (1929). Interruptions of any magnitude in the deposition have occurred along the margins of the basin only and represent structural adjustments of the "basement rocks."

Alvord Mountain has a history of renewed uplift since the beginning of Yermo deposition. Several major faults cross or border the basin. Recent movements have occurred along the Manix fault zone and the Cave (Afton) Canyon fault system. The latter caused damming of the Pleistocene Mojave River and formed the several stages of Lake Manix and possibly earlier pluvial lakes.

Hydrocarbons are found in minute quantities in Miocene fresh-water shale concretions in the Calico Mountains and several test wells have reported oil and gas in the Newberry Basin. Modern knowledge of the origin of petroleum and the understanding of the environments of sedimentation in this region allow for reasonable explanations, but do not predict significant occurrences of oil or gas. Saline minerals, primarily borates, are being extensively sought in the Mojave Desert region. Additional occurrences in the Newberry Basin area besides those in the Calico Mountains are evaluated in the light of the present study. The possibility of buried borate-bearing beds of the Miocene Barstow formation is considered to warrant further exploration.

(13) East Gosford Oil Field, Kern County, California

R. E. Horton, Kern County Land Company

The East Gosford oil field, 6 miles southwest of Bakersfield, was discovered in 1948 with completion of Hancock Oil Company's KCL 85-23 in Sec. 23, T. 30 S., R. 26 E. Development of the

upper Stevens from depths averaging 8,000 feet was orderly over 2½ years. Structure near the upper Stevens lenticular or channel-type sands is a gentle southwesterly plunging nose with minor unimportant normal faulting. Through 1957, 5,063,000 barrels were produced from 27 upper Stevens wells.

Late in 1957 Universal Consolidated Oil Company and State Exploration Company discovered lower Stevens oil ½ mile east of the original field limits. To date (September 10, 1958) 25 lower Stevens producers have been completed, 4 dry holes were drilled, and 3 wells are drilling. In contrast to the gentle bowing in upper Stevens rocks, there are one and perhaps two areas of structural closure at lower Stevens time. In general, greater pay thicknesses and better production are encountered high on the fold, but basin source sands are well developed downdip and additional stratigraphic traps in downdip wells have afforded commercial reservoirs.

Limits of lower Stevens production have not been reached as yet, but it is likely that principal future drilling will be in the southwest part of the pool, although northerly field limits are not entirely defined. At least 540 acres are proved in the lower Stevens pool (September 10, 1958). The ultimate size of the pool could be substantially larger. Cumulative production from lower Stevens at East Gosford through July, 1958, is 325,000 barrels from 21 wells. Average daily production, August, 1958, was approximately 3,000 barrels from lower Stevens.

(14) FAULT SYMPOSIUM

A. Evidence for Large Cumulative Right Strike-Slip Movement on San Andreas Fault System
Edward L. Winterer, U.C.L.A.

B. Conservative Concept of San Andreas Movement
Thomas H. Baldwin, Monterey Oil Company

C. Effects of Lateral Faulting on Oil Exploration
William Henry Corey, Continental Oil Company

D. Prepared Question on Fault Movement
Robert H. Paschall, Hancock Oil Company
Panel Discussion
Moderator: V. L. Vanderhoof

E. Proposal for Organized Study of Major California Faulting
U. S. Grant, President, Pacific Section A.A.P.G.

(15) STRATIGRAPHY OF LA HONDA AND SAN GREGORIO QUADRANGLES
R. M. Touring, Humble Oil and Refining Company

The oldest rocks exposed are Upper Cretaceous foraminiferal mudstones, graded sandstones, and conglomerates (9,500 feet) occurring in a fault slice along the coast south of Pescadero. Not in contact is the Butano formation (5,000 feet) of Eocene age, consisting of interbedded sandstones, siltstones, and mudstones. The sandstones are thicker and cleaner in the upper part of the Butano formation and produce oil in the La Honda field. Conformably overlying the Butano formation are 2,500 feet of San Lorenzo mudstones and siltstones (upper Eocene A-1 zone to lower Zemorrian) which are cut by diabase sills and dikes. These dikes were feeders to basalt flows which poured from subaerial volcanoes into shallow water. The volcanic rocks are interbedded with upper Zemorrian and Saucesian mudstones, quartzose sandstones, and organic calcarenites. This sequence totals 2,000 feet in thickness and is overlain by 500 feet of brown chert and laminated mudstone (Relizian ?). Transgressing all older rocks are the upper Miocene cherts and diatomaceous mudstones (0–9,000 feet thick) of the Monterey formation. The Pliocene Purisima formation (5,650 feet) overlies the Monterey comformably and is still transgressive. It is characterized by the first influx of andesitic debris, probably from the Sierra Nevada. The Purisima is divided into five mappable members, which from the base upward are: tuffaceous siltstone and sandstone member containing small amounts of oil in the La Honda field (2,150 feet); siliceous mudstone member (2,300 feet); pebbly sandstone member (150–350 feet); mudstone member (450 feet); fine sandstone member (400 feet). Pleistocene terraces, recent alluvium, and landslides complete the stratigraphic column.

It is believed that the Butano, the lower Miocene volcanics and the Purisima formation can be directly correlated across the present San Andreas fault into the Stanford-Woodside area. The correlation suggests that lateral displacements along the fault in this area may be a mile or two, but not hundreds of miles.

(16) GEOLOGY OF NORTHWEST TEN SECTION
N. H. MacKevett, Shell Oil Company

The Northwest Ten Section accumulation discovered in 1958 is between the Canal and Ten Section oil fields in Secs. 23 and 24, T. 30 S., R. 25 E., approximately 14 miles southwest of Bakersfield in Kern County, California. Shell Oil KCL 15X-24, a 15,739-foot basement test, is credited with finding two new Stevens oil accumulations; however, the first producing well in the pool was a follow-up well, Shell KCL 84-23. An upper Stevens accumulation was indicated in 15X when a formation test