carried on since the late nineteenth century. Repeated though unsuccessful attempts have been made to find petroleum.

Records indicate 15 wildcat oil wells have been drilled within the quadrangle since 1925. Of these wells, 12 were put down in the period 1949–56. Several wells may have encountered non-commercial gas and oil shows, but there has been no sustained production.

(7) Financing of Future Exploratory Companies
R. G. Greene, Great Basins Petroleum Company

It is assumed that the spirit of free enterprise in the United States will provide favorable environment for the formation of many new oil and gas companies in the years ahead. It is further assumed that many petroleum geologists and engineers have or will develop the desire and ambition to play the part of entrepreneurs in the oil and gas industry. The contents of this paper should prove helpful to a majority of technical men whose experience in public financing is limited.

(8) Oil Basins of Peru
Irving T. Schwade, Richfield Oil Corporation

The principal oil basin of Peru, confined between the Andes and the Pacific Ocean, is a part of the long narrow belt (750×50 miles) of chiefly marine Tertiary sediments extending from northern Peru to western Colombia. Oil is produced on the Talara-Negritos, Lobitos, and El Alto uplifts from innumerable normal fault traps, which appear to have developed due to differences in basement density and/or rigidity rather than tectonic folding. The faults reflect the persistent tensional stress which prevailed from early Tertiary to early Quaternary. The area produces about 50,000 b/d of 37° gravity oil; cumulative production to date is about 600 million barrels.

The other oil-producing area of Peru is the heavily jungle-covered, scarcely explored Maranon Basin, which occupies the upper Amazon tributary drainage east of the Andes. This basin is a part of the sub-Andean trough, an elongate downwarp which persists from eastern Venezuela, through eastern Colombia, Ecuador, Peru, Bolivia, into western Argentina, lying between the overriding Andean uplift and the Guiana and Brazilian shields. The basin contains up to 12,000 feet of Tertiary and Quaternary fluviatile and lacustrine sediments which mask the Mesozoic and upper Paleozoic objectives. From outcrops and seepages in the Andean foothills, these objectives should constitute substantial reservoir and source rocks. The Ganso Azul and recently discovered Maquia fields, lying on the southwestern margin of the Maranon Basin in the belt of surface folds, are the only producing structures in the basin to date, with a daily production of less than 3,000 barrels, and an ultimate yield of probably less than 15 million barrels.

Attention is directed to the many geological similarities exhibited by North and South America in structural framework, tectonics, paleogeography, and stratigraphy.

(9) California Offshore Oil, Present and Future
Francis J. Hortig, California State Land Commission

1. A general historical review of California coastal tide and submerged land development starting with the first tideland well in 1896.

2. General review of past production, locations, techniques, and magnitude—which have totalled 312,000,000 barrels and $126,000,000 State-lease royalty payments through December, 1957.

3. Summary of present problems in future leasing and development. Suggestions as to future requirements and some possible development techniques.

(10) Eocene Gorge in Northern Sacramento Valley
J. D. Frick, T. P. Harding, and A. W. Marianos, Humble Oil and Refining Company

A prominent erosion-and-fill feature has been observed in the subsurface of the Sacramento Valley in Northern California. The feature, which has been termed a "gorge," extends for approximately 40 miles along a narrow, sinuous trend that is generally parallel with the course of the Sacramento River.

As much as 2,000 feet of Upper Cretaceous section has been removed by erosion and the trough later filled with sediments that have been correlated with the Eocene B-2–B-4 zones of Laiming.

It is suggested that submarine erosion of this thick section of Upper Cretaceous deltaic sediments was initiated by the uplift of adjacent land areas with consequent rejuvenation of the stream. A filling of the trough was started as the sediments built up on the basin floor and the marginal landmass had been reduced by erosion. Foraminifera, as well as certain textural features of the sediments, indicate that the entire sequence was laid down in a marine environment. There is no evidence in the fill or in the underlying beds that subaerial processes were involved.

This feature is important in exploration in that natural gas is present in sediments within the "gorge" as well as being trapped in Cretaceous sediments truncated by the "gorge."

(11) Geologic Reconnaissance of Alturas Area, Northeastern California
T. E. Gay, Jr., and Q. A. Aune, California State Division of Mines

To augment the California Division of Mines State Geologic Map project, photogeologic map-

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