I. Lower San Joaquin Formation (Upper Pliocene) and Salton Sea deposits (Recent?)
II. Upper Etchegoin Formation (Pliocene) and Sunset Lagoon (Recent), Salt marshes of Mission Bay (Recent)
III. Upper Imperial Formation (Pliocene) and shore waters of the Gulf of California (Recent), mouth of Mission Bay (Recent)
IV. Upper Pico Formation (upper Pliocene or Pleistocene), Lower Etchegoin Formation (Pliocene), lower Imperial Formation (Pliocene or Miocene), Upper Wildcat Series (Upper Pliocene) and Pacific Coast, exposed, continental shelf bottom deposits
V. Lomita marl (Lower Pleistocene or Upper Pliocene) and Catalina Island lee shore marl (Recent)

Slides are presented to show locality map, anatomy, representative species, and occurrences in the Pliocene of the Midway-Sunset oil field, Kern County, California.

3. "The Glendora Volcanics," JOHN S. SHELTON, Pomona College, Claremont.

The term Glendora volcanics has been given to the series of volcanic rocks exposed in the northeastern San Gabriel basin, Los Angeles County, California. They consist of flows, tuff breccias, and tuffs ranging in composition from olivine basalt to glassy rhyolite or dacite, the most abundant being andesitic flows and pyroclastics. Thicknesses reach at least 2,000 feet in exposed sections and about 3,500 feet in wells. Luisian Foraminifera and fish scales from sediments interbedded with upper members of the volcanics indicate that they are probably largely of upper middle Miocene age.

4. "Highlights of Washington and Oregon Biostratigraphy," R. STANLEY BECK, consulting paleontologist, Bakersfield.

The biostratigraphy of type and classical localities of Washington and Oregon is discussed. Special emphasis is given to the Astoria, Cowlitz, Olympic peninsula and Coos Bay basins. Strata from Devonian to Recent are known from these areas and have a combined thickness of over 30,000 feet. These basins, as well as others, are possible areas in which oil and gas might be discovered in the future. Favorable as well as unfavorable geologic conditions will be discussed concerning oil possibilities of the Pacific Northwest.

5. "Tidal Waves from the Recent Aleutian Earthquake," FRANCIS P. SHEPARD, Scripps Institution of Oceanography, La Jolla.

On April 1, 1946, a sudden movement of the ocean bottom in the Aleutian deep started a train of sea waves which were picked up on tide gauges as far away as Australia and South America. Great damage was done to all of the north coasts of the Hawaiian Islands and the waves surged to heights as great as 55 feet in some places of convergence. Investigation of the five main Hawaiian islands showed relationships between high water marks and submarine topography. Also the height was greatly influenced by the existence of coral reefs and lagoons along the shore. Investigations in Hawaii have been compared with determinations by the Japanese in the 1933 tidal waves to devise a means of forecasting the relative danger of different situations from future tidal waves.

Personal experiences during the tidal wave are given along with accounts of other observers.

6. "Effects of World War II on California Oil Reserves," Graham B. Moody, Standard Oil Company of California, San Francisco.

The enormous demands of World War II for California oil were met successfully. Production was increased from 230,263,000 barrels in 1941 to 326,555,000 barrels in 1945. This is an increase of 41.8%. The comparable figure for the balance of the United States is 18%. During the period 1941 to 1945, inclusive, California produced 18.2% of total United States oil production and 11.7% of total world production. It increased its proportion of total United States production from 16.4% in 1941 to 19.1% in 1945. One other record of past performance is of interest: California had produced to December 31, 1945, about 22% and 14% of total cumulative production from the United States and the world, respectively. This performance was accomplished by development of about 245,000 proved productive acres, a small area compared to that in other producing states. Average ultimate recovery from California fields is estimated to be about 44,000 barrels per acre. Other major producing states have estimated ultimate recoveries of 8,000 to 14,000 barrels per acre. California pools have sufficient thickness to compensate for their restricted areal extent.

Despite the drain on California's oil resources by World War II, production in the middle of September, 1946, was about 870,000 barrels daily; the daily average during 1941 was about 631,000 barrels. During the period 1941 to 1945, inclusive, the discovery of new pools and new fields in California added estimated reserves equal to about one-third of production during that period. Additional reserves must be discovered in order to continue to meet the unprecedented peacetime demand for California oil. More new pools in present producing areas probably will add larger amounts to reserves than will new fields (Tidelands excepted). It will require intensified geological effort to find these new reserves. There still is ample opportunity in California for the competent and imaginative geologist who can evolve a productive program from a mass of factual information.

7. "Time of Oil and Gas Accumulation, A. I. LEVORSEN, Stanford University.

A perplexing problem in petroleum geology is whether the oil and gas originate at or very near the point of accumulation, or whether they have migrated in from some distant area of origin. Examples of both *in situ* and distant origin can be cited that seem to indicate both occur in nature.

For those pools which seem to indicate migration from a distant source, a rough guide as to the time of the accumulation is offered. It is based on the timing of the formation of the trap into which the oil and gas accumulate—the accumulation cannot occur before the trap is formed. In considering the interval between the time of formation of the reservoir rock and the present time, most producing traps can be separated into the varying component elements which go to make up the trap as it now exists. Examples of different combinations of trapmaking events are given as a guide to the time before which accumulation could not have occurred. Furthermore, the capacity of a trap is in part a function of the depth of burial of the reservoir—a phenomenon which also supports a relatively late accumulation of many pools.

8. "Permafrost and Related Engineering Problems," SIEMON WM. MULLER, Stanford University.

Permafrost or permanently frozen ground is a widespread phenomenon in the northern hemisphere. About one-fifth of all land area of the world is underlain by permafrost.

Wherever present, permafrost affects in one way or another (or is itself affected by) every field of human endeavor. The consideration of permafrost is vital in planning transportation routes, settlements, pipelines, drilling operations, etc. Roads, railroads, and buildings, inappropriately located or improperly designed and built, are likely to be damaged and rendered useless. Drilling tools may freeze in the hole, causing the abandonment of a project. In the permafrost area, the problem of water supply claims foremost attention.

Stresses that develop in freezing ground may exceed 2,000 kilograms per square centimeter. Just as the Russians have done in the past, we are learning, in the hard way, that it is uneconomical if not futile to "fight" the natural forces of frost by using stronger materials, more rigid designs, or to resort to periodic and costly repairs, which rarely if ever succeed in a permanent righting of the situation. Successful solution of permafrost problems depends on a thorough understanding and correct quantitative evaluation of the component elements and on the planning of the project in such a way that the frost forces are utilized to play into the hand of the engineer and not against it. A thorough and comprehensive survey of the permafrost conditions should therefore constitute a preliminary and an integral part of any engineering project.

9. "The Cretaceous of Colombia," J. WYATT DURHAM, California Institute of Technology, Pasadena.

During the Cretaceous varying amounts of marine and non-marine sediments were deposited in the North Andean geosyncline which passed through Venezuela, Colombia, and Ecuador. During the maximum period of flooding, all except extreme Western Colombia, part of Eastern Colombia, and a few islands appear to have been covered by the seaway. The Cretaceous sediments usually begin with a sandstone or limestone, which is followed by a thick sequence of black shales with occasional limestone members. Following the black shales, there is a more or less cherty shale or limestone, which is followed by either sands and shales or shales and limestones. The thickness of the sediments varies from around 2,000 feet to more than 40,000 feet. Marine faunas are often abundant and show marked relationships to both the Gulf Coast and the European Cretaceous faunas. From the faunas collected at various localities it appears that most, if not all of the standard Cretaceous section is represented in Colombia.

10. "Origin and Migration of Oil into Sespe Red Beds," THOMAS L. BAILEY, Rothschild Oil Company, Santa Fe Springs.

The name "Sespe formation" is applied to the non-marine red bed facies of a group of sedimentary rocks up to 7,500 feet thick. They range in age from upper Eocene into lower Miocene in the southern and eastern part of the Ventura basin but are probably confined to the Oligocene in most of the northwestern part of that basin. The lower portion becomes progressively marine westward beginning about 25 miles west of Santa Barbara, however, this marine Oligocene is mainly sandstone, low in organic material, and can hardly be a source rock.

The bulk of the evidence suggests that most of the oil was derived from Eocene shales. Upward migration across the bedding of several hundred to a few thousand feet of predominantly sandy strata seems to be required. Countless minor joints and cracks in the shaly interbeds are suggested as the principal channels of upward migration. In the southeastern part of the Ventura basin, some of the oil may have reached the lower, or Eocene portion of the Sespe by lateral migration from upper Eocene shales into which the lower Sespe may grade, followed by upward migration within the anticlines to the shalier middle Sespe where it is trapped.