ing. On April 25, 1950, the Hancock-Mohawk-Oceanic No. 65-10 well on the Clayton lease in Sec. 10, T. 11 N., R. 28 W., was completed as a new-pool discovery pumping 75 barrels per day of 32.8° gravity oil, 1% cut, from the Morales formation (Pliocene). There are now eleven wells in a proved area of about 120 acres, producing a total of about 800 barrels per day. The limits of the field at the south and east have been established. On August 22, 1950, the Hancock Oil Company made a discovery about $2\frac{3}{4}$ miles northwest of the Superior well in the Hancock-Bishop No. 44-31 well in Sec. 31, T. 32 S., R. 20 E., M.D.B. & M. The well was completed, pumping 226 barrels per day of 36.6° gravity oil, 0.4% cut, 100 pounds casing pressure and 100 M.c.f. gas from a new lower Miocene sand in the interval 5,785–6,020 feet. Three wells are drilling in the area.

FRIDAY MORNING

Presiding: CHARLES M. CROSS, Honolulu Oil Corporation, San Francisco
JOSEPH J. BRYAN, Union Oil Company of California, Bakersfield
GRAHAM B. MOODY, Standard Oil Company of California, San Francisco

SYMPOSIUM ON POSSIBLE FUTURE OIL PROVINCES OF THE PACIFIC COAST REGION

1. FOREWORD

GRAHAM B. MOODY, Chairman, Pacific Coast Committee on Possible Future Oil Provinces, Standard Oil Company of California, San Francisco

Experience influenced the Pacific Coast committee in its decision to examine critically and report on the future petroleum possibilities not only of the most promising undeveloped and presently producing regions but also of those regions that might seem to offer little encouragement for further exploration. Eastern Washington, the Modoc Lava Plateau of California, and a part of the Northern Coast Ranges of California are considered to be of insufficient interest to merit maps. The predominance of igneous and metamorphic rock exposures in these regions seems to eliminate them, at least for the present, from favorable consideration as possible future oil provinces.

A summary of data for the regions discussed is tabulated. Some of the numbers are, of necessity, approximations but are of the right order of magnitude according to available information. This tabulation affords a ready means of comparing the different regions.

The continental shelf adjacent to Southern California is treated in some detail, but the rest of the Pacific Coast continental shelf is not discussed in separate papers. The future oil possibilities of any part of the continental shelf may be considered as similar to the possibilities of the contiguous land area. Areas involved are:

CONTINENTAL SHELF

	Area in Square Miles Underlying Water Having Depth	
Coast of	*0–10 Fathoms*	*0–100 Fathoms*
Washington	380	5,200
Oregon	600	7,000
California	1,400	11,700

Nothing need be said concerning the merits of the following papers—they speak for themselves and reflect great credit on the writers. Special acknowledgment should be made to those committee members whose names do not appear as authors but who contributed substantially to committee work through suggestions, criticisms, and consultations. Association with this committee, a group of foward-looking geologists, has been stimulating indeed and leaves one with the firm conviction that there is ample opportunity for successful exploratory effort within the regions considered.

2. WASHINGTON

T. J. ETHERINGTON, Standard Oil Company of California, San Francisco

The Cascade Mountains divide the state into two major climatic provinces. These mountains, while topographically a north-south range, are structurally a series of major anticlinal folds with N. 40° W. to E.-W. trends developed in Paleozoic and Mesozoic rocks which have been metamorphosed by large batholithic intrusions of granodiorite. This general pattern of folding is reflected in the Tertiary rocks throughout western Washington with the exception of the Olympic Mountains and the coastal belt.

The Tertiary rocks ranging from upper Eocene to Pliocene probably offer the best possibilities for the development of future oil and gas reserves. The Cowlitz (upper Eocene) formation is best developed in the Cowlitz-Puget Sound trough. The Oligocene is best developed in southwestern Washington and again along the Straits of Juan de Fuca and adjacent part of the Puget Sound. Miocene and Pliocene rocks are best developed in the vicinity of Gray's Harbor.

Volcanics in the form of tuffs, flows, and breccias of basic or medio-basic character are widespread

and well developed in the lower and middle Eocene. Upper Eocene and younger volcanics are largely confined to the southern part of the state bordering the Columbia River.

Seepages of oil and gas are most abundant in the coastal belt but evidence of petroleum is found in Eocene and Oligocene rocks inland, ordinarily from water wells.

The most important wells, as far as evidence of oil and gas, are the Union State No. 1 and No. 3, located on the coast west of Gray's Harbor.

3. OREGON

H. J. BUDDENHAGEN, Shell Oil Company, Portland, Ore.

Oregon's prospective oil territory is considered to be limited to two areas where thick sections of unmetamorphosed marine sediments occur, namely, the Coast Range province of northwestern Oregon, and a part of the Ochoco Mountains region in central Oregon.

The former, with an area of 14,000 square miles, contains more than 15,000 feet of clastic sediments mostly of marine origin, together with several thousand feet of interbedded volcanics. These rocks range in age from middle Eocene to Pliocene.

In central Oregon more than 35,000 feet of Mesozoic and Paleozoic predominantly marine sediments, with no interbedded lavas, are exposed in windows in the regional cover of Tertiary and younger volcanics. Their extent below the volcanic cover is unknown.

The detailed structure and geologic history of neither region has been adequately deciphered. The Coast Range area seems to be essentially a broad, undulating northerly plunging geanticline, but it is modified and complicated by many lesser structural features. Dips are generally gentle and folds symmetrical. The central Oregon area is closely and complexly folded and numerous unconformities are present.

No oil seepages or oil sands are known in Oregon although oil and asphalt have been found in basalt vesicles, fossil cavities, and drusy cavities in quartz veins.

Ninety-five to 100 wildcat wells have been drilled in Oregon: 45–50 in the Coast Range Province; 3 in central Oregon; 25–30 in the Harney Basin and Vale areas of southeastern Oregon, with the remainder at scattered locations. Non-commercial amounts of gas were encountered in some of these wells, but no authenticated oil indications are known. Wildcatters have been attracted to the southeastern Oregon areas apparently by the occurrence of natural gas in the lacustrine and other continental sediments which occupy structural basins in this area.

4. NORTHERN COAST RANGES, CALIFORNIA

G. C. GESTER, Standard Oil Company of California, San Francisco

The California Northern Coast Ranges include the mountainous and semi-mountainous areas and intermontane valleys from the Oregon-California boundary on the north to San Francisco Bay on the arbitrary sinuous line which approximately follows the Southern Pacific Railway from Oregon southward to a point about 10 miles southwest of Redding, thence the boundary approximates the western limits of the Cretaceous of the Sacramento Valley province to a point a few miles northeast of Napa and thence, southward to Carquinez Straits.

It represents an area of approximately 19,938 square miles, of which about 8½%, or 1,700 square miles, are underlain by sedimentary rocks which are common to oil-field provinces. This total of 1,700 square miles is made up of a number of widely separated areas, in many of which the basement is relatively shallow. The calculated volume of sediments of the California Northern Coast Ranges, which might be placed in the classification of possible future oil provinces, is of the order of 500–550 cubic miles.

The sedimentary formations, herein considered, are of Tertiary and Cretaceous age, but some of the latter has not been included in our calculations. As explained in the body of the paper, there is an indeterminate quantity of Cretaceous sediments so intimately associated with steeply folded and faulted Franciscan rocks that a separation has not been made and it is believed that such phases of the Cretaceous and the Franciscan sediments of the California Northern Coast Ranges should not be considered in the areas of possible future oil provinces.

To date, no major oil or gas fields have been developed in this area; a small dry-gas field containing about 1½ square miles with only three producing wells supply gas to the Eureka district. Also, a little oil and gas have been developed in the vicinity of Petaluma but there is no sustained production, and the oil development is included within an area of 20–30 acres and the gas area covers about ½ square mile. The oil production from this area amounted to 1,186 barrels during 1949 and the total cumulative production to date amounts to 3,475 barrels.

5. SACRAMENTO VALLEY REGION

H. D. HOBSON, General Petroleum Corporation, Los Angeles

The Sacramento Valley province covers an area of 11,578 square miles in the northern part of the great interior valley of California. The eastern part is underlain by a complex series of Paleozoic and Mesozoic metamorphic and granitoid rocks, and the western part is underlain by tightly folded and partially metamorphosed sediments and basic intrusions of Jurassic age.