3. OIL IN 1954.
R. O. ANDERSON, President, Malco Refineries, Inc., Roswell, New Mexico.

The economic outlook for the Rocky Mountain region has changed enormously during the last decade, largely as a result of improved transportation facilities plus the development of additional refinery capacity and consumption within the region.

While the outlook is brighter than at any previous time, it is still dependent on the over-all world oil situation insofar as development in the future is concerned.

4. OIL AND GAS PRODUCTION POSSIBILITIES IN NEW MEXICO PART OF RATON BASIN.
HAL. S. CAVE, Consultant, Roswell, New Mexico.

The term Raton basin is vague and ambiguous. The name as herein used is applied to the area lying between T. 15 N. on the south; and the State line on the north; and between the foothills of the Sangre de Cristo Mountains on the west; and a southeast and east boundary extending approximately from the city of Las Vegas to the southeast corner of Colfax County and thence northward to the State line.

The available data are too limited to permit anything approaching a reasonable evaluation of the prospects for oil or gas production. Certain data are presented merely in the hope that they may serve as at least a partial guide for investigating the area.

Production possibilities for oil and/or gas appear to be largely limited to beds of Cretaceous and Lower Pennsylvanian age. The character of the Cretaceous beds leaves much to be desired for reservoir purposes. Likewise, the area underlain by the more prospective of the Cretaceous beds is rather limited in extent.

The Pennsylvanian beds offer more hope as reservoir rocks than do the Cretaceous beds. However, their distribution in subsurface is very questionable. Two distinct possibilities as to their presence in the northern part of the New Mexico portion of the basin are presented.

Subsurface control for the area is largely limited to regional data on the top of the pre-Cambrian. Over much of the area surface data indicate a relatively simple post-Cretaceous structural history.

A few surface structural features are known to be present in the basin. Among the better known are: Turkey Mountain in T. 20 N., R. 19 E.; Ocate in T. 21 N., R. 18 E., and an unnamed feature mainly in T. 25 N., R. 24–25 E. Questionable section at depth appears to have been the deterrent against testing these features.

The New Mexico part of the Raton basin must be given serious consideration for production possibilities because of appreciable thicknesses of marine beds of Cretaceous and Lower Pennsylvanian age over at least considerable areas. However, much work remains to be done before any serious drilling program should be started

5. GEOLOGY OF RIO GRANDE DEPRESSION IN NEW MEXICO.
SANFORD P. FAGADAU, Atlantic Refining Company, Roswell, New Mexico.

The Rio Grande depression, a lowland through which the Rio Grande flows, varies in width from 10 to 50 miles or more and extends southward about 450 miles from the head of the San Luis Valley in southern Colorado across central New Mexico to near El Paso, Texas. This report concerns only that part of the depression extending from the vicinity of Taos, New Mexico, on the north to a short distance north of Las Cruces, New Mexico, on the south. Both on the east and on the west the depression is bounded by series of rugged mountain ranges.

The Rio Grande area is covered by as much as 21,500 feet of rocks, late Cambrian to Recent in age, which rest on a pre-Cambrian basement. Gently tilted or folded Cenozoic formations occupy the surface throughout the depression. Older rocks are exposed in the bordering narrow uplifts and in many places are involved in complex folds and overthrusts.

The pre-Cambrian generally consists of granitic or metamorphic rocks.

Formations in the Paleozoic part of the section are primarily marine carbonates and clastics; non-marine clastics and evaporites are found principally in the Permian. Cambrian through Mississippian beds wedge out northward in the southern part of the area; isolated Devonian and Mississippian remnants occur in the northern and central parts, and Pennsylvanian and Permian formations are present in most of the area.

The Mesozoic is largely marine and non-marine clastics with a minor amount of evaporites in the Jurassic and thin marine carbonates in the Jurassic and Upper Cretaceous. Triassic and Jurassic strata are confined almost entirely to the northern and central parts of the area and thin to absence southward. Upper Cretaceous beds occur in most of the area.

Consolidated and partly consolidated non-marine clastics, evaporites, lavas, associated pyroclastics and intrusive rocks, constitute most of the rock types of the Cenozoic.

Epeirogenic and possibly local orogenic disturbances in the Rio Grande area during Paleozoic and most of Mesozoic time, culminated in the late Cretaceous and early Tertiary Laramide overturning and thrusting. Subsequent events probably included high-angle faulting and mild folding in Miocene(?) time, late Pliocene(?) faulting, tilting and uplift, and Quaternary faulting. The main

outlines of the depression may have been formed in Miocene(?) time, but its present configuration is chiefly the result of late Pliocene(?) deformation. Structurally, the depression is a series of north-trending grabens arranged en echelon north-northeasterly.

Slides showing possible thickness and distribution of the Cambrian-Ordovician-Silurian, Devonian-Mississippian, Pennsylvanian, Permian, and Triassic-Jurassic-Upper Cretaceous in the area are presented; also a schematic stratigraphic section north-south across the area and a map showing Laramide and younger tectonic features.

6. SIGNIFICANT EXPLORATORY DEVELOPMENTS OF 1953.
PHILIP C. INGALLS, Socony-Vacuum Oil Company, New York City.

Within the United States there are extensive little-tested areas believed to offer untold potentialities for the development of truly big oil and gas production. Outstanding in this respect are the Rocky Mountains, the Great Plains, and the southeastern states. But not to be overlooked are the apparently thoroughly prospected areas with "bottomless" sedimentary basins, and areas where complex faulting, numerous wedge-outs, or rapid lateral facies changes have slowed the accumulation of information needed for scientific wildcatting.

The year 1953 saw the completion of many wildcat discoveries in the United States which further

FIG. 1.—ROBERT H. DOTT, executive director, A.A.P.G., Tulsa, Oklahoma; GRAHAM B. MOODY, vice-president-elect, A.A.P.G., San Francisco, California.

broadened and brightened exploratory thinking. Some of these discoveries were in the wide-open spaces, others hugged or were within areas of big production; some were completed as significant producers, others made only small wells but afforded a positive indication of an area's potentialities.

7. EXPLORATION FRONTIERS IN WESTERN CANADA.
W. B. GALLUP, Royalite Oil Company, Limited, Calgary, Alberta.

This paper stresses problems concerning exploration in the western part of the Western Canada sedimentary basin, especially in the Alberta syncline and foothills belt. Some reference is made to certain problems elsewhere in the basin.

The area is seen as a true frontier both with respect to geography and geologic thinking. Problems of access and various exploration techniques peculiar to the wilderness areas are described. Geological thinking with respect to the syncline and foothills is changing rapidly and these approaches are also discussed.

8. WILLISTON BASIN DEVELOPMENTS, 1951–1953.
RAY L. HARRISON, JR., Lion Oil Company, Bismarck, North Dakota.

The phenomenal rate of development in the Williston basin can best be visualized by remembering that at the end of 1950 there was not one producing oil well within the basin parts of North Dakota, South Dakota, Montana, Saskatchewan, or Manitoba. During three years of unprecedented exploratory drilling which followed the first commercial production of oil in the Williston basin (Virden field, T. 10 N., R. 28 WPM., Manitoba, Canada), 55 oil fields, 20 field extensions, and 4 gas fields have been discovered. During this period, production has been established from 16 different formations. One of the most spectacular discoveries during this period came in August, 1953, when