ROCKY MOUNTAIN SECTION OFFICERS

Incoming officers of the Rocky Mountain Section of the A.A.P.G. at the annual meeting in Salt Lake City, Utah, February 28–29. Left to right: secretary T. C. Hiestand, Cities Service Oil Company, Casper, Wyoming; president Alexander Clark, Williston Oil and Gas Company, Casper; vice-president Paul H. Umbach, consulting geologist, Albuquerque, New Mexico. Approximately 1,200 people attended the meeting. Photograph by courtesy of the *Oil and Gas Journal*.

southeast of the town of Farmington. The field was discovered by the late Thomas W. Doswell and the late Todd M. Pettigrew and is now controlled by Lowry et al. Previous to the discovery, two non-commercial tests were drilled into the Morrison formation.

The discovery well, Doswell-Pettigrew No. 2 Scott-Federal, NW/4 SE/4 of Section 9, Township 26 North, Range 6 West, was completed in July, 1951. It was drilled to a total depth of 6,700 feet, through the Tocito, and completed for an initial production of 404 barrels of oil daily, flowing through 12/64-inch choke.

Average daily production from the No. 2 Scott-Federal to January 1, 1952, was 390 barrels of oil, and the Lowry et al. No. 4-13-132 Federal, the second producer, NE/4 NE/4 of Section 9, Township 26 North, Range 6 West, has averaged 186 barrels of oil daily since completion. Cumulative production of the field to January 1, 1952, was 64,054 barrels of oil.

The limits of the field have not been defined; however, one mile south and updip from the discovery well, the Doswell-Pettigrew No. 1 State found the Tocito sandstone to be tight and shaly.

The Doswell field probably represents a stratigraphic trap with no apparent structural uplift; however, subsequent drilling may indicate the presence of a structural trap, and sand conditions are the determining factor for oil accumulation.

The producing formation, the Tocito sandstone lentil of the Mancos formation of Upper Cretaceous age, has been correlated with the Gallup sandstone, a tongue of the lower Mesaverde formation. The Tocito sandstone of marine deposition lenticular, and cross-bedded, has good development in the upper and fair development in the lower part.

13. JOHN W. HARSHBARGER, U.S.G.S., Holbrook, Arizona
The Cow Springs Sandstone Formation of the Black Mesa Basin and Adjoining Areas

The Ground Water Branch of the United States Geological Survey is making an investigation of the ground-water resources of the Navajo country. The recognition of intertonguing, lateral gradation, and facies changes within strata of Jurassic age is essential for exploration of water in the Navajo country. One of the major physiographic features of the region is the Black Mesa basin in northeastern Arizona.

Several Upper Jurassic formations in the area grade laterally and intertongue southwest into a distinct eolian-sandstone phase, which the writer has named the Cow Springs sandstone. This sandstone was deposited in the southern part of the region at the same time that subaqueous Upper Jurassic strata were being laid down in the northern part of the region. The type locality of the Cow

Springs sandstone is on the west side of the Black Mesa basin, where the formation consists of greenish gray well sorted cross-stratified firmly cemented quartzitic sandstone. This formation extends from northwestern New Mexico to south-central Utah and attains a maximum thickness of nearly 500 feet in the southern part of the area.

The Upper Jurassic strata that comprise the northern phase of deposition include the Entrada sandstone, Summerville formation, and Bluff-sandstone member and the other members of the Morrison formation. A better understanding of lateral gradation and intertonguing of these rocks with the southern eolian sandstone phase is dependent upon the recognition of contemporaneous eolian and subaqueous environments.

14. JOHN PAUL GRIES, South Dakota School of Mines, Rapid City, South Dakota

History of Exploration in Williston Basin, North Dakota, South Dakota, Montana, and Canada

The presence of a structural basin in the western Dakotas, was noted by exploration parties along the Missouri River about 100 years ago. Discovery of gold in the Black Hills in 1874, and of artesian water in the Dakota sandstone early in the 1880's, led to rapid delineation of the eastern and southwestern sides of the basin. The Cedar Creek anticline and the Nesson anticline were discovered in 1910 and 1917, respectively, incidental to the inventory of our coal resources.

About 25 oil tests were started within the basin proper between 1920 and 1925. Six or eight of these went deep enough to supply useful pre-Cretaceous stratigraphic information, but most of the early interpretations were incorrect.

Appreciation of the oil possibilities of the area as a structural basin awaited the development of the Michigan and Illinois basins in the early 1930's. Modern exploration began with the drilling of the Gypsy No. 1 Hunter in South Dakota and the California No. 1 Kamp in North Dakota in 1937–38. The first concerted efforts to locate stratigraphic traps were made in the 1940's.

15. HERBERT HADLEY, Billings Geological Service, Billings, Montana

Résumé of Recent Drilling Activity in Williston Basin, Montana, North Dakota, South Dakota, and Canada

More test holes for oil and gas were drilled in the Williston basin last year than in any previous year. As a result of this activity several new fields were discovered and oil in commercial quantity found in rock of at least three different ages. Problems of drilling are being overcome and it appears that activity in 1952 will only be limited by the number of available rigs.

16. DONALD TOWSE, North Dakota Geological Survey, Grand Forks, North Dakota

Preliminary Report on Sedimentational History of North Dakota

Subsurface data presently available are inadequate for a detailed sedimentational analysis of the stratigraphy of North Dakota, but some preliminary interpretations are possible. This paper is a progress report on a continuing study, the results of which will be presented in detail when the current drilling program has provided the necessary data.

Thickness maps and facies analysis are used to interpret and to illustrate the stratigraphy. The Williston basin in North Dakota was a gently subsiding intracratonic basin during most of post-Cambrian time. Differentiation of the pre-Cambrian basement suggests pre-Huronian folding in the area later occupied by the basin.

Middle Ordovician marine shales and quartzose sandstones cover most of the state. Western North Dakota was the center of Ordovician deposition, and the sands were apparently derived from erosion of the shield area to the southeast. Continued gentle downwarp was accompanied by deposition of Upper Ordovician and Silurian carbonates. The center of Silurian deposition was to the northwest in Canada, and some Silurian sandstones were derived from erosion in the southeast. Reef structures are possible in the Silurian, and the top of the system is marked by a disconformity.

Middle Devonian through Middle Mississippian rocks are largely carbonates and evaporites. A northwesterly plunging uplift, herein named the Burleigh uplift, is apparent in thickness maps of the Silurian and Devonian systems in the south-central part of the state. The uplift was the site of nondeposition and clastic deposition. The Upper Devonian series is restricted to the northwestern part of the state. The Upper Devonian evaporite and carbonate basin extended into Montana, and the Middle Devonian extends into Manitoba and Saskatchewan.

Lower and Middle Mississippian rocks cover the western three-quarters of the state and thicken toward the west and northwest. The present eastern edge is near the original shoreline, and the Charles evaporite facies is restricted to the western half of the state.

The Upper Mississippian Big Snowy group and Amsden formation are largely marine clastics deposited during a westward regression of the seas. Local concentrations of shoreline sands may provide stratigraphic traps.

No Pennsylvanian or Permian rocks have been recognized in the state, and the Amsden and Big Snowy sediments are overlapped by Triassic redbeds and evaporites. Evaporites and a thick section characterize the Triassic in the west, whereas the system is thin and sandy in the east.