is compared and contrasted with that of the Rocky Mountain region. It is noted that Pennsylvanian and Permian rocks occur extensively below Jurassic sediments in the Denver basin with progressive changes from the typical lithologies of eastern Kansas and southeastern Nebraska to the significantly different lithologies of eastern Wyoming and southwestern South Dakota. The pre-Pennsylvanian Paleozoic rocks, however, have not been traced to date through the Denver basin between the outcrop areas southeast and northwest of the basin, and there is evidence of a broad, northeast-southwest band through the basin where Pennsylvanian rocks rest on the pre-Cambrian. It appears that the Mississippian rests on progressively older pre-Mississippian sediments as this area is approached. The Paleozoic history of the Denver basin, as interpreted from available data, is presented.

6. JOHN C. MAHER, U. S. Geological Survey, Tulsa, Oklahoma, "Paleozoic History of Southeastern Colorado and Adjacent Areas."

The structural backbone of southeastern Colorado is formed by the Front Range, the Wet Mountains, and a buried ridge, the Apishapa-Sierra Grande uplift, which extends southeastward from the Wet Mountains. The Las Animas arch, of later origin, plunges off this buried ridge to the northeast. Parts of three major structural basins are present in the area—the Hugoton embayment of the Anadarko basin, the Denver basin, and the Raton basin.

Southeastern Colorado was first covered by Paleozoic seas in late Cambrian time, when coarse clastics (Lamotte sandstone) derived mainly from the north were deposited in front of a low landmass that extended from Union County, New Mexico, northwestward to the vicinity of Cañon City. The seas gradually encroached on this landmass, depositing additional upper Cambrian (Bonneterre dolomite) and lower Ordovician (Arbuckle group) rocks farther southwest. Near the close of early Ordovician time, gentle upwarping, possibly related to the development of the Transcontinental arch of Eardley, raised the central part of southeastern Colorado above sea-level. Seas of middle and late Ordovician age lapped upon the eastern and western slopes of this upwarping, depositing the sediments of the Simpson group and the Viola limestone. After the close of Ordovician time, uplifting, probably with some faulting, along the present trend of the Front Range, Wet Mountains, and Ahishapa-Sierra Grande uplift permitted the removal by erosion of most of the Cambrian and Ordovician rocks from that area.

In Mississippian time the seas advanced from the Anadarko basin, lapping on the gently sloping landmass. During Meramec time the seas probably completely covered the landmass and at the end of Meramec time began a withdrawal into the Anadarko basin. During Chester time the seas appear to have been restricted to the Hugoton embayment in the southeasternmost part of Colorado.

At the beginning of Pennsylvanian time, the Morrow seas advanced upon the flanks of the low landmass of eastern Colorado, bringing clastic material from the southeast. Near the end of Morrow time major uplifting with faulting elevated the Apishapa-Sierra Grande uplift, the Wet Mountains, and the Front Range, which supplied clastic material to transgressing seas during the remainder of Pennsylvanian time. A cross-flexure marking the earliest beginnings of the Las Animas arch seems to have occurred near the end of Missouri time. During early Permian time the seas gradually covered the Apishapa-Sierra Grande landmass, and during late Permian time the shore line remained fairly stable, until the seas receded at the close of the period.

7. JOHN R. FANSHAWE, consulting geologist, Billings, Montana, "Traps and Reservoirs in the Phosphoria and Tensleep Formations of the Big Horn Basin."

Phosphoria and Tensleep traps in the Big Horn basin are contrasted as to those controlled by strong artesian water flow, and others where subsurface water movement is at a minimum. Fresh waters cause changes in the nature of the entrapped petroleum as a result of lower temperatures and replenishment of oxygen at the oil-water interface. Closures protected from the regional direction of movement for artesian waters are less affected by these factors and contain crudes of abnormally high gravity, or gases with high concentrations of H_2S.

It is concluded that reservoirs modified least by mechanical and chemical effect of artesian waters are those which most closely approximate the original conditions of petroleum generation and entrapment. These reservoirs are in the deeper part of the basin, or in traps where pressure alone—rather than motion and pressure—holds the hydrocarbons and associated substances in place.

8. J. D. LOVE, U. S. Geological Survey, Laramie, Wyoming, "Periods of Folding and Faulting in Wyoming During Late Cretaceous and Tertiary Times."

Recognition of the timing of differential crustal movements in the Rocky Mountain region should lead to a clearer understanding of (a) the types of forces involved in Laramide and post-Laramide folding and faulting, (b) the possible times of accumulation of oil and gas in traps that may later have been modified, and (c) the reasons for the absence of oil and gas in apparently good traps. The following is the writer's interpretation of significant periods of folding and faulting that developed the known structures in Wyoming.

1. Post-Lewis, pre-Lance time: broad regional uplift occurred along the western margin of Wyoming; a westward-trending gentle anticline formed in central Wyoming; the Medicine Bow and Uinta mountains began to rise.

2. Close of Cretaceous time: sharply folded anticlines, overthrust toward the west, developed in Jackson Hole; local anticlines formed in south-central and southwestern Wyoming; some eastward thrusting may have occurred in westernmost Wyoming; broad mountain arches rose in approximate positions of the present Salt River, Wind River, Granite, Bighorn, Medicine Bow, and Sierra Madre mountains; regional uplift occurred in the southeast corner of Wyoming.

3. Close of Paleocene time: Salt River and Wyoming ranges were thrust toward the east; southward thrusting occurred along the western part of the Owl Creek Mountains and at the south end of the Bighorn Mountains; the Wind River Mountains were thrust southwest; other mountain arches and major anticlines continued to rise.

4. Close of earliest Eocene (Indian Meadows) time: rapid uplift accompanied by extensive erosion occurred in the Bighorn, Beartooth, Owl Creek, Wind River, Granite, Medicine Bow, and Laramie mountains; the east flank of the Medicine Bow Mountains was thrust east; southward thrusting occurred along the south flank of the Owl Creek, Washakie, and Granite mountains; southeastward movement emplaced the South Fork thrust block near Cody.

5. Close of early Eocene time: southwestward thrusting occurred in the northwest part of the Wind River basin, eastward thrusting in the central Bighorn Mountains; southeastward movement emplaced the Heart Mountain thrust sheet; recurrent folding continued along many previously formed anticlines.

6. Close of middle Eocene time: the Uinta Mountains were thrust northward.

7. Close of Eocene time: southeastern Wyoming again was regionally uplifted and rugged topography developed on this upland; gentle folding and small-scale faulting occurred in southwestern and northwestern Wyoming.

8. Close of Oligocene time: gentle northwestward-trending folds developed in central Wyoming; gentle warping occurred in the Absaroka region; the southeast rim of the Powder River basin may have been tilted southeast at this time.

9. Close of early Pliocene time: extensive thrust sheets moved southwestward in southern part of Jackson Hole, and the western part of the Gros Ventre Mountains was uplifted.

10. Post-middle Pliocene, pre-Pleistocene time: large-scale block faults developed in many parts of Wyoming; the floor of Jackson Hole dropped several thousand feet; the southern end of the Wind River Mountains collapsed; the central arch of the Granite Mountains dropped several thousand feet; local areas west of the east margins of the Sierra Madre, Medicine Bow, and Laramie mountains were downdropped; part of the Rawlins uplift collapsed and a broad westward-trending anticline formed south of Rawlins; a large area southeast of the Hartville uplift was down-faulted; the southern end of the Bighorn Mountains probably collapsed at this time.

9. P. W. REINHART, Shell Oil Company, Casper, Wyoming, "The Ash Creek Oil Field, Sheridan County, Wyoming."

The Ash Creek oil field is located in the northernmost part of Sheridan County, Wyoming. Discovered in April, 1952, the field had seven producing wells as of January, 1953, and development drilling was continuing as of that date. The wells produce from an Upper Cretaceous sandstone 20 feet thick at a depth of approximately 4,700 feet. Production from the field has been curtailed to less than 100 barrels per day pending completion of arrangements to transport the oil. The oil accumulation is the result of a structural trap consisting of a broad, plunging nose cut by a transverse zone of normal faulting. The exploration methods used in mapping the geology of this area include photogeology, surface geologic mapping, seismic work, core drilling, and wildcat drilling.

10. V. E. MCKELVEY, Trace Elements Office, U. S. Geological Survey, Washington, D. C., "Search for Uranium in the Western States."

The search for uranium in the United States is one of the most intensive ever made for any metal during our history. The number of prospectors and miners involved is difficult to estimate, but some measure of the size of the effort is indicated by the fact that about 500 geologists are employed by government and industry in the work—more than the total number of geologists engaged in the study of all other minerals together except oil.

The largest part of the effort has been concentrated in the western states. No single deposit of major importance by world standards has been discovered, but the search has led to the discovery of important minable deposits of carnotite and related minerals on the Colorado Plateau; of large, low-grade deposits of uranium in phosphates in the northwestern states and in lignites in the Dakotas, Wyoming, Idaho, and New Mexico; and of many new and some promising occurrences of uranium in carnotite-like deposits and in vein deposits. Despite the fact that a large number of the districts considered favorable for the occurrence of uranium have already been examined, the outlook for future discoveries is bright, particularly for uranium in vien and in carnotite-like deposits in the Rocky Mountain states.