It is suggested that the southeast-trending structures may be at the base and in the lower part of the crust, and may have controlled the shallower and more obvious structures at the surface. This perhaps could be tested by determining whether the foci of deep-seated earthquakes (ca. 65 kms.) under the Rocky Mountains have a different distribution pattern from the shallow ones (<45 km).

If similar structures can be identified elsewhere in the northern hemisphere, and if a counter set of northeast-trending structures with left-lateral displacement could be found in the southern hemisphere, this would be compelling structural evidence that the crust is drifting eastward on top of the mantle and that the Mohorovicic discontinuity is a shear plane, or rather a float plane.

The merit in this hypothesis of continental rifting is chiefly in the possibility it provides of explaining the forces required to form geosynclines and to form folded mountains and overthrusts. Too, it offers a mechanism for generating magmas, whether basalt derived from the base of the crust or silicic magmas derived by palingenesis of higher parts of the crust.

18. Structural Evolution of Part of Southeastern Arizona: R. W. JONES, Standard Oil Company of California, Western Operations, Inc., Salt Lake City, Utah

The structural evolution of southeastern Arizona has been dominated by the differential vertical uplift of the Precambrian and Triassic-Jurassic granites. Most of the ranges are complex anticlines with Precambrian or Triassic-Jurassic granites in their core. Some uplifts exceed 25,000 feet. Many of the ranges began to rise in Triassic-Jurassic time and have continued to rise intermittently in essentially the same position at least through Miocene time. This conclusion is supported by: (1) truncation of Paleozoic strata on the flanks of the present ranges in pre-Lower Cretaceous time, (2) depositional thinning of Cretaceous strata down the flanks of the present ranges and the development of Cretaceous basins adjacent to and parallel with incipient ranges rising in Cretaceous time, (3) high-angle "Laramide" reverse faults which define the flanks of present ranges and uplift the granite cores with respect to the schist which underlies the range flanks, and (4) Basin-and-Range type faulting which further developed uplifts already in existence.

Most of the previous investigators of the structural geology of southeastern Arizona have described intensive and extensive overthrusting. Overthrusting has probably been overemphasized, primarily because of a failure to discriminate between large overthrusts and detached blocks which have moved down the flanks of large anticlines under the influence of gravity. This conclusion is based on recognition of a possible source and an available declivity, and, in particular, on a study of the internal structures of the detached blocks which has often shown that the blocks moved down the mountain flank rather than out of the valley onto the uplifted mountain block.

Of interest to the petroleum geologist are the structural and stratigraphic variations along the flanks of the intermittently rising anticlines and the comparatively simple structure which may exist in the intervening valleys.

19. *Structural Development of Salt Anticlines of Eastern* Utah and Western Colorado: FRED W. CATER and D. P. ELSTON, U. S. Geological Survey, Denver, Colorado

The salt anticlines of eastern Utah and western Colorado formed in the deepest part of Paradox basin, a basin developed during Pennsylvanian time and filled by great thicknesses of upper Paleozoic sediments, including a thick sequence of evaporites belonging to the Paradox member of the Hermosa formation. The salt anticlines originated either as tectonic folds or as folds over basement faults soon after the evaporites were deposited, probably in Middle Pennsylvanian time. These structures were parallel to and probably formed concomitantly with the rise of the ancestral Uncompahgre highland, the front of which paralleled rather closely that of the southwest front of the present-day Uncompahgre Plateau. Rapidly accumulating arkosic sediments of the Permian Cutler formation, derived from this highland, probably buried parts of the salt anticlines; elsewhere along the anticlines the salt rose isostatically as rapidly as the sediments were deposited. In places the Cutler was later intruded by the cores of the buried salt anticlines. Parts of the cores were exposed at the surface at least until the Morrison formation was deposited in Late Jurassic, so that the formations pinch out along the flanks of the salt cores. Variations in thicknesses—chiefly thinning—of the Morrison and later Mesozoic formations over the crests of the salt cores indicate that salt flowage was still active after the salt cores were buried.

The salt anticlines attained their present form—except for modifications imposed by later collapse of the crestal parts of the anticlines—during the early Tertiary when the rocks of the region were folded, and the salt anticlines were accentuated.

20. Laramide Faults and Stress Distribution in Front Range, Colorado: JOHN C. HARMS, Ohio Oil Company, Denver Research Center, Littleton, Colorado

The Front Range of Colorado is a large uplift about 180 miles long and 40 miles wide. Precambrian rocks along the crest of the range are three to five miles above the basement rocks of the adjacent Denver basin.

The eastern flank of the Front Range is marked by faults with large vertical displacements or by steep monoclinal folds, so that the change in elevation of the Precambrian surface takes place in a relatively narrow belt. South of Denver, large Laramide faults, upthrown to the west, place Precambrian rocks in contact with sediments as young as Tertiary in age. Stratigraphic displacement ranges up to 15,000 feet.

An analysis of sandstone dikes in the upthrown blocks leads to the conclusion that the stress distribution causing the injection of the dikes is governed by dip-slip movement along steeply westward dipping, convex upward fault surfaces. Therefore, the major structures outlining the flank of the range south of Denver are high-angle reverse faults whose dips steepen with depth. Other large reverse faults whose dips probably also steepen with depth are found at Golden and Boulder and along the west flank of the range. These faults are bordered in the downthrown block by a narrow belt of steeply dipping or overturned faulted and fractured sediments. Any undiscovered petroleum accumulations associated with the Front Range are probably limited to this narrow belt, but the structural complexity makes the location of such reserves a difficult task.

If elastic theory and model experiment work can be extrapolated to a large crustal block of complex composition, faults of the type observed may be formed only by vertical normal stresses arranged to create a step-like displacement or an unbroken upwarp along the bottom surface of the block. Horizontal normal and