along the western edge of the Central Basin platform exceeded 12,000 feet. Shelf limestones were deposited on the marginal shallows, but turbidites and flysch poured in to practically fill the basin during the Wolfcampian. Subsidence continued during the Leonardian, which is characterized by bedded sands, dark limestones and dark shales. In the Guadalupian, the reef-bordered marginal limestone shelves began encroaching on the semi-starved sand and shale floored basinal area. This fore-stepping was checked when reef growths sealed off the seaward opening to the basin. Upper Permian, Ochoan, evaporites furnished the final filling for the structurally negative Delaware basin. Overlying Triassic terrestrials and Cretaceous shelf limestones show no evidence of a buried deep basin in the area.

20. JOHN C. OSMOND, Consulting Geologist, Salt Lake City, Utah

GEOLOGIC HISTORY OF SITE OF UINTA BASIN, UTAH

The Uinta basin in northeastern Utah includes an area of 9,300 square miles. The differential vertical movements which created the basin and its rim began in Paleocene or Eocene time, during the deposition of the Wasatch Formation. The synclinal axis of the basin trends easterly and is slightly convex northward. The basin is asymmetric with a broad gently-dipping south flank and a north flank which is up to 10 miles wide with beds near vertical and locally overthrust.

The configuration of the Uinta basin is controlled in part by pre-existing structures and geologic trends, but much of the present rim is the result of Tertiary tectonics.

The dominant tectonic factor in the development of the basin is the rise of the Uinta Mountains block and the simultaneous subsidence of the synclinal axis of the basin. This major flexure in the crust probably conforms to the edge of the late Precambrian trough in which the rocks of the Uinta Mountains block were deposited. This belt of Precambrian rocks was essentially dormant until Eocene when it began to rise from depths of about 16,000 feet below sea level to elevations of 7,000 to 13,000 feet above sea level.

During lower Paleozoic the Uinta basin area was on a stable crust just east of the Cordilleran geosyncline. In the Pennsylvanian Period the Uncompahgre uplift formed a mountain range part of which now underlies the southeastern part of the present basin. This major tectonic feature had a northwest trend, and several small folds or faults with similar trends developed in the eastern part of the basin. These structures were gradually masked by Mesozoic sediments. Slight Tertiary upwarping and differential compaction allow some of these structures to be reflected as folds plunging into the eastern part of the Uinta basin.

In Cretaceous time the Rocky Mountain geosyncline occupied the region and received clastic sediments from the Cordilleran geanticline in western Utah. In Late Cretaceous time easterly directed compressive forces resulted in folding and over thrusting at the western edge of the Uinta basin area and possibly also caused slight arching of the eastern edge.

During Tertiary time western North America was elevated above sea level. Concurrent with this epeirogeny the mountain ranges and basins of the Rocky Mountain Region were developed by differential uplift. To the west of the Rockies the Basin and Range province was also elevated, and tilted fault-block mountains and valleys were created. This difference between the Rockies and the Basin and Range province reflects the difference in the Paleozoic between the stable block and the geosyncline.

The Uinta basin was outlined in Tertiary time by the central part not being elevated as high as its rim. The northern sector of the rim was the most active in pushing upward. The eastern and southern sectors of the rim were formed by the stable elements supported by the Douglas Creek arch and part of the Uncompahgre block. The southwestern sector of the rim was formed by the San Rafael swell, a Tertiary anticline formed by subsidence of adjacent areas and probably localized by an upper Paleozoic positive trend.

The western sector of the rim of the Uinta basin was created by the interplay of tilting of fault blocks above the eastern margin of the Paleozoic geosyncline and north-trending faults that developed over Mesozoic troughs which, in turn, were superimposed on the margin of the geosyncline.

The structure of the Uinta basin is the result of regional uplift of a heterogeneous area of the crust which incorporated both the sturdy and the weak, or weakened, products of prior deformations. The absence of intrusive igneous rocks is striking.

21. C. A. MARTIN, Continental Oil Company, Durango, Colorado

DENVER BASIN

The Denver basin is one of the largest structural basins in the Rocky Mountain area and extends across portions of Colorado, Nebraska, and Wyoming. The basin is typically asymmetrical with its axis paralleling and close to the Front Range. The deepest portion of the basin lies near Denver, where more than 12,500 feet of sediments are present.

Recently discovered outcrops suggest that during pre-Pennsylvanian time, the Denver basin area was a normal marine shelf receiving sediments from early Paleozoic seas. Post depositional uplift along Siouxia exposed this area to deep erosion removing nearly all the early sediments.

In Early Pennsylvanian time, transgressive seas entered the Denver basin area from the Anadarko basin, depositing a predominantly clastic terrane. Near the end of the Atoka, the first major pulses of the Ancestral Rockies occurred. This uplift reached maximum proportions during the Des Moines. Clastic material eroded from the uplifted mountains was deposited contemporaneously with marine sediments deposited in the expanding seaway. This expansion reached its maximum during the Missourian and was followed by a slight Virgil regression. Continued Permian regression left a full suite of environments and facies ranging from normal marine through an evaporitic sequence to terrestrial deposits. Late Permian and Triassic sediments indicate the Ancestral Rockies were weakly positive and supplied sediments to a shallow hypersaline sea. Non-depositional conditions persisted from Upper Triassic through Lower Jurassic, and into Mid-Jurassic time. During Middle and Upper Jurassic time, transgressive seas fluctuated across the basin from the northwest. As these seas regressed at the close of the Jurassic, a broad inland flood plain developed.

Early Cretaceous seas inundated the area from the north and south reworking earlier sediments and obscuring the Jurassic-Cretaceous boundary. Initial basin-forming movement occurred at this time. Fluviatile material from exposed areas to the east and northeast developed a complex deltaic pattern as it interfingered with marine sediments basinward. Deltaic deposits also extended into the area from the southwest merging with sediments from the east. Another cycle of transgression and regression developed similar depositional patterns. It is within these two Early Cretaceous sedimentary