

**CENOZOIC HISTORY OF THE COLORADO PLATEAU***by*CHAS. B. HUNT<sup>1</sup>**Abstract<sup>2</sup>**

The pre-Tertiary structural history of the Colorado Plateau undoubtedly controlled to considerable extent its Cenozoic history. The pre-Tertiary history seems to have been one of comparative stability, because during most of Paleozoic and Mesozoic time the Colorado Plateau was a shelf area and was without deep geosynclinal basins except during the Pennsylvanian. Thus, the general plateau structure, which is of Cenozoic age, appears to be an inherited feature.

Deposits of early Cenozoic age are well represented on or adjacent to the Colorado Plateau, but deposits of late Cenozoic age are scarce. As a result, the early Cenozoic history is known fairly well, but there are major gaps in the record for late Cenozoic time. In adjoining parts of the Basin and Range province the reverse is true; there, deposits of early Tertiary age are scarce but deposits of late Tertiary age are extensive.

Paleocene and Eocene deposits in the Uinta Basin and San Juan Basin record that the Plateau area was a basin or trough, probably near sea-level, and was surrounded by newly formed mountains. The trough or basin was the product of folding that began in Late Cretaceous time and continued intermittently during the first half of the Tertiary. In the lower parts of the trough, several thousand feet of lacustrine and fluvial sediments were deposited.

After Eocene time conditions changed markedly. General aggradation of the Plateau area ceased and general degradation began. Igneous activity, in the form of volcanism and intrusion, became extensive. There was extensive faulting, especially along the west and south edges of the province, and epeirogenic uplift began. The erosion, igneous activity, faulting, and uplift have continued to the present time.

It is inferred that exterior drainage started when the Plateau began to be uplifted, and that the major courses of the streams probably were established before epeirogenic uplift had progressed very far. Also, it is believed that the canyon cutting began when the uplift started and that it has progressed to the present time.

Cenozoic intrusive rocks, believed to be of late Tertiary age, in the Colorado Plateau occur as stocks, laccoliths, and bysmaliths in the dozen or so laccolithic mountains. Upper Tertiary eruptive rocks occur at the large central-type volcanoes at Mount Taylor and San Francisco Mountain and as extensive sheets of basaltic lavas and pyroclastic rocks. The volume of igneous rocks is only a percent or so of the volume of eruptives in the San Juan Mountains or of adjoining parts of the Basin and Range province.

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As a petrographic province the Colorado Plateau is high in alkalis and alumina. Four subprovinces can be distinguished within the Plateau. In the interior, in the laccolithic mountains, the percentage of soda greatly exceeds that of potash. In the High Plateaus, soda and potash are about equal. In the Navajo and Tuba volcanic fields potash exceeds soda. Along the southern edge of the Plateau, as in the interior, soda exceeds potash.

At the end of Cretaceous time the Plateau was a piedmont area extending eastward and northeastward from the foot of mountains that had been built by thrust faulting and folding in the adjacent parts of the Basin and Range province. When the Rocky Mountains were raised the Plateau area became a structural basin or trough.

The orogenic structures on the Plateau are believed to have formed during early Tertiary time. The structures associated with the igneous activity are believed to have been formed while the area was being uplifted epeirogenically in middle or late Tertiary time.

The meandering course of the Colorado River across the various orogenic structures led to the concept of antecedence, and later to that of superposition. Actually, neither theory alone seems adequate to explain all the anomalies of the Colorado River drainage, but a combination of the two processes, for which the term anteposition is suggested, offers explanation for many of them. Anteposition refers to arching of a canyon so that a stream becomes ponded and deposits sediment upstream from the arch. When downcutting is resumed a new superposed course is developed in the stretch represented by the reservoir. But the low point on the rim of the reservoir is the raised portion of the old valley; this becomes the new spillway, and downstream from this point the new valley has the aspects of antecedence.