The Case for the Sevier Arch

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Working for some years with many other geologists in the Great Basin, I have been convinced that a buried ancestral highland area existed to the east of Schuchert's (1923) Cordilleran Intermontain Geanticline, probably rising somewhat later than the latter. The axis of this highland is thought to lie parallel to, but a hundred miles or so east of, the axis of the Cordilleran Geanticline. The uplift forming this highland was initiated perhaps as early as late Jurassic, but no later than earliest Cretaceous. Together with the Manhattan Geanticline of Nolan (1943) and the Cordilleran Geanticline this would constitute the third of a series of major upwarps, each developing farther east and later in time.

Spieker (1946) was one of the first to recognize the need for a highland in this position postulating a belt of strong folding not far west of the southern Wasatch Mountains in order to account for the formation of the Indianola conglomerate. Christiansen (1952), while studying the Indianola formation in the Canyon Range, postulated an uplifted area immediately to the west saying:

> "The extremely coarse, unsorted, and unrounded boulders and cobbles in the lower part of the (Indianola) sequence could hardly have been derived from sources more than five miles away, and probably came from precipitous uplands. . . ."

Coarse Indianola conglomerates found in the northern portion of the Mineral Range, along the Gunnison Plateau, and in the Cedar Hills make it very clear that steep mountains lay just to the west of these localities as well, although this whole region is pictured by Eardley (1951) as generally emergent but not an orogenic belt.

H. D. Harris (1959) integrated these somewhat vague ideas, concerning an ancestral highland, into a more formal hypothesis, naming this linear positive element the Sevier Arch because of the proximity of its axis to Sevier Lake in western Utah. The development of the Sevier Arch, as outlined by Harris, involves an early period of linear uplift alone, initiated in late Jurassic and culminating in a second period of orogeny consisting of the eastward thrusting of older over younger rocks. The thrusting was localized along the western border of the Arch paralleling a marginal synclinal trough just to the east of the Arch.

Erosion of the linear uplift developed the thick sections of conglomerate represented in the Indianola formation and its southern correlative, the Iron Springs formation, while erosion of the highlands, elevated by the thrusting, formed deposits of latest Cretaceous and early Cenozoic; that is, Price River as contrasted with Indianola or Kaiparowits as contrasted with Iron Springs. Continued erosion of these highlands furnished the coarse sediments for the western facies of the North Horn and Flagstaff formations.

This concept of a linear upwarp and ancestral mountains undergoing erosion during most of Cretaceous and early Cenozoic time would lead to visualization of a deeply eroded area, generally denuded of Mesozoic and upper Paleozoic rocks; perhaps in many places stripped of all Paleozoics and exposing large areas of Precambrian strata. Examination of the area immediately overlying the Sevier Arch fails to produce a readily recognizable area of this nature since extensive volcanic activity during late Eocene and early Oligocene has produced thick ignimbrites and lava flows which cover all but a few protruding islands of older rock. Present Basin Ranges have been produced by both normal and thrust faulting of late Tertiary age and debris from erosion of these late topographic highs has aided in covering the ancestral highlands of the Sevier Arch.

However, field work in the area of the Sevier Arch has not only convinced me of the general validity of the Sevier Arch concept, but has suggested evidence other than that so far reported bearing upon the presence of the Arch. A compilation of evidence both reported and so far unreported follows:

(1) An area can be outlined on the map within whose borders outcropping rock, exclusive of Cenozoic igneous rock, is all Precambrian or Cambro-Ordovician, suggesting an area which has undergone long and intensive erosion.

(2) The Indianola and Iron Springs formations offer several bits of evidence:

(a) They thicken and coarsen westward, indicating a source to the west.

(b) In several instances, as in the Canyon Range, the Gunnison Plateau, and the Cedar Hills, very large slightly rounded boulders indicate a source no more than five to ten miles away.

(c) Qualitative study of the cobbles and boulders of the Indianola at many localities reveal a basal zone rich in Paleozoic carbonates, sometimes largely dolomite as in the Mineral Mountains, and some Mesozoic sandstone which grades upward into a pure quartzite conglomerate. The sedimentary sequence of far western and central Utah begins with a thick sequence of Precambrian (Proterozoic?) and lower Cambrian quartzites, which is followed by an even thicker sequence of Paleozoic carbonates, both limestone and dolomites but with dolomite particularly notable in the lower portions. The Indianola, then, would appear to be formed during uplift and progressive denudation of a hinterland composed of some Mesozoic sandstones underlain by limestones, dolomites, and quartzites progressing from the top down.

(3) Within the area tentatively outlined as the Sevier Arch little but low amplitude folding is noted. The thrusts along the eastern and northern boundaries of the Arch are apparently missing in this central area. This suggests an upwarp or anticlinorium, with orogeny culminating with thrusting along the eastern and northern borders.

The concept of linear upwarp followed by and culminating in thrusting for the entire Sevier Arch area is undoubtedly too simple. Within such a large region events are apt to proceed faster in one portion than in another. Hence, minor irregularities, such as evidence of thrusting in the Canyon Range prior to Indianola time, or the presence of limited patches of upper Paleozoic rock within the Arch boundaries should not lead to rejection of the entire hypothesis.

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