

# THE WESTERN BROOKS RANGE, ALASKA: TOO MUCH CRUST\*

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## ABSTRACT

The western Brooks Range underwent a major compressional event, the Brooks Range orogeny, during Late Jurassic and Early Cretaceous time. In the first part of this orogeny, an ophiolitic plutonic sequence was thrust northward over a sequence of pillow-basalt flows of unknown affinity. Later, these igneous sequences were thrust over Devonian to Jurassic sedimentary rocks of the Arctic Alaska basin, which were, in turn, thrust northward. Both the igneous and the north side of the Brooks Range, and probably overlap partly coeval strata in the subsurface of the North Slope. Total north-south bedding length of the sedimentary allochthons, estimated from cross sections in the De Long Mountains is more than 200 km. Restoring the sedimentary allochthons so that coeval strata do not overlap requires more space than exists in the present Brooks Range; the south edge of the preorogenic Arctic Alaska basin must have extended at least 50 km into the territory now occupied by the Yukon-Koyukuk basin. An alternative reconstruction, which assumes that the structurally lowest exposed rocks in the De Long Mountains are also allochthonous, extends the preorogenic Arctic Alaska basin 200 km or more into the area of the Yukon-Koyukuk basin.

Because the allochthonous part of the Arctic Alaska basin was the site of shallow-water deposition from Devonian through Late Carboniferous time, it probably was underlain by continental crust. Thrust sheets in the De Long Mountains are generally less than 1 km thick; the crust which underlay them before the Brooks Range orogeny is, therefore, "missing." This "missing" crust may have been thrust beneath the northern part of the Yukon-Koyukuk basin.

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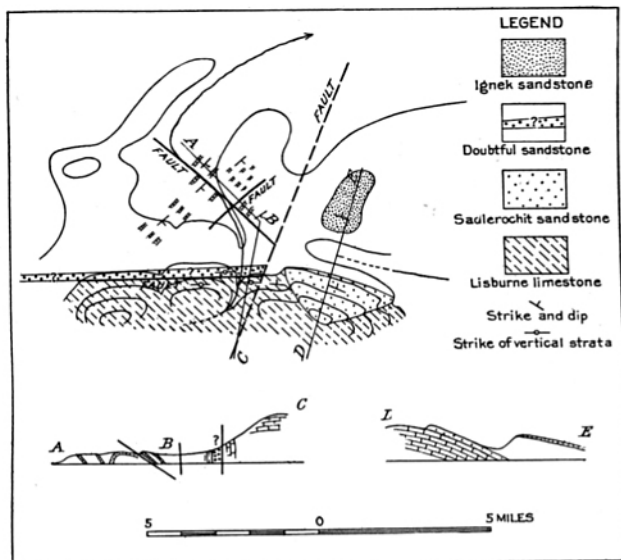


FIGURE 8.—Outcrops of the rocks and structure at the head of Marsh Creek.

Near the head of Marsh Creek, which flows northward from a point near the east end of the Sadlerochit Mountains, there is an area in which red beds, black shales, and sandstones occur in rather complicated relations. In the high bluff on the west side of the creek there is an exposure of red, orange, yellow, green, and bluish shales, masked by a disintegrated talus through which little of the structure can be seen. Near the north end of the exposure these shales are capped by a dark sandstone whose thickness could not be ascertained. On the east side of the river for a mile or so there are similar highly colored exposures but no sandstone capping. No fossils were found there, but from the lithologic similarity this locality is correlated with the upper part of the Ignek formation of Red Hill. Red beds were also observed from a distance to occur close to the northern foot of the mountains near the head of Katakaturuk River.

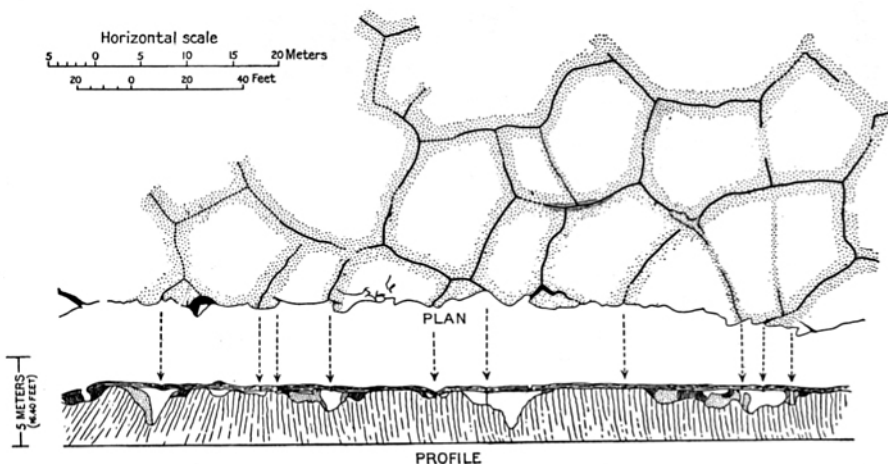


FIGURE 9.—Boulder on the surface of Flaxman Island.

Leffingwell, E. deK., 1919, *The Canning River region, Alaska*: U.S. Geological Survey Professional Paper 109, p. 122, 143, 210.