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## *Southwestern edge of Late Paleozoic landmass in New Mexico*

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# SOUTHWESTERN EDGE OF LATE PALEOZOIC LANDMASS IN NEW MEXICO

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United States Geological Survey Professional Paper 400B\*

At many localities in central New Mexico, Permian strata lie directly on Precambrian rocks. The surface on the Precambrian rocks is highly irregular, being locally diversified with hills, ridges, and even mountains. Thompson (1942) said that "these pre-Cambrian rocks probably represent the buried remnants of a large land area of the Ancestral Rocky Mountains," and he named this positive element the Pedernal landmass. It is difficult, if not impossible, to determine the exact extent of the Pedernal landmass; in many parts of New Mexico evidence on this point can be obtained only from widely spaced outcrops and drill holes. It has been shown, however, that during parts of Pennsylvanian and Permian time this landmass extended north-south at least 150 miles in central New Mexico.

The remarkable influence of the Pedernal landmass on Pennsylvanian and Permian sedimentation has been discussed by other workers (Read and Wood, 1947; Cline, 1959; Otte, 1959).

During reconnaissance geologic mapping in 1954, R. L. Sutton and I discovered exposures in northern Otero County, N. Mex., where the Abo formation of Permian age lies on rocks of Precambrian age (Bachman, 1954; Dane and Bachman, 1958). These exposures are near Bent, which is about 12 miles northeast of Tularosa, in secs. 25 and 26, T. 13 S., R. 11 E., and sec. 30, T. 13 S., R. 12 E. The outcrops are on the east flank of a small dome, here called Bent dome. I have since mapped these exposures in more detail (fig. 1). They are the southernmost exposures in New Mexico, so far as I know, in which this relation may be observed at the surface, and they are of particular interest because in the Sacramento Mountains, about 20 miles to the south of Bent dome, pre-Permian Paleozoic rocks attain a thickness of about 5,500 feet (Pray, 1959, p. 88).

The Precambrian rocks on Bent dome consist chiefly of light-gray quartzite. At one small exposure (sec. 25, T. 13 S., R. 11 E.) the quartzite appears to be intruded by coarsely crystalline granite, which closely resembles that forming cobbles and pebbles in the Abo formation on Bent dome and in areas to the west. The Abo formation contains cobbles and pebbles of quartzite that resembles Precambrian quartzite in texture but not in color, being generally dark gray, maroon, or purple whereas the quartzite of the Precambrian exposures is light gray.

Diorite exposed on the west side of Bent dome (sec. 26, T. 13 S., R. 11 E.) may also be of Precambrian age (Foster, 1959, p. 143), but its age is uncertain. This diorite is very similar to Tertiary diorite found elsewhere in the region; and, moreover, it is not intricately jointed

as are the rocks known to be Precambrian, and no pebbles of diorite like that on Bent dome have been identified in the Abo formation.

On the west side of Bent dome, and also in the vicinity of the Virginia Mine and at a locality on U.S. Highway 70 one mile east of Bent, there are exposures of light-gray, medium-grained, well-sorted sandstone beds thought to be of Pennsylvanian age. The Abo formation overlies these beds unconformably. The supposedly Pennsylvanian beds are estimated to be about 200 feet thick near the Virginia Mine, but they are absent on the east side of the dome and are presumed to wedge out eastward from the mine. The high degree of sorting indicates that these beds may have been deposited before major uplift of the Pedernal landmass.

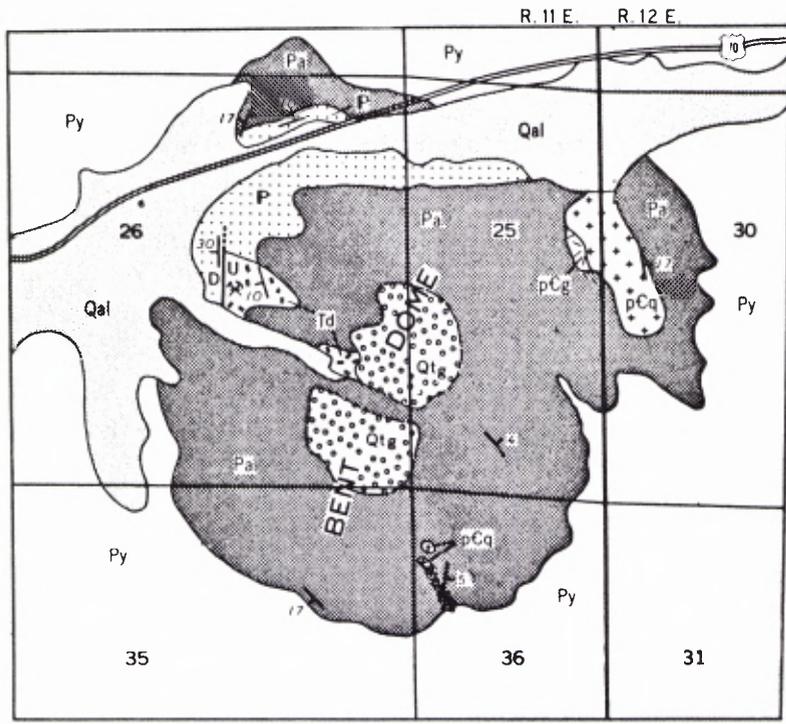
The Abo formation on Bent dome consists of poorly consolidated dark-red shale, arkose, and conglomerate. Cobbles of granite and quartzite as much as 10 inches in diameter have been observed at the base of the formation, and also some pebbles of a distinctive brownish-red rhyolite porphyry. The formation is 220 feet thick on the southeastern part of the dome (fig. 2). On the eastern flank of the dome the Abo is apparently thinner and it may be no more than 100 feet thick where it overlies the highest points on the surface of Precambrian rocks (NW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 30, T. 13 S., R. 12 E.). About 6 miles west of Bent dome the Abo formation is about 1,400 feet thick (Pray, 1959, p. 118) and rests on rocks of Late Pennsylvanian and early Permian age.

The unconformity at the base of the Abo sandstone and the onlap of the Abo on pre-Permian rocks of various ages in the Sacramento Mountains have long been known (Pray, 1949, p. 1914-1915). Early Permian folding and faulting are indicated throughout the length of the Sacramento Mountains and are directly related to uplift of the Pedernal landmass. The exposures at Bent dome provide a point of geographic control for the southwestern part of the landmass and probably represent a part of the early Permian tectonic system of the Sacramento Mountains.

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\*Permission to publish obtained by Field Trip Chairman from author.



**EXPLANATION**

**SEDIMENTARY ROCKS**

-  Qal  
Alluvium
-  Qtg  
Terrace gravel
-  Td  
Diorite
-  Py  
Yeso formation
-  Pa  
Abo formation
-  P  
Pennsylvanian(?) rocks undivided
-  pCg  
Granite
-  pCq  
Quartzite

QUATERNARY  
 TERTIARY  
 PERMIAN  
 PENNSYLVANIAN(?)  
 PRECAMBRIAN

-  Contact  
*Dashed where approximately located*
-  Fault  
*Dotted where concealed. U, upthrown side  
D, downthrown side*
-  Strike and dip of beds
-  Virginia Mine  
Abandoned
-  Line of measured section

Figure 1. — Geologic map of Bent dome, Otero County, N. Mex.

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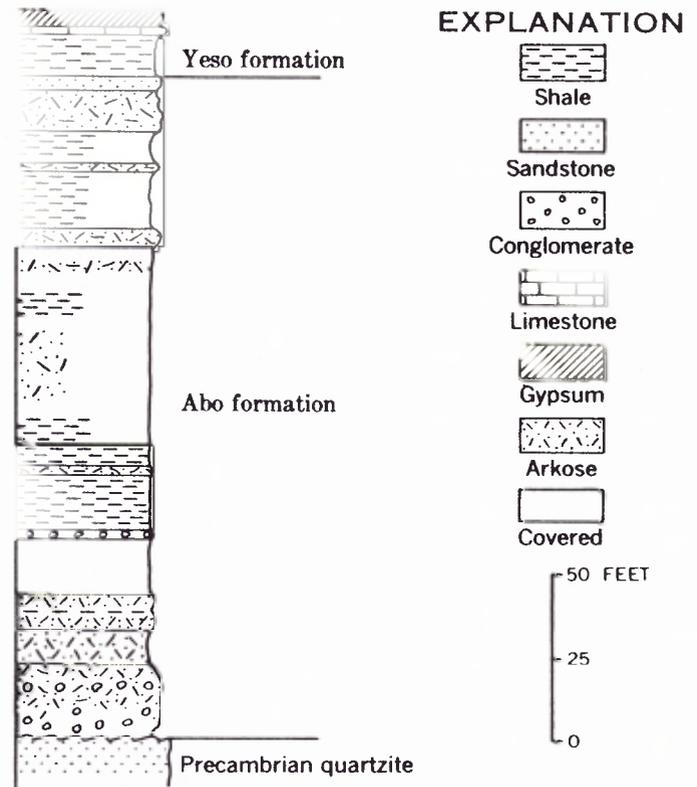


Figure 2. — Graphic section of Abo formation and adjacent rocks at Bent dome NW<sup>1</sup>/<sub>4</sub> sec. 36, T. 13 S., R. 11 E.