# *Pre-Pennsylvanian Paleozoic rocks in western Colorado and southeastern Utah in Guidebook of the north and east sides of the San Juan Basin, NM and CO*

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# PRE-PENNSYLVANIAN PALEOZOIC ROCKS IN WESTERN COLORADO AND SOUTHEASTERN UTAH

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## Introduction

Probably the most significant facts about the pre-Pennsylvanian Paleozoic rocks in the region including southwestern Colorado, southeastern Utah, and adjacent states are (1) the gradual appearance to the northwest in the subsurface of a thick sequence of Cambrian limestone, dolomite, and sandy shale; (2) the increase in thickness northwestward of the Devonian rocks, and the appearance of porous sandstone and dolomite in them; (3) the increase in thickness northwestward of the Mississippian rocks and the presence in them of porous, oolitic, coarsely crystalline limestone and porous dolomite beds. These facts are shown graphically in Figure 1. This cross section extends from the Stockton and Fairfield quadrangles, 20 miles southwest of Salt Lake City, where a section of 8,000 feet of pre-Pennsylvanian rocks is exposed (Gilluly, p. 7) (including rocks younger than the Madison limestone that are not shown on the cross section), southeastward through three wells in southeastern Utah that reached pre-Cambrian rocks, to the thin sequence exposed north of Durango in Animas River Valley, Colorado, and thence northeastward 150 miles to the Glenwood Canyon of the Colorado River on the south flank of the White River Uplift. Essentially all data shown in columns 1 to 5 of the cross section were obtained from Preliminary Chart 7 of the Oil and Gas Investigations Series of the United States Geological Survey. The stratigraphic section shown in column 6, which was obtained by the writer in his present investigation of the Glenwood Springs quadrangle, Colorado, is included here because when considered together with columns 1 and 2, it suggests that a relatively thick section of pre-Pennsylvanian rocks may be present in parts of east-central Utah and west-central Colorado.

## Cambrian Rocks

At the west end of the cross section, 20 miles south of Salt Lake City, the Cambrian system consists chiefly of dark-gray limestone and dolomite, some beds of which are oolitic, and lesser amounts of sandstone, shale, and quartzite whose total thickness is 2,350 feet. It is noteworthy that in the Animas River Valley, which the conferees will visit, the Cambrian system consists only of quartzite less than 100 feet thick. On the White River Uplift (column 6) the rocks of the Cambrian system are 600 feet thick and consist chiefly of quartzite and porous sandstone, but they include more than 75 feet of dolomite and sandy dolomite in the upper part of the sequence. In the Stockton and Fairfield quadrangles, Gilluly was able to identify Lower, Middle, and Upper Cambrian divisions by fossil collections. The formations are, in ascending order, a basal quartzite, a greenish-gray micaceous shale, two thick limestone formations that contain beds of oolitic limestone, and an uppermost thick formation of dolomite. In the wells that have been drilled on the San Rafael Swell and on the Elk Ridge anticline (columns 2 and 3), the general similarity of the sequence to that exposed in the Stockton and Fairfield quadrangles, the presence of beds of oolitic limestone similar to those described by Gilluly, and the occurrence of glauconite in abundance in some beds all suggest that each of the Cambrian formations present in the Stockton and Fairfield quadrangles was penetrated but that the thickness of each unit is much diminished. The Cambrian formations were tentatively identified in the sample logs of the two wells except that the Hartmann and Bowman limestones of Middle Cambrian age were combined in one unit. It should be stressed, however, that these tentative correlations may be greatly in error, particularly in view of the fact that the Cambrian rocks, where exposed in western Utah, show great lateral variation (Gilluly, pp. 18-19, and figs. 2 and 3).

In the Cedar Mesa well, shown in column 4, a thick basal quartzite is correlated with the Tintic quartzite, but may be slightly younger. In the area traversed by the cross section (figure 1), the basal sandstone and quartzite unit is probably progressively younger eastward. In most if not all of Colorado this unit is of Upper Cambrian age. The basal quartzite formation in the Cedar Mesa well (No. 4) is overlain by a sequence, nearly 500 feet thick, that may contain some parts of each of the four Cambrian formations that overlie the Tintic quartzite in the Stockton and Fairfield quadrangles, but these formations were not differentiated in the sample well log.

## Ordovician Rocks

The uppermost several hundred feet of beds shown as Cambrian in the log of the San Rafael Swell well (column 2), and present elsewhere in the region, may really be of Ordovician age. It is noteworthy that a sequence of limestone and dolomite, more than 2,000 feet thick, of Ordovician age is present in the Tintic mining district, 20 miles south of the Stockton and Fairfield quadrangles (Loughlin, pp. 31-36). Moreover, a unit a little more than 100 feet thick, consisting chiefly of thin-bedded dolomite and limestone breccia in the White River Uplift (column 6), contains fossils that have been tentatively identified

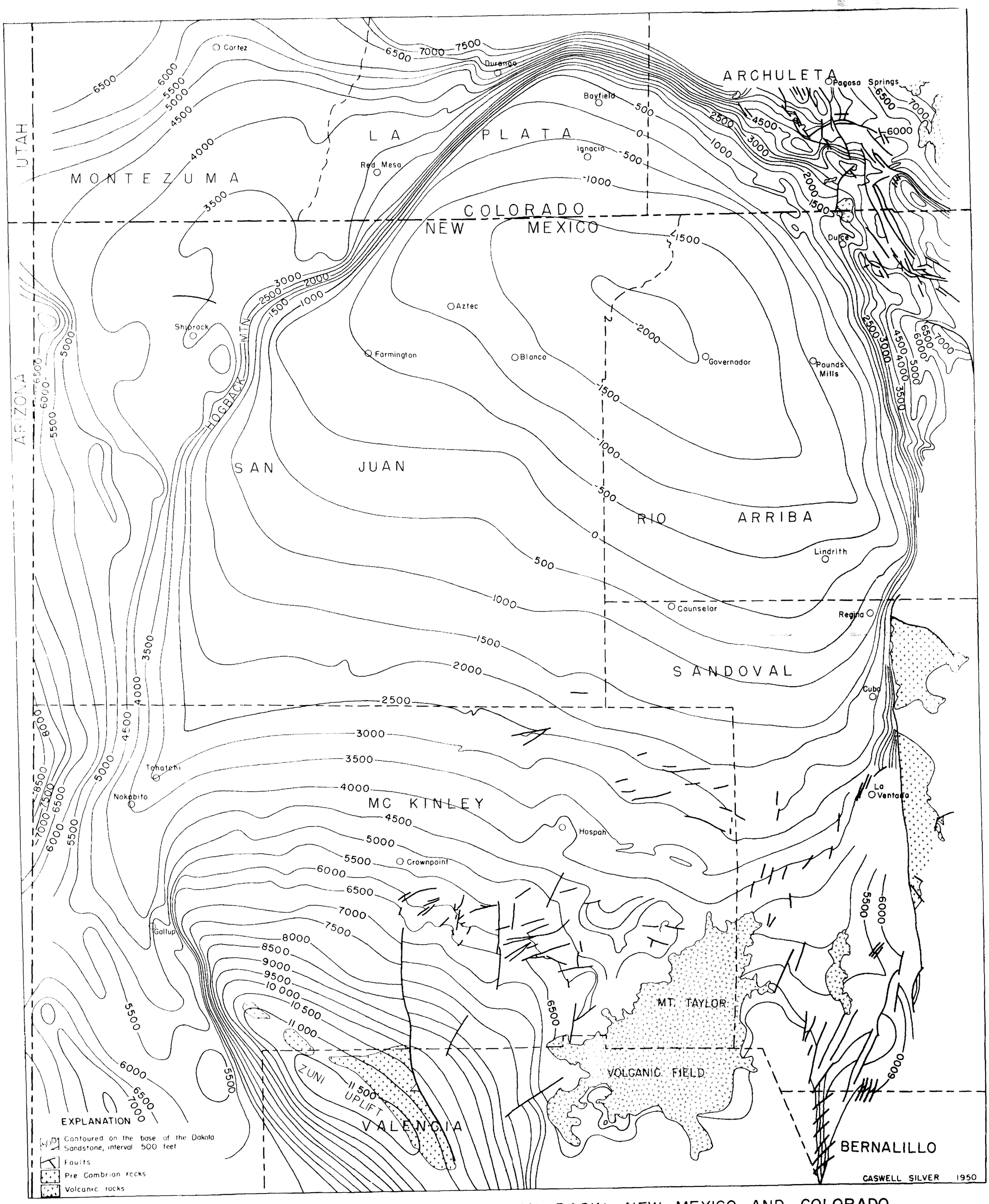


FIG. 6. MAP SHOWING STRUCTURE OF THE SAN JUAN BASIN, NEW MEXICO AND COLORADO

IN PART AFTER SEARS, J D, HUNT, C B, DANE, C H, WOOD, G H, ZAPP, A D, AND OTHERS WITH ADDITIONS AND MODIFICATIONS BY CASWELL SILVER, 1950

by P. E. Cloud as probably of Lower Ordovician age. It is possible, therefore, that Ordovician rocks are present in parts of southeastern Utah and west-central Colorado.

## Devonian Rocks

The rocks of Devonian age consist chiefly of a lower unit of quartzitic sandstone, greenish-gray and locally maroon sandy shale, and an overlying sequence of limestone and dolomite, some beds of which are sandy. The entire system is thin in the Animas River Valley, but appears to thicken northeastward and northwestward. In Glenwood Canyon (column 6) the upper unit consists of abundantly fossiliferous dark-gray limestone and interbedded dense limestone and dolomite, some beds of which are sandy. The correlations suggested on the chart allot to the Devonian system a sequence ranging from less than 100 feet in thickness in column 5 to about 400 feet in column 2.

## Mississippian Rocks

Mississippian rocks consist almost entirely of limestone and dolomite, some beds of which are cherty and the uppermost part of which is oolitic at many places in an extensive region including southeastern Utah and southwestern Colorado. A sandy limestone is present at the base of the Mississippian sequence at Glenwood Canyon and in the White River Uplift. The top of the system is marked by a widespread unconformity. Only the Madison limestone (Leadville) is known to be present in much of the region. Thick formations of limestone and dolomite that are younger than the Madison, however, are present in western Utah (Gilluly, pp. 22-34) and on the south flanks of the Uinta Mountains, in northern Utah. Parts of these younger Mississippian formations may extend into southeastern Utah.

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