DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, DIRECTOR

BULLETIN 580—B

NOTES ON THE

UNAWEEP COPPER DISTRICT, COLORADO

BY

B. S. BUTLER

CONTRIBUTIONS TO ECONOMIC GEOLOGY, 1913, PART I—B

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By B. S. Butler.

INTRODUCTION.

The following notes are the result of a visit of two days to the Unaweep district, in September, 1913. The time spent was altogether too short for a detailed study of the geology, and owing to the meager development and the fact that most of the properties were idle opportunity for a very satisfactory study of the ore deposits was lacking. The geology, however, is relatively simple, and it is believed that the more important features bearing on the ore deposits are recorded in the following paragraphs. The writer wishes to acknowledge assistance and courtesies from Mr. J. S. Shaw, of Grand Junction, and Mr. F. B. Grant.

The Unaweep district is located in Mesa County, Colo., 12 to 15 miles west of Whitewater, a station on the Montrose branch of the Denver & Rio Grande Railroad. The wagon road to the district has rather heavy grades for the first 8 to 9 miles, beyond which it follows Unaweep Canyon with moderate grade. The heavy grades are due to the fact that the road passes over a spur of the mesa instead of following the Unaweep Canyon, but a road following the grade of the canyon could be constructed. The bottom of Unaweep Canyon in the central portion of the district has an elevation of about 6,250 feet. Most of the prospects are several hundred feet above the bottom of the canyon. A small stream in the canyon furnishes water for irrigating a few ranches devoted mainly to the raising of alfalfa. Several of the prospects have developed sufficient water for uses other than domestic, and the side canyons have small springs that furnish water for a part of the year.

TOPOGRAPHY AND PHYSIOGRAPHY.

Topographically and physiographically the district is typical of the plateau country. Unaweep Canyon is a great cut through the plateau from the canyon of Gunnison River on the east to that of Dolores River on the west. The divide between the two drainage

systems in this canyon is exceptionally low. In the vicinity of the mines the lower 300 feet of the canyon is in granite, the walls rising steeply from the flat bottom. Extending back from the upper edge of the granite is a bench varying from less than 100 to 200 or 300 yards in width. The floor of this bench is the surface of the granite from which the overlying sediments have been removed. Immediately back of the granite bench is a short talus slope formed from a soft shale overlying the granite, and above this rises a nearly perpendicular wall of red sandstone. In the vicinity of the mines this sandstone is about 200 feet thick, but is said to attain a thickness of 400 feet at some localities. On the top of the red sandstone is a second bench bounded by cliffs of gray sandstone, which was not examined, but which has a thickness of several hundred feet.

The granite bench renders building of roads to the prospects relatively easy, as most of the prospects have been developed on this bench or but slightly above it, and few of the side canyons have been cut back across the bench to the base of the red sandstone cliff.

GEOLOGY.

IGNEOUS ROCKS.

The district contains both igneous and sedimentary rocks. The basal formation is a granite that includes irregular blocks of mica and hornblende schist. The granite varies considerably in physical and chemical properties. Much of it is rather uniformly medium grained and is composed of feldspar, quartz, muscovite, and biotite, recognizable in the hand specimen. Under the microscope apatite, rutile, zircon, and magnetite are recognized as accessory minerals. The feldspar is mainly microcline but includes a little plagioclase near albite in composition. The muscovite is as a rule considerably more aboundant than the biotite, though there is considerable variation in the mica content and in the relative proportion of the two varieties.

At some places the granite is very much coarser, containing feldspar crystals as much as an inch in greatest dimension. The coarser type appears to be more siliceous, quartz and pink feldspar being more abundant and the amount of mica being correspondingly decreased. In one specimen examined microscopically titanite is rather abundant. Between the finer and coarser type there are apparently all gradations.

The irregular bodies of schist inclosed in the granite are for the most part mica and hornblende schists, but some of them are very siliceous.

The granite and schist are cut by a great number of pegmatite dikes, which range in size from a few inches to several feet. The dike rocks are usually very coarsely crystalline and are composed

essentially of quartz, alkali feldspar, and muscovite. In the larger dikes the individual crystals of the minerals may reach several inches in greatest dimension, and lenses of quartz that extend a few feet along the strike and are 6 inches or more in thickness are not uncommon. The granite is also cut by dikes of diabasic rock. The largest of these dikes observed, in Taylor Gulch, is said to have an average thickness of 200 feet or more. The writer did not confirm this measurement, but the dike seems to have fully this thickness at some points. The dike on the Chance and Bell claims is 12 to 14 feet thick, and the one on the McKinley claim is reported to be of the same thickness, and is generally supposed to be the same dike. There are numerous other dikes of various sizes in the district.

The composition of the dikes varies somewhat, but they are all diabase composed essentially of plagioclase, augite, and magnetite. The rocks have been considerably altered, and an accurate determination of the composition of the feldspar is not possible, but it is probably close to andesine. In most of the dikes the augite has been largely serpentinized.

SEDIMENTARY ROCKS.

The sedimentary rocks of the area consist of shales and sandstones. Lying immediately on the granite is 50 to 70 feet of red ferruginous shale which breaks down readily, forming a talus that obscures the immediate contact. In some places there seemed to be a few inches of a rather fine conglomerate immediately above the granite, but at no point observed was the actual contact of granite and sediments well exposed. Overlying the red shale is 200 feet of red sandstone with beds of fine conglomerate. Above the red sandstone are beds of white to gray sandstone, the thickness of which was not estimated.

No fossils were collected in the district, and the formations were not traced into areas where the age of the sediments has been determined. The beds above the pre-Cambrian farther west in Unaweep Canyon are considered by Cross[1] to be equivalent to the Dolores and La Plata formations of the San Juan region, and the rocks in the Unaweep district are probably to be correlated with these formations.

RELATION OF SEDIMENTARY AND IGNEOUS ROCKS.

The sedimentary rocks at all points where they were observed appear to have been deposited on the granite, and as no dikes were found in the sediments all the igneous rocks appear to be older than the sedimentary rocks. The exact age of the crystalline rocks can not be stated, but there is little doubt that they are of pre-Cambrian age and that they had been deeply eroded before they were covered by the sediments.[2]

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[1] Cross, Whitman, Jour. Geology, vol. 15, No. 7, p. 648, 1907

[2] Idem, p. 676.

STRUCTURE.

The structure of the district is relatively simple. When observed locally the sedimentary beds appear essentially horizontal. As one goes up the valley, however, the surface of the granite is seen to rise from the valley bottom to fully 350 feet above the bottom in a distance of about 3 miles. The dip of the strata is therefore considerably greater than the grade of the stream. The granite surface apparently has a dip of 4°–5° NE.

Some fissuring and faulting have occurred in the district. Many of the dikes, both the pegmatites and the basic dikes, strike about N. 70°–80° W. (magnetic) and dip very steeply. These dikes have evidently occupied fissures. There is also a prominent jointing in the granite having the same general direction.

The fissures that have been occupied by the dikes were apparently formed prior to the deposition of the sedimentary rocks, soon after the granite was solidified, but along some of the prominent fissures there has been movement that has faulted the sedimentary rocks. Such faulting was noted near the McKinley mine, and a fault with 60 to 70 feet throw crosses the canyon 1 to 1½ miles east of Grant's ranch. There has been considerable prospecting along this fault. It strikes in the same general direction as the others and is probably an old fissure which has been reopened.

ORE DEPOSITS.

Copper is the main valuable metal in the district, though the ores contain some gold and silver. It is reported that several carloads of copper ore were shipped about 10 years ago. A matte smelter was erected in the district some years ago, and a few tons of ore treated.

The ore deposits occur in fissures that cut both the igneous and sedimentary rocks. Several of the ore fissures are apparently due to later movements along the fissures in which the basic dikes were intruded, and thus there is apparently a close relation between these dikes and the ore deposits, though basic dikes are not associated with all the deposits.

In the ore deposits associated with basic dikes the vein usually lies along one wall of the dike, between the dike and the granite. The other deposits are distinct fissure veins with granite or shale walls, or where faulting has occurred granite may form one wall and shale the other for short distances. Most of the prospecting has been done in the igneous rocks, though on the Nancy claim ore occurs in the shale a short distance above the granite. Alteration of the massive igneous rocks along fissures has usually been slight, but where the fault fissures have cut the sandstones there has been a marked

addition of silica, cementing the sandstones into a resistant quartzite for several feet from the fissure, as is well illustrated 1 to 1½ miles east of Grant's ranch.

The prevailing vein minerals are calcite, quartz, and a little fluorite, together with pyrite and chalcopyrite and in some deposits rather abundant hematite.

Oxidation has not been very extensive, as most of the ore contains a rather large percentage of primary sulphide, even in the shallow workings. The oxidation has resulted principally in the formation of limonite and malachite. A little chalcocite was noted, but there has apparently been very little sulphide enrichment. The copper sulphate resulting from the oxidation of chalcopyrite has apparently reacted with the calcite of the gangue to form the relatively stable copper carbonate. There seems no reason for believing that there has been any considerable migration of the copper or that in the district in general richer or larger ore bodies than those near the surface are to be expected at greater depth. It is of course possible that in an individual deposit the outcrop may chance to be a narrow or lean portion of the vein and that it will be found to be larger and richer at greater depth. It should be borne in mind, however, that the reverse is quite as likely to be true.

There has been considerable prospecting in the district, but most of the properties were idle at the time of visit, and it is therefore impossible to give an accurate description of the different prospects. The deepest mine is the McKinley, which has been developed by a shaft said to be about 600 feet deep. It is stated that at a depth of about 150 feet a small body of ore was encountered. The Nancy is developed by two shafts, each reported to be more than 100 feet deep, and by a tunnel about 300 feet long. A shoot of ore was found near the surface and was followed to a depth of more than 50 feet, and the writer was informed by Mr. J. S. Shaw that 21 cars of ore averaging 16 per cent of copper were shipped from this deposit. The ore on the dump contains pyrite and chalcopyrite with abundant hematite.

The Chance claim is developed by a tunnel 700 feet long connecting with a shaft more than 300 feet in depth. The tunnel follows a basic dike and disclosed small bodies of vein minerals between the dike and the granite walls.

The Bell claim is believed to be on the same vein as the Chance and has been developed by a shaft, said to be about 120 feet in depth, which encountered some ore. There are numerous other claims in the district on which some development work has been done and in which some ore has been found.

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