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Transmitted herewith are four copies of a report by W. E. Mead and R. L. Wells entitled, "Preliminary Reconnaissance of the Dripping Spring Quartzite Formation in Gila and Pinal Counties, Arizona," dated June, 1953.

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U. S. ATOMIC ENERGY COMMISSION
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PRELIMINARY RECONNAISSANCE OF THE DRIPPING SPRING QUARTZITE FORMATION IN GILA AND PINAL COUNTIES, ARIZONA

by
W. E. Mead
and
R. L. Wells

JUNE 1953
Salt Lake City, Utah

PRELIMINARY RECONNAISSANCE OF THE DRIPPING SPRING QUARTZITE FORMATION IN GILA AND PINAL COUNTIES, ARIZONA

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PRELIMINARY RECONNAISSANCE OF THE DRIPPING SPRING QUARTZITE FORMATION IN GILA AND PINAL COUNTIES, ARIZONA

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PRELIMINARY RECONNAISSANCE OF THE DRIPPING SPRING QUARTZITE FORMATION IN GILA AND PINAL COUNTIES, ARIZONA

ABSTRACT

A four-week reconnaissance examination of certain portions of the mountainous area in Gila and Pinal Counties, Arizona was undertaken in March and April, 1953 to inspect accessible outcrops of Dripping Spring quartzite, a pre-Cambrian formation which has lately attracted the interest of the Atomic Energy Commission by the discovery of two separate occurrences of uranium mineralization. Although no new deposits were found during the field work, a more thorough examination of the quartzite seems warranted. Recommendations for further prospecting by airborne and ground methods are presented in this report, and are based largely on observations made during the brief visit.

INTRODUCTION

During March and April of 1953, portions of the mountainous region lying roughly 100 miles east of Phoenix, Arizona and extending for an airline distance of 150 miles from the vicinity of Payson and Young on the north nearly to Tucson on the south, were examined in reconnaissance fashion, using a Halross Model 939A Surface Scintillometer and an El-tronics Model SM-3 beta-gamma counter. Attention was centered around the Dripping Spring quartzite member of the pre-Cambrian Apache Group. The quartzite contains two noteworthy occurrences of uranium occupying essentially the same horizon, and persisting generally throughout the formation is a higher degree of radioactivity than normally found in the surrounding rocks.

Most of the field time was spent in the vicinity of the Sierra Ancha Mountains, which are bounded on the south by the Salt River, on the west by Tonto Basin, and on the northeast by the Mogollon Rim of the Colorado Plateau.

With the aid of U. S. Geological Survey topographic quadrangles, state road maps, and maps furnished by the County Highway Departments and the U. S. Forest Service, all means of access by field car to or near outcroppings of the Dripping Spring quartzite were examined radiometrically. The only area not checked is in the Vekol Mountains about 50 miles southwest of Florence, Arizona, where a small amount of the quartzite outcrops.

The possibility of making an airborne radiometric survey of the region was constantly kept in mind during the reconnaissance. It was observed that some localities could be flown with relative facility, while others would require ground prospecting on foot or on horseback. Specific proposals as to future reconnaissance work are set forth later in this report.

GENERAL GEOLOGY

The state of Arizona may be divided physiographically into three major units. In the northeastern sector lie the gently tilted, highly colored Mesozoic and late Paleozoic strata of the Colorado Plateau

province. The plateau is separated from the Quaternary lavas and coarse clastics (Gila conglomerate) of the Sonoran Desert region in southwestern Arizona by a belt of mountain ranges trending diagonally across the state from northwest to southeast. This belt is called the Southern Rocky Mountains or Mexican Highlands. The mountains are made up principally of pre-Cambrian sediments and intrusives overlain by Paleozoic beds and widespread Tertiary volcanics. Constituting the pre-Cambrian rocks are strata of limestone, quartzite, argillite, and schist underlain by older granite. The term "Apache Group" is applied to the series of pre-Cambrian metasediments of which the Dripping Spring quartzite is a part. Diabasic sills and dikes, probably of later pre-Cambrian age, intrude the Apache Group. Nearly all the pre-Tertiary rocks in the mountainous belt have resisted the attack of erosion. The canyons are usually steep and narrow and the mountains precipitous. Rims, hogbacks, and sheer bluffs make travel in much of the region little short of impossible except along the few established routes.

A generalized columnar section of the region has been given in a report by Kaiser (1) as follows:

Age		Formation	Thickness
Tertiary & Quaternary		Gravel & sand	
Cambrian		Troy Sandstone	500 feet
		Unconformity	
Younger pre-Cambrian	Apache Group	Vesicular basalt flow	0-75
		Mescal limestone	225-400
		Dripping Spring Quartzite	450-700
		Barnes conglomerate	5-50
		Pioneer shale	150-250
		Scanlan conglomerate	0-30
		Unconformity	
Older pre-Cambrian		Granite and schist	

OCCURRENCE AND LITHOLOGY OF THE DRIPPING SPRING QUARTZITE

Examination of the Arizona state geological map shows intermittent exposures of Dripping Spring quartzite from Payson southeastward to Tucson, an airline distance of nearly 150 miles. (See map.) Interrupted outcrops of the formation extend in an east-west direction for as much as 40 linear miles, as along the Salt River.

Lithologically, the quartzite displays two fairly consistent and quite distinct phases termed by Kaiser (1) the "upper silty quartzite member" and the "lower white quartzite member." They are readily distinguishable in the field.

The upper member is a thinly-laminated, fine-grained, silty quartzite which is dark grey to white in fresh exposure, reddish-brown or rusty on the weathered surface. At the Red Bluff property located in the foothills bordering the south slope of the Sierra Ancha Mountains (see map), a three to eight-foot layer of grayish-white, medium-grained quartzite occurs in the Dripping Spring formation about 50 feet below the top of the upper silty quartzite member. This layer is reported to be widespread enough to serve as a reliable horizon marker. At this same locality, the uranium mineralization seems to bear a spatial relationship (?) to two thin rusty black siltstone marker beds from 4 to 12 inches in thickness in the upper member of the Dripping Spring.

The lower, white quartzite member is a light grey or white, medium-grained arkosic quartzite which is more massively bedded and weathered to a lighter color than the upper member. Slightly radioactive concretions have been reported in the lower member by Gordon Gastil, who at the time of this investigation is doing work in the area for a Ph.D. thesis, University of California.

In all areas examined, an effort was made to maintain stratigraphic orientation by identifying the white and black marker beds. Except in one locality, this attempt met with little success although the cursory nature of the investigation precluded making very detailed observations. On the Stockman and Shepp claims, about ten miles east of the town of Young, a stratum was noted 100 feet or more up on the cliff faces of two box canyons, that could be the white

quartzite marker bed described at the Red Bluff property. However, the bed was not continuous and in places other strata below it were similar in character. Furthermore, the upper contact of the Dripping Spring formation with the Mescal limestone was not observable and therefore, the distance of the white quartzite below the top of the Dripping Spring could not be determined to permit a correlation with the Red Bluff sequence.

Several black siltstone beds in the upper member were also noted on the Stockman claims but they appeared to bear no relation to the zones of anomalous radioactivity occurring there.

As a result of these observations, the widespread use of any particular horizon as a guide to prospecting in the upper silty quartzite member of the Dripping Spring formation does not seem practical unless more thorough geologic work proves otherwise.

Rock relationships at the Red Bluff prospect suggest that the uranium mineralization may be genetically associated with diabasic sills and dikes. The occurrences of uranium at the Stockman and Shepp claims east of Young are not far removed from an intrusion of diabase, and the asbestos deposits in the Mescal limestone nearby quite definitely originated from contact metamorphic effects produced by a diabase sill. Favorable areas for prospecting might therefore include those localities where diabase intrudes the Dripping Spring quartzite. The field worker will find this association occurring frequently and over a broad area.

As a matter of passing interest, Mr. Gastil in correspondence with this office has noted that the Pioneer shale which underlies the Dripping Spring quartzite and is separated from it by a conglomerate layer (Barnes conglomerate), registers abnormal radioactivity up to several times background, especially in the dark maroon phases.

RADIOACTIVITY

The fact has been quite well established that generally the Dripping Spring quartzite possesses a higher degree of radioactivity than the other formations in the region. This applies especially to outcroppings of the quartzite north of Roosevelt Reservoir, where a

sufficiently large volume of the formation is present, relative to other rocks in the area, to be the prime influence on background count. In the districts where smaller isolated Dripping Spring quartzite outcrops are surrounded by limestone, granites, volcanics, and alluvium, and where it was not possible to get close to the quartzite for Scintillometer readings, there was often no significant variation in the radioactivity from one formation to another. From no increase to 10 or occasionally 20 counts per second higher near the Dripping Spring was typical in these regions.

The maximum radioactivity noted near outcroppings of the Dripping Spring quartzite was on the order of 150 counts per second on the Scintillometer. Generally the count was lower, however, ranging from about 60 to 120, except at the Red Bluff property, where a high of around 500 counts per second was noted, and at the Stockman-Shepp claims, where a maximum of 1,000 counts per second was obtained at one place for a distance of about 15 feet along the canyon wall of Wilson Creek.

CONCLUSIONS AND RECOMMENDATIONS

In view of these observations, there seems ample justification for more detailed work on the Dripping Spring quartzite. Since the control of deposition of uranium at the Red Bluff and Stockman-Shepp properties is somewhat obscure, there is no reason to suppose that these concentrations are unique. A very good possibility exists that other such deposits occur in the formation, perhaps of commercial volume and tenor. Further prospecting is thus recommended in some manner similar to that outlined below.

Inspection of the accompanying map will show that the most extensive single outcrop of Dripping Spring quartzite is bounded roughly by the Mogollon Plateau on the north, Tonto Creek on the west, Cherry Creek on the east, and Roosevelt Reservoir on the south. Scintillometer readings were quite consistently higher in this area than elsewhere, and considering the location of the two uranium discoveries on the east or Cherry Creek side of the area, there seems reason to recommend this general region for first attention. Here the Dripping Spring quartzite is flat-lying, except perhaps for local tilting due to faulting. Normal faulting was observed in numerous instances. Major side canyons entering

Tonto Basin from the mountains expose Dripping Spring quartzite in the cliff walls and are wide enough for at least some distance to permit access by plane. In some cases, however, the favorable member of the quartzite will be too near the base of narrow canyons for efficient radiometric checking by air. Rim flying on the western flank of the Sierra Anchas would be the most advisable manner in which to explore the area because of its apparent amenability to aerial reconnaissance and because of its extreme inaccessibility by any other means. The interior of the range itself is almost entirely capped by Dripping Spring quartzite and probably could be explored best by grid flying. The Cherry Creek area on the east side of the Sierra Anchas, in the section examined, is drained by narrower, deeper canyons exposing the upper quartzite member near the canyon bottom. Aerial reconnaissance in this terrain would be ineffectual and if such topography is characteristic of the region drained by Cherry Creek, exploration by a ground party on horseback will be necessary as there are no roads into most of the country.

A maximum of two weeks of aerial reconnaissance on the flanks and interior of the area and one week of ground work along Cherry Creek should be adequate, unless these investigations disclose more deposits of interest.

Consideration of all other regions where Dripping Spring quartzite is found should be of secondary importance to the area north of Roosevelt Reservoir, and the feasibility of more careful examination of those outlying regions should depend on the outcome of work herein proposed. If favorable results are obtained, the Salt River Canyon near the mining town of Chrysotile should be considered for aerial prospecting. The canyon is broad and Dripping Spring quartzite is exposed in the cliff walls for a distance of several miles throughout which it is essentially flat-lying.

Next in importance to the Salt River Canyon would be the Mescal Mountains. This range extends in a southeasterly direction about 15 miles south of the town of Globe. Here, formations ranging in age from pre-Cambrian granite through Mississippian Redwall limestone are well exposed in a series of cuesta type ridges in which the strata dip southwestward. Dripping Spring quartzite is present in the rock sequence and the canyons are broad enough for flying. No more than three or four days should be necessary to examine the Mescal Range by aerial methods.

The region east of Cherry Creek and west of Canyon Creek contains a considerable amount of Dripping Spring quartzite but it cannot be reached by road and nothing is known of its favorability for prospecting.

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b. Kaiser, E. P., Uraniferous Quartzite, Red Bluff Prospect, Gila County, Arizona: U. S. Geol. Survey Circular 137, 1951.

PAYSON

TONTO CREEK

YOUNG

MOGOLLON RIM

N

SIERRA ANCHA

CLINE

ROOSEVELT RESERVOIR

CHERRY CREEK

SALT RIVER

SALT RIVER

CHRYSOTILE

U.S. 60

MIAMI

GLOBE

SAN CARLOS

U.S. 70

MESCAL MTS.

U.S. 89

SUPERIOR

PHOENIX-34 MI.

SAN CARLOS RES.

ORAY

GILA RIVER

WINKELMAN

COPPER CREEK

SAN PEDRO RIVER

MAMMOTH

SOMBRERO BUTTE

U.S. 80

ORACLE

RME 2003

RECONNAISSANCE MAP

DRIPPING SPRING OUTCROPS

EAST - CENTRAL ARIZONA

1" = 12 MILES APRIL, 1953

REF. MAPS: U.S.G.S. GEOLOGIC AND TOPOGRAPHIC MAPS OF ARIZONA. R.F.: 1:500,000.

ACCOMPANIES MEMORANDUM: RECOMMENDATIONS FOR RECONNAISSANCE OF DRIPPING SPRING FORMATION.

PREPARED BY W.E.M. AND R.L.W.

LEGEND:

DRIPPING SPRING QUARTZITE

1: RED BLUFF PROPERTY

2: STOCKMAN-SHEPP CLAIMS

MT. LEMMON

TUCSON

ARIZONA

WINSLOW

PAYSON

YOUNG

PHOENIX

GLOBE

TUCSON

AREA COVERED IN REPORT