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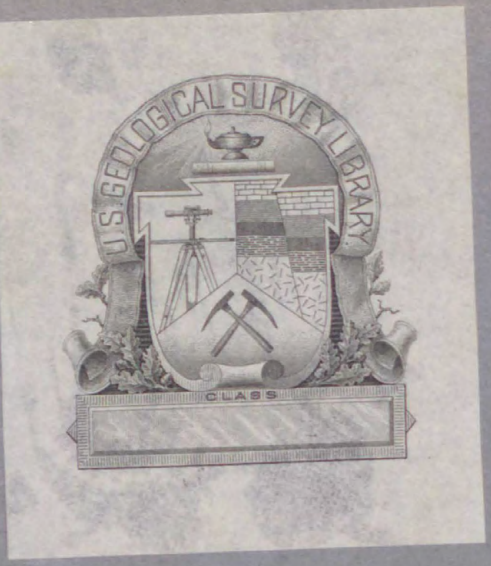
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SUMMARY OF TRIP DURING MAY-JUNE 1964

TO THE SOUTHERN TUWAYQ QUADRANGLE

SAUDI ARABIA

by

William C. Overstreet and Jesse W. Whitlow
U. S. Geological Survey

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1. Magnetometer survey in the Jebel Idsas area, Saudi Arabia, by W. E. Davis, R. V. Allen, and M. N. Akhrass. 8 p., 2 figs.

2. Preliminary report on the ancient mines and mineral occurrences in northeastern Hijaz quadrangle 205 and the southwest part of Wadi Ar Rimah quadrangle 206, Saudi Arabia, by C. L. Hummel, Abdullah Ankary, and Hashim Hakim. 45 p. (incl. 1 fig.), 6 tables, 1 pl.

3. Evaluation of a diamond drilling program at the Samrah Mine near Ad Dawadimi, Kingdom of Saudi Arabia, by T. H. Kiilsgaard. 77 p., 13 figs., 3 tables.

4. Report on the field trip in the northwestern Hijaz quadrangle, Saudi Arabia, during the period February 21 to March 28, 1965, by Robert F. Johnson and Virgil A. Trent. 3 p., 1 fig.

5. Summary of field trip March-April 1964 to the southern Tuwayq quadrangle, Saudi Arabia, by William C. Overstreet, Jesse W. Whitlow, and Abdullah O. Ankary. 7 p.

6. Summary of trip during May-June 1964 to the southern Tuwayq quadrangle, Saudi Arabia, by William C. Overstreet and Jesse W. Whitlow. 4 p.

7. Geologic log and chemical data, diamond drill hole 1, Samrah, Kingdom of Saudi Arabia, by Paul K. Theobald, Jr., Charles E. Thompson, and Henry D. Horn. 61 p., 15 figs., 5 tables.

8. Geology of Samrah and vicinity, Kingdom of Saudi Arabia, by Paul K. Theobald, Jr. 24 p., 2 figs.

9. Mineral investigations in the Bir Al Bayda-Al 'Ula area, Saudi Arabia, by Virgil A. Trent. 2 p.

10. A mineral reconnaissance of the Jabal Sahah quadrangle, Kingdom of Saudi Arabia, by Jesse W. Whitlow. 16 p., 3 figs.

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PREFACE

In 1963, in response to a request from the Ministry of Petroleum and Mineral Resources, the Saudi Arabian Government and the U. S. Geological Survey, U. S. Department of the Interior, with the approval of the U. S. Department of State, undertook a joint and cooperative effort to map and evaluate the mineral potential of central and western Saudi Arabia. The results of this program are being released in USGS open files in the United States and are also available in the Library of the Ministry of Petroleum and Mineral Resources. Also on open file in that office is a large amount of material, in the form of unpublished manuscripts, maps, field notes, drill logs, annotated aerial photographs, etc., that has resulted from other previous geologic work by Saudi Arabian government agencies. The Government of Saudi Arabia makes this information available to interested persons, and has set up a liberal mining code which is included in "Mineral Resources of Saudi Arabia, a Guide for Investment and Development," published in 1965 as Bulletin 1 of the Ministry of Petroleum and Mineral Resources, Directorate General of Mineral Resources, Jiddah, Saudi Arabia.

SUMMARY OF TRIP DURING MAY - JUNE 1964 TO THE SOUTHERN TUWAYQ QUADRANGLE, SAUDI ARABIA

by

William C. Overstreet and Jesse W. Whitlow

Introduction

The trip was to complete the economic geologic, geochemical, and heavy-mineral reconnaissance of the Precambrian rocks exposed in the western part of the Southern Tuwayq Quadrangle, sheet I-212A, prepared by R. A. Bramkamp, R. D. Gierhart, G. F. Brown, and R. O. Jackson. An initial work plan for this quadrangle was submitted on February 29, 1964, and was followed by the initial trip from March 7 to April 12. During that first trip the area east of longitude 45°E. was examined southward from latitude 24°N. to 22°45'N. and eastward to the Permian Khuff Formation. A second work plan, addressed on April 28, 1964 to Dr. Kabbani was followed by the second trip, which extended from May 10 to June 2, 1964. On that trip the proposed work was completed eastward from 45°E. to the Khuff Formation and southward from latitude 22°45'N. to 21°15'N., thus completing the area of proposed field investigation in sheet I-212A. The objectives of the trip were similar to the objectives of the initial work plan, which were summarized in a preliminary report submitted May 9, 1964.

General geology

Reconnaissance mapping at 1:50,000 scale was extended over the area of investigation in a continuation of work begun south of Jabal Idsas on the previous trip. This reconnaissance showed that the general geology as represented at 1:500,000 scale on sheet I-212A conveys a good approximation of the distribution of major lithologic units, but, as is to be expected when the scale of the work is changed from 1:500,000, some differences in interpretation resulted. The most significant difference, because it affects structural interpretations and possibly affects economic geology, is the stratigraphic position of the unit called "sericite and chlorite schist" (s) on map I-212A. Minor differences involve the composition of the rocks around Jabal al Badr, the extent of silicified marble, and the extension of faults.

The unit called "sericite and chlorite schist" (s) in the vicinity of Wadi Ghamrah was found to be rather flat-lying, open-folded, strongly jointed and commonly strongly cleaved graywacke, graywacke conglomerate, and argillite. The unit is in fault contact with hornblende schist along its northern edge. The southern and southwestern edges of the unit rest unconformably on massive

red granite and massive epidotized hornblende granodiorite, both intruded by red rhyolite and red felsite. Locally preserved along this contact is a thick basal conglomerate containing boulders of red granite, red rhyolite, red felsite, and epidotized hornblende granodiorite. The matrix of this conglomerate contains abundant detrital epidote and hornblende. The conglomerate is formed from the young granitic rocks labelled "granite" (g) on sheet I-212A. Thus, the unit (s) "sericite and chlorite schist" in this area is younger than the young granite (g), and its position in the stratigraphic column lies above the unit (g) granite. A few rhyolite and andesite dikes cut the graywacke, therefore the graywacke would be placed below the unit called "Dikes, etc." in the column, but it should be noted that most of the dikes are older than the graywacke.

The graywacke is essentially unmetamorphosed, therefore the term "sericite schist and chlorite schist" is not strictly applicable. A slight progressive regional metamorphism was noticed, however, coming in toward the north along the great northwest-trending fault. In the vicinity of the fault, at a position farthest from the basal conglomerate and the young granite to the south, the graywacke can be classed as sericite-chlorite phyllite. Lack of metamorphism at the contact with the granite is further evidence of the unconformable relation.

The unit appears to occupy a shallow, broad syncline with a southern flank steepened where it approaches the southern buttress of granite on which the unit was deposited. Doubtless some faulting has occured between the graywacke and the granite, because the basal conglomerate is not everywhere present, but the essential relation is preserved. Many sedimentary features like graded bedding, filled channels, scour, and ripple marks attest that the graywacke sequence is right side up.

Observation of relations of the graywacke unit made on this trip confirm the tentative interpretation made on the previous trip that the unit is younger than the great andesitic formations. This might lead to some speculation about

the age of gold, silver, copper, lead, and zinc mineralization, but at this stage of our information the speculation is not justified. If the granite underlying the graywacke proves to be late Precambrian in age, then the possibility exists that these sedimentary rocks are Eocambrian or Early Cambrian in age.

In the area around Jabal al Badr and Bi'r al Badriyah (ca. 22°35'N.x 45° 20'E.) the rocks are shown as "amphibolite schist, etc." (a) on sheet I-212A. This designation is satisfactory for the mass immediately west of Bi'r al Badriyah, but the northwesterly elongate mass to the north of the well is a spectacular ridge of reddish-brown silicified marble with dark gray to black unsilicified marble at the extreme northwestern end.

Silicified marble, some accompanied by serpentinite, is more common from Jabal al Badr southward than it is between Al Amar and Jabal Idsas. However, in the region south of Jabal al Badr no ancient mines were found in the vicinity of the marble, and no evidence of sulfide mineralization was observed.

The great faults in the Al Amar-Jabal Idsas area, or parallel faults, extend southeastward across the Precambrian area.

Economic geology

The Precambrian rocks south of latitude 22°45'N. and between longitude 45°E. and the Khuff Formation are essentially barren of visible mineralization. Only two ancient workings were discovered. Both apparently were mined for gold. Local people reported several more workings or prospects in the same general area as the workings we located along the southern side of Wadi Umm Musraha.

Between Jabal al Badr and Ayn al Uwayja anastamosing veinlets of magnesite are present in olivine-bearing ultrabasic rocks, but it is estimated that the magnesite at no point makes up as much as 0.5 percent of the volume of the host rock. In this area serpentinite and dunite are present. The serpentinite is rather common, but the dunite was seen in only one exposure. Chromite was not

found, nor was asbestos seen.

The black marble northwest of Jabal al Badr is very pure. It would make an excellent raw material for cement if some andesite, which crops out within 2 kilometers, was blended with it.

Some 600 to 700 speciments of rocks were examined by ultra-violet light at night. Neither scheelite nor hydrozincite was found.

Radioactivity measurements could not be made during the trip owing to damage to the scintillometer the fourth day in the field; thus, it is not possible to exclude definitively the presence of radioactive minerals. There is no megascopic evidence of the possible presence of radioactive minerals in economic quantities. Some of the younger granite is allanite-bearing, but the mineral is not an ore of the rare earths, thorium, or uranium.

The Khuff Formation was sampled at two localities for possible Pb and Zn, but megascopic evidence of base metals was lacking.

Plans and reommmendations

The writers plan to submit a final report on geochemical and heavy-mineral exploration in the western part of the Southern Tuwayq quadrangle when the results of the laboratory work are available. Should any significant anomalous features show up in the analyses, the areas in which they occur will be revisited for detailed study.

The results of this work show that the mineralized zone from Jabal Idsas to Al Quway'iyah has the most potential of any part of the Precambrian area in sheet I-212A. This area should be mapped at 1:50,000 scale, and the mapping should be accompanied by geochemical exploration for Cu, Pb, Zn, Mo, and Ag. Mapping at 1:50,000 scale has been and is being done by the Ministry (Victor Kahr) in this area. It would be appropriate for Kahr to continue this work until the geology of the mineralized region is understood. The geochemical exploration also could be conducted by a Ministry employee, Mr. Peter Curtis.