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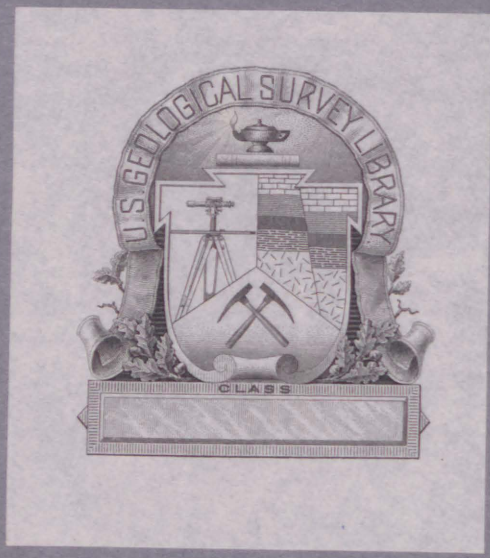
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Saudi Arabia Investigation Report
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PRELIMINARY REPORT ON THE DAWADAMI DISTRICT

SAUDI ARABIA

by

Paul K. Theobald, Jr.
U. S. Geological Survey

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10. Preliminary report on the Dawadami district, Saudi Arabia, by Paul K. Theobald, Jr. 4 p.

(*) Note: Item 1, above, is also available for inspection at 504 Custom House, San Francisco, Calif. 94111; 7638 Federal Bldg., Los Angeles, Calif. 90012; 1012 Federal Bldg., Denver, Colo. 80202; 8102 Federal Office Bldg., Salt Lake City, Utah; and in the Library, Mackay School of Mines, University of Nevada, Reno, Nev. 89507.

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 Also on open file in that office is a large amount of material, in the form of unpublished manuscripts, maps, field notes, drill logs, annotated aerial photographs, etc., that has resulted from other previous geologic work by Saudi Arabian government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.

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Field work in the Harrat Jaylaney-Samrah area of the Dawadami district, Saudi Arabia, occupied the greater part of the period December 1964-January 1965, along with sample preparation. The mafic igneous complex at Harrat Jaylaney was mapped (1:60,000 scale) and sampled to the extent that aerial photographs were available. About two-thirds of the complex was mapped. The mafic mass consists of inward dipping alternate layers of diorite and gabbro complicated by many differentiates, giving an overall compositional range from anorthosite to pyroxenite and probably granodiorite to peridotite. The mass is enclosed in a gneissic granitic rock, probably of the composition of granodiorite. Foliation in this rock appears to parallel that of the mafic complex. Cutting both the granodiorite and mafic complex are equigranular to seriate porphyritic granitic dikes of probable quartz monzonite composition. A group of aphanitic or porphyritic dark-colored dike rocks cut the quartz monzonite and were given the field term lamprophyre. Cutting these are intergradational dikes and small masses of aplite and pegmatite. Persistent dikes of dacite and andesite underlie long ridges that transect all earlier rocks. Veins of quartz or quartz and carbonate, commonly in mylonite or breccia zones, cut and alter the andesite and dacite dikes as well as earlier rocks. These are commonly rich in zinc or molybdenum though relatively poor in copper.

The mafic igneous complex has been extensively altered adjacent to dikes of quartz monzonite and particularly altered adjacent to aplite and pegmatite. Both gabbroic and dioritic layers have been converted to hornblende-plagioclase rocks that have been given the field term amphibolite. The size of an alteration halo about a given dike depends upon the composition of the dike and the composition of the rock penetrated. The largest halos are around pegmatitic masses and the smallest adjacent to quartz monzonite dikes. For a given dike, the alteration halo is wide in dioritic rocks and narrow in gabbroic rocks. Amphibolite is one of the commonest rock types underlying the broad valleys between gabbroic layers. Although some of this may be of primary origin the possibility is good that all of the amphibolite results from interchange of material, mostly water, with the late granitic rocks.

Copper, zinc, molybdenum, and nickel have been determined for rocks and stream sediments from the mafic complex. Though small disseminated grains or clots of sulfides are commonly seen in the rocks, these appear at first appraisal to be correct as no unusual concentration of either copper or nickel has been found in that part of the intrusive that has been sampled. Copper appears, if anything, to be abnormally low over the mafic complex. Nickel content of these samples is 2 to 5 times greater than in other Arabian samples, but not unusual for a rock of this composition. These data will have to be further synthesized before a firm conclusion can be drawn.

Remnants of ancient mining activity are common along the relatively young mylonite and breccia zones that criss-cross the country adjacent

to the mafic complex. Though most of these mines and fault zones are outside of the mafic complex, there appears to be a general spacial association of ore-bearing faults and the mafic rocks. Present data include the mines at Jabal Ar Radahat, located on a mylonite zone within 100 meters of the south contact of the Harrat Jaylaney mafic ring complex; Samrah, located on a mylonite and breccia zone that cuts a mafic complex extending southeast from the main ring complex; and Wadi Hamrur, on a mylonite zone well to the east of the mafic complex. Little work has been done at Wadi Humrur and Jabal Ar Radahat; and only one week was spent at Samrah, but enough data is available to show that this is one of the richest areas seen to date in Arabia. The main ore shoots appear at terminations, bends, or intersections of the fault zones. Of the metals presently determined, copper, zinc, and molybdenum, the mineralization at Samrah and Wadi Hamrur is dominated by the zinc whereas that at Jabal Ar Radahat is dominated by molybdenum. This is in complete contrast to the dominant or major role of copper in other areas that have been studied.

I recommend that about another month of field work be undertaken in the Samrah area to fill in and extend the available information to include the Dike mine, Jabal Umargaba, and the ground between these and the south end of the mafic ring structure. The Ministry should undertake regional mapping at a scale of 1:10,000 or 1:20,000 to gain information on the entire mining district. This should be incorporated with a geochemical program. Drilling should be undertaken. As a preliminary step the Geological Survey could drill one hole, at the west end of Samrah, for information on the nature of the mineralization, and one or

two holes to the west or east of Samrah on the extension of the Samrah mylonite zone at intersections with cross structures or at bends in the structure. Two such geologically favorable situations can be predicted from available information but neither the mapping nor the chemical information are adequate to locate a drill hole. There is already sufficient information to give the general nature of the mineralization and its controls. Samrah should be drilled systematically in search of additional ore shoots beneath the old workings, and this drilling will produce detailed information on paragenesis.