ON THE RELATION BETWEEN GABBROS AND MINERALIZATIONS IN THE EASTERN DESERT

A Thesis Presented

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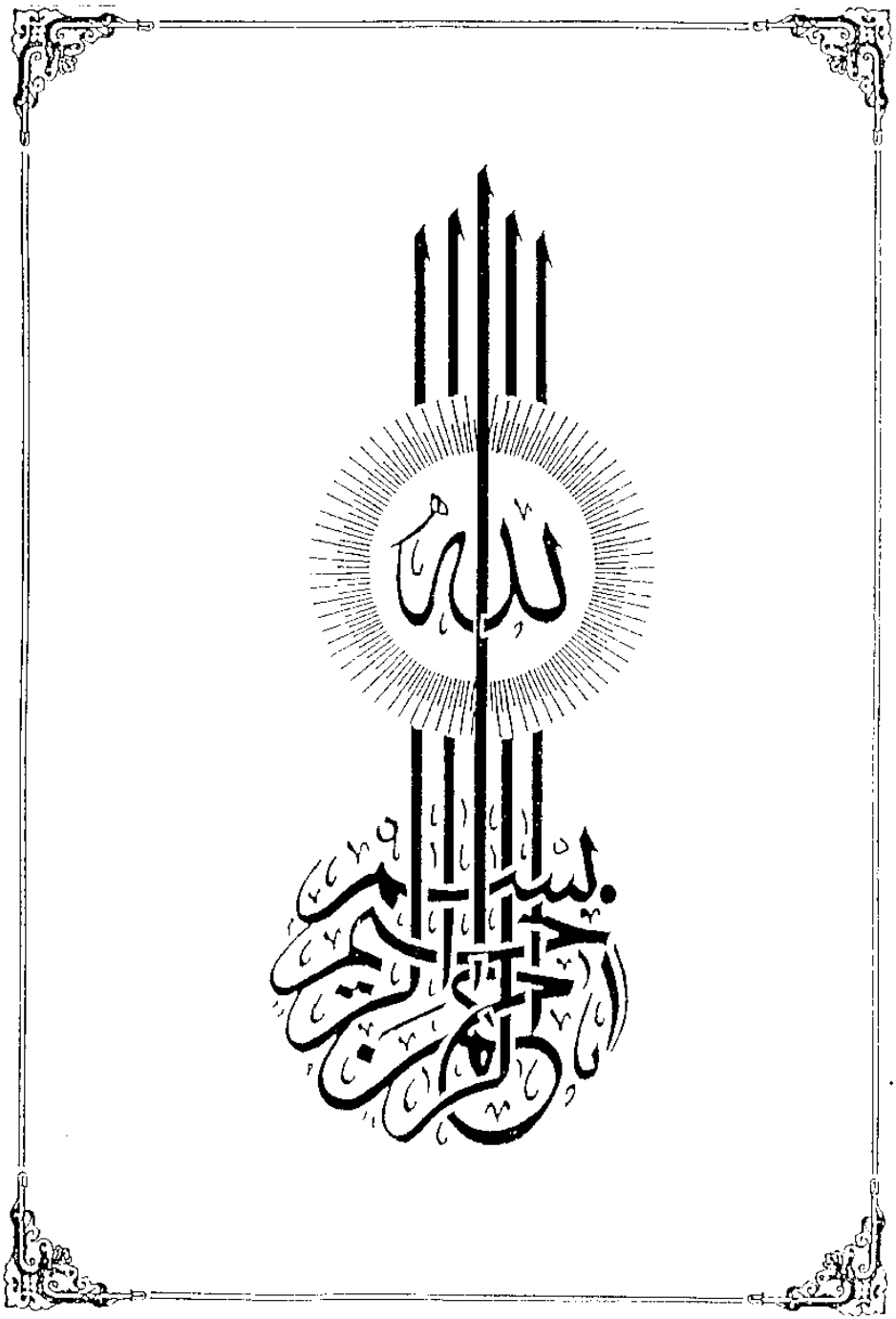

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PART IV
DISCUSSION

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INTRODUCTION

To fulfill the requirements of the present study on the relation between gabbros and mineralizations in the Eastern Desert, three localities have been chosen for this purpose, namely Um Rus, Wadi El Miyah and Atud. These areas exhibite variable characterestics illustrating such a relation forming the subject of the present Thesis.

Thus at Um Rus, an extensive sheet like gabbroic body, intrudes the older metasediments and is intruded itself by a younger circumscrit granodioritic body. The gabbro mass has, thus acquired a semicircular shape roughly moulding the contacts of the younger granodiorite. The intrusion of the latter had variable hydrothermal and metamorphic effects on the gabbro, whereby a great variety of " metagabbros " were developed within the mass, outcropping together with relics of weakly or non-metamorphosed patches. The characteristic banding exhibited by this basic sheet-like body may be due, in a great deal to such processes of metamorphism. Small lensoid bodies highly enriched in opaques (ilmenite and magnetite), were also developed, although they do not form economic ore deposits.

At Wadi El Miyah the metasedimentary belt is intruded by a mass of highly metamorphosed gabbro (amphibolite).

Younger bodies of grey and pink pegmatitic granites intrude the whole area with distinct local contact affects. The amphibolite mass contains small bodies of concentrated iron-titanium oxides, while numerous varieties of metagabbros constitute their country rocks.

Lastly, at Atud, a body of non-metamorphosed gabbro intrudes the country formed of metasedimentary and dioritic rocks. This gabbro is practically unaffected except by the gold-bearing hydrothermal quartz veins cutting its base.

The study of each of these three distinct gabbroic occurrences, and their relation to the iron-titanium mineralization constitutes the bulk of the present Thesis. In the first place, a field study of the mode of occurrence of the gabbros and the disposition of the local mineralized bodies within these masses, and their relation to any apparent trend of banding or tectonism (shearing or other), was carried out. Then the detailed microscopic study of both the transparent components as well as the opaque constituents met with in the different gabbroic varieties and the opaque-enriched bodies, cleared to a great extent, the relation between the formation of these titanium-iron rich bodies and the type or "state" of the enclosing gabbroic rock.

The fine microstructures revealed through detailed ore microscopic study were of great significance in this domain.

The Thesis includes four main parts. Part I deals with Um Rus area, Part II with Wadi El Miyah area and Part III with Atud area. Each of these parts involves two chapters: the first deals with the general geology of the studied area, while the other gives the detailed petrographical and mineralogical description of the different rock types and related mineralizations. Finally, Part IV deals with the discussion of the obtained data and their comparison with other previously studied occurrences of iron-titanium ore bearing gabbro bodies, chiefly at Abu Ghalga area. The conclusions that could be formulated through the present work are then set-forth.

CHAPTER I

GENERAL GEOLOGY

LOCATION AND TOROGRAPHY:

The UM RUS area is bounded by Lat. 25° 25' and 25° 30' 20" N and by Long. 34° 30' and 34° 36' E. The area is near to the coastal asphaltic road of Suez-Ras Banas, to which it is connected by a desert road beginning from UM RUS gold mine.

The area is a moderate hilly country, with some extreme rises at the north-western side. Few wadis cut the area and drain into the Red Sea. These include wadi GHALIB, wadi ABU DOB and wadi MUBARAK.

GEOLOGIC SETTING AND PREVIOUS WORK:

The UM RUS area was examined many years ago by Ferrar (1906-1907) and Hume (1907-1935 and 1937) within the frame of the general reconnaissance of the Eastern Desert .

Later on, Amin (1955-a) drew a geological map,

as an olivine gabbro alternating layers alternating with troctolite. He also mentioned that at the northern and southern borders of the mass, both the olivine gabbro and the troctolite are associated with green coloured rocks with a composition approaching that of diabase.

Kabesh, Hilmy and Bishady (1968) mentioned that the metasediments are the oldest formations in the present area, being intruded by both the granite mass of Gabel Abu Dob and the the gabbros. Some serpentine masses elongated in an almost N-S direction are also intruded into the schists. Moreover, Kabesh, Hilmy and Bishady (op.cit.) described the petrography of the different rock types at UM RUS. They mentioned that the metasediments comprise two major sub-divisions: the meta-mudstones and the schists. For the granodiorite mass, they recognized its heterogenity with rocks ranging in composition from basic hornblende tonalites to the more acid biotite adamellites. Two varieties of granite were identified: microcline-perthite type and nonmicrocline-perthite type.

Kabesh, Hilmy and Bishady (op.cit.) added that the gabbro was intruded into the meta-sediments; the arcuate shape of the mass conforming roughly with the changing trend of the country rocks. This may suggest, according to these authors, the existence of some relation

between the present shape of the gabbro mass and the local structure of the area under consideration. Concerning the layering and banding which is a characteristic feature of this gabbro, they noted that it is due not only to variation in the amounts of felsic and mafic components but, to a large extent, to the alternation of olivine gabbro with troctolite. Thus it was interpreted as an original primary structure.

On the world scale, Hall (1932) and Hess (1938) attributed banding in gabbres to gravitational differentiation of the magma. Wager and Dear (1939) attributed this feature to regular movements resulting from the convection currents within the magma. Turner and Verhoogen (1960) mentioned that gravity and gravitational differentiation in the basic magma is the principal mechanism producing that banding. Bowen (1956) noted that banding in basic igneous rocks originates during slow crystallization with the attendant opportunity for crystal sorting.

The olivine gabbro and troctolite at UM RUS are associated with diabase rocks "uralitized gabbro" characterized by their green aspect. These diabases occur in the extreme northern and south-western parts of the gabbro mass. Kabesh, Hilmy and Bishady (1968) mentioned that, the alteration of

fresh gabbro to this meta gabbro "diabase" is undoubtedly produced by the hydrothermal action of the hydrothermic fluids resulting from the gabbroic magma.

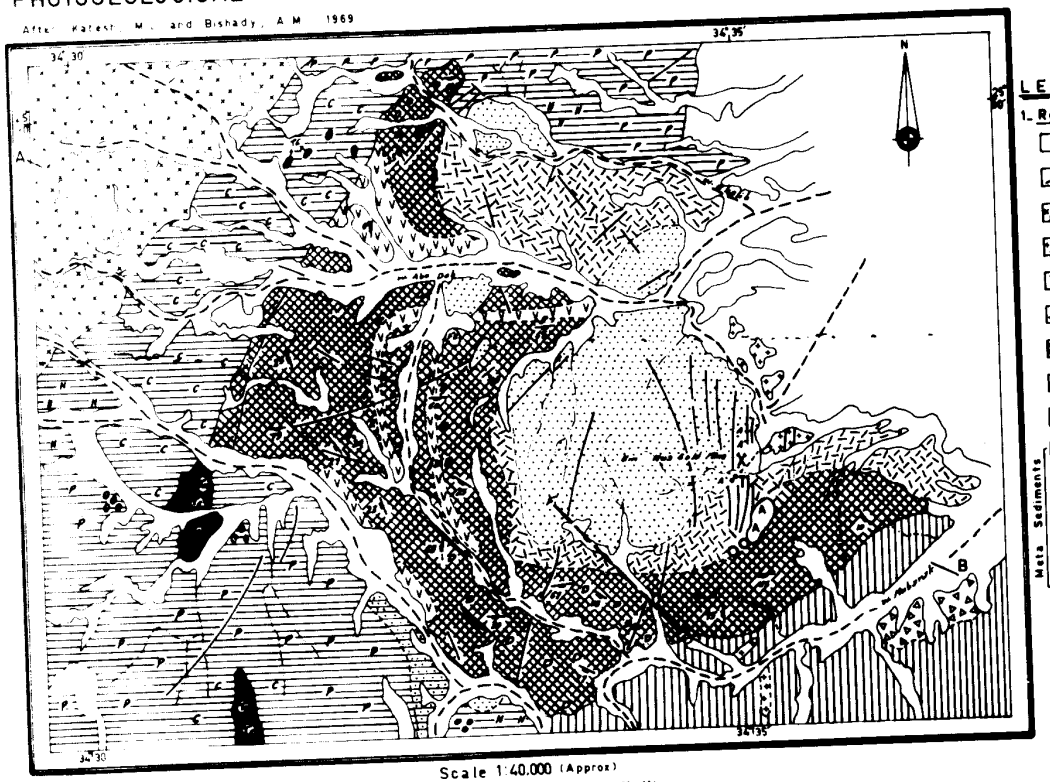
In the gabbros at the western part of the mass, there are aggregated ore bodies and disseminations in the host gabbro. This deposit is of a limited extent and has no economic importance.

Hilmy, Kabesh, Saleeb-Roufaill and Bishady (1968), mentioned that this ore body extends for some 100 m along strike with an average width of 10 m . The contact of the ore body with the enclosing gabbro is rather gradational, and within a zone of few metres the gabbro contains disseminations of the titaniferous iron ore. Through investigation of polished surfaces, these authors mentioned that the ore was found to be formed essentially of an aggregate of medium to coarse grained magnetite and ilmenite; the former being more common. The magnetite shows various types of ilmenite and spinel intergrowths. The ilmenite intergrowths range from fine to coarse lamellae, parallel mainly to the octahedral planes of magnetite, and form about 20% of the grains. Transparent spinel lamellae, parallel either to the "100" or to the "111" planes of magnetite were also identified. The martitization of magnetite is generally

Map 1

PHOTOGEOLOGICAL MAP OF THE AREA AROUND UM – RUS GOLD MINE

Afte: Kafrawi, M., and Bishady, A.M. 1969



LEGEND

1- Rock Formations

- Wadi Deposits
- Post - Granite Dykes & Veins
- Microcline - Perthite Granites
- Non Microcline - Perthite Granites
- Granodiorites including Tonalites Adamellites (A)
- Hybrid Rocks
- Gabbros including Olivine Gabbros (V), Diabases (D) and Troctolites (R)
- Diorites
- Serpentines & Related Rocks including Serpentinites Antigeritites & Talc Garbonate Rocks (Tc)
- Schists including Hornblendic (H), Psamma-Pelitic (P) & Calc-Pelite (C) Varieties
- Conglomeratic Schist
- Pebbly Schist
- Hornblendic Mudstone Bands
- Meta-Mudstones

Meta Sediments

- Opaque-Rich Gabbro
- Anorthosite Bands
- Tre Tremolite Rock
- Titaniferous Iron Ore

3- Topography

in an advanced stage especially along the crystal borders. According to these authors, the ilmenite is generally homogeneous but rarely contains exsolutions of titan-hematite and rutile. Ilmenite shows a partial secondary alteration to a fine aggregate of rutile-anatase, a feature confined to the grain borders or along the cracks traversing the ilmenite grains.

The general geologic setting of the area can be summarized, both from the previously reviewed literature and the personal field observations carried out by the author as follows:

The gabbro of UM RUS area forms a semicircular mass surrounding the granodiorite (Map 1). These gabbroic rocks form low hills (Fig.1) with flat cones whose summits are covered with weathered blocks having rusty brown colour. The gabbros of this area cut across the bedding planes of the metasediments, they are thus definitely younger than the metasediments, while the granodiorite is intruding the gabbro as indicated from the apophyses and tongues injecting it.

Again, the field relations between the gabbro and granites in the studied area show that the latter are younger than the former.