Petrographical, Geochemical and Mechanical Studies of Some Eocene Carbonate Rocks Along the Nile Valley Between 27° and 29° Latitudes

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By.

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[illegible] in
partial [illegible] in geology. [illegible] this thesis, two semesters [illegible] courses for one year in the following topics :

I. Field Geology :

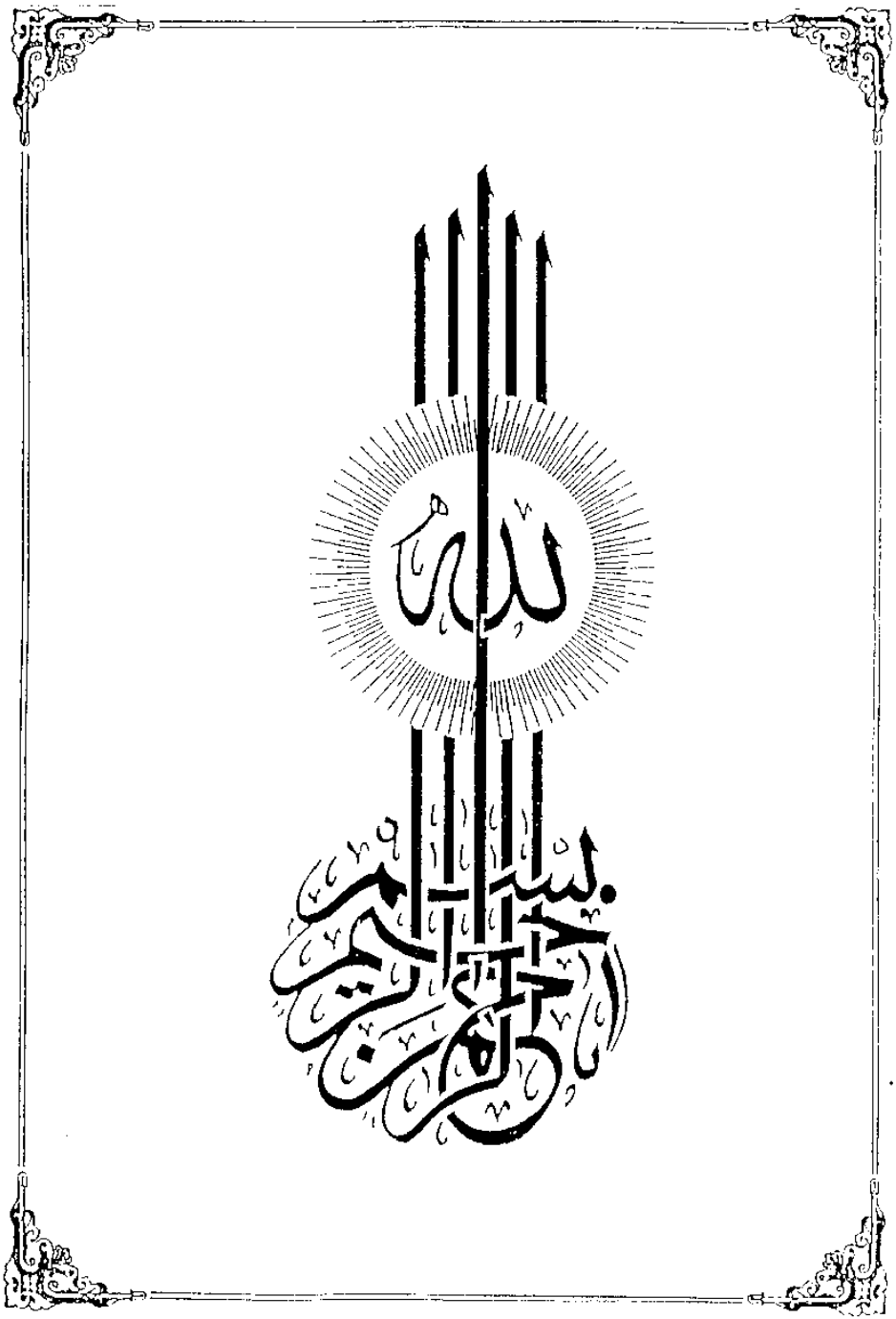
1- Field geology.
2- Sampling
3- Photogeology

II. Advanced Mineralogy :

4- Crystallography
5- Mineralogy
6- Geochemistry

III. Advanced Petrology :

7- Igneous petrology
8- Metamorphic petrology
9- Sedimentary petrology



TO MY PARENTS AND FIANCEE FOR ALL THE DEVOTION

AND [illegible] SUPPORT THEY GAVE ME.

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[illegible]

The present [illegible]
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A detailed petrographical [illegible], microscopic examination, X-ray diffraction, differential thermal and infrared spectral analyses, for the identification of mineral composition, biofacies and lithofacies in these rocks. Major and minor elements (Ca, Mg, Si, Al, Ti, Fe) were determined. Sr and Mn were quantitatively determined and their distributions were discussed.

Results of uniaxial compression tests on five dry limestones were also described. The physical properties of sixty seven limestone specimens were determined. Stress-strain curves were obtained for each rock. Relations between ultimate strength and voids ratio, mean grain size and volumetric weight were given respectively.

The petrographic [illegible] that calcite is the main constituent [illegible], [illegible] resented by [illegible], quartz, chalcedony [illegible] and illit). [illegible] were [illegible], [illegible] biomicrudite, [illegible] dite, [illegible] biolerrudite, algal [illegible] dolomitic [illegible] calcareous shale.

The [illegible] subjected to a number of diagenetic [illegible], recrystallization, silicification [illegible].

[illegible] normal marine environment [illegible], oxidizing conditions [illegible].

[illegible] low-magnesian calcite. [illegible] correlate positively [illegible] correlates positively [illegible] relationship with [illegible]. There is no definite [illegible] contents.

The strength of the studied limestones increases with [illegible] voids ratio. Slightly porous limestones are strong and very brittle, semi porous limestones are intermediate, while highly porous limestones are very weak.

C O N T E N T S

CHAPTER I

INTRODUCTION

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Carbonate rocks are widely distributed in Egypt. They cover about one half of the surface area of Egypt. Within the stratigraphic column, a wide variety of carbonates is known to occur, specially in the Eocene where they constitute the major part. The Eocene rocks cover about one fifth of the surface of Egypt (Fig. 1) and is one of the prominent system in the geologic column of the country. These rocks are mainly represented by fossiliferous limestones and uncommonly shales.

The present study deals essentially with the petrography, geochemistry, physical and mechanical properties of some Eocene limestones exposed in the area delimited by latitudes 27° and 29° N along the Nile Valley (Fig. 2). The examined localities are :-

1- East of Minia.

2- Gebel El-Teir (12.5 km north of Minia).

3- Gebel Qarara (east of Maghagha).

4- Beni-Hassan (north of Minia, Nacine Abu Qorqas).

5- Zawyet Sultan (5 km north of Minia).

6- Beni-Khaled (east of Samalut)

7- Shosha (about 25 km north west of Samalut).

8- El-Bahnasa (about 36 km north west of Samalut, 22 km east of Nile).

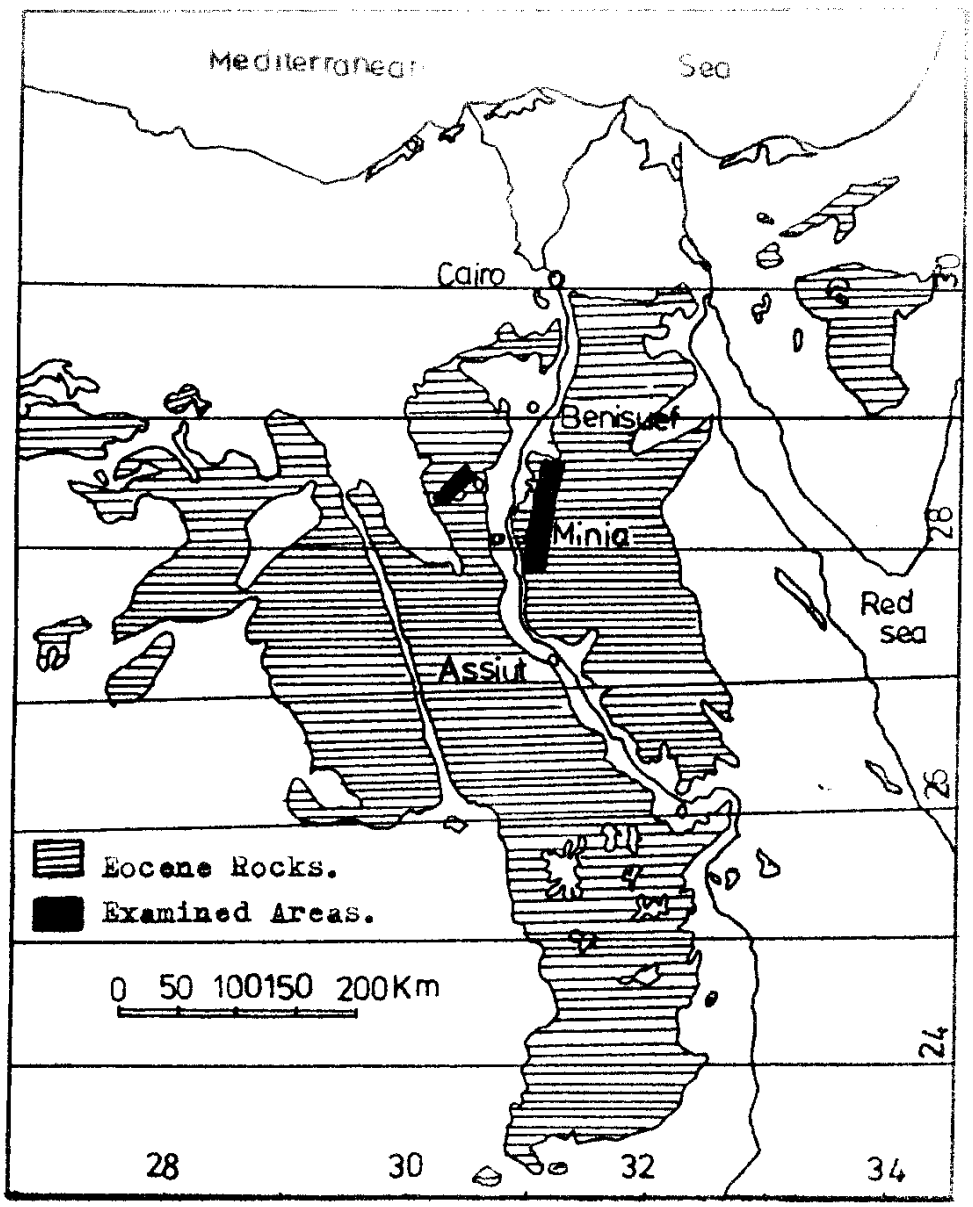
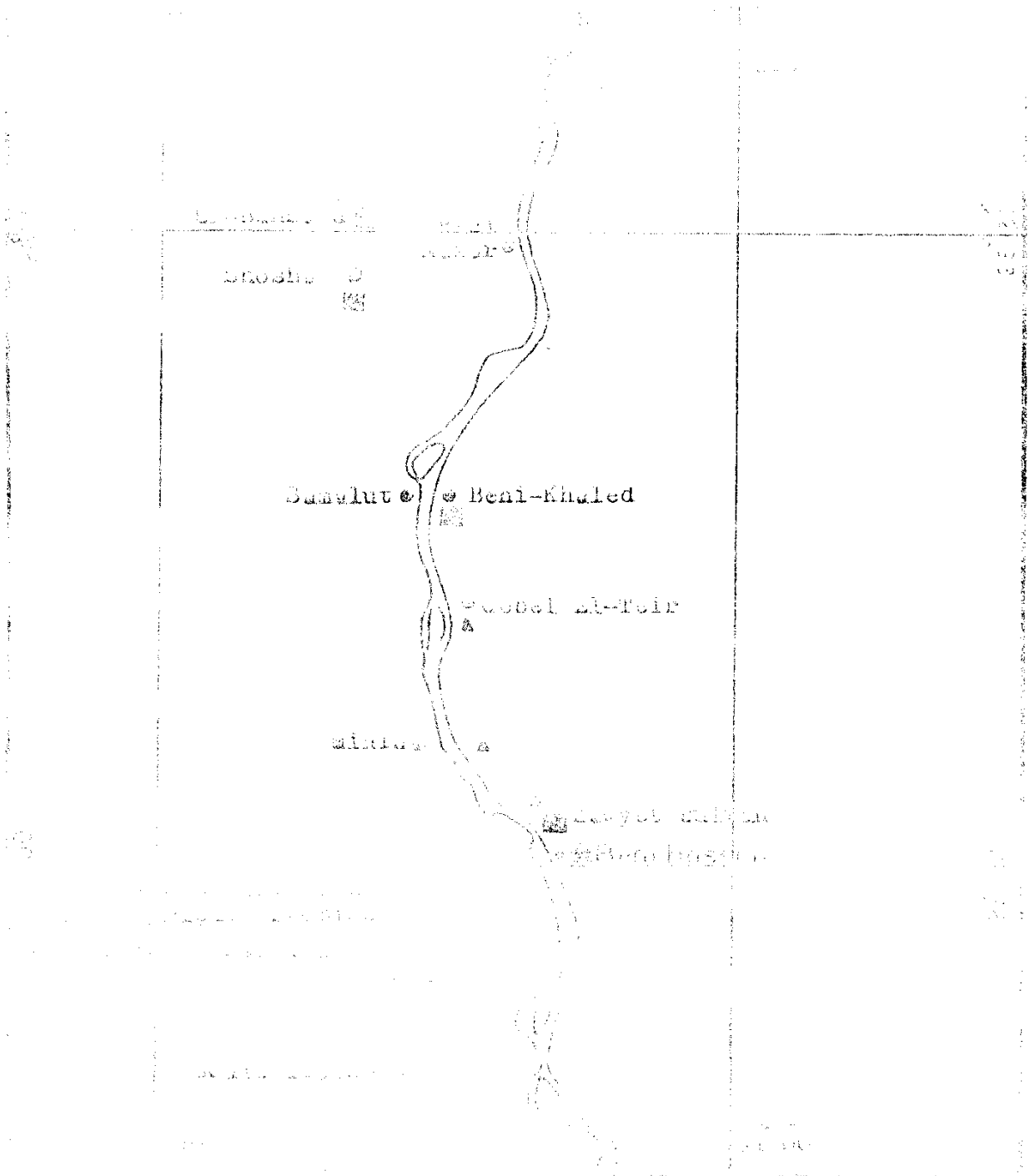


Fig.(1) Distribution of Eocene limestone in Egypt
(after Said,1962)



The Eocene period in Egypt has long attracted the attention of paleontologists and biostratigraphers. Its importance lies in its nature as a transitional period between two different tectoenvironmental conditions; those of Late Cretaceous by which tectonic movements led to pronounced paleotectonic variations and those of Oligocene-Miocene in which tectonism was associated by volcanic activity that affected considerably the older rocks and created various structures of large magnitude.

Fraas (1867), was probably the first to study the Eocene rocks of Egypt, but Zittel (1883), is generally considered the first to start the systematic study of Paleogene sections of the Nile Valley. This was followed by the works of Fourtau (1897), Beadnell (1905), and many others.

Fourtau (1897), assigned a Lutetian age to the whole Eocene succession exposed in the Mokattam area, which he also subdivided into Lower, Middle and Upper Lutetian. Blankenhorn (1902), classified the Eocene rocks in Egypt into Upper (Mokattam), Middle (Mokkatamian) and Lower (Libyan). Hume (1911), distinguished three stages within the Middle Eocene of Egypt and also modified the classification of the Fayoum successions. Ansary and Ismail (1956) studied the

foraminifera present in the Eocene rocks of Helwan and placed the boundary between the Middle and Upper Eocene below "El Qurn". Bishay (1961, 1966), introduced many formational names to the Eocene rocks in Sinai and the Nile Valley. Said (1962), subdivided the Eocene rocks along the Nile Valley into different formations including from base to top : Esna shale, Thebes, Minia, Mokattam and Maadi formations. Boukhary (1970), studied the lithostratigraphic and biostratigraphic classification of the Eocene in Minia-Cairo reach of the Nile Valley. He subdivided the foraminiferal assemblages recorded in the area from top to bottom into :

a- Shallow-littoral benthonic assemblage.

b- Pelagic assemblage.

c- Large foraminferal assemblages.

Beside these paleontologic and stratigraphic studies, a petrographic and geochemical studies were carried out on the Eocene rocks of Egypt. Paris and Soliman (1954, 1961), studied the petrography of carbonate rocks of Abu Roash and adjacent localities. Kabesh and Nosseda (1954), investigated the area extending from Gebel El-Ahmadi to south of Helwan, and reported the chemical analysis of each locality. The aim of their study was to search for limestones suitable for metallurgical processes in the iron and steel industry.

Ghorab and Ismail (1957), carried out a microfacies study of the Eocene and Pliocene rocks east of Helwan. Akaad and Naggar (1964a, 1964b, 1967), described petrographically the "Egyptian alabaster" occurrence at Wadi Assiuty and Wadi Sannur. Hassan (1966), reported on the petrography of the Eocene limestones in some northern parts of Egypt, and its evaluation for petroleum prospecting. El-Hinnawi and Loukina (1971), carried out chemical analysis for some carbonate samples from different localities along the Nile Valley (Mokattam, east of Helwan, Abu Roash, Beni Suef, Sannur, Edfo and Gebel Drunka). Khadr (1972), studied the mineralogy, petrology and geochemical characters of the Eocene limestones section of Drunka; Assiut district. El-Hinnawi and Loukina (1972), reported also on the distribution of strontium in Egyptian carbonate rocks of the Cretaceous and Upper Eocene. Later, Loukina (1974), carried out some studies on the geochemistry of Egyptian carbonate rocks of Pre-Cambrian to Recent ages. Kholief (1975), studied the sedimentological and petrographical characteristics of some subsurface Eocene sediments in the Western Desert. Hanna (1977), made geomorphological, stratigraphical and petrographical investigations on the Middle Eocene Samalut and Minia between latitudes 28° 03' and 28° 22', along the Nile Valley. El-Gindy (1978), also discussed the sedimentary environment of the Middle Eocene carbonate rocks in Beni Khaled - Beni Hassan area, east of Minia.