

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

*Thesis Submitted to the
Faculty of Science, Ain Shams University*

By.

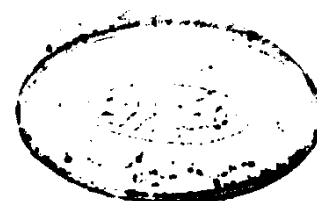
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- 5- Mineralogy
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6- Geochemistry
7- Igneous petrology
8- Metamorphic petrology
9- Sedimentary petrology



TO MY PARENTS AND FRIENDS FOR WHOSE DEVOTION
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A detailed petrographical study of the partial melt, microscopic examinations, X-ray diffraction, differential thermal and infrared spectral analyses, for the identification of mineral composition, biotites and lithofacies in these rocks. Major and minor elements (Ca, Mg, Si, Al, Ti, Fe) were determined. Sr and Rb 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 work has led to the conclusion that calcite is the main constituent mineral, other minor constituents are represented by quartz, epidote, hornblende, garnet, quartz, chlorite, pyroxene, plagioclase, biotite, ilmenite and illite). Five of the most characteristic minerals were identified: calcite, quartz, hornblende, biotite, siderite, and ilmenite. The rock is a dark gray, fine-grained, micaceous, silty shale.

The crystalline polymer is subjected to a number of dielectric measurements. The polymer is crystallized, recrystallized, and the crystallinity is determined by x-ray diffraction.

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operations in the Pacific. The U.S. naval marine, studying
a situation, was a major factor in the U.S. naval marine.

Results of the correlation analysis of low-magnesian calcite and high-magnesian calcite in the same sample positively indicate that the two types of calcite occur in the same sample. The results of the correlation analysis of the relationship with dolomite in the same sample indicate that there is no definite relationship between the two types of calcite and dolomite.

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

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CHAPTER I
INTRODUCTION

CHAPTER I

INTRODUCTION

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 Warara (east of Maghagha).
- 4- Beni-Hassan (north of Minia, Kacine Abu Torqas).
- 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).

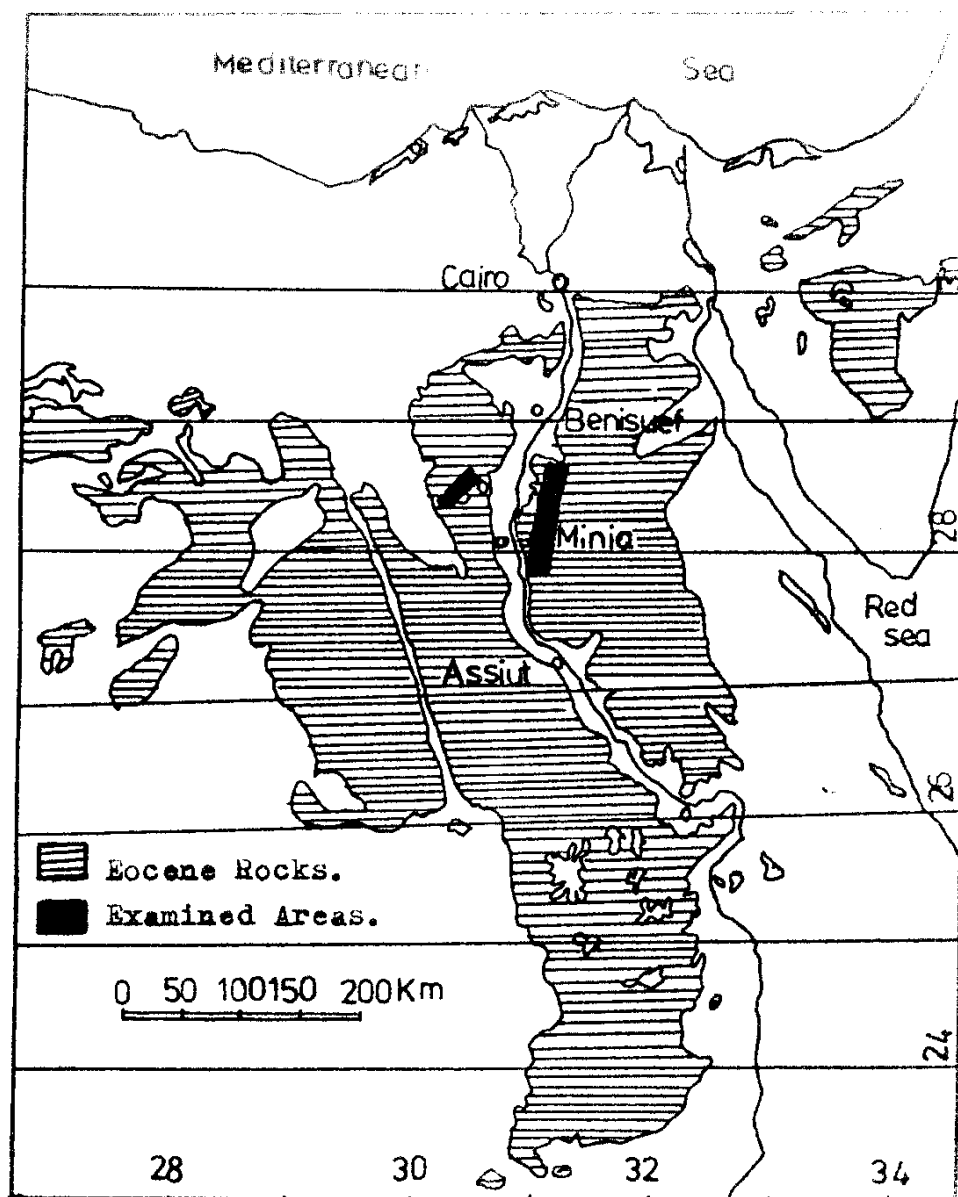


Fig.(1) Distribution of Eocene limestone in Egypt
(after Said,1962)

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. Blakenhorne (1902), classified the Eocene rocks in Egypt into Upper (Maroccan, Sicilian, Parisian) and Lower (Libyan). Hurd (1911), subdivided the Eocene layers within the Middle Eocene of Egypt and also modified the classification of the Tertiary succession. 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 foraminiferal assemblages.

Beside these paleontologic and stratigraphic studies, a petrographic and geochemical studies were carried out on the Eocene rocks of Egypt. Maris and Soliman (1954, 1961), studied the petrography of carbonate rocks of Abu Roash and adjacent localities. Rabeh and Hamada (1954), investigated the area extending from Giza El-Dokki 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 microfossils study of the Eocene and Pliocene rocks east of Helwan. Akead 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, Edao 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 Gharbat al-Fir between latitudes $28^{\circ} 03'$ and $28^{\circ} 22'$, 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.