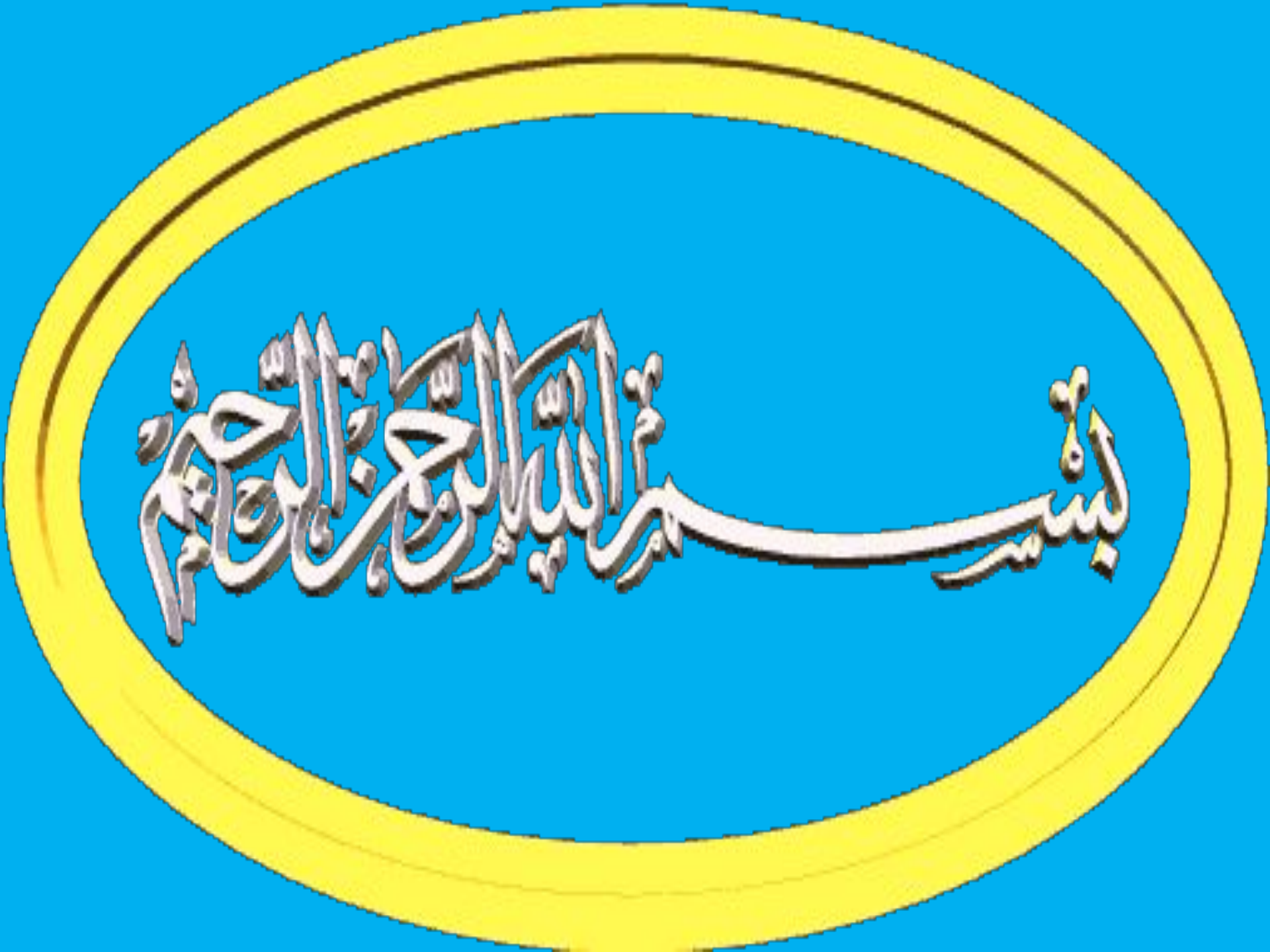
بسم الله الرحمن الرحيم


THE
Phanerzoic
OF EGYPT
G411
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# THE PHANEROZOIC OF EGYPT


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- Zagazig Univ.

Faculty of science

Geology Department


Fourth year of Geol. and chem. & Geophysics

1st Semester 2019/2020

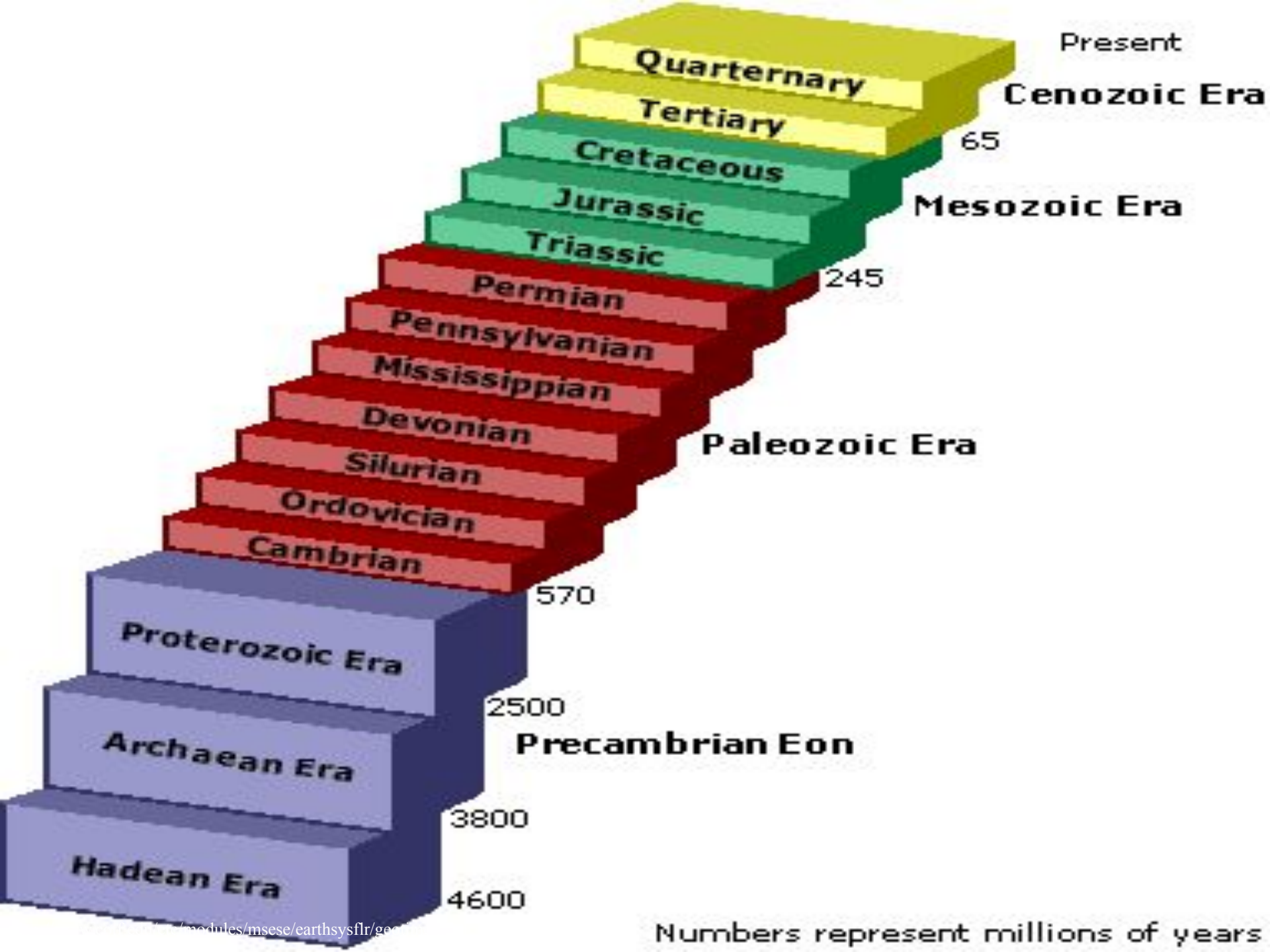
# Course Grading

| ACTIVITIES | PERCENTAGES |
| --- | --- |
| Class Exercises | 10 % |
| Lab exam | 10 % |
| Midterm exam | 10 % |
| Oral exam | 10% |
| **Total** | **40 %** |
| **Final exam** | **60 %** |
| **Total** | **100 %** |

**Purpose**: To introduce undergraduate students to Know geology of Egypt from Geomorphology, Seismicity, Egypt in the framework of global tectonic, Volcanicity, Basement complex and stratigraphy of Egypt Phanerozoic Eon( Paleozoic Era, Mesozoic Era and Cenozoic Era) and the economic resources .

# Example of text books

- **Said, R., 1962:** The geology of Egypt.- Elseveir Publishing Co.- Amsterdam, New York, 377 pp.
- **Said, R., 1990:** The Geology of Egypt, Balkema Publ.Co.Rotterdam,. 743p.
- **Issawi, B., Francis, M. H., Youssef, E. A. A., and Osman, R. A., 2009:** The Phanerozoic geology of Egypt, a geodynamic approach (2nd ed.) Special Pub. No.81, Egypt. Mineral Resources : 589p,Cairo.


Present
Quarternary
Tertiary
Cenozoic Era
65
Cretaceous
Jurassic
Triassic
Mesozoic Era
245
Permian
Pennsylvanian
Mississippian
Devonian
Silurian
Ordovician
Cambrian
Paleozoic Era
570
Proterozoic Era
2500
Archaean Era
Precambrian Eon
3800
Hadean Era
4600
Numbers represent millions of years

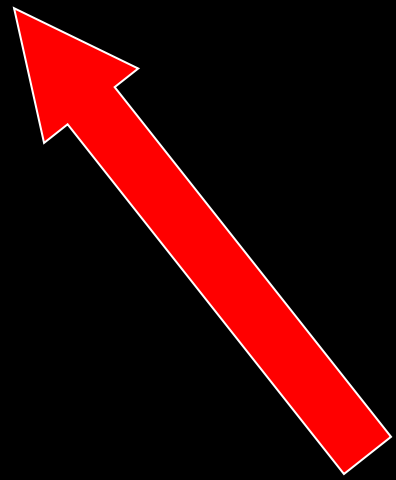
# Introduction

- The present work presents the framework on the Phanerozoic of Egypt; its stratigraphy & structural settings as its sedimentary & economic mineral and deposits.
- Other geological branches,e.g. Geomorphology , paleontology (macro - and micro – index fossil) etc.... Are in consideration .
- Therefore, its highly recommended that the reader must be aware at least the general basis of the above mentioned geological sciences / branches , to follow and assimilate the content of the present work.

# G 411 Lecture Topics 1st semester 2019

- Course Introduction
- GEOMORPHOLOGY OF EGYPT
- Egypt in the framework of global tectonic
- **Phanerozoic Eon**
  - Paleozoic Era
  - Mesozoic Era
  - Cenozoic Era

# Course Introduction



# Geographic Situation

- Egypt forms the northeast corner of Africa and occupies nearly one-thirtieth
- (1/30) of the total area of that continent and extends beyond the Gulf of Suez and the Suez Canal into Asian near East.

# Geographic Situation

- Bounded by to the North by the Mediterranean Sea, to the south by Republic of the Sudan, to the west by the Republic of Libya and to the east by Palestine, Gulf of Aqaba and the Red Sea.

# Geographic Situation

- It measures 1,073km in greatest length from north to south,1,226km in greatest breadth from west to east and embraces a total area of almost one million square kilometers.
- Situated between Latitudes 22° and 32° N Longitudes 25° and 35° E.

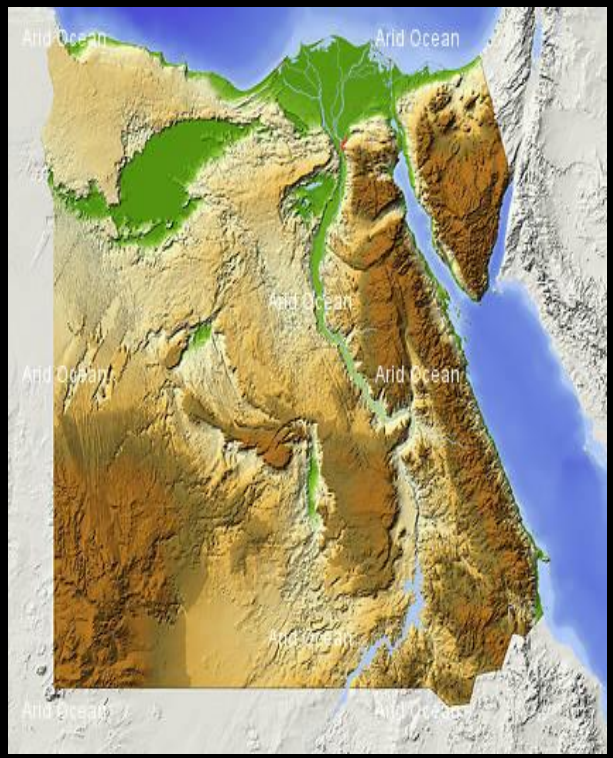
# Climatic Condition

- Egypt lies for the most part in the temperate zone, with less than a quarter of its area south of the tropic corner due to the near of tropic cancer.

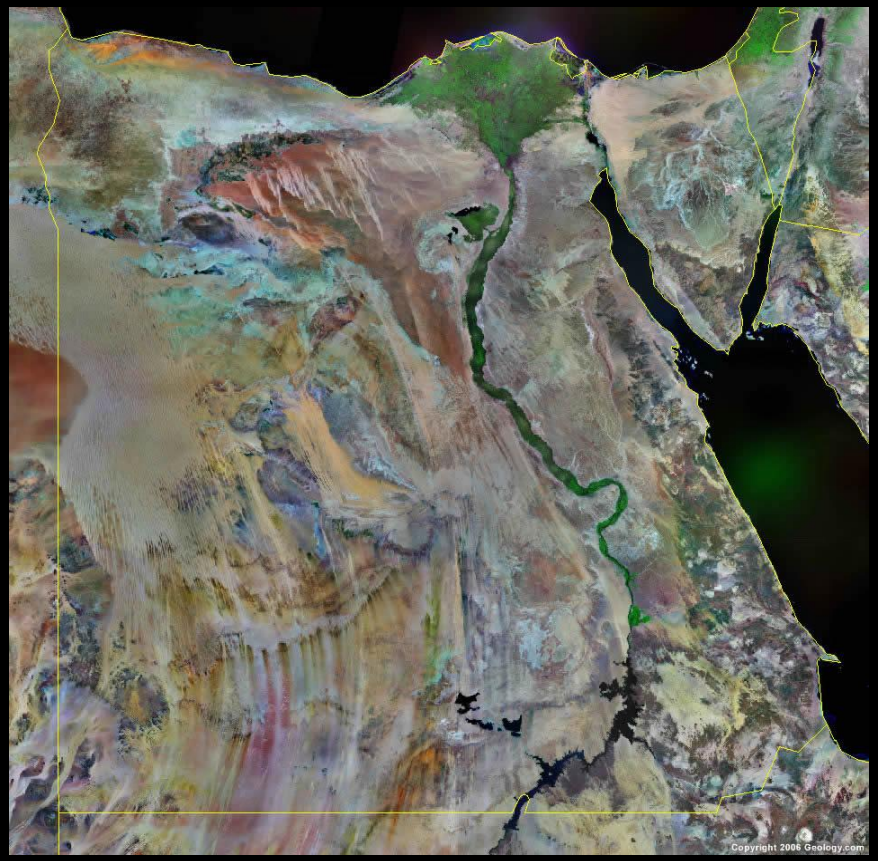
- **Egypt lies in the arid belt (great desert belt or the Great Sahara with Dry hot climate ) which extends from the Atlantic Ocean due to the west crossing whole North Africa.**

Morocco, Algeria, Tunis, Lybia and Egypt and further to the east ,Saudi Arabia, Arab Gulf , Iran , and Pakistan , passing by Afghanistan.

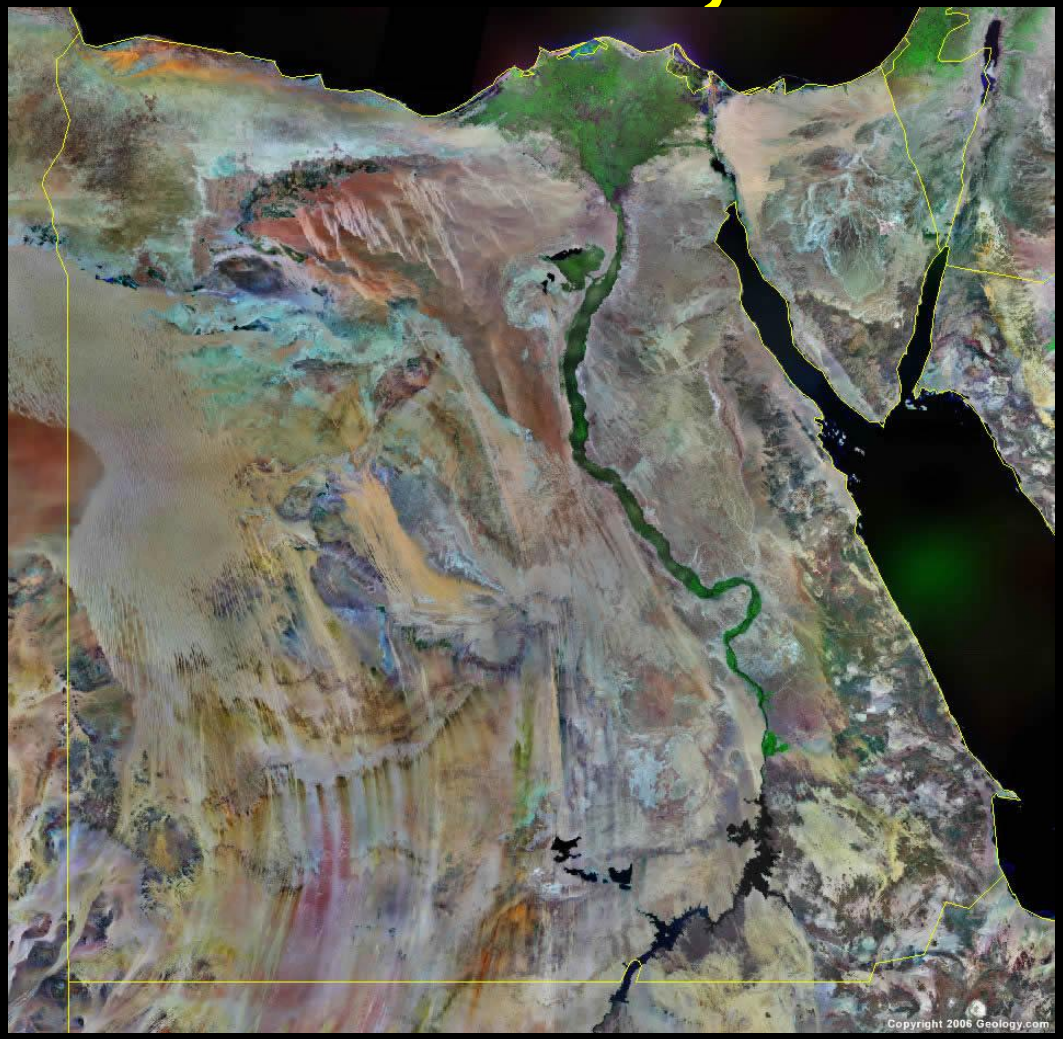
- **The climate is characterized by a warm and almost rainless climate.**
- **The air temperature in Egypt frequently rises to over 40 degree in day time during the summer and seldom fall as low as zero degree even during the coldest nights of winter.**
- **Exceptions are registered in high mountainous land stretches in Southern Sinai (G.St.katerina) and Northern Eastern desert (G. El shayib).**



- The average rainfall over the country of winter only about 1 cm a year .
- Even along the Mediterranean littoral , where most of the rain occurs , the average yearly precipitation is less than 20 cm .
- The scanty rainfall of Egypt accounts for the fact that the greater part of Egypt consists of barren and desolate desert.



- Its only through the River Nile that a regular and voluminous supply of water ,coming from the highlands lying far to the south, is secured.



- The average density of population in the habitable part of Egypt is more than 1500 person /km square while there is only one inhabitant /6 km square in the vast desert areas.

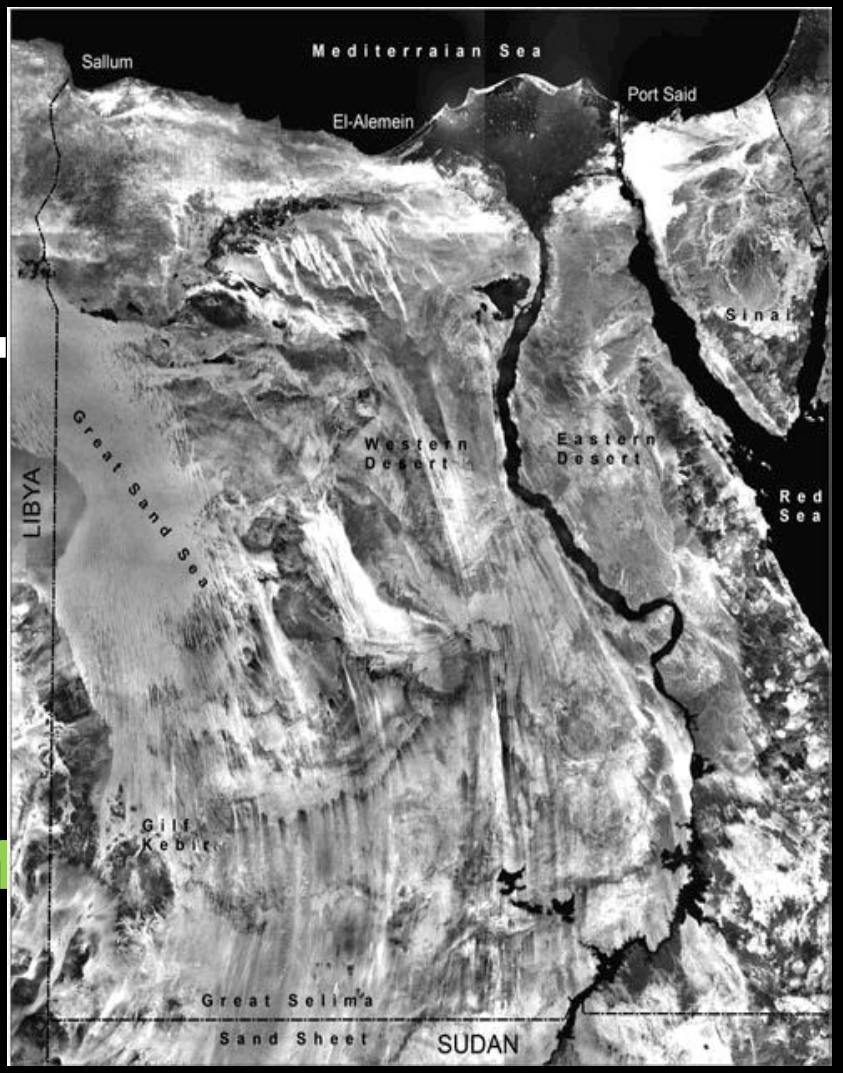
- **The River Nile has given Egypt a strip of fertile land which has made possible not only the development of its famed ancient agricultural civilization but also the growth of this civilization in peace and stability.**

# NILE RIVER

- The statement “ The Nile is the gift of Egypt” is true, since the Nile gave and gives Egypt not only fresh water for living beings, but also its old civilization and agriculture.
- As a matter of fact, without the Nile, Egypt is a desert, as a country.

- **The River Nile is considered a conspicuous geomorphologic phenomena in Egypt.**

- **The River Nile subdivided Egypt into two distinct morphological region (The Western Desert and the Eastern Desert).**



- The region to the east consists of a dissected plateau draining to the Nile river or Red Sea(Eastern desert or Arabian desert).
- Although the land to the east of Nile forms one geomorphological region ; its geographically into Eastern Desert and Peninsula of Sinai separated by the Gulf of Suez.

- While the region to the west consists of a series of unconnected depressions with wide and large plateau (Western desert or Libyan desert).

- **The table - land between kharga Oasis and the Nile is in continuation with Maasa plateau of the Eastern Desert.**

# Review

- Egypt forms the northeastern corner of Africa and occupies nearly 1/30$^{th}$ of the total area of Africa.
- Total area 1.000,000 km$^2$, the greatest N-S length: 1073 km, and the greatest E-W breadth 1226 km.
- Egypt lies within the great desert belt: the Sahara, i.e. of warm and almost rainless climate.

# Review

- Max. Summer temp. over 40°C and min. Winter temp. 0°C.
- Average rainfall 1cm/y, along the Mediter. coast >20 cm/y.
- The Nile is the most important geomorphologic feature in Egypt. It occupies 3% of the total Egyptian area.
- Population on the Nile strip > 1500 person/km², population on desert one person/ 6 km².

# GEOMORPHOLOGICAL FEATURES OF EGYPT

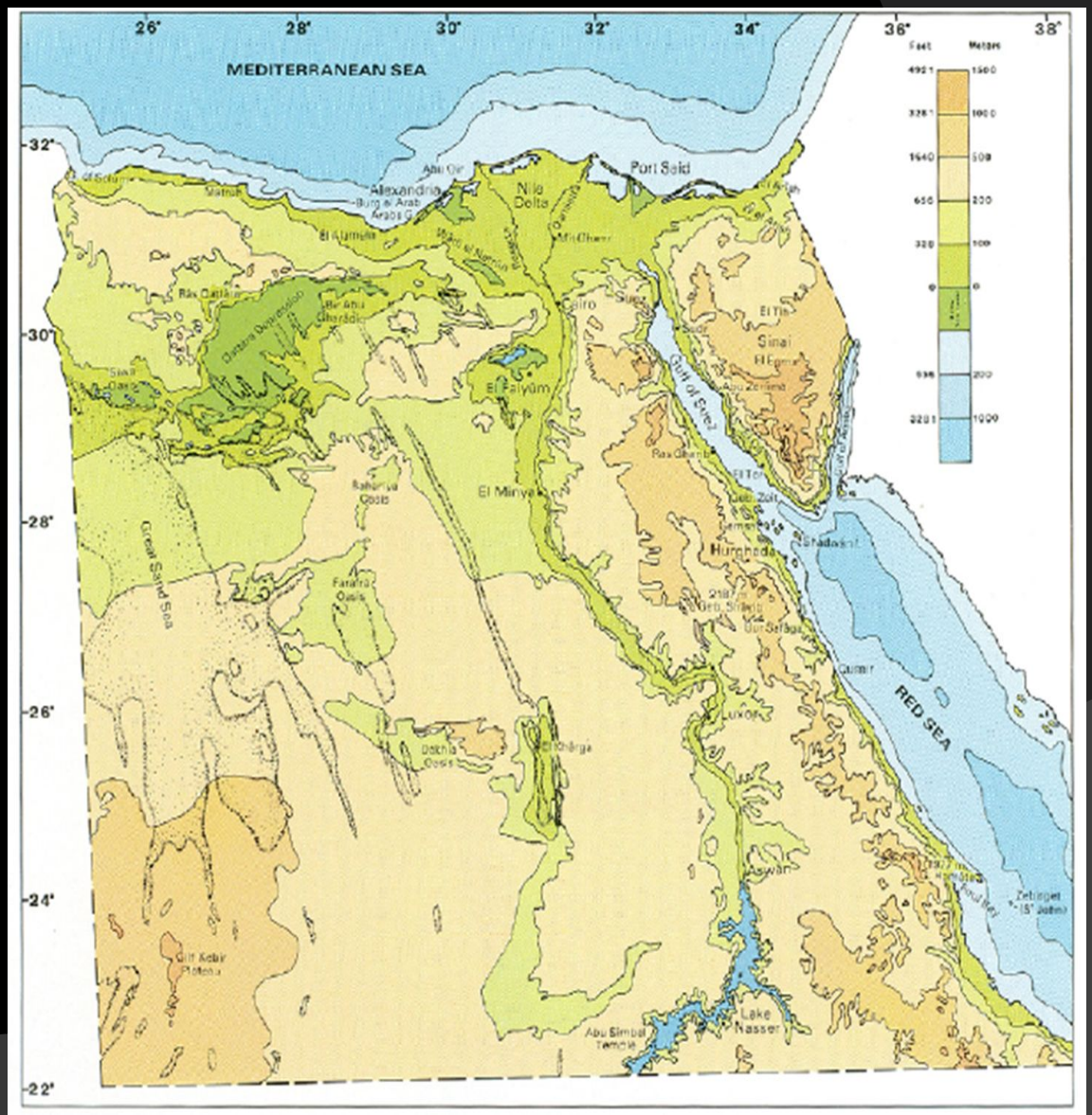
# Objectives

- Base of geomorphological classification
- Main Geomorphological units

# Base of geomorphological classification

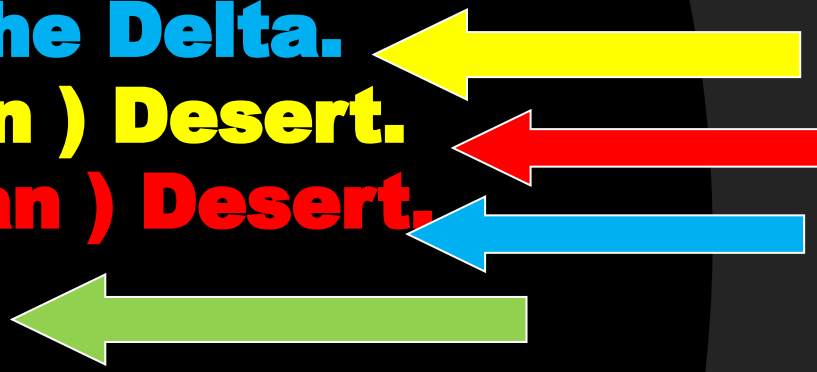
- The River Nile is considered a conspicuous geomorphologic phenomena in Egypt.

- The River Nile divided the desert Land of Egypt into two divisions: The Western Desert and the Eastern Desert.



# GEOMORPHOLOGICAL FEATURES OF EGYPT

- Geomorphologically ( physiographyically) Egypt is classified into major super geomorphic units:
- 1- The Nile valley and the Delta.
- 2- The Western ( Libyian ) Desert.
- 3- The Eastern ( Arabian ) Desert.
- 4-The Sinai Peninsula.



**Each of super unit above can be geomorphologically divided into small units .**


# 1- Nile Valley,
# Nile Delta
# and
# Fayum Depression

# A- The Nile valley

- The Nile Valley ,is as we know, one of the longest rivers in the world (6825 km in length), its basin (including the southern countries e.g. Kenai ,Sudan...etc.).

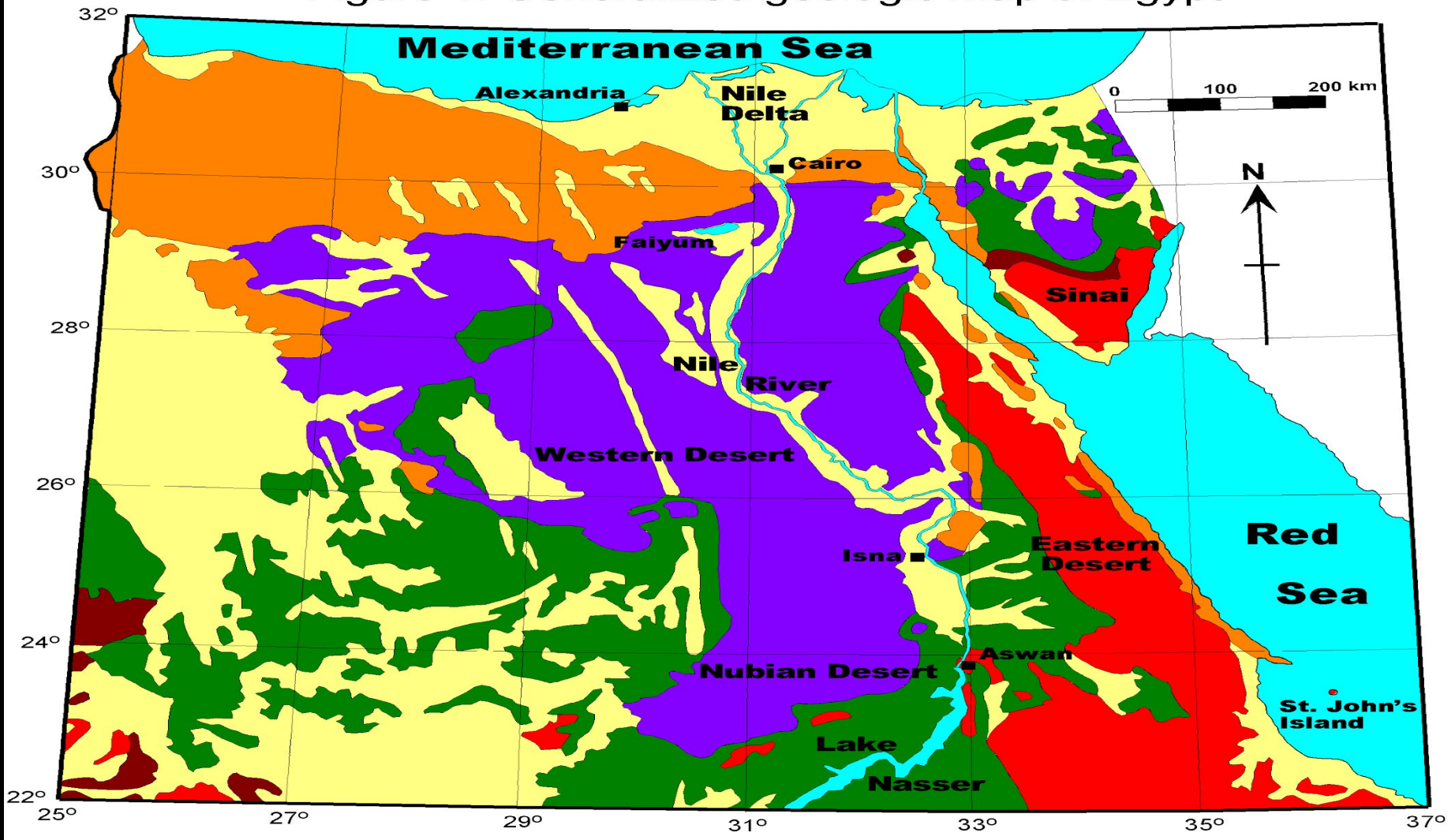
- its basin measures an area of about 50.000 square kilometers with annual discharge being about 86 billion cubic meter/ year.

- **The Nile enters Egypt at Adindan Village in Wadi Halfa (at Egyptian -Sudanese border), and flows northward without receiving any tributaries until debauching its load in the Mediterranean via Rossetta and Damietta branches.**

- **The Nile has a meander pass with several islands; its valley has different widths and is drained by many large wadies (e.g. Wadi Kalabsha, Wadi Alaqi, Wadi Kharit, Wadi Shait, Wadi Assuti, Wadi Qena, and Wadi Tarfa).**

- The Nile valley and Delta occupy the alluvial tract a long 1,350 km of the River Nile .
- These lie within the border of Egypt.
- Along this course no tributary joins the Nile.
- The valley is embanked with different rocks from place to another.

# Figure 1: Generalized geologic map of Egypt




**CENOZOIC**
- QUATERNARY — Thick deposits of unconsolidated sediments: mainly sand dunes in the Western Desert; floodplain sand, silt and clay in the Nile Valley; and wadi sand and gravel in the Eastern Desert and Sinai
- TERTIARY
  - Neogene — Mainly sandstone and conglomerate
  - Paleogene — Mainly limestone

**MESOZOIC** — Mainly sandstone of Upper Cretaceous age

**PALEOZOIC** — Mainly sandstone and shale

**PRECAMBRIAN** — Igneous and metamorphic rocks ('crystalline basement')

# NILE VALLEY & DELTA

- **The Nile of Aswan or The Nubian Nile**(the southern 300 km., with slope rate reaches 1m./11 km).
- **The Nile Aswan – Cairo** (940 km, little slope rate, passes through the Nubian Sandstone till Qena bent, then through Limestone till Cairo )■
- **The Delta and Fayum depression**


Egypt
International Boundary
Governorate Boundary
Buffer Zones/Treaty Lines
Road
River
National Capital
Governorate Capital
City or Town
0 50 100 150 KM
0 50 100 150 Miles
© 2007 Geology.com
Mediterranean Sea
Nicosia
CYPRUS
Crete (Greece)
LEBANON
Beirut
Sidon
Damascus
SYRIA
Hims
Irbid
GOLAN HEIGHTS
WEST BANK
ISRAEL
Amman
Jerusalem
GAZA STRIP
Dead Sea
Al Karak
Beersheba
Al 'Arish
Port Said
Damietta
Baltim
Kafr ash Shaykh
Alexandria
Damanhur
Tanta
Al Mansurah
Zagazig
Ismaʻilia
Shibin al Kom
Banha
Al Jizah
Cairo
Helwan
Suez
Sudr
Elat
Al 'Aqabah
JORDAN
Maʻan
Tabuk
SAUDI ARABIA
Gulf of Suez
Gulf of Aqaba
Red Sea
Ra's Gharib
Al Tur
Sharm ash Shaykh
Al Ghardaqah
Bur Safajah
Al Qusayr
Marsa al 'Alam
Baranis
As Sallum
Marsa Matruh
Siwah
LIBYA
Bani Suwayf
Al Fayyum
Al Bawiti
Al Minya
Asyut
Suhaj
Qina
Luxor
Idfu
Aswan
Lake Nasser
Abu Sunbul
Lake Nubia
Wadi Halfa'
Hala'ib
Dunqunab
SUDAN
EGYPT
Mut
Al Kharijah
Baris

- **The Nile of Aswan(The Nubian Nile). The southern 300 km., with slope rate reaches 1m./11 km.**

# A- The Nile valley

- After entering Egypt at Adindan village in Wadi Halfa, it passes for more than 300 km throw a narrow valley surrounded by cliffs of the Cretaceous sandstone and shale rocks of the Nubia Group and granite on both its east and west sides until it reaches the First cataract which commences about 7 km south of Aswan.

# A- The Nile valley

- The stretch, between Adindan (at the Sudanese – Egyptian border ) and the cliffs ordering the High Dam (Nasser Lake) is composed of sandstone and quartzitic sandstone with minor shale intercalation (know as Nubian sandstone)attain an elevation at 2oom a.s.l.

- The beds on both sides of Nasser lake are nearly horizontal, and sometimes have very gentle dips(2N).
- looking at the east, the color of the rocks are bright to red (granites) , while the color in the western direction is brown (Nubia Sandstone).
- Farther to the west ,the color of the rocks is pale white (Limestone).

- The natural gradient of the river in Nubia (1m/11km), and decreases north of Aswan.

- The landestrech is dissected by main wadies draining in the lake Nasser from the east ,Wadi Alaqi and from the west Wadi Kalabash and Wadi Kurkkur (south of Aswan).

- At Kalabsha , the Nile cuts through Pre-Cambrian. Granite covered by thin sandstone beds.

- Southwest Aswan by about 150 -200 kms is the Sin El kaddab up to 400m a.s.l. made of shales and limestone's (Upper Cretaceous-Paleocene ).

# Review (The Nubian Nile)

- 300 km from Wadi Halfa to the 1st Cataract to the south of Aswan.
- Narrow valley, surrounded by sandstone and granite cliffs from both sides, now covered by Lake Naser, one of the largest artificial lakes in the world.
- Gradient in Nubia: 1m/ 11km, and decreases north of Aswan.

# The Nile Aswan – Cairo

- North of Aswan ,the Nile Valley broadens and flat strips of cultivated land , extending between the river and cliffs that bound its valley on either side , gradually increase in width northward.

North Aswan, steep scarps of Nubian sandstone, and borders the Nile from both sides.

These scarps host the economic iron ore of Aswan.

- At Kom Ombo town the Nile forms the widest part of its valley known as Kom Ombo plain.
- The Kom Ombo plain is structurally a graben having E-W . faults.

Going downstream, from Idfu to Luxor, the Nile Valley is banked by the Upper Cretaceous rocks capped by the Lower Eocene Carbonates.

- **At that stretch is located the Phosphate deposits of the Nile Valley (at El Mahamid village**

- At Qena about 120 km north of Esna, the river makes a great bend bounded by limestone cliffs rising to heights of more 3000m.

From Nag Hammadi to Assiut city the Eastern side of the Nile Valley is borderd by high plateaux , hills ,and hilloks of Eocene limestone north Manfalout , these Eocene cliffs (Middle Eocene) extend north.

l– wards to Cairo for example the thick sequence of Helwane, Tura , and G.El Mokattam which overlook Cairo.

# REVIEW

- 940 km, with gradient less than 1m/ 11km.
- From Aswan to Esna (160 km) surrounded by sandstone cliffs of Nubia Formation.
- To the north of Esna by limestone cliffs (Tertiary: Paleocene-Eocene).
- The limestone cliffs reach their max. height at Assiut (300 m).

# REVIEW

- The eastern cliff is always higher than the western one and the age of the cliffs becomes younger northward.
- The average alluvial breadth is 10 km and the average river breadth 0.75 km.
- The Nile tends to occupy the eastern side of its valley
- .

# REVIEW

- Isolated blocks of granites obstruct the Nile course forming cataracts (e.g. Aswan cataract)
- North Aswan, steep scarps of Nubian sandstone rise which borders the Nile from both sides. These scarps host the economic iron ore of Aswan.
- At Kom Ombo town (N. of Aswan) the Nubian sandstone cliffs ,where the Nile forms the widest part of its valley known as Kom Ombo plain.

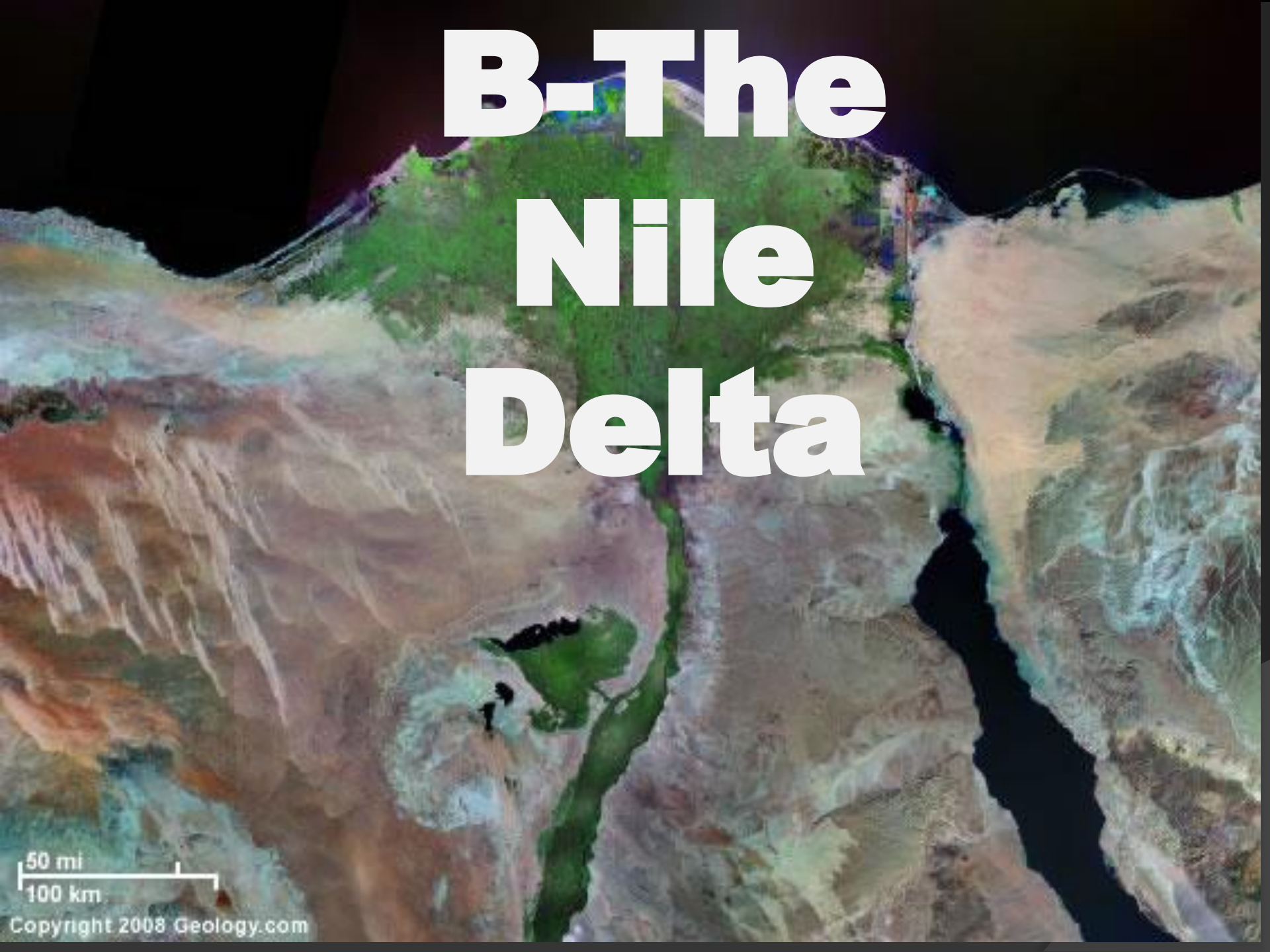
# REVIEW

- From Idfu to Luxor, the Nile Valley is banked by the Upper Cretaceous rocks capped by the Lower Eocene Carbonates.
- At Qena, the Nile forms its famous bend (Qena bend), and from there to Cairo, it is bordered from both sides by the Eocene carbonates, which build the Mokattam and Giza Pyramid plateaus overlooking Cairo.

# B-The Delta and Fayum depression

The Latitude and Longitude of CAIRO are 30 degree N and 31 degree E respectively.

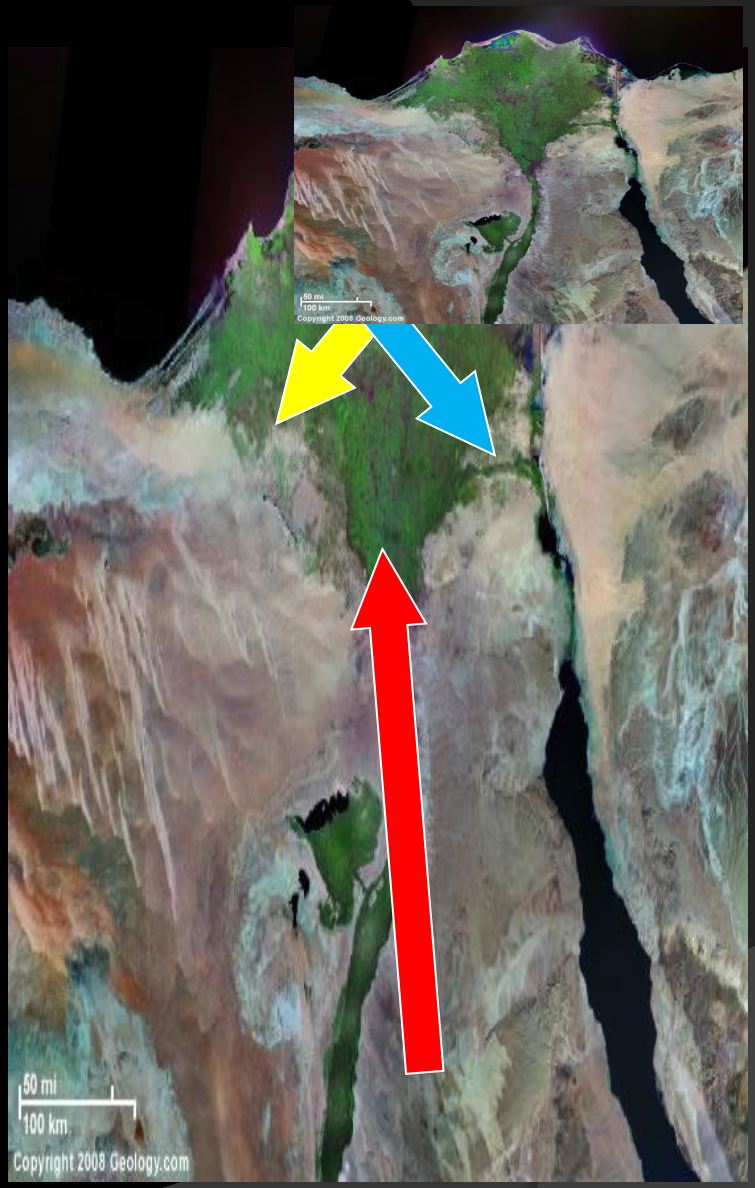
# B-The Nile Delta



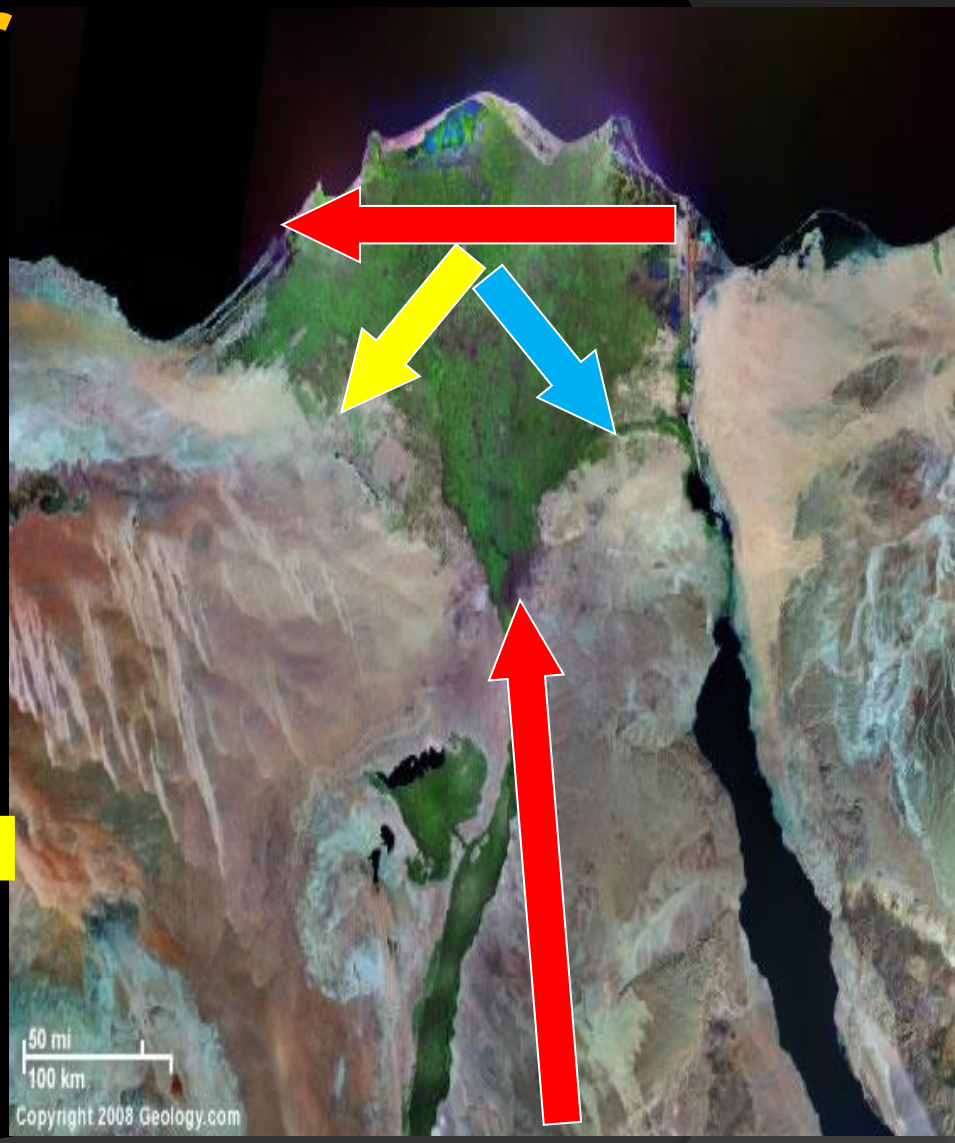
# B.The Nile Delta

- After passing Cairo, the Nile pursues a northwest direction for about 20 km and then divided into two branches , each of which meanders separately through the delta to the sea.

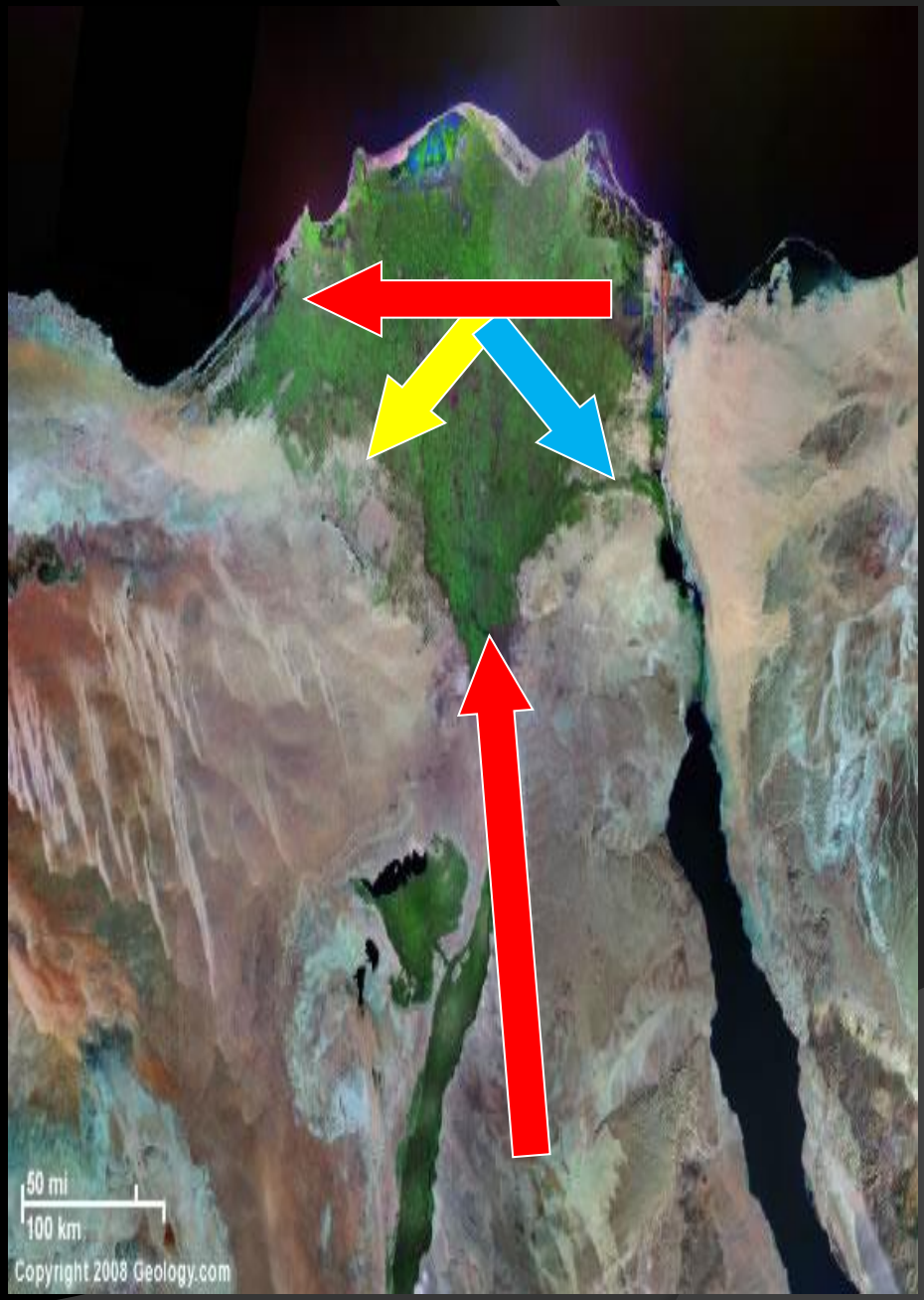
- The western branch (239km in length) debouches into the Mediterranean at Rosetta,
- and the eastern branch, which is about 245km in length ,at Damietta.



- The Nile delta cover an area of about 21000 sq.km, of the triangular shape .
- Its apex is north Cairo (at el kanater el Khairia) where the Nile bifurcates into the Rosetta and Dametta branches.



- At the northern part of the Delta several land patches are covered by sand dunes and sabkha unsuitable for cultivation and are reclamation.



# REVIEW

- It begins 20 km to the north of Cairo.
- The Nile Delta covers a triangular area of about 21.000 sq. Km; its apex is at north of Cairo (at El Kanater El Khairia) where the Nile bifurcates into Rosetta and Damietta branches.
- These branches are the remnant of pre-existing six branches that crossed the Delta with the beginning of the Holocene and in historic times.

# REVIEW

- The famous old branch is the Pellusia branch that drained its load in Lake Manzala and in the Mediterranean Sea.
- Rosetta branch 239 km, of northwest direction.
- Damietta branch 245 km, of northeast direction.

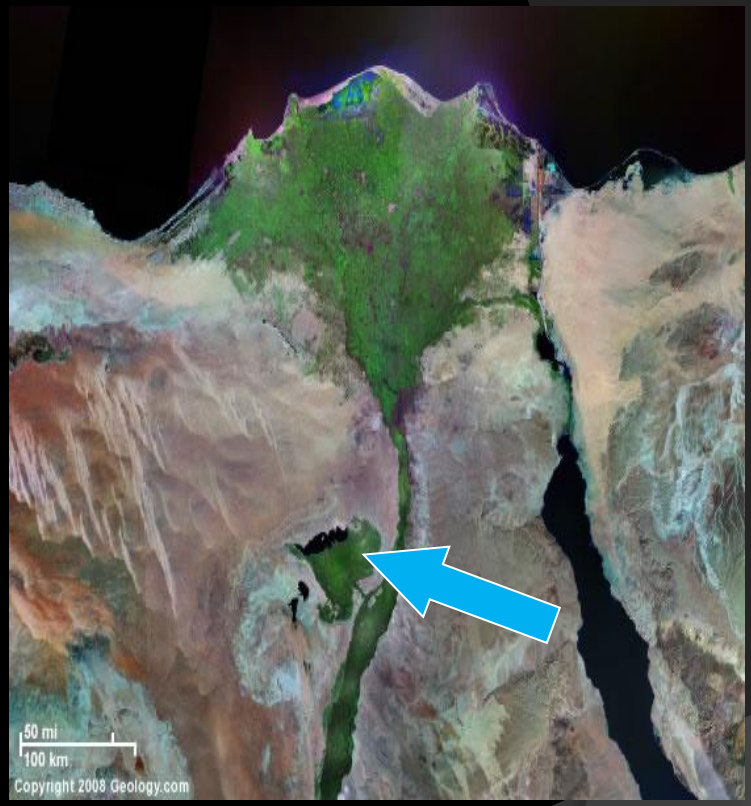
# C-The Fayum and Wadi Rayan Depressions

# C.1-The Fayum Depression

- Closely connected with the River Nile is the Fayum depression which lies at a little distance to the west of the Nile Valley

# The Fayum Depression

- The Fayum and Wadi Rayan depression are dealt with the Nile Valley and Delta geomorphic unit, because they are close to the Nile Valley.
- The Fayum Depression is connected with the Nile by the water channel "Bahr Youssif"..



# .Birket Qarun

- The lowest part of the depression is occupied by a shallow brackish lack called Birket Qarun.
- Birket Qarun occupies its northern part, and is delimited from the north by an elongate scarp of Gabal Qatrani .
- Birket Qarun is about -45m below sea level and about 200 km.sq.

# C.2-Wad Rayan Depressions

- Due to the south of fayum depression lies **Wadi El Rayan depression** over -60m. Below the level .
- Now, it is connected with the Fayum depression by subsurface canal in order to get rid of the drainage water of the cultivated lands of the Fayum instead of drain this water into Birket Qarun.

# REVIEW

- The Faytum and Rayan depression are dealt with the Nile Valley and Delta geomorphic unit because they are close to the Nile Valley, and the Fayum is connected with the Nile by the water channel "Bahr Youssif".

# REVIEW

- The Fayum depression has a total area of about 1700 sq. km.
- Birket Qarun (-45 m, below sea level) occupies its northern part, and is delimited from the north by an elongate scarp of Gabal Qatrani . Qarun, is brackish water, and covered 200 km².
- The Lake Qarun occupied much area in old times (pre-historic) proved by the presence of old raised beaches containing relics of ancient man (implements), and was known as Lake "Moeris".

# REVIEW

- Due to the south of Fayum depression lies Wadi El Rayan depression being over -60 m below sea level.
- Now, it is connected with the Fayum depression by subsurface canal in order to get rid of the drainage water of the cultivated lands of the Fayum instead of drain this water into Birket Qarun.


Thank You