

Topic:- Zoo-geological time scale

Paper:- 401 Unit- III

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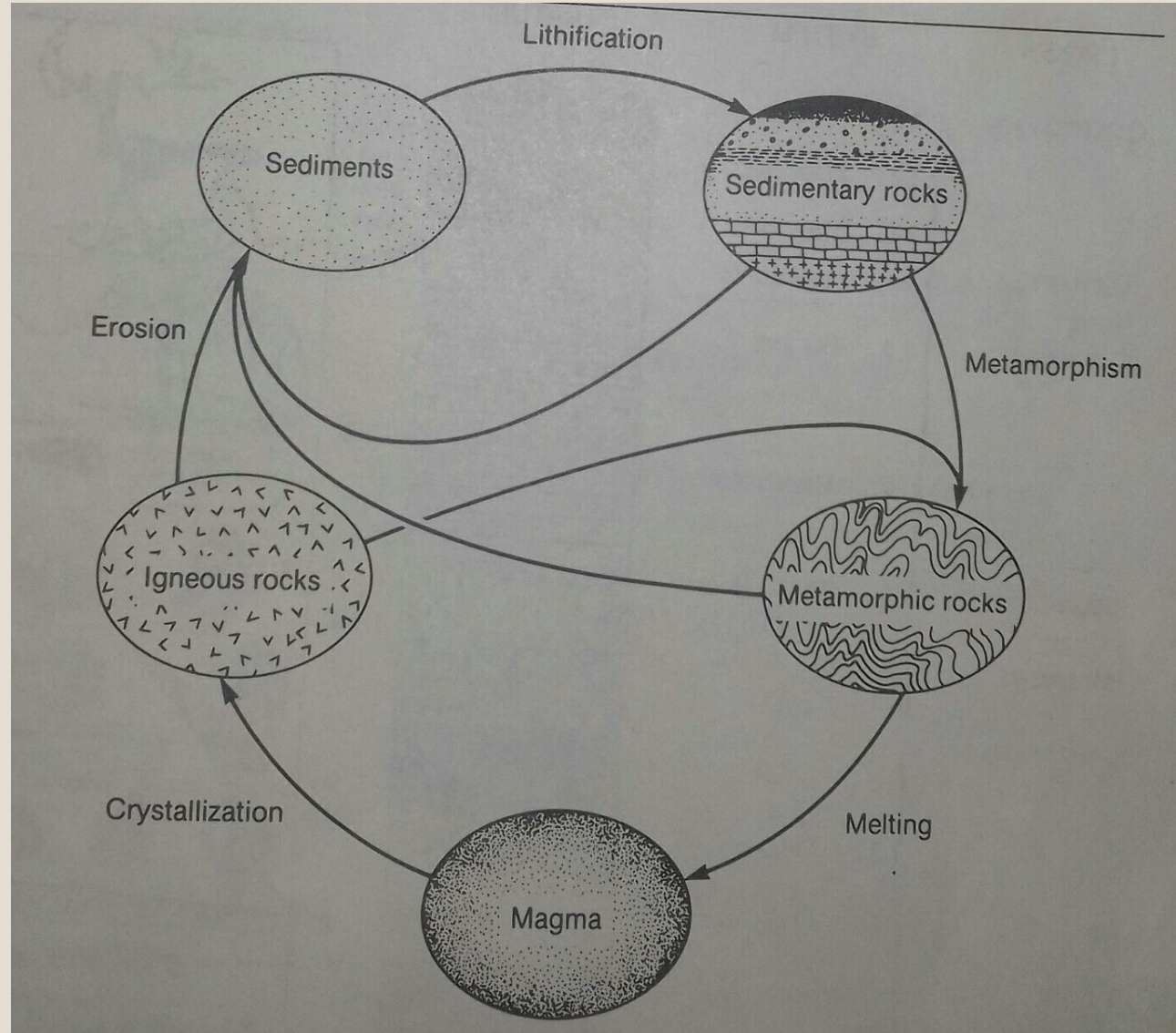
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INTRODUCTION

- The entire lifespan of earth is called geological time scale.
- It was first formed by **Giovanni Audvina**.
- The age of the earth is determined to be roughly about 6,000 million years, where as life existed on earth for about 3,000 million years.
- It gives us sequential arrangement of living organisms i.e., the time of evolution of particular organisms.

STRATIGRAPHY

- We know most about the crust, and can distinguish three basic types of rocks:
- **IGNEOUS ROCKS**
- **SEDIMENTARY ROCKS**
- **METAMORPHIC ROCKS**
- **The law of superposition**
- **William Smith** discovered how to identify different strata by the unique kind of fossils found within them.

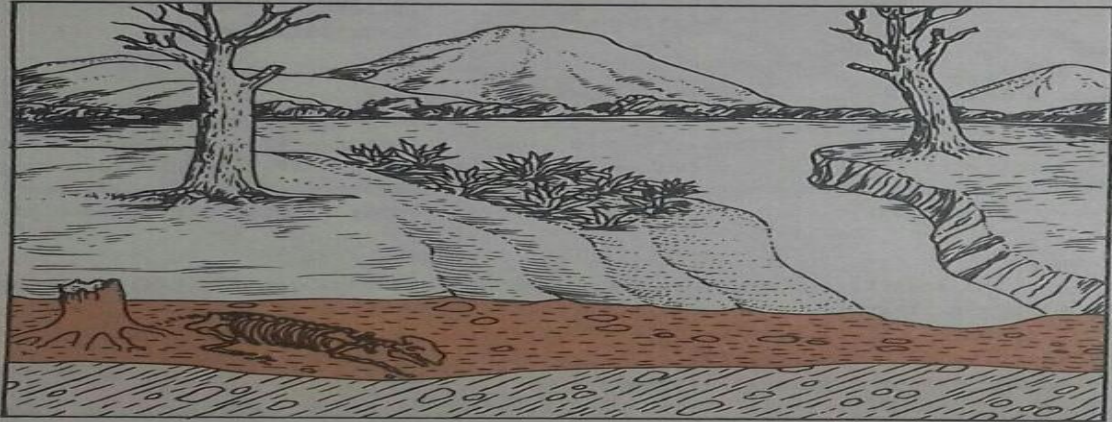




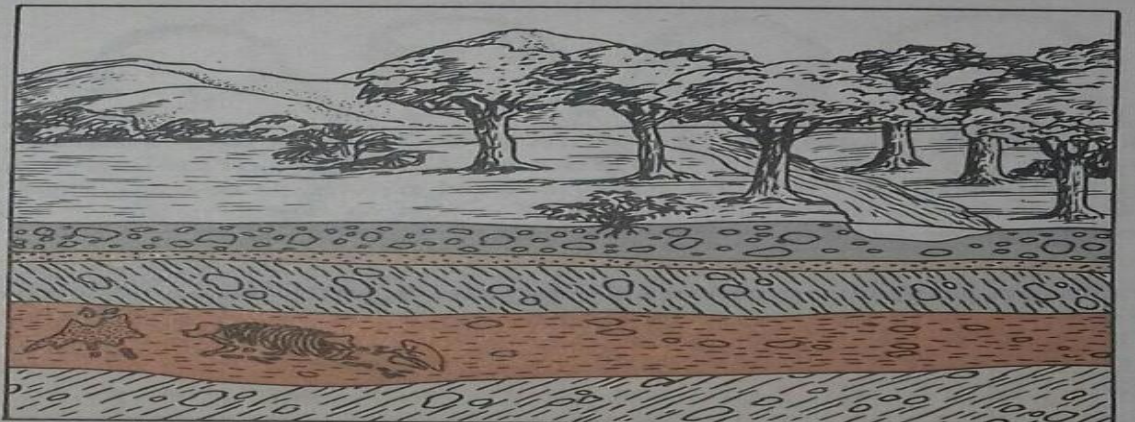
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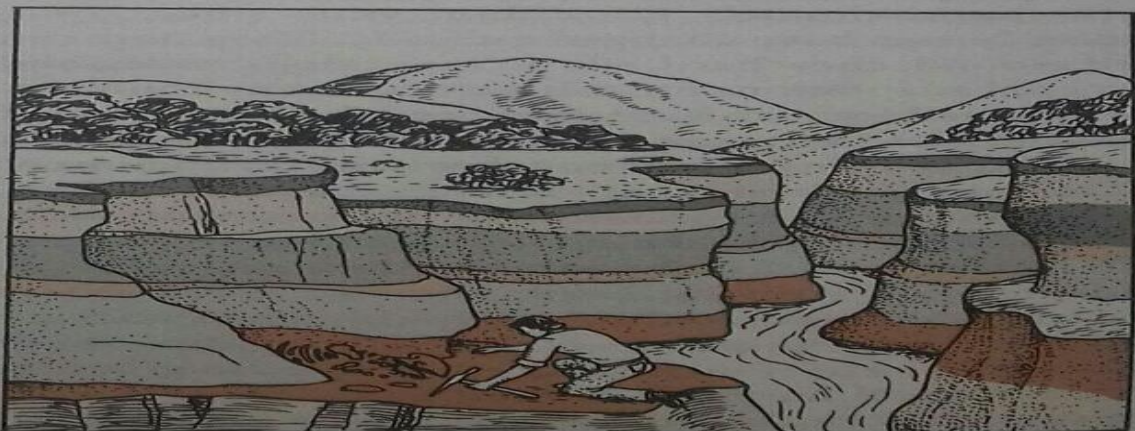
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RADIOACTIVE DATING

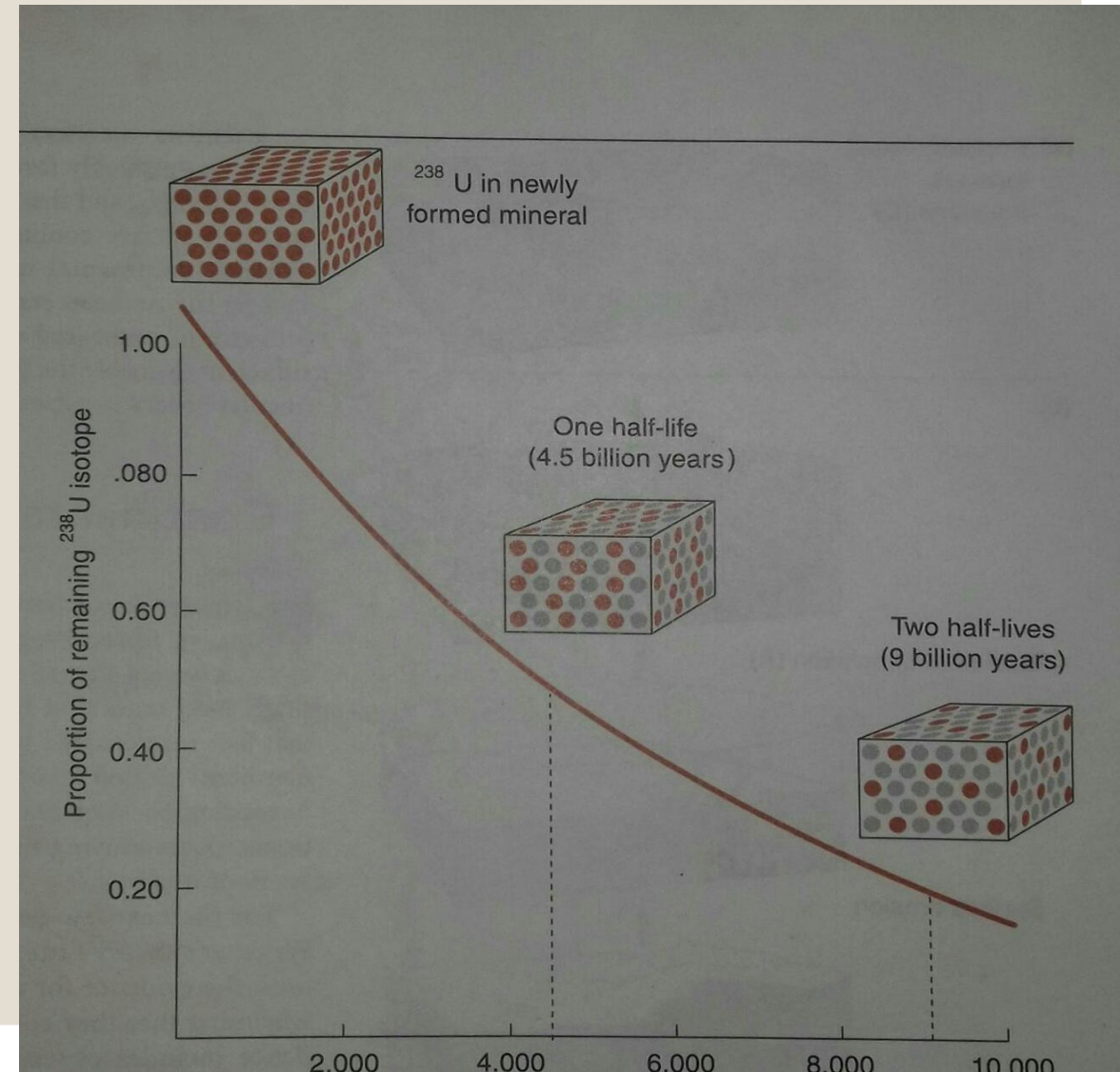
- Geologists have discovered dating methods using radioactivity that permit them to date rocks even billions of years old.

- A somewhat simplified formula that scientists can use for this purpose is

$$t = 1/\lambda \ln (Pb^{206} / U^{238} + 1)$$

Where λ is decay constant

$$1.537 \times 10^{-10}$$



AZOIC ERA

- **Beginning**: Earliest time in the history of earth.
- **Duration**: 0.6 to 1.0 billion years.
- Earth was formed, cooled and underwent many changes.
- Life absent.
- Only chemical evolution took place in this era, which are required for the formation of cellular structure.
- Igneous rocks devoid of fossils.

ARCHEOZOIC ERA

- ❖ **Beginning**: 3.9 billion years ago.
- ❖ **Duration**: 1.4 billion years.
- ❖ Second largest era.
- ❖ Life originated and was microscopic in nature.
- ❖ Eubacteria, BGA and Archaeobacteria formed.
- ❖ Photosynthesis.
- ❖ Oxygen formation.

PROTEROIC ERA

- ❖ **Beginning:** 2.5 billion years ago.
- ❖ Largest duration of 2 billion years.
- ❖ Era of ancient life.
- ❖ Dominant life prokaryotes and fungi.
- ❖ Origin and evolution of lower invertebrates started.



PALAEOZOIC ERA

- **Beginning**: 0.6 billion years ago.
- **Duration**: 300 million years.
- Six periods.
- **Cambrian**: Higher invertebrates
- **Ordovician**: First vertebrates
- **Silurian**: First land plants and land invertebrates.
- **Devonian**: “Golden age of fishes”.
- **Carboniferous**: Dominant amphibians and early reptiles.
- **Permian**: Proliferation of reptiles.

MESOZOIC ERA

- Started from 245- 65 million years ago, smallest duration era.
- Three periods.
 1. Triassic: First mammals but oviparous. Dinosaurs originated.
 2. Jurassic: **Golden age of Dinosaurs**, origin of first toothed bird.
 3. Cretaceous: Dinosaur extinction. Origin of first primate like mammal
Origin of first real primates.



COENOZOIC ERA

Era	Period	Epoch
Cenozoic	Quaternary	Recent (last 5,000 years)
		Pleistocene
	Tertiary	Pliocene
		Miocene
		Oligocene
		Eocene
		Paleocene



TABLE 6-2 Geological ages and associated organic events

Time Scale (eon)	Era	Period	Epoch	Millions of Years Before Present (approx.)	Duration in Millions of Years (approx.)	Some Major Organic Events	
Phanerozoic	Cenozoic	Quaternary	Recent (last 5,000 years)		1.6	Appearance of humans	
			Pleistocene				
		Tertiary		Pliocene	1.64	3.5	Dominance of mammals and birds
				Miocene	5.2	18.3	Proliferation of bony fishes (teleosts)
				Oligocene	23.5	10.5	Rise of modern groups of mammals and invertebrates
				Eocene	34	21	Dominance of flowering plants
				Paleocene	55	10	Radiation of primitive mammals
	Mesozoic		Cretaceous	65	81	First flowering plants Extinction of dinosaurs	
			Jurassic	146	62	Rise of giant dinosaurs Appearance of first birds	
			Triassic	208	37	Development of conifer plants	
	Paleozoic		Permian	245	45	Proliferation of reptiles Extinction of many early forms (invertebrates)	
			Carboniferous	Pennsylvanian	290	30	Appearance of early reptiles
				Mississippian	320	43	Development of amphibians and insects
			Devonian	363	46	Rise of fishes First land vertebrates	
			Silurian	409	30	First land plants and land invertebrates	
			Ordovician	459	66	Dominance of invertebrates First vertebrates	
			Cambrian	505	40	Sharp increase in fossils of invertebrate phyla	
Precambrian	Proterozoic	Upper	545	355	Appearance of multicellular organisms		
		Middle	900	700	Appearance of eukaryotic cells		
		Lower	1,600	900	Appearance of planktonic prokaryotes		
	Archean	2,500	1,400	Appearance of sedimentary rocks, stromatolites, and benthic prokaryotes			
	Hadean	3,900	600	From the formation of Earth until first appearance of sedimentary rocks; no observable fossil organisms			
				4,500			

*Note: Dates derived mostly from Harland et al. Some geologists divide the Precambrian eon into two major eras, Proterozoic and Archean, and then denote the Hadean as the first Archean period (Fig. 9-13). However, the exact dates that mark each geological period are often only approximate, and other authors provide somewhat different time spans.

CONCLUSION.

- It gives us information about the formation of earth.
- It gives the information about sequential evolution of organisms from simple to complex.
- It provides us time information about when a particular organism evolved.
- The time is measured by radioactive dating.

REFERENCES

- INVERTEBRATE PALEONTOLOGY by Abdelbaset Sabry El-Sorogy.
- EVOLUTION by Morne W. Strickberger.