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**ENVIRONMENT**

*for* Civil Services Exam

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**UNIT**

**1**

# **ECOLOGY & ECOSYSTEM**

# ORIGIN OF LIFE FORMS

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## ■ Evolution of Earth

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- Geologists estimate that the earth is somewhat **4.5 billion year old**.
- The beginning of geological era, the Precambrian, which extended from **4.5 to 0.5 billion** year's ago, witnessed the production of an atmosphere and a hydrosphere. The evolution of preliving components and their autotrophic life takes place thereafter.
- The internal reorganization of Earth and the development of ocean basins and continents took place simultaneously.
- On the whole over the years of the geological past, the Earth's geomorphology, climate and biotic community changed gradually. In early Paleozoic era (just after Precambrian) some million years ago, there were separate land masses existed in earth viz Asia, North America and Europe and Gondwanaland (which includes present day Africa, South America, Australia, New Zealand and Antartica).
- During late Palaeozoic era around **420 million** years ago, North America and Africa lay close together around the south pole and the rest of Gondwanaland lay on the far side of the south pole, pointing towards the equator. Subsequently such land mass slowly moved northward by carboniferous period (**340 millions years ago**).
- During the Permian periods, however, all three blocks of land masses joined together forming a single landmass called "**Pangaea**", which further moved north ward, and began to break apart slowly by mid Mesozoic period.
- Subsequently, by the mid-cretaceous (about 100 million years ago), Africa and South America had split apart and also by the end of cretaceous period, Gondwanaland had broken up. But North America land remained intact till lower Eocene period.
- Then it split into North America and Europe connected by Greenland and Scandinavia. Thus the formation, breakup and northward drift of continents resulted in broad climate changes and the formation of geological barriers that affected evolving plant and animal's life.

## ■ Origin of Life Forms

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- Aerobic life cannot exist without oxygen, which was not a part of the original atmosphere. However, life in the form of primeval bacteria and algae evolved without oxygen; these life-forms consumed carbon dioxide and nitrogen, which were in the original atmosphere, and emitted oxygen as a waste.
- In addition to adding oxygen to the atmosphere, this process also formed the ozone layer, which filters out harmful ultraviolet radiation from the sun. The first life-forms evolved in the seas.
- As indicated in Table, there is evidence of life-forms as early as **3,500 mya**, of an **ozone layer 2,500 mya**, and of a **breathable oxygenated atmosphere 1,700 mya**. Such early life-forms were not affected by the absence of an ozone layer because they lived below the surface of the water.

- Oxygen-breathing life, initially single and later multi-celled, appeared following the creation of a suitable atmosphere. **Soft-bodied** animals, comparable to jellyfish, evolved **650 mya**, and **shelled animals** about **70 million years** later.
- Human ancestors diverged from the **ape line** approximately **6 mya**. The most compelling evidence of a common origin is that humans and chimpanzees differ in only about 1 per cent of their genes; this means that these species could not have been evolving separately for more than about 6 million years.

Eons	Era	Period	Epoch	Age/Years Before Present	Life/Major Events	
	<b>Cainozoic</b> (From 65 million years to the present times)	Quaternary	Holocene	0 - 10,000	Modern Man	
			Pleistocene	10,000 - 2 Million	Homo Sapiens	
		Tertiary	Pliocene	2 - 5 Million	Early Human Ancestor	
			Miocene	5 - 24 Million	Ape: Flowering Plants and Trees	
			Oligocene	24 - 37 Million	Anthropoid Ape	
			Eocene	37 - 58 Million	Rabbits and Hare	
			Palaeocene	57 - 65 Million	Small Mammals: Rats - Mice	
	<b>Mesozoic</b> 65-245 Million	Cretaceous		65 - 144 Million	Extinction of Dinosaurs	
		Jurassic		144 - 208 Million	Age of Dinosaurs	
		Triassic		208 - 245 Million	Frogs and turtles	
	<b>Palaeozoic</b> 245 - 570 Million	Permian		245 - 286 Million	Reptile dominate- replace amphibians	
		Carboniferous		286 - 360 Million	First Reptiles: Vertebrates: Coal beds	
		Devonian		360 - 408 Million	Amphibians	
		Silurian		408 - 438 Million	First trace of life on land: Plants	
		Ordovician		438 - 505 Million	First Fish	
		Cambria		505 - 570 Million	No terrestrial Life: Marine Invertebrate	
	<b>Proterozoic</b>	<b>Pre Cambrian</b> 570 Million - 4.800 Million			570 - 2,500 Million	Soft-bodied arthropods
	<b>Archean</b>				2,500 - 3,800 Million	Blue green Algae: Unicellular bacteria
	<b>Hadean</b>				3,800 - 4,800 Million	Oceans and Continents form - Ocean and Atmosphere are rich in Carbon dioxide

<b>Origin of Stars</b>	5,000 - 13,700 Million			5,000 Million	Origin of the sun
<b>Supernova</b>				12,000 Million	Origin of the universe
<b>Big Bang</b>				13,700 Million	

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