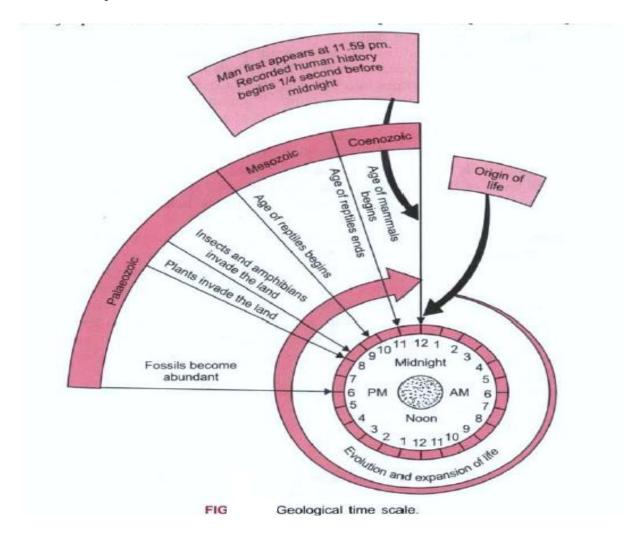
Paper: PRINCIPLES OF ECOLOGY & EVOLUTION

Topic: Geological Time Scale

By studying the types of fossils in different rock strata and determining their age by radioactive dating method, geologists have constructed a geological time scale or stratographical scale. This scale is the calendar of the Earth's past history indicating the evolution of life through time recorded in the sequence of rocks. The geological time was developed by Giovanni Arduiana (1760). It is estimated that the Earth was formed about 4.6 or 5 billion years ago and life on the Earth originated about 3.6 billion years ago.

By determining the age of rocks and fossils contained therein, a geological time scale has been reconstructed. It depicts characteristic climatic conditions, occurrence of specific living plants and animals and adaptive modifications in them.



Geologists, as a result of their studies of the strata of sedimentary rocks in the different regions of the world, have classified geologic history into six **eras**.

The oldest era with fossils is the **Archeozoic** (era of primitive life) and this is followed in turn by the **Proterozoic** (era of early life), the **Paleozoic** (era of ancient life), the **Mesozoic** (era of medieval life), and the **Cenozoic** (era of modern life).

The following table of geologic time-table shows the eras and some of their subdivisions, the approximate duration of each era, some of the important geological features, and the characteristic animals and plants.

TABLE 2.2 Geological Time Scale of Earth

(To be read from below upward, duration of each Epoch and period is in million years)

Eras	Periods	Epoches	Dominant Animal and Plant Groups
Coenozoic (Era of modern life)	1. Quaternary	Recent (1 million yrs)	Age of mammals: modern man, apes, monkeys and other mammals, birds and insects.
	TANK HAIR N	Pleistocene (2-2.5 million yrs)	Appearance of primitive man; extinction of large mammals.
(Age of Mammals and Angio- sperms) (65 million years)	2. Tertiary	Pliocene (6–7 million yrs)	Emergence of man; evolution of modern mammals (horse, camel, elephant).
		Miocene (25 million yrs)	Formation of first man-like ape; mammals dominating and at the height of evolution.
		Oligocene (38 million yrs)	Extinction of archaic mammals; rise of first modern mammals
		Eocene (54 million yrs)	Diversification of placental mam- mals (Eutherians), carnivores and hoofed forms appeared.
		Palaeocene (65 million yrs)	Rise of placental mammals and evolution of modern birds.
2. Mesozoic (Era of in- termediate or medieval life)	1. Cretaceous (135 million yrs)		Appearance of archaic eutherian mammals; rise of modern birds and teleost fishes; extinction of giant reptiles and toothed birds. Dwindling of gymnosperms and increase of angiosperms.
(Age of Reptiles and Gym- nosperms)	2. Jurassic (180 million yrs)		Age of gymnosperms and rep- tiles: dominance of dinosaurs; rise of toothed birds; spread of reptiles. First angiosperm and first bird appeared.
	3. Triassic (225 million yrs)		Rise of first dinosaur and egg laying mammals; extinction of primitive amphibians. Abundance of cycadophytes, gymnosperms
3. Plaeozoic (Era of ancient life)	1. Permian (275 million yrs)		Abundance of primitive reptiles, decline of amphi bians; extinction of many marine invertebrates; rise of modern insects.

(Age of Amphibi- ans)	2. Carboniferous (345 million yrs (Pensylvanian + Mississipian)		Age of amphibians: Spread of ancient sharks; first reptile appeared; rise of insects.
(Age of Fishes)	3. Devonian (395 million yrs)	LEPTON OF	Age of fishes: Origin of amphibians; abundance and diversification of fishes.
	4. Silurian (430 million yrs)	L integral	Origin of jawed fishes and wing- less insects; wide expansion of invertebrate phyla.
(Age of Inverte-brates)	5. Ordovician (500 million yrs)		Origin of vertebrates and jawless fishes; corals and trilobites abundant; diversification of molluscs.
	6. Cambrian (600 million yrs)	lines.	All invertebrate phyla estab- lished; trilobites dominant.
4. Proterozo- ic (Era of Primi tive life)	2000 million yrs	ACREATE TO	Sedimentary rocks; origin of first simple marine in vertebrates; shelled protozoans, coelenter- ates. (fossils scanty)
5. Archaeo- zoic (Era of dawn of life)	3800 million yrs	Precambrian Period	Origin of life, fossils of primitive bacteria-like and algae-like forms found (fossils rare).

The fossil of Archaeopteryx shows that birds evolved from reptiles. Huxley called birds as **glorified reptiles**. The presence of a wish-bone (furcula) in the skeleton of a fossil cursorial and carnivorous dinosaur, Velociraptor, shows that birds are closest to dinosaurs and have evolved from them.

References:

- Evolutionary Biology by Rastogi
- Cell biology , molecular biology, evoluition and ecology by verma and agarwal