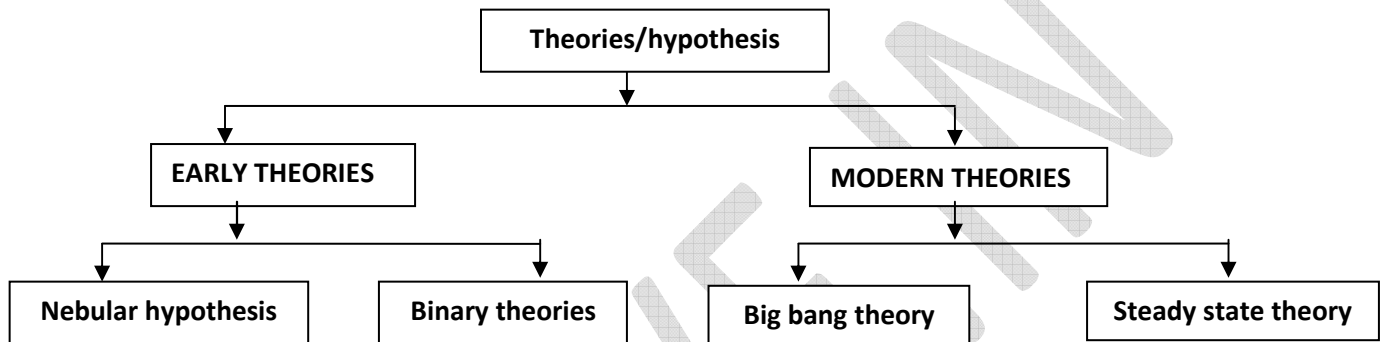


Chapter 2

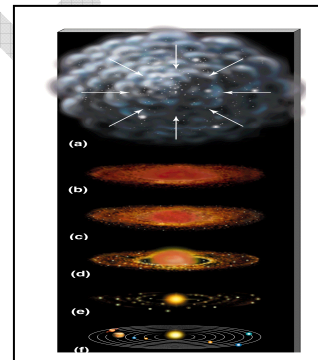
THE ORIGIN AND EVOLUTION OF THE EARTH

A large number of hypotheses were put forth by different philosophers and scientist regarding the origin of earth.



NEBULAR HYPOTHESES

- Put forwarded by Immanuel Kant
- Revised by Laplace in 1796
- Otto Schmidt and Carl Weizsacker in 1950
- Planets were formed out of a cloud of gas (Nebula) scattered in to number of globular bodies.
- **The hypothesis considered that the planets were formed out of a cloud of material associated with a youthful sun, which was slowly rotating.**



BINARY THEORIES

- In 1900, Chamberlain and Moulton considered that a wandering star approached the sun . As a result, a cigar-shape extension of material was separated from the solar surface. As the passing star moved away, the materials separated from the solar surface continued to revolve around the sun and it slowly condensed in to planets.
- James jeans and Harold Jeffrey supported this argument.



STEADY STATE THEORY

- In 1948 British scientist FRED HOYLE and his team came out with this concept
- **Steady State theory** is an alternative to the Big Bang model of the evolution of the universe.
- In the steady-state theory, the density of matter in the expanding universe remains unchanged due to a continuous creation of matter, thus adhering to the perfect cosmological principle, a principle that asserts that the observable universe is basically the same at any time as well as at any place.
- While the steady state model enjoyed some popularity in the mid-20th century, it is now rejected by the vast majority of cosmologists, astrophysicists and astronomers, as the observational evidence points to a hot Big Bang cosmology with a finite age of the universe, which the Steady State model does not predict

BIG BANG THEORY

- Also called expanding universe hypothesis.
- The most popular arguments regarding the origin of universe.
- Forwarded by Edwin Hubble in 1920.
- As time passes, galaxies move further and further apart, like inflating the balloon.

Three stages in the development of universe

1. A tiny ball with an unimaginably small volume, infinite temperature and infinite density
2. The tiny ball exploded violently about 13.7 billion years before present (big bang), within first three minutes from the big bang the first Atom began to form
3. Within 300000 years from the big bang, the universe became transparent.

LIGHT YEAR

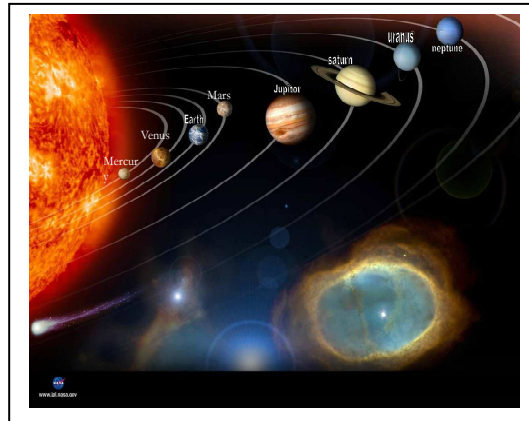
- LIGHT YEAR is a measure of distance.
- The distance the light will travel in ONE YEAR is taken to be one light year.
- One light year is 9.46×10^{12} km
- Light travels at speed of 300000 km/second.
- Distance between sun and earth 149598000 km. In terms of light years, it is 8.311 minutes.

OUR SOLAR SYSTEM

Our solar system consists of the sun, 8 planets, 63 moons, millions of smaller bodies like comets and asteroids and huge amount of dust- grains and gases.

PLANETS

1. **Mercury**
 2. **Venus**
 3. **Earth**
 4. **Mars**
 5. **Jupiter**
 6. **Saturn**
 7. **Uranus**
 8. **Neptune**
- } **inner planets**
(**Terrestrial**)
- } **outer planets**
(**Jovian**)



✓ Till 2006 Pluto was considered a planet.

The international Astronomical Union decided in its meeting that Pluto could be called a “DWARF PLANET”

Differences between Terrestrial and Jovian planets

Terrestrial	Jovian
They are closer to the sun and lies between sun and Jupiter	They are beyond the orbit of mars
They have structure simile to earth	They have structure similar to Jupiter
They are smaller in size and are dense	They have bigger in size and less density
They do not have rings around them	Most of them possess rings around them

THE MOON

- The only natural satellite of the earth.
- “THE BIG SPLAT” a body of the size of one to three times that of mars collided in to the earth sometimes shortly after the earth was formed. It blasted a large part of the earth in to space. This portion of blasted material then continued to orbit the earth and eventually formed into the present MOON about 4.44 billion years ago

Evolution of these spheres

- ✓ Evolution of lithosphere
- ✓ Evolution of atmosphere
- ✓ Evolution of hydrosphere
- ✓ Evolution of biosphere.

Highlighting the followings phenomenon

- ❖ Differentiation
- ❖ Degassing
- ❖ Photosynthesis
- ❖ Origin of life

DEGASSING

The process through which the gases were outpoured from the interior.

FOSSILS

Fossils are the remains or representation of a pre historic plant or animal which had been petrified [organic matter turned into stony substance].

- Age of the earth - 4600 million (4.6 billion) years
- Oceans were formed- 4000 million (4 billion) years ago
- Life began to evolve - 3800 million (3.8 billion) years ago
- Photosynthesis started - 2500- 3000 million (2.5- 3 billion) years ago

GEOLOGICAL TIME SCALE

- The **geological time scale (GTS)** is a system of chronological dating that relates geological strata (stratigraphy) to time, and is used by geologists, palaeontologists, and other Earth scientists to describe the timing and relationships of events that have occurred during Earth's history.

Geologic Time Scale				
Era	System & Period	Series & Epoch	Some Distinctive Features	Years Before Present
CENOZOIC	Quaternary	Recent	Modern man.	11,000
		Pleistocene	Early man; northern glaciation.	1/2 to 2 million
	Tertiary	Pliocene	Large carnivorans.	13 + 1 million
		Miocene	First abundant grazing mammals.	25 + 1 million
		Oligocene	Large running mammals.	36 + 2 million
		Eocene	Many modern types of mammals.	58 + 2 million
		Paleocene	First placental mammals.	63 + 2 million
MESOZOIC	Cretaceous		First flowering plants; climax of dinosaurs and ammonites, followed by Cretaceous-Tertiary extinction.	135 + 5 million
	Jurassic		First birds, first mammals dinosaurs and ammonites abundant.	181 + 5 million
	Triassic		First dinosaurs. Abundant cycads and conifers.	230 + 10 million
PALEOZOIC	Permian		Extinction of most kinds of marine animals, including trilobites. Southern glaciation.	280 + 10 million
	Carboniferous	Pennsylvanian	Great coal forests, conifers. First reptiles.	310 + 10 million
		Mississippian	Sharks and amphibians abundant. Large and numerous scale trees and seed ferns.	345 + 10 million
	Devonian		First amphibians; ammonites; fishes abundant.	405 + 10 million
	Silurian		First terrestrial plants and animals.	425 + 10 million
	Ordovician		First fishes; invertebrates dominant.	500 + 10 million
	Cambrian		First abundant record of marine life; trilobites dominant.	600 + 50 million
	Precambrian		Fossils extremely rare, consisting of primitive aquatic plants. Evidence of glaciation. Oldest dated algae, over 2,600 million years; oldest dated meteorites 4,500 million years.	