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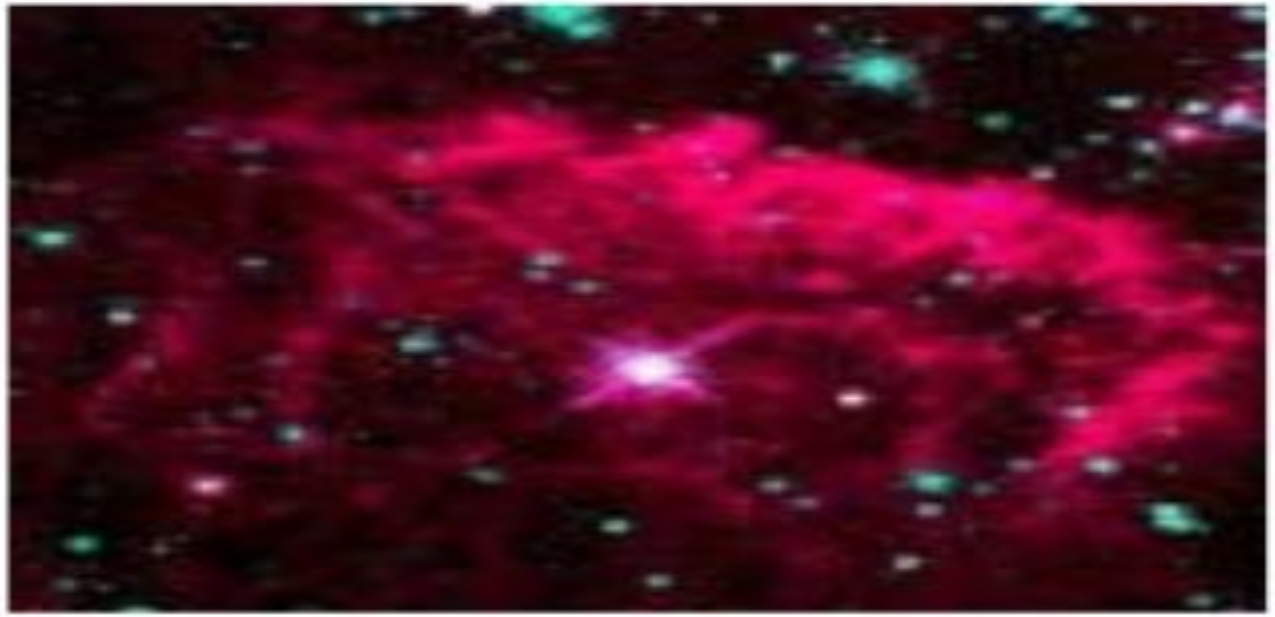
EVOLUTION

Theories on the Origin of Life



Extraterrestrial Origin

This theory states that life originated on other Planets outside of our solar system, and was carried here on a meteorite or asteroid.

1. Intelligent life seeded the planet.
2. Organic molecules (1st bacterial cells) formed in space and were carried here by meteorites or asteroids.

Creationism

Life was put here, on Earth, by divine forces.

- Because of the separation of church and state, we are not allowed to teach this in school.
- This is based on faith not fact.
- Relies on stories that have been passed down over the years.

Definition of Evolution

- Evolution is the process of change through time.
- It is the process by which modern organisms have descended from ancient organisms.

Evolutionary Theory

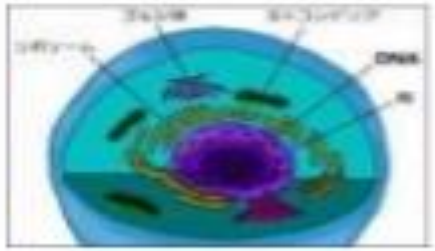
- Is the unifying principle for all the biological sciences.
- Provides an explanation for the differences in structure, function, and behavior among life forms.
- It includes the change in characteristics of populations through generations. Thus existing life forms have evolved from earlier life forms.

Supporting Evidence

- Comparative Anatomy- this is the comparative study of certain organisms showing similarities in anatomical features.

- Comparative Embryology- comparison of early embryonic development among groups of organisms reveals similarities which suggest common ancestry.

More Supporting Evidence



- <u>Comparative Cytology</u>- Organelles are structurally and functionally similar in most divergent organisms, suggesting that all living things are related to some degree.

- <u>Comparative Biochemistry</u>- Many different organisms have similar proteins and enzymes, therefore their DNA must be similar.

- <u>Geologic Records</u>- Fossils, the direct or indirect remains of organisms preserved in media, suggest links between modern and ancient forms, as well as, divergent pathways from common ancestors.

Origins of Life

Early Theories on How Life Began:

Spontaneous Generation and Scientific Experiments

Spontaneous Generation

ABIOGENESIS- creation without life.

Spontaneous Generation was the mistaken idea that life can arise from non-living materials. We now believe the cell theory. The cell theory states that all cells come from pre-existing cells.

- Ancient Egyptians believed that eels and frogs came from the mud of the Nile.
- Aristotle "active principle" responsible for life:

  fleas come from sweat

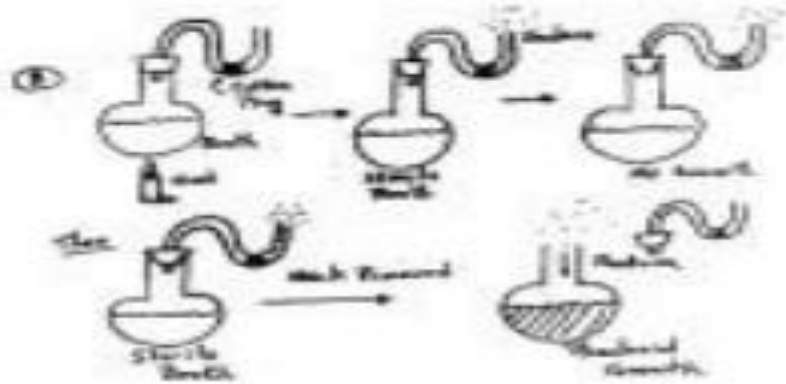
  mice come from garbage

  flies and maggots come from dead and decaying meat

Scientists and Experiments

- Jan Baptista van Helmont- He was a supporter of the belief in Spontanous Generation. He experimented with wheat grains in a sweaty shirt. After 21 days wheat grains are gone and mice are present. The active ingredient was sweat.
- Francisco Redi- (mid 1600's) discovered maggots came from flies not decaying meat. Questioning Spontaneous Generation.
- Anton Van Leeowenhoek- Was the first to use a microscope to see the first living cells. He called the small animals he observed "animacules". Took pond water and boiled it. Then added hay. Organisms were found- hay was the active ingredient.
- John Needham- (1745) boiled flasks of broth, then sealed them. Days later microorganisms were found in the broth. Hypothesized that "animacules" came from the gravy.

- Lorenzo Spallenzini- challenged Needham. Boiled contents longer, and left one flask open and the others closed. Life was found in the open flask, and not in the closed flask. This experiment supported Redi's in that it proved life can only come from existing life.
- Louis Pasteur- took microorganisms/spores in the air and used flask with long curved necks to demonstrate that it was exposure to the air that allowed for the microorganisms to get into the broth in the flask This experiment took place over one year. This finally, and conclusively, disproved Spontaneous generation.



Primitive Life Forms

- Raw Materials- primitive Earth was very hot, consisting of inorganic substances in liquid, solid, and gaseous states, having a rich supply of energy.

- Matter- water condensing and falling as rain, carried the dissolved and atmospheric gases and minerals into the seas, forming a hot, thin, soup.

- Energy sources- in addition to heat energy in the form of lightening, solar radiation, and radioactive materials in the rocks, provided an energy rich environment.

Synthesis

- Energy from the environment contributed to the formation of chemical bonds among the dissolved particles of the "hot, thin soup" of the seas.

- *What was formed by the chemical bonds?*

- This type of synthesis led to the formation of organic molecules such as simple sugars, amino acids, and nucleic acids.

THANK YOU