



Theories of Evolution

LAMARCKISM

Theories of Organic Evolution

- ▶ Theories of organic evolution postulate that since life began on the earth it has been continuous and that later organisms have been derived from earlier forms by the inheritance of variations, either large or small, and induced either by the environment or by processes within the animals
- ▶ Evolutionary processes are
 - ▶ Considered to be slow in action
 - ▶ Difficult to test experimentally

Earlier Notions about Evolution

- ▶ Primitive human races
 - ▶ The origin of man and animals to creative acts of supernatural powers
- ▶ Aristotle (384-322 B.C.),
 - ▶ Each organism had been created separately but that, once created, the organisms had been changed to some degree by a "perfecting principle."
- ▶ Last century (Linnaeus, Cuvier, Agassiz, Owen)
 - ▶ Species had been created separately

Earlier Notions about Evolution

- ▶ Theory of catastrophism (Cuvier)
 - ▶ Life had been created many times, wiped out by various means (including a worldwide flood during the time of Noah)
 - ▶ Replaced by new forms, differing somewhat from the former inhabitants (a higher types)
- ▶ Buffon (French, 1707-1788) challenged the concept of special creation
 - ▶ Living organisms were easily changed by the environment, that any small changes were accumulated from generation to generation to make larger changes, and that each animal in an ascending series resulted from changes accumulated by the successive ancestors

Lamarckism

- ▶ The first general theory of evolution
 - ▶ Outlined in 1802 and fully reported in 1809
 - ▶ By a Frenchman, Jean Baptiste de Lamarck (1744-1829)
- ▶ Jean Baptiste Lamarck proposed the theory of 'inheritance of acquired characters' or also popularly known as 'Lamarckism'.
 - ▶ The environment affects the shape and organization of animals; frequent or continuous use develops and enlarges any organ, while by permanent disuse it weakens until it finally disappears; all acquisitions or losses wrought through influence of the environment, and hence through use and disuse, are preserved by reproduction.

Lamarckism

- ▶ Theory of inheritance of acquired characteristics
 - 1) **Internal Vital Force:** Living organisms and their component parts tend to increase continually in size.
 - 2) **Use and Disuse of Organs:** If an organ is used constantly, it tends to become enlarged, whereas lack of use results in degeneration.
 - 3) **Effect of Environment and New Needs:** Production of a new organ results from a new need and from the new movements which this need starts and maintains.
 - 4) **Inheritance of Acquired Characters:** Modification produced by the above principles during the lifetime of an individual will be inherited by its offspring, with the result that changes are cumulative over a period of time.

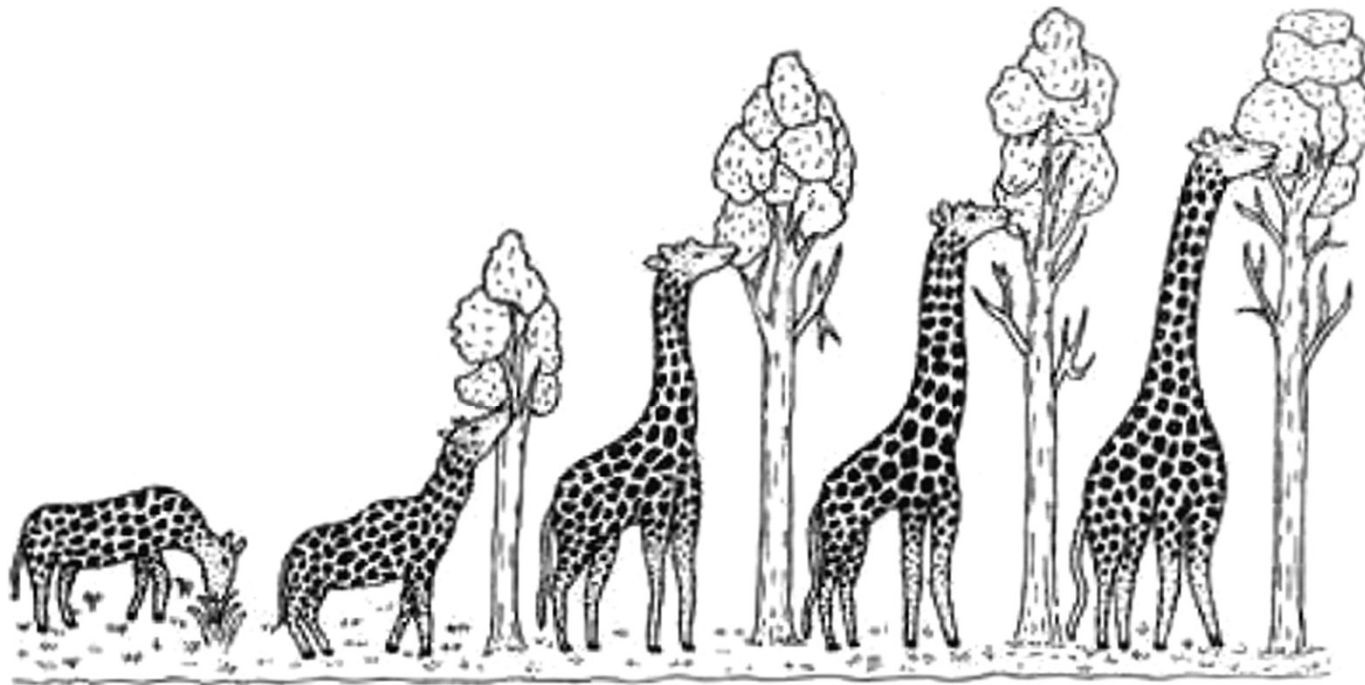


Examples in Support of Lamarckism

Examples used by Lamarck

- ▶ Examples like
 - ▶ Long neck of giraffe
 - ▶ Disappearance of limbs in snakes
 - ▶ Webbed feet of ducks
 - ▶ Blindness of moles
 - ▶ Flat Fishes
 - ▶ Flightless Birds
 - ▶ Retractable Claws of Carnivorous Mammals
 - ▶ Speed of Deer
 - ▶ Cave Dwellers
 - ▶ Emergent Hydrophytes
 - ▶ Dimorphism of submerged and aerial leaves in aquatic plants

Elongated neck in Giraffe



Elongation of neck in Giraffe according of Lamarck

Criticism of Lamarckism

- ▶ The first proposition of the theory does not have any ground because there is no vital force in organisms which increases their body parts.
- ▶ As regards the second proposition, the environment can affect the animal but it is doubtful that a new need forms new structures.
- ▶ The third proposition, the use and disuse of the organs is correct up to some extent.
- ▶ The fourth proposition regarding the inheritance of acquired characters is disputed.
- ▶ Mendel's Laws of Inheritance and Weismann's Theory of Continuity of Germplasm (1892)
 - ▶ Discarded Lamarck's concept of inheritance of acquired characters



Evidences against the Inheritance of Acquired Characters

Weismann's Theory of Continuity of Germplasm

- ▶ August Weismann (1834-1914), a German biologist
 - ▶ The main opposer of the inheritance of acquired characters
- ▶ The characters influencing the germ cells are only inherited. There is a continuity of germplasm (protoplasm of germ cells) but the somatoplasm (protoplasm of somatic cells) is not transmitted to the next generation hence it does not carry characters to next generation.
 - ▶ Cut off the tails of rats for as many as 22 generations and allowed them to breed, but tailless rats were never born

Continuity of Germplasm

- 1) Boring of pinna (external ear) and nose of Indian women is never inherited to the next generations.
- 2) The wrestler's powerful muscles are not transmitted to the offspring.
- 3) European ladies wear tight waist garments in order to keep their waist slender but their offspring at the time of birth have normal waists.
- 4) Chinese women used to wear iron shoes in order to have small feet, but their children at the time of birth have always normal feet.
- 5) Circumcision of penis is in Jews and Muslims but it is not inherited to the next generation.
- 6) Dull progeny of Nobel Prize winners cannot be explained by Lamarckism.



Evidences in Favour of the Inheritance of Acquired Characters

Evidences in Favour of Lamarckism

- ▶ Formation of Germ Cells from Somatic Cells
 - ▶ Vegetative propagation in plants and regeneration in animals
- ▶ Effect of Environment directly on Germ Cells
 - ▶ Tower's observations indicate direct effect of environment on germ cells
 - ▶ Exposed the young developing Potato Beetles to extremes of temperature and humidity at the time of the development of their reproductive organs
- ▶ Effect of Radiation
 - ▶ Auerbach *et al* obtained a number of mutations and chromosome aberrations in *Drosophila* with the help of mustard gas

Evidences in Favour of Lamarckism

- ▶ Agar
 - ▶ Agar reared water fleas in a culture of green flagellates and found that some abnormalities were developed in their structures
- ▶ Effect of Chemicals
 - ▶ Change in the secretion of hormones results in the change of different parts of the body
- ▶ Guyar and Smith
 - ▶ Guyar and Smith took the solution of the eye lens of rabbit and inoculated the same into fowl
- ▶ Effect of Change of Environment
 - ▶ Radish is a two-year crop in cold countries but completes its growth in one year in tropical areas

Neo-Lamarckism

- ▶ Modified form of Lamarckism is called Neo-Lamarckism (neo = new). Neo-Lamarckism proposes that
 - 1) Environment does influence an organism and change its heredity.
 - 2) At least some of the variations acquired by an individual can be passed on to the offspring.
 - 3) Internal vital force and appetency do not play any role in evolution.
 - 4) Only those variations are passed on to the offspring which also affect germ cells or where somatic cells give rise to germ cells.
- ▶ Evidences in favour of the inheritance of acquired characters support the Neo-Lamarckism.

