

# SCHOOL OF STUDIES IN ZOOLOGY JIWAJI UNIVERSITY, GWALIOR. (M.P.)



**Paper 401: Animal Taxonomy and Evolution**

**Topic: Theories of Organic Evolution (Neo-Darwinism)**

**Dr. Hemant Samadhiya**

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# INTRODUCTION

- The term organic evolution was proposed **by Charles Darwin** and signifies as “**Descent with modification**” which states that, the present complex plants and animals have evolved from earlier simpler forms of life by gradual changes over a long period of time.
- According to organic evolution, unicellular organisms evolved from simple to multicellular complex forms.
- Hence, the evolution is simply process of continuous change.
- The various theories of organic evolution are **Lamarckism theory, Darwinism theory, Mutation theory, Neo-Darwinism theory.**

# MUTATION THEORY

- According to the Hugo De Varis “Evolution is a jerky and discontinuous process which is caused by the sudden discontinuous inheritable genetic variations or mutations that attain full constancy at once and give rise to new elementary species”.
- Hence mutations are the raw materials for evolution and they may be useful, useless or harmful.
- Nature selects only useful variations.
- The main postulates of this theory are:

- **Raw material:** Mutations are the raw material for evolution and evolution can't occur without mutation.
- **Sudden variations:** Mutations appear all of sudden.
- **Intermediate forms:** Mutations don't fluctuate around the normal sites the species.
- **Expression:** Mutations appear full constancy at once and express their effect immediately.
- **Natural selection:** Beneficial mutations are selected by nature but not harmful mutations.
- **Dis-continious evolution:** Evolution is not a continuous process but it is jerky and discontinuous process.

# NATURAL SELECTION THEORY

- It was given by **Darwin**, according to this theory, “ **Organic evolution occurs through natural selection and accumulation of small variations which provide structural and functional superiority over others in their survival and differential reproduction.**
- The main postulates of this theory are as:
  - **Rapid multiplication:** Organisms have high biotic or reproductive potential.
  - **Limited food and space:** Every ecosystem has a limited carrying capacity for its different members of biotic community.

- **Struggle for existence:** Every organism has to struggle for food, reproduction and space for survival.
- **Variations:** Variations occur in all individuals e.g. size, shape, structure etc. Only useful variations are selected.
- **Natural selection:** It is commonly called as “survival of fittest”.  
Each generation produces a large number of offspring's, however, only few survives while others are eliminated.
- **Inheritance of useful variations:** Darwin believed that the selected individuals pass their useful variations to their offspring's, so that they are born fit to the changed environment.

# NEO-DARWANISM

- It is the improvement of original theory of “ **natural selection**” in order to remove its defects and incorporate latest information.
- It believes that **only genetic variations are inheritable**.
- Natural selection operates through differential reproduction.
- The main postulates of this theory are:
  - ✓ **Genetic variability**: Variations are the raw materials for evolution.
  - The units of both heredity and mutations are genes which are located in linear manner on the chromosome.
  - The various sources of the genetic variability in gene pool are chromosomal aberrations, gene mutations, genetic drift, migration, hybridization and random matting.



- **Natural selection:** Natural selection of Neo- Darwinism differs from that of Darwinism that “It does not operate through the survival of fittest or Natural Selection” but it operates through the differential reproduction and comparative reproductive success.
- Differential reproduction means “Those members of the population are best adapted to the environment that produce more offspring's than those which are less adapted and the genes of such individuals will remain predominant in the gene pool and pass to the next generation”.
- **Reproductive isolation:** It is must so as to allow the accumulation of variations leading to the formation of new species by preventing hybridization and it helps in evolutionary divergence i.e., polytypic species.

# LAMARKASIM THEORY

- It is also known as, **theory of inheritance of acquired characters**, given by Lamarck .
- It is defined as , **the changes (variations) developed in the body of an organism from normal characters, in response to changes in environment, or in the functioning (use and disuse) of organs, in their own life time.**
- The main postulates of this theory are:
  - **INTERNAL VITAL FORCE:**
  - Every organism has an internal vital force that causes them to increase in size and undergo elaboration of its traits.

## ➤ **Perfecting principle:**

- It is also called **as fitness of design.**
- Every organism has a tendency to perfectly adopt themselves to the environment.

## ➤ **Change in environment:**

- A change in environment sets in a new chain of adaptations in the organisms.

## ➤ **New needs:**

- It is also called as “**Doctrine of Desires**” or “**Appetency**”.
- New needs or desires set in a new movement that culminates in the formation of new organ.
- It also produces a chain of modifications due to habit change, modifications of existing organs.

## ➤ **Use and disuse of organs:**

- Growth, development, form and functioning of an organ depends upon its use and disuse.
- Continued use of organs makes it larger, more elaborate, strong and efficient and vice versa.

## ➤ **Inheritance of acquired characters:**

- New traits are acquired by organisms during their life time due to internal vital force, new needs, use and disuse of organs ,and are passed to the next generation.

## ➤ **Isolation:**

- New traits develop due to isolation.

# CONCLUSION

- Organic evolution simply means descent with modification, which encompasses evolutionary change at genetic, organismal or population level.
- Lamarck believes that evolution occurs through the internal vital force and use and disuse of organs.
- Darwin's theory believed that evolution occurs through natural selection or survival of fittest and inheritance of useful variations.
- Hugo de Vries believed that, evolution occurs through useful mutations but not harmful mutations.
- Neo-Darwinism believes that evolution occurs through differential reproduction and comparative reproductive success.