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Q: Write Notes on Role of Heredity and variation in Evolution?

Ans:-

Variation is important because it contributes to the evolution and forms the basis of heredity. Variation is caused due to gene mutations, the interaction of genes with the environment and various combinations of genetic material. Remember that variation can occur through the asexual reproduction process too.

Genetics and evolution through the ages :-

My reflection when I first made myself master of the central idea of the origin was, "How extremely stupid not to have thought of that."

— Thomas Huxley, on reading Charles Darwin's seminal book on evolution, on the origin of species

Genes: the units of heredity

One of the key things we see in the living world all around us is the principle of heredity: the rule that like begets like. A seed from an apple gives rise to another apple tree, not an orange tree or a beanstalk. Children invariably resemble their parents both in looks and in personality. How does this come about? How does the tiny seed 'know' that it has to grow into an apple tree and not anything else? Clearly, there must be some medium for the transmission of information from parent to seed, or

parent to child. The concept of a gene as the basic unit of this medium was first proposed by an Austrian priest who enjoyed experimenting with pea plants in his backyard -

In his most famous experiments done between 1856-63, Mendel took two different varieties of the plant, a tall one and a short one, and produced offspring by hybridising them (i.e., using pollen from one to fertilise the other).

According to the blending inheritance theory popular at that time, the progeny should have been of medium height, intermediate between the characteristics of the parents. However, Mendel found that the progeny in the first generation, known as the F₁ (First Filial) generation, were always tall. When these hybrids were further interbred, to produce second generation or F₂ progeny, the

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short variety unapproached, but only 1 in 4 (or 25%) of the F_2 plants were short and the rest were tall.

Based on his experiments, Mendel proposed the idea that biological traits were inherited discretely - for instance, the height of the pea plant would take on one of only two values, "tall" or "short", rather than being able to vary continuously over a range of values. The term 'gene' was coined for a unit of heredity that determined a single biological trait; at that time people had no idea what genes were actually made of or where they were located, but we now know that they are composed of a molecule called deoxyribonucleic acid (DNA), and are found inside the cell nucleus.

Types :-

The description of a mode of biological inheritance consists of three main categories:

1. Number of involved loci
 - Monogenetic (also called "simple") - one locus
 - Oligogenetic - few loci
 - Polygenetic - many loci
- Involved chromosomes
 - Autosomal - loci are not situated on a sex chromosome
 - Gonosomal - loci are situated on a sex chromosome
 - o X-chromosomal - loci are situated on the X-chromosome (the more common case)
 - o Y-chromosomal - loci are situated on the Y-chromosome
 - Mitochondrial - loci are situated on the mitochondrial DNA.