

By MBC - Mridul Bhaiya Classes

# **HEREDITY AND EVOLUTION**



**NOTES BY MRIDUL BHAIYA**

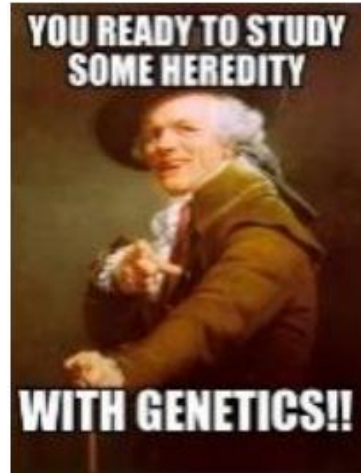


# HERIDITY AND EVOLUTION

## Genetics:

[AI - 2019]

“Branch of Biology that deals with study of Heredity and variation”



## Heredity:

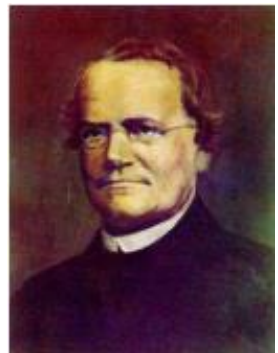
[AI - 2014]

Heredity is transmission of characters from parent to offspring.

## Father of Genetics:

“Gregor Johann Mendel”

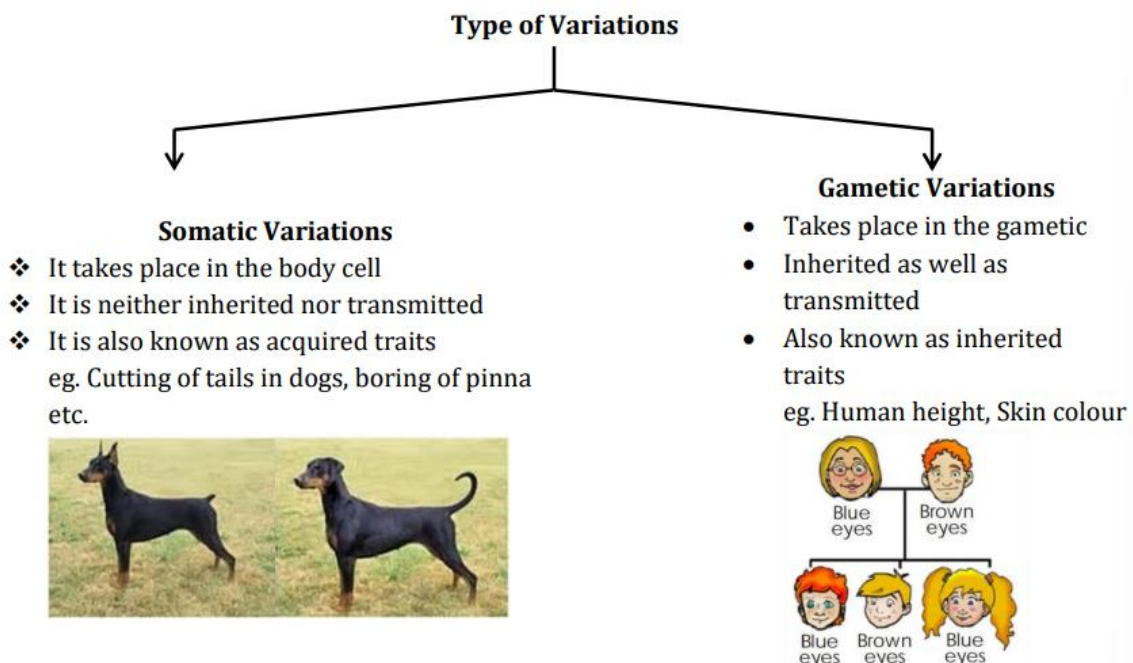
- i. He was the first to demonstrate the mechanism of transmission of characters from one generation to the other
- ii. Mendel proposed the concept of hereditary unit “Equal numbers of Factors inherited from each Parent”
- iii. Mendel’s work remained unnoticed for 34 years.





## Variation During Reproduction:

- The difference in the characters among the individuals of a species is termed as variations.
- These variations are accumulated by the process of sexual reproduction.
- Slight changes, the variations, which are responsible for difference in the offspring, generation after generation.
- Errors during DNA replication at the time of cell division is the reason for appearance of variations.
- A common basic body design which is reflected in the form of similarities between parent and offspring.
- Variations produced during asexual reproduction are much less than the variation produced during sexual reproduction, because during sexual reproduction there is no fusion of male and female gamete





## Accumulation of Variations during Reproduction:

- ⇒ Variations that appear in the off springs of one generation are passed on to the off spring of next generation and so on. Also in each generation, they acquire and add some new variations. Thus variations accumulate and passed on to more individual.
- ⇒ Variations increase with each passing generation and diversity spreads over next generation.
- ⇒ Selection of Variants by environmental factors form the basis for evolutionary process.

## Heredity:

Heredity is also called inheritance. It is the transmission of character from parent to child; It help us in understanding the basis of similarities between closely related individuals.

Inherited Traits	Acquired Traits
➤ Characteristic features that are inherited from the previous generation	➤ Traits or characteristics which develop in response to the environment and cannot be inherited
➤ Occur due to a change in a genes or DNA	➤ No change in genes or DNA is involved
➤ Pass on from one generation to another eg. Red Curly hair, Brown eye.	➤ Cannot pass on from on e generation to another eg. Cycling and Swimming





## Terminologies :

**1. Gene:** A gene is the basic Physical and Functional unit of heredity; genes are made up of DNA, and it control the expression of a character.

**2. Allele:** Alternative form of a gene, there are two alleles of a gene which govern the expression of a pair of contrasting character. (Alleles are also called allelomorph)

**3. Monohybrid Cross:** A cross in which single pair of contrasting character is studied at a time.

**4. Dihybrid Cross:** A cross involving two pairs of contracting characters; eg. Cross involving round and yellow seeded plants and Green rinkled plant

**5. F1 – Generation:** (First Filial Generation) The off springs produced by the selfing of Parental generation

**6. F2 – Generation:** (Second Filial Generation) The off spring produced by the selfing of F1 generation

**7. Dominant Character:** An inherited trait that results from the expression of dominant allele over the recessive allele.

Or

Character which can express it self even if only one dominant allele is present.

**8. Recessive Character:** Any character present in the parental generation that does not appear in the F1 generation but reappear in the F2 – generation.

Or

The character which cannot expresses it self in the presence of dominant allele.

## Off springs/Progeny



Organisms produced as a result of sexual reproduction

### Homozygous Condition:

Homozygous refers to a cell that has two identical alleles for a single trait from both father and mother cell. Eg. TT or tt

### Heterozygous Condition :

Heterozygous is the state in which an organism has inherited different forms of a particular gene from each one of the biological parents. eg – Tt

### Gamete:

Reproductive cells containing only one set of dissimilar chromosomes. **Genotype:**

Genetic make up of an individual

### Phenotype:

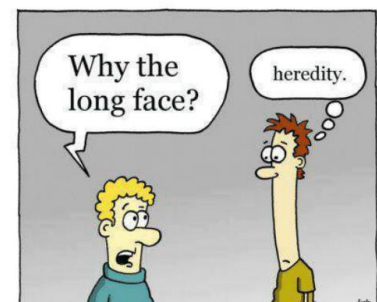
An individual's phenotype consists of the traits we can observe; These can include features of appearance behaviour, metabolism, or anything we can detect.

### Test Cross:

Crossing F1 heterozygous with homozygous recessive parent e.g. F1 hybrid tall plant (Tt) with pure dwarf plant tt.

### Mendel's Experiment: [Exemplar]

Mendel selected Garden pea (*Pisum Sativum*) for his experiment why Mendel selected pea plant?



Gene took his answer at face value.



- Large number of seeds are produced per plant
- Plant is grown easily.
- Pea flower normally remain closed and undergo self-pollination.
- It is an annual plant and gives result in a year time.
- Pea plants showed a number of easily detectable contrasting characters.
- Pure varieties of Pea plants are available.

### Selection of Parents:

- Mendel selected 7 pairs of pure or true breeding varieties for his experiment .
- All the characters had easily distinguishable alternate traits e.g tallness and dwarfness, violet or white flowers

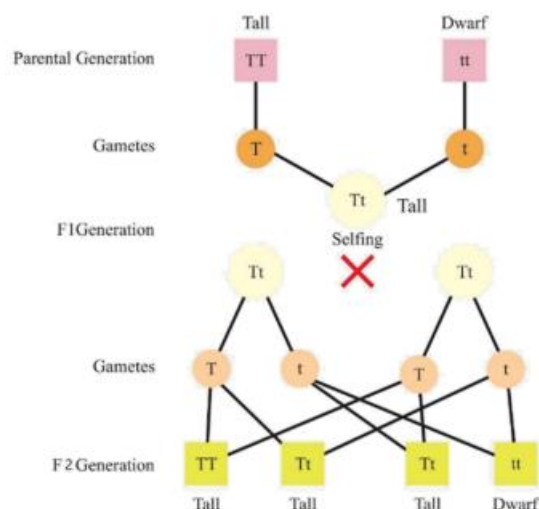
### Monohybrid Cross: [Delhi – 2016, 2019, AI – 2017, 2014, 2012]

A cross between two parents taking the alternative trait of single character.

Eg. a cross between alternative TT and tt

TT – Dominant

tt – Recessive







Trait	Character
<ul style="list-style-type: none"><li>• A state of character</li></ul>	<ul style="list-style-type: none"><li>• A distinguishing feature of a particular organism.</li></ul>
<ul style="list-style-type: none"><li>• two traits occur in combination</li></ul>	<ul style="list-style-type: none"><li>• A single character occurs in a group of organisms.</li></ul>
<ul style="list-style-type: none"><li>• Tallness or Dwarfness is a trait.</li></ul>	<ul style="list-style-type: none"><li>• Height of Pea plant is character</li></ul>
<ul style="list-style-type: none"><li>• Blue eye colour is an example of a trait</li></ul>	<ul style="list-style-type: none"><li>• Colour of the eye is an example of a character.</li></ul>

1. Mendel took pea plants with different characteristics such as height.
2. The progeny produced from them were all tall (F1 – gen)
3. Mendel then allowed F1 Progeny plants to undergo self-pollination.
4. In the F2 – Generation, He found that all plants were not tall, three quarter were tall and one quarter of them were short.
5. This observation indicated that both the traits of shortness and tallness were inherited in F1 – generation. But, only the tallness trait were expressed in F1 – generation.