

Pre-Mendelian and Post-Mendelian Concepts of Heredity



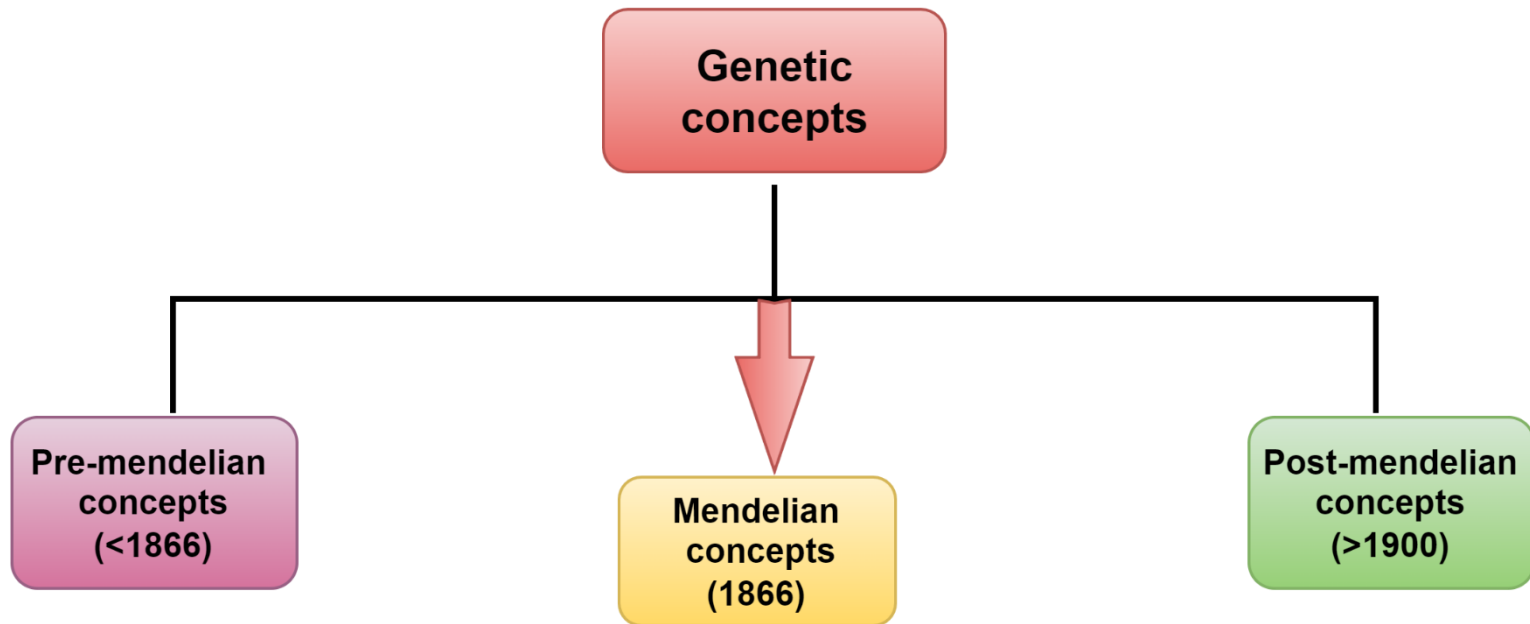
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Introduction

- The importance of heredity in biology.
- How our understanding has evolved over time





Pre-Mendelian theories

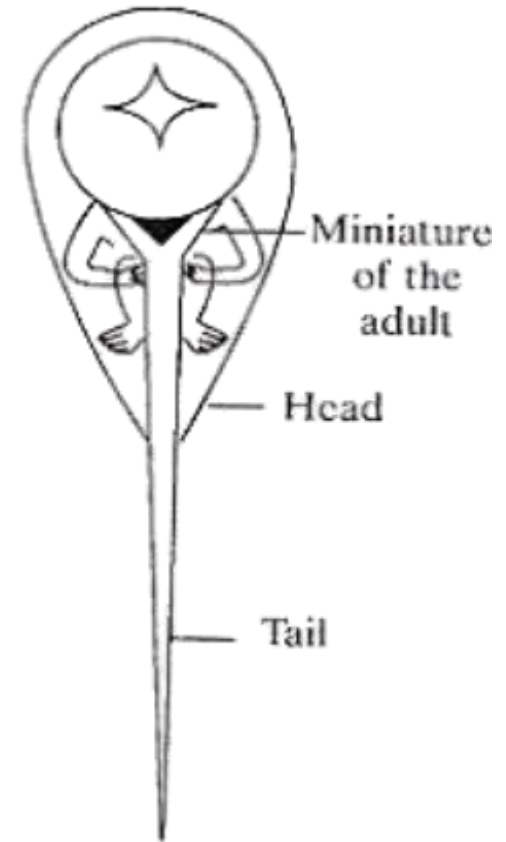
- Blending Inheritance
- Preformation theory (Preformationism)
- Theory of Epigenesis
- Theory of inheritance of acquire characters,
- Pangenesis, (Darwin's Theory)

Blending Inheritance

- The idea that offspring are a blend of parental traits
- Example: Mixing of paints (e.g., red + white = pink)
- **Problems:** Inconsistent with the observation of distinct traits reappearing in later generations

Preformation theory

- Swammerdam and Bonnet (1720-1793), Dutch biologists
- The idea that a fully formed, miniature human (homunculus) is present in either the sperm or egg which grows into human being after formation of zygote.
- **Critique: Lack of evidence**



Theory of Epigenesis

- Wolff (1738-1794), German biologist
- the theory states that the egg and sperms are **undifferentiated cells**
- The **differentiation** into various organs/parts takes place only after fertilization in the zygote resulting in the development of adult tissues and organs.
- **This concept is universally accepted.**



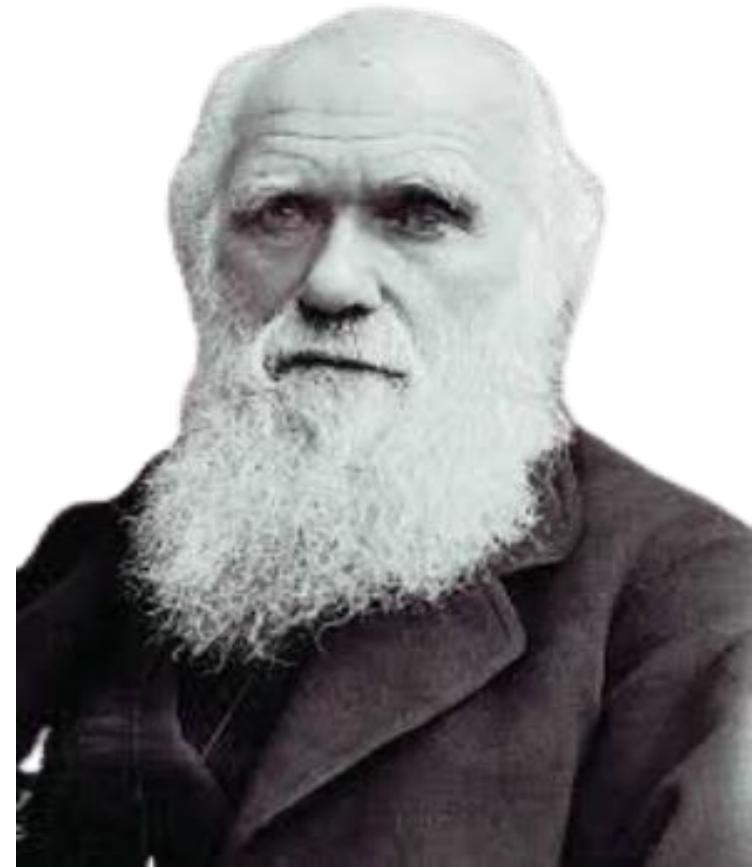
Theory of inheritance of acquire character

- Jean-Baptiste Lamarck (1744-1829), French biologist
- Lamarck's theory that traits acquired during an organism's life can be passed on to offspring
- **Example:** Giraffe's neck lengthening over generations
- **Critique:** Lack of evidence and rejected by Weismann



Theory of Pangenesis

- Charles Darwin (1809-1882), English naturalist
- Proposed by Charles Darwin
- The idea that all parts of the body emit tiny particles called "gemmules" that are passed on to offspring
- **Critique:** No experimental evidence



Mendelian Concepts of Heredity

- **Principles**
 - Law of Segregation
 - Law of Independent Assortment
 - Law of Dominance
- **Importance**
- Foundation of modern genetics





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Erich von Tschermak-
Seysenegg

- In 1900, that Mendel's work was rediscovered by three scientist independently.
 1. Hugo de Vries in Holland,
 2. Franz Correns in Germany,
 3. Erich Tschermak in AustriaMendel is regarded as father of classical genetics.

Post-mendelian Concepts of Heredity

- Co-dominance
- Incomplete dominance
- Cytoplasmic inheritance
- Chromosome Theory of Inheritance
- Linkage and Genetic Recombination
- Discovery of DNA as Genetic Material
- The Structure of DNA
- Modern genetics
 - The Human Genome Project
 - CRISPR and gene editing
 - Epigenetics and non-Mendelian inheritance

A man with brown hair and glasses, wearing a black shirt, is holding a green flower on a stick. He is looking at the flower with a slight smile. A speech bubble with a yellow background and the word "Thanks" in black text is positioned to the right of his head. The background is a light blue sky with green foliage.

Thanks