

# Genetics

## Basics of Genetics

Genetics is the science of **heredity** and **variability** of organisms. By heredity we mean the ability of an organism to react in a certain way to certain conditions of the external environment and their changes. It is therefore a question of the transfer of certain methods of metabolism which are potentially contained in the cell, from one generation to the next, where, of course, there is still a need for a certain influence of the environment. Thus, heredity ensures that the offspring always resemble their parents and have a number of identical traits with them. Variability, on the other hand, ensures the difference of individuals of one species. Manifestations of variability expand due to the influence of external environmental factors. The main method of genetic research is crossing or hybridization. It is the sexual reproduction of two individuals.

## Development of genetics

The earliest accounts of heredity date back to the ancient Greek writings of Plato, Hippocrates and Galen. However, there is a lack of closer knowledge of the reproduction of plants, animals and humans. So genetics is a relatively young science. Its history began to be written only in the 19th century and it reached greater development only in the 20th century. The founder of modern genetics is **Johann Gregor Mendel**. He was the first to postulate the existence of genes. After a mathematical evaluation of the results, he discovered that characters are not directly inherited, but **aptitudes** for them. The results of his work are known as :

1. The law of homogeneity (= uniformity) of the first generation of hybrids (F1)
2. Law of non-uniformity of the second generation of hybrids (F2)
3. The Act on the Free Combinability of Skills

At the beginning of the 20th century, certain deviations from Mendel's 2nd law were found. **Thomas Hunt Morgan** studied chromosomes and experimented with fruit flies, a model organism in genetics. He brought a lot of new knowledge about genes and genetic linkage. He formulated his findings into two laws:

1. Genes on a chromosome are arranged in a linear sequence and their location is unchanging
2. Genes on one chromosome form a so-called linkage group (there are 23 linkage groups in humans)

An important milestone was the discovery of the structure of the DNA molecule, which was achieved after 1953 by Mr. James D. Watson, Francis H. Crick and Maurice H. F. Wilkins. Next, development occurs at the cytogenetic level. Today, research is carried out mainly on the use of knowledge of the human genome for example: in the field of pharmacogenomics or gene therapy.

## Human genetics

The genetic study of humans is quite different from the study of other organisms. For ethical reasons, we cannot perform cross-breeding and selection on humans. Humans have a long generation time, also usually a very small number of offspring. The founder of human genetics is F. Galton. The most common method of studying human heredity is **genealogy** or the family tree method. It is used to build a family tree of several generations using international symbols. All known and important information about individual persons and their health status is recorded in the family tree. The **geminological method**, which examines monozygotic and dizygotic twins, is also very beneficial.

## Links

### Related articles

- Genealogy

### Sources

- VYMĚTALOVÁ, Veronika. *Biologie pro biomedicínské inženýrství. I. díl*. 1. edition. Prague : Česká technika - nakladatelství ČVUT, 2008. ISBN 978-80-01-04013-3.

ws: Genetika (<https://www.wikiskripta.eu/index.php?curid=41872>)

### Reference

- <http://www.genetika-biologie.cz/>