

# Difference Between Genetics and Epigenetics

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## Key Difference – Genetics vs Epigenetics

The evolution of modern biology explains phenotypic changes in living organisms in terms of two aspects; Genetics and Epigenetics. As a result of the development of these ideologies, scientists concentrate more on elucidating the relationships between these genetic and epigenetic factors in the development of diseases. These fields historically initiated with the findings of Mendel and evolved throughout the past few decades. **Genetics is the field which deals with the total content of genes in a living system and is the study of heredity, passing on of traits from parents to their offspring. Epigenetics is the field in which heritable phenotypes are developed due to other factors such as environmental and behavioral patterns and are not stored in the form of genes.** This is the key difference between genetics and epigenetics.

## What is Genetics?

Genetics is one avenue of science which is concerned with the study of genes, heredity and genetic variation in living organisms. The father of genetics is Gregor Mendel. He studied and described the mechanism of trait inheritance patterns where different traits of an organism are passed from the parent organism to the offspring. He described such inheritance occurred through the passing of a particular set of units of inheritance from one generation to the next. Mendel used garden pea plants to describe these phenomena. In the modern world, the unit of inheritance is referred to as a gene. Genes are present in the chromosomes of an organism. A chromosome is composed of both DNA and protein. In the past, scientists could not differentiate the molecule of inheritance between DNA and protein present in the chromosome. But later on, with different experiments performed by scientists, it was confirmed that the DNA is the molecule which is responsible for inheritance. Therefore, genetic information to be passed from one generation to the next is stored within the molecules of DNA.

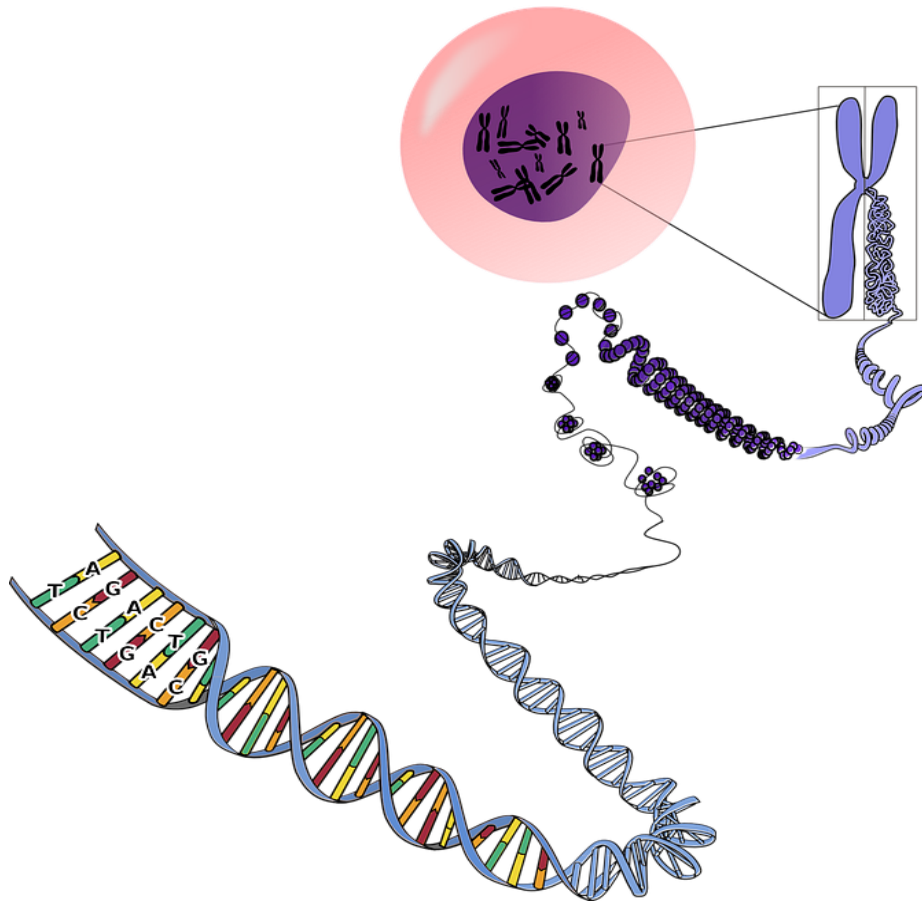


Figure 01: Genetics

With the development of technology, modern genetics has spread its wings to study the structure and functioning of genes at its molecular level, the behavioral patterns of genes within a particular organism and gene variation and distribution within a [population](#) based on the primary principles of genetics: the trait inheritance and the molecular inheritance mechanisms of genes.

## What is Epigenetics?

Epigenetics is the alteration in heritable traits in gene expression which does not involve the changes of the DNA sequence. In other words, it is the change in the phenotype without changing the genotype. Repressor proteins which are attached to the silencer regions of the DNA control [gene expression](#). Epigenetics takes place naturally and regularly, but it can be caused by external and internal environment, age and diseased conditions. Histone modification, DNA methylation and noncoding RNA (ncRNA) associated gene silencing are mechanisms which initiate and uphold epigenetics. Other epigenetic processes may include paramutation, [X chromosome](#) inactivation, imprinting, bookmarking and cloning. DNA damage may

also cause epigenetic alterations. The changes occurring in epigenetics persist through cell divisions in the duration of the life span of the cell, or it can remain for many generations without involving in the changes in the DNA sequence; the monogenetic factors may help the genes of an organism to behave differently. An example of epigenetic alteration is the cellular differentiation process. The changes in epigenetics cause the modification of genes, but not the nucleotide sequence of DNA. These changes may transmit from generation to generation through a process called transgenerational epigenetic inheritance.

In epigenetics, external modifications to DNA cause the genes turn ‘on’ or ‘off.’ DNA methylation is a good example of epigenetics. The addition of a [methyl](#) group to a part of the DNA molecule prevents certain genes from being expressed. [Histone](#) modification is another example for epigenetics. If histones squeeze DNA tightly, it affects the reading of genes by the cell.

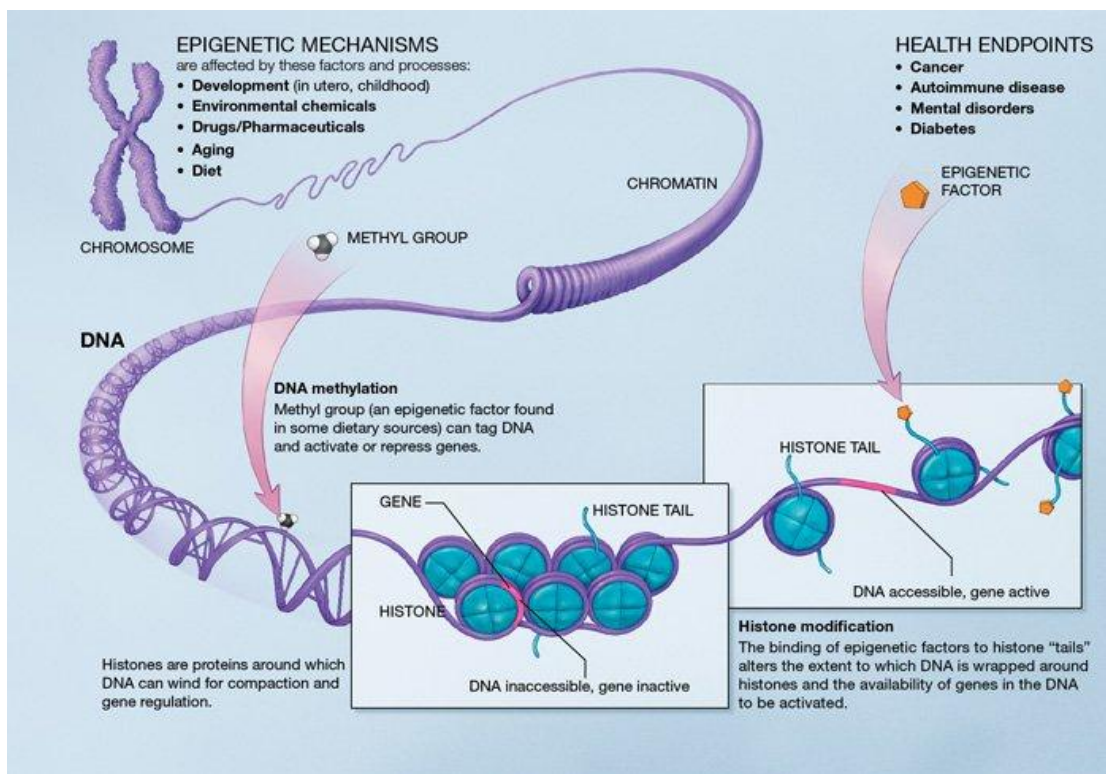


Figure 02: Epigenetics

# What is the difference between Genetics and Epigenetics?

## Genetics vs Epigenetics

Genetics is the study of genes, genetic variation, and heredity of living organisms.

Epigenetics is the alteration in heritable traits in the gene expression which does not involve the changes of the DNA sequence.

## Phenotypic Traits

In genetics, phenotypic traits are developed with the inheritance of genetic information in the form of genes.

In epigenetics, development of phenotypic traits occurs due to external factors such as environmental and behavioral patterns.

## Summary – Genetics vs Epigenetics

Genetics and epigenetics explain different phenotypic changes in traits of different organisms with the evolution of modern science. Genetics is a pathway of science concentrated on the study of genes, heredity and genetic variations of living organisms. Gregor Mendel explained that different traits of an organism are passed from one generation to the next by a set of units of inheritance, which were later named as genes. With time, different experiments revealed that DNA is the molecule which is responsible for inheritance where the genetic information to be passed to the next generation from the previous is stored. Genetics initiated the study of different sub categories such as epigenetics and population genetics. Epigenetics refers to the development of different heritable phenotypes due to the influence of external factors like behavioral patterns, environmental conditions. This is the difference between genetics and epigenetics.

### References:

- 1."Epigenetics: Fundamentals." What is Epigenetics?N.p., n.d. Web. [Available here](#). 11 Aug. 2017.
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3. Rettner, Rachael. "Epigenetics: Definition & Examples." LiveScience. Purch, 24 June 2013. Web. [Available here](#). 12 Aug. 2017.

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**APA:** Difference Between Genetics and Epigenetics. (2017, August 16). Retrieved (date), from <http://differencebetween.com/difference-between-genetics-and-vs-epigenetics/>

**MLA:** "Difference Between Genetics and Epigenetics" *Difference Between.Com*. 16 August 2017. Web.

**Chicago:** “Difference Between Genetics and Epigenetics.” *Difference Between.Com*. <http://differencebetween.com/difference-between-genetics-and-vs-epigenetics/> accessed (accessed [date]).



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