

Gene

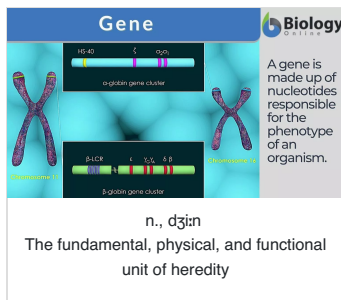
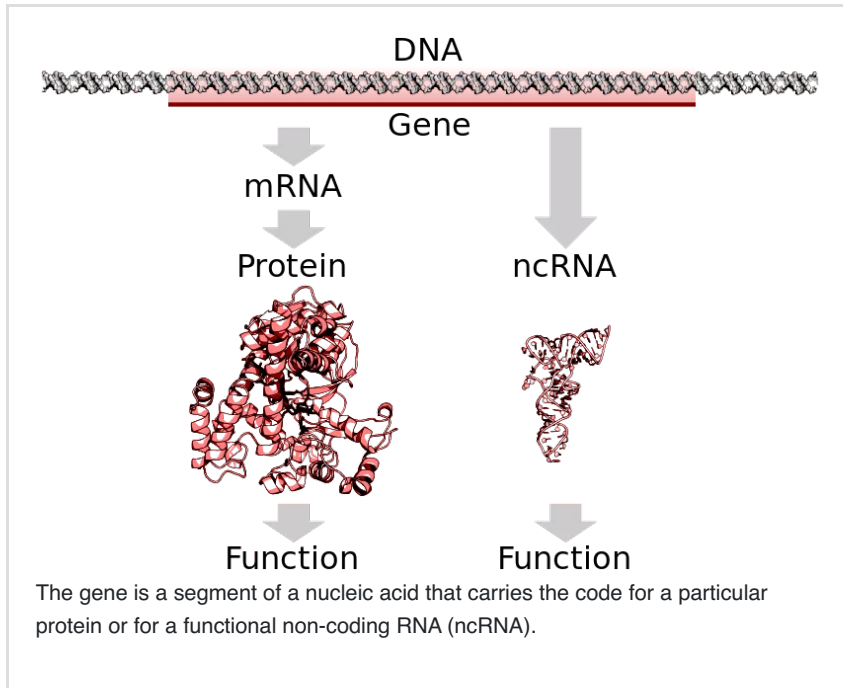


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A gene is the fundamental, physical, and functional unit of heredity. The genes make up the sequences of DNA ([genotypes](#)). The genotypes, together with the other factors (e.g. environmental factors), determine the phenotypic trait of an organism. These changes in the genes drive [evolution](#) and [natural selection](#). The gene was formerly called a [factor](#). The existence of a gene

as an independent heritable *factor* was first identified by Gregor Mendel who is now credited as the *father of genetics*. Mendel formulated the laws of heredity based on his careful breeding experiments on garden pea plants. Later, it was called *gene* as introduced by Wilhelm Johannsen, a Danish botanist and plant physiologist, in 1905. Prior to Mendel's work, the popular belief is that male and female parents provide *fluids* that blend or mix during fertilization. Charles Darwin referred to the particles that mix at fertilization as *gemmule*. Mendel's work was published in 1886. However, it was in the late 1900s that it was accepted as it was supported by the same results from the works of Hugo de Vries, Carl Correns, and Erich von Tschermak. ⁽¹⁾

Further study in the next century led to an understanding of the molecular structure and function of the gene. It was found out that the gene is comprised of expressed DNA. The works of Rosalind Franklin and Maurice Wilkins and later on of James D. Watson and Francis Crick identified DNA structure. The scientific study of the patterns of inheritance of specific traits, relating to genes and genetic information and heredity is referred to as *genetics*.



A *gene* is defined as the fundamental, physical, and functional unit of heredity since a gene is comprised of [nucleotides](#) (on a specific site on a [chromosome](#)) that is responsible for the physical and heritable characteristics or [phenotype](#) of an [organism](#). It, therefore, specifies the structure of a [protein](#), and an [RNA molecule](#).

Etymology

The term *gene* came from the German *gen*, from *gen*, meaning “begetting” or from Greek *genos*, meaning “race”, “offspring”. Synonyms: factor (*obsolete*).

Gene vs. Genome

Genome is defined as the complete set of genetic material in an organism. Thus, all the genes contained inside a cell, i.e. the nuclear and extranuclear genes, are collectively referred to as the genome. For instance, the genome of a bacterium refers to the whole single chromosome contained inside it. The human genome, in contrast, is made up of approximately 35,000 genes or three billion chemical base pairs.

Gene vs. Allele

The variants of a gene controlling the same trait and occupying a specific region on a chromosome are referred to as [alleles](#). A particular trait may be determined by a pair of alleles or by the interaction of a series of alleles as in the case of the *multiple allelic traits* (or polygenic inheritance). Certain traits are determined by a pair of alleles; one of them would be dominant while the other, recessive.

Structure and Function

A gene is a sequence of [nucleotides](#) in a particular [nucleic acid](#). Thus, it is a segment in DNA or RNA molecule that encodes for either an RNA or a protein by gene expression. The nucleotide is the structural unit of a nucleic acid. It is comprised of phosphoric acid, sugar (5-carbon), and a nitrogenous base. The chains of nucleotides in a nucleic acid are linked by 3', 5' phosphodiester linkages. This means that the 5'-phosphoric group of one nucleotide is esterified with the 3'-hydroxyl of the adjoining nucleotide.