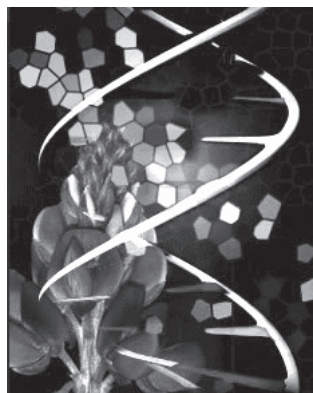


What are genes?

Why do children resemble their parents and yet are still different?

Why can we recognize the different species and varieties of animals and plants?

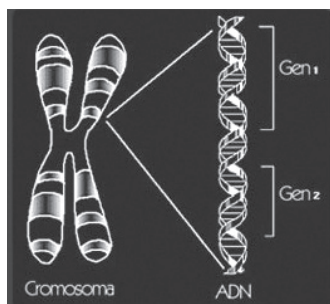


The characteristics of form, function and behavior of organisms are passed from generation to generation through **genetic information**. Information on the size, color, number of flowers, fruits, operation of the senses and behavior of the organism is found in the genetic code. The set of transmissible characters

is known as **genotype** and its expression (anatomy, physiology and behavior) is known as **phenotype**.

Within the nucleus of cells of living beings (except for those of the Archaea and Bacteria) are organelles shaped like sticks, known as **chromosomes** (from the Greek *chrome*, *color* and *body soma*). The name comes from their staining properties. Each species has a characteristic number of chromosomes. Some species have few chromosomes, while others have many; maize has 10 pairs, some butterflies have more than 200 pairs and humans have 23 pairs.

Chromosomes are composed of long chains of molecules of **deoxyribonucleic acid** (or DNA for short). These chains



are divided into functional segments containing particular information, known as **genes**. The gene is the unit of storage and transmission of information regarding heredity of the species.

Each organism has at least two forms of each gene,

called **alleles**, one from the father and one from the mother. They may have the same or different information. Their position on the chromosome is called the locus (from the Latin *locus*, *place*, plural *loci*). For example, for determining the color of eyes, one allele contains the information necessary for blue and the other for brown. When both alleles contain the same information the individual is **homozygous**, and when they contain different information the individual is **heterozygous**, for that particular trait. When the two alleles contain different information, normally only one is expressed. This one is known as the "dominant" allele, while the other is called "recessive." The degree of allelic variability in a species is known as **heterozygosity**.

With no knowledge of the structure of the genetic code, the Austrian naturalist and Augustinian monk Gregory Mendel (1822-1884) described the behavior of the alleles by analyzing crosses of peas with different characteristics. His descriptions of the laws of heredity, published in 1866, are now known as **Mendel's laws**.

The **structure of DNA** was deciphered by the British biophysicist Rosalind Franklin (1920-1958), New Zealand physicist Maurice Wilkins (1916-2004), zoologist and biologist James Watson (1928) and English physicist and biologist Francis Crick (1916-2004). The latter three received the Nobel Prize for Medicine in 1962.

In organisms which reproduce sexually, half of the chromosomes originate from each parent. During the formation of sex cells (gametes) in both parents, the chromosome number is reduced by half (in a process known as **meiosis**). These cells are called **haploid** (from the Greek *haploos*, single). During fertilization, the chromosomes from each parent re-assemble and the cells are then called **diploid** (from the Greek, *diploos*, double). This means that each organism has two copies of each gene. Some organisms may have three (triploids) or four copies (tetraploids).