Genetics Image Contest
Terms, Definitions and Examples

Deoxyribonucleic Acid (DNA)

Deoxyribonucleic acid (DNA) is the chemical compound that contains the instructions needed to develop and direct the activities of nearly all living organisms. DNA molecules are made of two twisting, paired strands, often referred to as a double helix.

Each DNA strand is made of combinations of four chemical units, called nucleotide bases, which comprise the genetic "alphabet." The bases are adenine (A), thymine (T), guanine (G), and cytosine (C). Bases on opposite strands pair specifically: A's always pair with T's, and C's always pair with G's. The order of the A's, T's, C's and G's determines the meaning of the information encoded in DNA just as the order of alphabet letters determines the meaning of a word.

An organism's complete set of DNA is called its genome. Virtually every single cell in the body contains a complete copy of the approximately 3 billion DNA base pairs, or letters, that make up the human genome. An important property of DNA is that it can replicate to make copies of itself for new cells.

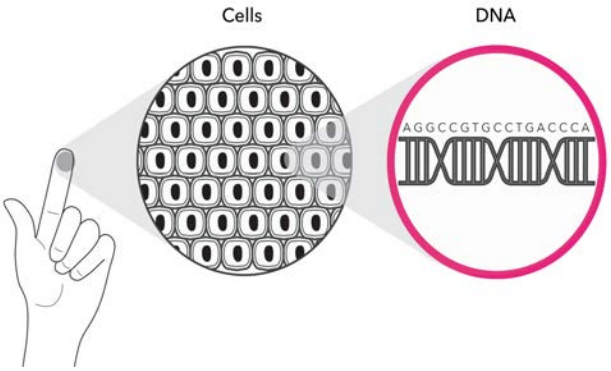
Read more:

http://www.genome.gov/18016863
http://ghr.nlm.nih.gov/handbook/basics/dna

Genetics in Vatican Architecture Image by Esther K.

The spiral ramp, located in the Vatican Museum, depicts the double helical structure of DNA.

Zooming in on DNA Image by Peilun S.



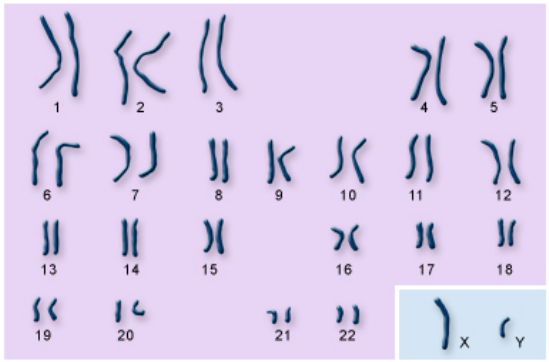
DNA is compactly stored in the nucleus of cells, which make up our body.

Chromosome

In the nucleus of each cell, the DNA is packaged into thread-like structures called **chromosomes**. Each chromosome is made up of DNA tightly coiled around proteins called histones.

In humans, each cell normally contains 23 pairs of chromosomes, for a total of 46. Twenty-two of these pairs, called autosomes, are the same in both males and females. The 23rd pair, the sex chromosomes, differs between the sexes. Females have two copies of the X chromosome, while males have one X and one Y-chromosome.

The 22 autosomes are numbered by size. The other two chromosomes, X and Y, are the sex chromosomes. This picture of the human chromosomes lined up in pairs is called a karyotype.



U.S. National Library of Medicine

Read more:

http://www.genome.gov/glossary/index.cfm?id=33

http://ghr.nlm.nih.gov/handbook/basics/chromosome

Chromosomes and Jeans Image by Annalisa P.

We have 23 chromosomes, which are made up of many genes (not jeans)!

Brother and Sister Image by Matthew S.

The purple segments represent DNA that is shared between a brother and sister. Siblings typically share 50% of DNA.

Gene

A **gene** refers to a unit of DNA that carries the instructions for making a specific protein or set of proteins. It is estimated that there are 20,000 to 25,000 genes in the human genome.

Located on 23 pairs of chromosomes packed into the nucleus of a human cell, genes direct the production of proteins with the assistance of enzymes and messenger molecules.

Proteins make up body structures like organs and tissue, as well as control chemical reactions and carry signals between cells. If a gene is mutated, an abnormal protein may be produced, which can disrupt the body's usual processes and lead to a disease such as cancer.

Read more:

http://www.genome.gov/18016863

20,000 Genes in the Verona Arena Image by Esther K.

This ancient arena used to house 20-30K spectators per event. If each person represents a single gene, then it takes a arena this big to house all 20K genes in the human genome.

Bring on the Heat Image by Jeff P.

Genes control the color and heat intensity of certain peppers.

Allele

Alleles are versions of the same gene with small differences in their sequence of DNA bases. These small differences contribute to each person's unique physical features. An individual inherits two alleles for each gene, one from each parent. If the two alleles are the same, the individual is homozygous for that gene. If the alleles are different, the individual is heterozygous.

For example, the gene for seed color in pea plants exists in two versions, or alleles: (G) is the dominant allele for green seed color and (g) is the recessive allele for yellow seed color. Different combinations of the two alleles display different physical traits:

GG = green seed color
Gg = green seed color
gg = yellow seed color

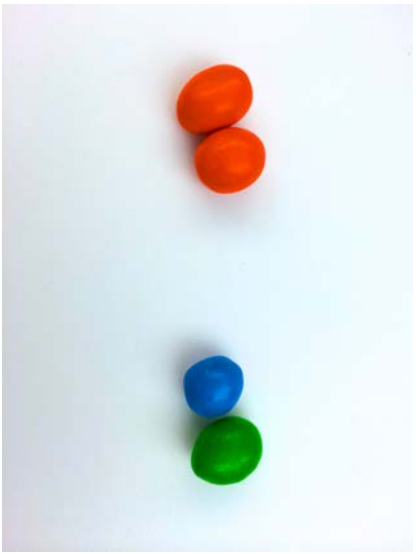
Read more:

http://www.genome.gov/glossary/index.cfm?id=4

Alleles Come in Different Flavours Image by Quinn W.

The chromosomes are made out of gummy worms. The colored sections represent the various alleles present on a chromosome.

Alles as told by M&M's Image by Carmen A.



The two organge M&M's represent a homozygous pairing and the blue and green M&M's represent a heterozygous pairing.

Heredity/Inheritance Pattern

Heredity refers to the genetic transmission of traits from parents to children. Heredity helps explain why children tend to resemble their parents, as well as how a genetic disease runs in a family.

Traits are usually inherited in one of several patterns, including autosomal dominant, autosomal recessive, X-linked dominant, X-linked recessive, and codominant.

Examples: Whereas freckles are inherited in an autosomal dominant manner, color-blindness is inherited in an X-linked recessive fashion. ABO blood groups, on the other hand, display codominant inheritance.

Read more:

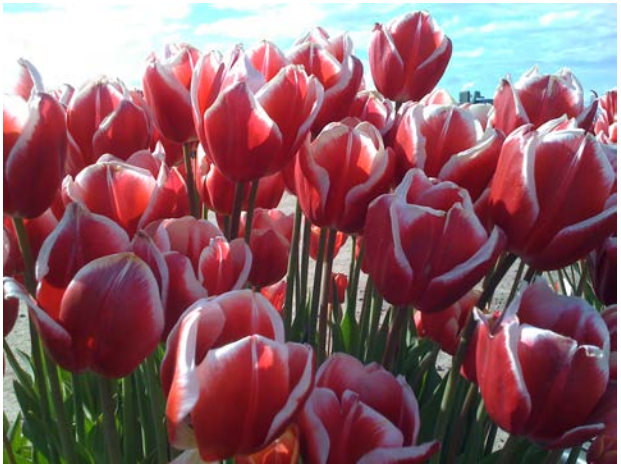
http://geneed.nlm.nih.gov/topic_subtopic.php?tid=5d

http://ghr.nlm.nih.gov/handbook/inheritance/inheritancepatterns

Heterochromia Image by Cary K.

Jedi displays heterochromia, an autosomal dominant condition, characterized by two eyes with different color pigments.

The Genetics of Tulips Image by Carmen A.



The tulips display codominance of red and white pigments.