Here is an explanation of the terms applied to Y-DNA studies as I understand them.

genome is the entirety of an organism's hereditary information. It is encoded in DNA. The genome includes both the genes and the non-coding sequences of the DNA.

A **gene** is a molecular unit of heredity of a living organism. It is a name given to some stretches of DNA that code for a type of protein that has a function in the organism. Living beings depend on genes, as they specify all proteins and functional RNA chains. Genes hold the information to build and maintain an organism's cells and pass genetic traits to offspring. All organisms have many genes corresponding to various different biological traits, some of which are immediately visible, such as eye color or number of limbs, and some of which are not, such as blood type or increased risk for specific diseases, or the thousands of basic biochemical processes that comprise life.

A gene is the basic instruction -- a sequence of nucleic acids (DNA or, in the case of certain viruses RNA), while an **allele** is one variant of that gene.

A **chromosome** is an organized structure of DNA and protein found in cells. It is a single piece of coiled DNA containing many genes, regulatory elements and other nucleotide sequences. The set of chromosomes in a cell makes up its genome; the human genome has approximately 3 billion base pairs of DNA arranged into 46 chromosomes.[71] The information carried by DNA is held in the sequence of pieces of DNA called genes.

Chromosomes can be divided into two types—autosomes, and sex chromosomes. Certain genetic traits are linked to a person's sex and are passed on through the sex chromosomes. The autosomes contain the rest of the genetic hereditary information. All act in the same way during cell division. Human cells have 23 pairs of large linear nuclear chromosomes (22 pairs of autosomes and one pair of sex chromosomes), giving a total of 46 per cell.

It is only the Y chromosome that we are concerned with here. It contains 454 genes made up of almost 60 million base pairs.

DNA (Deoxyribonucleic acid) is a nucleic acid that contains the genetic instructions used in the development and functioning of all known living organisms. Within cells DNA is organized into long structures called chromosomes. The DNA segments that carry this genetic information are called genes. DNA consists of two long polymers of simple units called **nucleotides**. These two strands run in opposite directions to each other – the famous double-helix. Attached to the backbone is one of four types of molecules called bases. It is the sequence of these four bases along the backbone that encodes information. Although each individual repeating unit is very small, DNA polymers can be very large molecules containing millions of nucleotides. For instance, the largest human chromosome, chromosome number 1, is approximately 220 million base pairs long.

The four bases found in DNA are adenine (abbreviated A), cytosine (C), guanine (G) and thymine (T). These four bases are attached to the sugar/phosphate backbone to form the complete nucleotide.

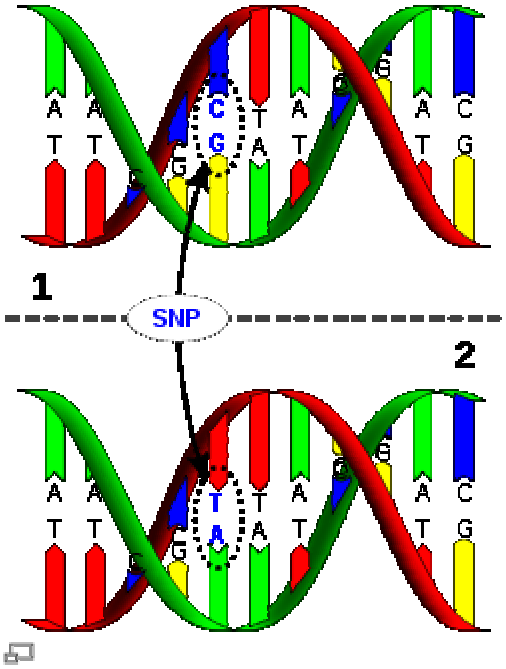
In a DNA double helix, each type of base on one strand normally interacts with just one type of base on the other strand with A bonding only to T, and C bonding only to G. This arrangement of two nucleotides binding together across the double helix is called a base pair.

A **genealogical DNA test** examines the nucleotides at specific locations on a person's DNA for genetic genealogy purposes. The test results are not meant to have any informative medical value and do not determine specific genetic diseases or disorders; they are intended only to give genealogical information. Genealogical DNA tests generally involve comparing the results of living individuals to historic populations.

A chromosome contains sequences of repeating nucleotides known as short tandem repeats (**STRs**). The number of repetitions varies from one person to another and a particular number of repetitions is known as an allele of the marker.

A single-nucleotide polymorphism (**SNP**) is a change to a single nucleotide in a DNA sequence. The relative mutation rate for an SNP is extremely low. This makes them ideal for marking the history of the human genetic tree.

SNP markers



Strand 1 differs from strand 2 at a single base pair location (a C → T polymorphism).

Understanding test results

Y-DNA tests generally examine 10-67 STR markers on the Y chromosome, but over 100 markers are available. STR test results provide the personal haplotype. SNP results indicate the haplogroup.

Haplotype

A Y-DNA haplotype is the numbered results of a genealogical Y-DNA test. Each allele value has a distinctive frequency within a population. For example, at DYS455, the results will show 8, 9, 10, 11 or

12 repeats, with 11 being most common. For high marker tests the allele frequencies provide a signature for a surname lineage.

The test results are then compared to another project member's results to determine the time frame in which the two people shared a most recent common ancestor (MRCA). If the two tests match perfectly on 37 markers, there is a 50% probability that the MRCA was fewer than 2 to 3 generations ago, 90% probability that the MRCA was fewer than 5 generations ago, and 95% probability that the MRCA was fewer than 7 generations ago.