

Genetic History

WHAT IS DNA

DNA is short for DeoxyriboNucleic Acid. DNA is a double-stranded helical molecule found in the cells of all organisms. DNA contains the biological, genetic instructions to build an organism. DNA also controls the day-to-day function of all cells. These instructions are passed down from parent to child via the DNA we inherit from our parents. A gene is an instruction containing section of the long, double-stranded helical molecule of DNA which contains specific instructions for some specific function such as making a protein. About 25 thousand genes are packaged in the DNA packages called chromosomes. 46 chromosomes arranged in 23 pairs or sets define the human genome. The complete human genome contains billions of bits of information. All men and only men have a Y chromosome. This biological fact allows us to trace back in time a direct, largely unchanged genetic line of inheritance from father to son.¹

GENETICS

The two most common types of genetic genealogy tests are Y-DNA (paternal line) and mtDNA (maternal line) genealogical DNA tests. These tests involve the comparison of certain sequences of DNA pairs of individuals in order to estimate the probability that they share a common. Y-DNA research involves short tandem repeat (STR) and, sometimes, single nucleotide polymorphism (SNP) testing of the Y-chromosome. The Y-chromosome is present only in males and reveals information on the strict paternal line. These tests can provide insight in the recent (via STRs) and ancient (via SNPs) genetic ancestry. A Y-chromosome STR test will reveal a haplotype, which should be similar among all male descendants of a male ancestor. SNP tests are used to assign people to a paternal haplogroup, which defines a genetic population. One goal in DNA testing is to acquire quantified, scientific linkage to a specific ancestral group.²

GENOGRAPHIC PROJECT

The fossil record fixes human origins in Africa, but little is known about the great journey that took Homo sapiens to the far reaches of the Earth. Genetic evidence indicates that we are all related, descended from a common African ancestor who lived only 60,000 years ago.

The Genographic Project is seeking to chart new knowledge about the migratory history of the human species by using sophisticated laboratory and computer analysis of DNA contributed by hundreds of thousands of people from around the world. The Genographic Project is a five-year research partnership led by National Geographic and IBM researchers using cutting-edge genetic and computational technologies to analyze historical patterns in DNA from participants around the world to better understand our human genetic roots.

When DNA is passed from one generation to the next, most of it is recombined by the processes that give each of us our individuality. But some parts of the DNA chain remain largely intact through the generations, altered only occasionally by mutations which become "genetic markers." These markers allow geneticists trace our common evolutionary timeline back through the ages. Different populations carry distinct markers. Following them through the generations reveals a genetic tree on which today's many diverse branches may be followed ever backward to their common African root. Our genes allow us to chart the ancient human migrations from Africa across the continents.

Participants test for either their mitochondrial DNA, which is passed down each generation from mother to child and reveals direct maternal ancestry; or their Y chromosome (males only), which is passed down from father to son and reveals direct paternal ancestry. The results reveal the deep ancestry along a single line of direct descent (paternal or maternal) and show the migration paths they followed thousands of years ago. The results will also place the participant on a particular branch of the human family tree. Some anthropological stories are