# Introduction to the Field of Genetics

Overview of Genetics' History

Genetics is the biology of heredity. First started by a Josef Koelreuter, a German botanist, the initial step was successful hybridization of different species of tobacco plants in 1760. Later, Gregor Mendel did extensive research with sweet pea plants in the 1820's. Eventually, this led to the discovery of DNA, or deoxyribonucleic acid, by [James Watson and Francis Crick](http://www.brunel.ac.uk/depts/AI/alife/al-watso.htm). The discovery of DNA greatly increased the understanding of genetics because it was the key to the beginning of understanding gene sequencing and coding. Currently, some scientists that work in genetics are working on the [Human Genome](http://www-hgc.lbl.gov/inf/HGcenters.html) project. This project's aim is to map all of the genes in the human DNA. Other organisms' genes are also being mapped. Furthermore, some scientists have recently cloned two sheep in England.

Human Genome Project

The [Human Genome Project](http://www.ornl.gov/TechResources/Human_Genome/home.html) was started in 1990 to map all of the chromosomes in the human body. Although 95% of the DNA in all people is the same, it is important to map all of it because it could provide answers to many scientific questions. Also, the other 5% of human DNA that actually changes is the part of the human genome that is least likely to be represented accurately. The 95% that is mostly structural for packing of the DNA into chromosomes when cells divide is the part that houses ancient information that is no longer needed or is not information at all, but instead filler DNA that needs to be there for some unknown reason. When the human genome is mapped, scientists will have a better idea of what to do with all of the information. Already, it's being used to help diagnose some chromosomal and genetic disorders, as well as treat them. The Human Genome project once had a projected finish date of 2005, but researchers now feel that they can map the genome in much less time.

Polymerase Chain Reaction

[Polymerase Chain Reaction](http://opbs.okstate.edu/~melcher/MG/MGW4/MG426.html), or PCR, was dicovered in the 1980's at Perkin-Elmer Cetus Corp., which has since been aquired by Chiron. The rights to Cetus' PCR technology are now held by Hoffmann-La Roche. PCR has become the basis of rapid replication of DNA because it uses the same efficient process used by cells to replicate DNA. PCR only became possible after the discovery of TaqPolymerase, a protein that replicates DNA and can withstand high temperatures. It was found in bacteria that live in hot springs and is now widely used as a main ingredient in PCR. The process of PCR involves a cycle of temperatures at which different stages of replication can be completed. The first stage denatures the DNA at 95 degrees Celsius. The second stage cools the DNA to about 55 degrees Celsius, at which temperature primers can be annealed to each strand on DNA. The third stage is to reheat the DNA to 72 degrees Celsius to extend the annealed primers and replicate the DNA. This process is usually repeated about 35 times for each sample being amplified. This is the most basic of PCR protocols, but there are others that are much more complex for different methods of DNA amplification. PCR can also be used for amplication of RNA and DNA that was coded from RNA using reverse transcriptase. The technology to go from RNA to DNA was found in retroviruses that must use reverse transcriptase to replicate in a host cell.

PCR is a simple tool for the use of geneticists and other scientists to obtain information about the body. It can be used to speed up research in just about any biological field that invoves DNA or RNA. It can be used to help in sequencing of genomic DNA or it can be used in tests that help determine how cancer got started in someone's body. It is a mere tool that has changed research in a remarkable way.

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