The human genome project

A genome is all the DNA in an organism, including it’s genes.

Genes carry information for making all the proteins required by all organisms. These proteins determine, among other things, how the organism looks, acts, processes and fights infections. DNA is made up of four similar chemicals (bases, adenine , Thymine , cytosine , and guanine) that are repeated millions or billions of times throughout a genome. The human genome has three billion base pairs.

The order of these base pairs are extremely important and determine everything in an organism. The Human Genome Project started in the mid-1980’s and was discussed widely throughout the scientific community and public press in the last years of the decade. In the United States, DOE first and soon afterward NIH were the main research agencies within the US government responsible for developing and planning the project. By 1988, the two agencies were working together, and their relationship was formalized by the signing of a Memorandum of Understanding, to coordinate research and technical activities related to the human genome.

The initial planning process culminated in 1990 with the publication of a joint research plan. The Human Genome Project’s ultimate goal is to discover all the more than 80, 000 human genes and render them for further biological study.

To facilitate the future interpretation of human gene function, parallel studies are being carried out on selected model organisms. Smaller goals include, to identify all the approximately 100, 000 genes in human DNA, to determine the sequences of the three billion chemical bases that make up

human DNA, to store this information in databases, to develop faster and more efficient sequencing technologies, to develop tools for data analysis, and to address the ethical, legal and social issues (ELSI) that may arise from the project. The massive amount of data and related technologies generated by the HGP and other genomic research presents a wide array of commercial opportunities.

These opportunities range from medicine and food to energy and environmental resources. Older companies are racing to retool and newer companies are seeking parts in the information revolution with DNA at it’s core.

IMB, Compaq, DuPoint, and other big pharmaceutical companies are among those interested in the potential for targeting and applying genome data. In HGP there are two types of sequences, the draft and the high quality. To get the draft sequence, scientist determine the order of base pairs in each chromosomal area at least four to five times to ensure data accuracy and to help with reassembling DNA fragments in their original order. This repeated sequencing is known as genome “ depth of coverage.” The draft sequence for the human genome was completed on June 26, 2000.

To generate high quality sequencing , additional sequencing is needed to close gaps, reduce mistakes and allow only a single error in 10, 000 bases.

The finished version will provide an estimated eight to nine times the coverage of each chromosome. Thus far, high quality sequences have been generated for human chromosomes 21 and 22. Chromosome 22 The euchromatic portion of chromosome 22 is estimated to be a 33. 5-Mb

structure comprising at least 545 and possibly up to 1000 genes, ranging in size from 1000 to 583, 000 bases.

Chromosome 22’s sequences of DNA is of extremely high quality with an error rate of less than 1 in 50, 000 bases. Gene variants on chromosome 22 have been implicated in immune system function and in at least 27 disorders, including congenital heart disease, schizophrenia, mental retardation, birth defects, and leukemia and other cancers.

Chromosome 21 Chromosome 21 revealed a very low gene density, estimated at around 225 active genes in the 33. 8 Mb of DNA covering 99.

7% of the chromosome’s long arm. Scientists speculate that this gene scarcity could contribute to individuals with trisomy 21. Chromosome 5 Diseases linked to chromosome 5 are; colorectal cancer, basal cell carcinoma, acute myelogenous leukemia, salt-resistant hypertension, and a type of dwarfism. Chromosome 16 Diseases linked to chromosome 16 are; breast and prostate cancers, Crohns disease and adult polycystic kidney disease. After the full genome sequencing is done there are some things we still will not know such as; Gene number and exact locations and functions, gene regulation, DNA sequence organization, interaction of proteins in complex molecular machines, and developmental genetics, genomics.