The project began in 1990 and was aimed at finding the base sequence of the entire human genome; it drove improvements in sequence techniques which allowed a draft sequence to be published much sooner than expected (2000)

The final sequence was completed in 2003

The knowledge of the entire base sequence hasn't given us immediate understanding; it has given us a mine of data, which will be worked by researches

It is possible to predict which base sequences are protein coding genes; there are 23,000 of these in the human genome

Estimates for the number of genes were much higher

Another discovery was that most of the genome is not transcribed; originally called Junk DNA it is being increasingly recognized that in these regions there are elements that affect gene expression along with satellite DNA

The genome sequences isn't THE human genome, it is A human genome

Work is being done to discover the variations in sequences between humans

determined at the moment of fertilization by one chromosome carried in the sperm; can either by X or a Y

A karyogram shows the chromosome of an organism in homologous pairs of decreasing length

The chromosomes of an organism are visible in cells that are in mitosis with cells in metaphase giving the clearest view

If dividing cells are stained and placed on a microscopic slide and are then burst by pressing on the slip, the chromosomes spread

Then a micrograph can be taken of the stained chromosomes

One diploid nucleus divides by meiosis to produce four haploid nuclei

The nucleus divides twice; first division produces two nuclei, each of which divides again to give four total nuclei

Two divisions: Meiosis I and Meiosis II

The nucleus that undergoes the first division of meiosis is diploid; contains two chromosomes of each type

Each of the four produced have one chromosomes of each type; they're haploid

Meiosis is also known as reduction division

Cells produced by meiosis I have one chromosome of each type; so the halving of the chromosome number happens in the first division not the second

Two nuclei produced in meiosis I have the haploid number of chromosomes, but each chromosome still consists of two chromatids

Genotype, Phenotype, and Test Cross 6/11/2016 7:45:00 PM

The alleles that an organism carries make up the genotype of that organism; when the genotype is where two alleles are the same then it is pure bred or homozygous

When alleles are different, then the genotype is heterozygous

Genotype is the genetic constitution of an organism;

alleles interact in different ways and also with environmental factors, and so the phenotype is the way in which, or the outcome, of how the genotype is expressed (includes appearance)

You can have different genotypes that result in the same phenotype (eg: Tt and TT)

In certain types of monohybrid crosses, the 3:1 ratio is not obtained

Co-dominance
It is possible for both the alleles to be expressed simultaneously

In the flower called Antirrhinum, when red flowers are crossed with white ones, the F1 result is all pink

When the pink ones are crossed, then F2 offspring are red, pink, and white (1:2:1 , respectively)

Pink occurs because both alleles are expressed together, the red and white are co-dominant; in a diagram these sort of genes are represented

and Y chromosome will only pair for a short part and the centromeres will repel each other

Sex linkage

Genes that are based on the sex of the organism are called sex linked characteristics; sex linkage is a special case of linkage where a gene is located on the sex chromosome

Inheritance of these sex linked genes is different from the inheritance from autosomal chromosomes

X chromosome is much longer than the Y chromosome and so has genes that are absent on the Y chromosome

In a male, most alleles on the X chromosome lack a corresponding allele on the Y and so are visible in the phenotype even if the allele is recessive

On the other hand, the allele may be masked on the female because the other X chromosome has a dominant allele for that gene

When a heterozygous individual has a recessive allele but its not expressed then the individual is called a carrier

Specific Sex Linked Genes

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Red Green Color Blindness

A red green color blind individual sees yellow, blue, orange, and red all as the same color

The condition affects 8% of males and only 0.4% of females

The female may be:

- homozygous for normal vision (X^B and X^B)
- heterozygous (X^B and X^b) and still have normal vision
- the only way the female is red green color blind is if she has homozygous blindness (X^b and X^b)

The male will be red green color blind if he receives a recessive allele (X^b and Y)

The only way there is a female with red green color blindness is if the father has the condition and the mother has or is a carrier of it

Hemophilia

Hemophilia is when there is uncontrollable bleeding due to the lack of a blood clotting mechanism

There are two kinds of hemophilia, A and B

Occurs due to a failure to make an adequate amount of blood proteins that are essential to the complex blood clotting mechanism

Today, you can just administer the clotting factor that the patient lacks

The proteins production genes are on the X chromosome; it is recessive allele

Occurs largely in males, due to same reason as red green color blindness

A female may only have it if she homozygous for hemophilia and this is fatal in the uterus, leading to natural abortion

Genetic modification is carried out by gene transfer between species

Genetic code is universal, so when genes are transferred between species, the amino acid sequence is unchanged--- same polypeptide produced

Genes have been transferred from eukaryotes to bacteria; one of the early examples was the transfer of the gene for making human insulin to a bacterium

New characteristics can be added to animal species; goats have been produced that secrete milk containing spider silk protein; spider silk is very strong but spiders could not be used to produce it commercially

Crop plant can be made too; genes from snapdragons have been transferred to tomatoes to make them purple rather than red

Golden rice needed two genes from daffodils and one from a bacterium to make beta carotene