Inheritance (TB ch. 14, p. 341)

A *pedigree chart* can be used to trace genetic traits through families.

Circles are used to represent females, squares for males
Shaded diagrams represent the phenotype you're looking for,
unshaded ones do not show the phenotype.

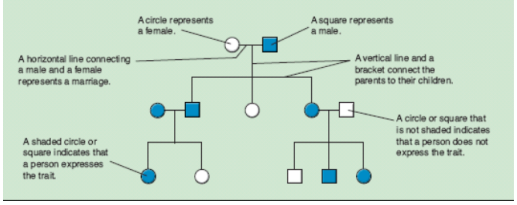

Figure 14 - 3, p. 342

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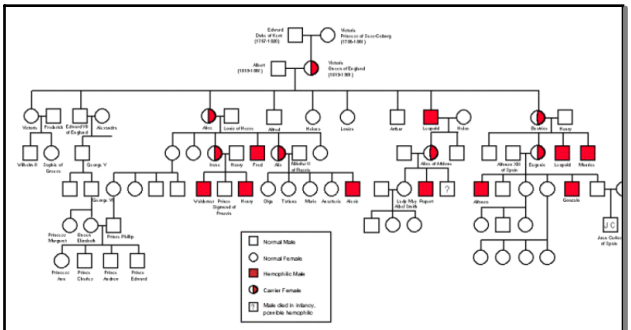

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Try it out!

Create a pedigree in which two grandparents have 4 children (one boy and three girls). All girls are married. The first daughter has 2 sons, the second daughter has one daughter and the third daughter is childless.

In this family, the grandfather expresses the gene for Huntington's disease, as well as his son and his first daughter. The third daughter married a man who expresses the same gene.

One of the first daughter's son's expresses the gene.

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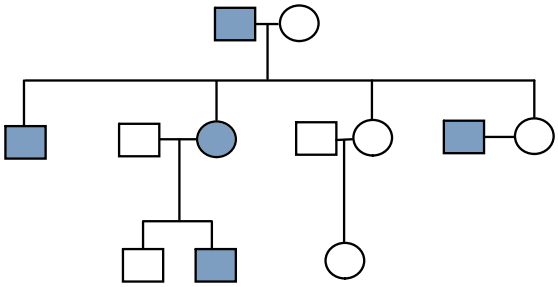

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Some traits can even be influenced by the environment in which you are raised.

ex: Nutrition, medications, exercise...

Human traits known to be influenced by non-genetic factors include height, certain diseases (ex: arthritis, heart disease, diabetes, cancer, depression and addiction) as well as certain behaviours.

How do we know this? Research done on identical twins raised in different environments has given scientists a window into the effects on environment on genetics.

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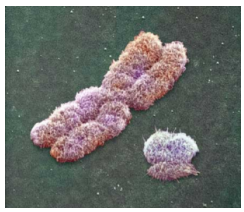
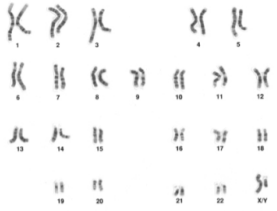
Sex-linked Genes

Genes pairs are numbered 1 - 22 based on their size. Chromosome pair 23 are the chromosomes that determine a person's gender.

A female received two large XX chromosomes (their size fits somewhere between chromosome 7 and 8).

A male received one X and one Y chromosome. The Y chromosome is the smallest chromosome in the human body.





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Many genetic disorders have been sex-linked to the X chromosome.

In the case of sex-linked genes, normal Mendelian probabilities apply to females (who receive two X chromosomes carrying alleles of the same genes).

In males, however, many genes found on the X chromosome do not appear on the Y chromosome at all. Defective genes that would normally be recessive do not have a chance to be "hidden" by a dominant gene, and are expressed more often.

ex: Colour blindness

$X^c X$ $X^c Y$

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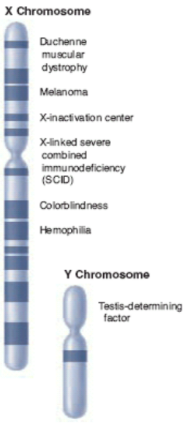

Figure 14 - 12, p. 350

All X-linked alleles are expressed in males, even if they are recessive.

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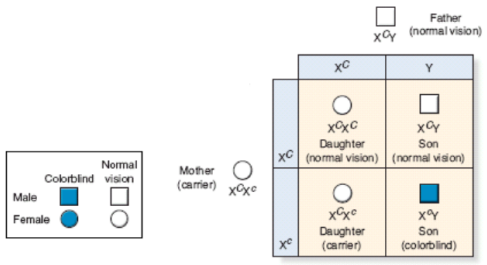

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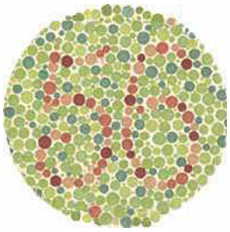
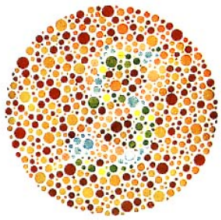
Sex-linked genetic disorders

Colour blindness: genes associated with colour vision are located on the X chromosome.
Red-green colour blindness is found in 1 out 10 males, but only 1 out of 100 females.





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Hemophilia : Blood clotting is controlled by 2 genes found on the X chromosomes.
A recessive allele in either gene causes hemophilia, characterised by excessive bleeding, sometimes internal.

Currently treated by injecting clotting proteins in patients, or blood transfusions for those already bleeding.

Duchenne Muscular Dystrophy : Characterized by the loss of skeletal muscles.

No treatment currently exist, though scientists are trying to develop a type of gene therapy that could help.

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