Psy236 Biopsychology and Learning Lecture Notes

Week 1: Behavioural Neuroscience: Genetics

- A study of the biological mechanisms which mediate our behaviour. One of the main regulators of our biopsychology is the function of our genes.
- Behaviour: Nature vs Nurture
    - Behaviour is the response of an individual, group or species to stimuli (trigger) in the environment
    - Why do people (or other species) respond differently to a similar environment trigger?
    - Their genetic make-up (nature): evolution (e.g. human vs bird), parental traits (color of skin, height, intelligence, ability to sing)
    - Factors in their environment (nurture/experience): how they are 'feeling' at the time (hungry, tired, happy, hot), previous experiences (or taught a skill or how to behave) and culture

- Genetics
    - What are chromosomes?
    - What are genes?
    - Why do we have them?
    - What is heritability?
    - How do genes and heritability affect behaviour?

- Chromosomes
    - Are found in every cell of our body
    - Contain our genetic material: our genes
    - Genes drive the function of our cells

- Human – 46 chromosomes – 23 pairs
    - It is unusual to see chromosomes as a single structure as they are usually in a replicated stage
    - So there are two of each (sister chromatids) joined together at the centromere
    - Males have XX
    - Females have XY
    - Females will always contribute an X chromosome to offspring and males will give X or Y (males determine the sex of the child)
    - Chromosomes are made of DNA

- What are Genes?
    - Genes are regions of DNA that are units of hereditary (this means that information can be passed from one generation to another)
    - DNA: double strands of nucleotide "base-pairs" on chromosomes; sequences of these strands are called genes

- These are in the NUCLEUS of cells (animals and plants)
- DNA: deoxyribonucleic acid
- The genes are very important for making proteins in the body

- What's a Nucleus?
  - The nucleus is a membrane found part of a cell which contains all genetic information to promote survival of the cell (organism)
  - Cells are present in all body parts – groups of cells make an organism. Each cell contains a nucleus and contains chromosomes made up of genes.

- What are Genes and why do we have them?
  - Chromosomes are made up of genes
  - Particular sequences of DNA are known as genes
  - DNA is essential for life: the DNA in each gene programmes the manufacture of different proteins for use in the body
  - Proteins are made with amino acids
  - Amino acids are obtained from our diet and are the building blocks of life

- 9 Essential Amino Acids
  - There are 20 amino acids used to make proteins
  - 9 of these amino acids are essential for us to make proteins which make us live
    1. Histidine: is not produced when you are an infant but becomes naturally produced as you get older
    2. Isoleucine
    3. Leucine
    4. Lysine – beans
    5. Methionine
    6. Phenylalanine
    7. Threonine
    8. Tryptophan
    9. Valine

- DNA makes proteins essential for life
  - The sequence of amino acids to form the protein is determined by an intermediate RNA (ribonucleic acid) from DNA
  - Essentially, DNA is made up of base-pairs; they are called nucleotides that are either purines or pyrimidines. For DNA the nucleotides are: A, T, G and C (these pair up as AT and GC). So a base pair is basically a pair of these.
  - DNA is a self-replicating molecule; when it needs to replicate the DNA splits and you get a copy of either side which is called RNA. RNA is basically a copy of one strand of the DNA.
  - For DNA to make RNA, this is called transcription.
  - In order for the RNA to make the protein, the sequence of the bases determines which amino acids need to be joined in the manufacturing process