History of the Cell Theory

* CELLS - the basic structural and functional unit of all living organisms

- all living things are composed of cells

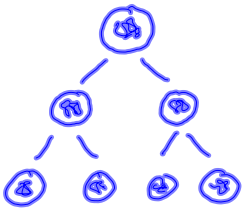
- cells were unknown until the invention of the microscope

* Robert Hooke (1665)
  - invented the first microscope and looked at a piece of cork
  - noticed small box-like structures in the cork
  - he called these structures cells because they reminded him of the cells that monks live in at monastaries
* Anton van Leeuwenhoek (late 1600's)
  - made his own microscope and observed small living things in pond water, milk, and various other substances
* Marthias Schleiden
  - studied plant tissues and said that all plants were made of cells
* Theodor Schwann
  - studied animal tissues and said that animal tissue is also composed of cells
* Rudolph Virchow
  - proposed that all cells are produced from the division of existing cells

The Cell Theory

Modern cell theory has 3 main principles

1. all living organisms are composed of one or more cells
2. cells are the basic unit of structure and organization of all living organisms
3. cells arise from previously existing cells with cells passing copies of their genetic material on to their daughter cells



Types of Microscopes

Compound Light Microscope 10x · 10x · 5x = 500x

- consists of a series of glass lenses and visible light to produce a magnified image
- each lens of the series magnifies the image of the previous lens

ex. 10 X 10 = 100x

4x · 10x = 40x

40x · 10x = 400x

Electron Microscope

- uses magnets to direct a beam of electrons at thin slices of cells
- called a transmission electron microscope (TEM)
- can magnify an image up to 500,000 X but specimen must be dead, sliced very thinly, and stained with heavy metals
- scanning electron microscope (SEM), pass electrons over the surface of a specimen to give a 3-D image
- scanning tunneling electron microscope --- brings a charged tip close to the surface of a specimen so electrons can tunnel through a small gap between the tip and the specimen

Cells

*all cells have a number of functions in common

- most cells have genetic material in them that provides instructions for making substances that the cell needs
- cells break down molecules to generate energy for metabolism

Prokaryotic cells

- cells without a nucleus or membrane-bound organelles

No nucleus
No membrane bound organelles

specialized structures that carry out specific cell functions

- many bacteria are made up of these type of cells and are called prokaryotes

Eukaryotic cells

- cells that contain a nucleus and other organelles that are bound by a membrane

Has a nucleus
Has organelles

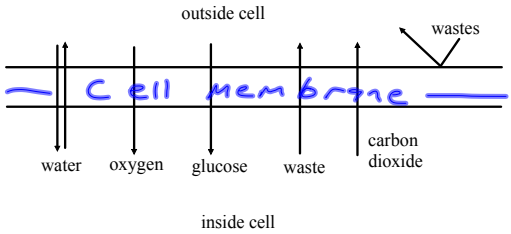
a distinct central organelle that contains the cell's genetic material in the form of DNA

- organisms that are made of eukaryotic cells are called eukaryotes

Humans
Dog
Cat
Bird
Plant

Plasma Membrane / Cell membrane

- a special boundary that controls what enters and leaves the cell
- all prokaryotic and eukaryotic cells contain a plasma membrane
- selective permeability
  - the membrane allows some substances to pass through but it keeps other substances out



Plasma Membrane Structure

- composed of lipids

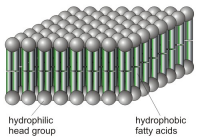
polar head
non polar tail

- phospholipid bilayer
  - two layers of phospholipids arranged tail-to-tail
  - allows plasma membrane to exist in watery environments
- phospholipid ---- polar head and non-polar tail (2)
  - polar head is attracted to water (hydrophillic) and the tails are not attracted to water (hydrophobic)

water loving

water hating

Phospholipid bilayer



- other components of the plasma membrane
  - cholesterol
    - prevents tails from sticking together, helps with membrane fluidity
  - proteins
    - help move things through membrane (transport proteins)
    - internal support structure
  - carbohydrates
    - identify chemical signals
    - define cell's characteristics

*** fluid mosaic model - the components of the plasma membrane are in constant motion, sliding past one another