Cells: Notes

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The Cell:

- **Smallest and most basic unit of life**

- **The Events that Led up to the Cell Theory:**
    - 1665: Robert Hooke
        - Observed the remains of dead plant cells
        - Observed and named cells
    - 1675: Anton van Leeuwenhoek
        - First to see cells under a microscope
    - 1838: Matthias Schleiden
        - Concluded that plants were made of cells
    - 1839: Theodor Schwann
        - Concluded that animals were made of cells
    - 1855: Rudolf Virchow
        - Said that cells are made of cells

- **Cell Theory (From Schleiden, Schwann, and Virchow)**
    - All living things are made of cells.
    - Smallest living unit structure and function of all organisms is the cell.
    - All cells arise from the preexisting cells.

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- Discards the idea of Spontaneous Generation (some organisms come from thin air)

Bacteria vs. Virus:

	Bacteria	**Virus**
Living	Yes	No
Number of Cells	1	None
Reproduction	Yes	No
Size	0.5-5.0 micrometers (length)	5-300 nanometers

Prokaryote vs. Eukaryote:

	Prokaryote	**Eukaryote**
Examples	Bacteria Cell	Plant Cell
Nucleus	No	Yes
Organelles	No	Yes
Cell Wall Material	Peptidoglycan	Cellulose
Ribosomes	Yes	Yes
Cell Organization	Unicellular	Multicellular

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Animal Cells:

- Eukaryotic cell
- **Parts of this cell:**
    - Cell membrane
        - Controls what comes in and out of the cell
        - Outer Layer
    - Nucleus
        - Has a round shape
        - Surrounded by the organelles
        - Controls the cell's activities
    - Cytoplasm
        - Clear, gel-like fluid
        - Surrounds all organelles
    - Mitochondria
        - Bean shaped
        - Has inner membrane
        - Breaks down sugar molecules to create energy
    - Endoplasmic reticulum
        - Network of folded tubes or membranes
        - Carries proteins and other materials from one part of the cell to another
        - There is a smooth and a rough ER
    - Ribosomes
        - Small bodies floating free or attached to the rough ER
        - Produce proteins
    - Golgi bodies
        - Flattened sacs or tubes
        - Receives proteins or other materials from the ER, packages them, and redistributes them
    - Vacuoles
        - Fluid filled sacs
        - Storage area for cells
    - Lysosomes
        - Small, round structures
        - Use chemicals to break down large food molecules into smaller ones
        - breaks down old cells

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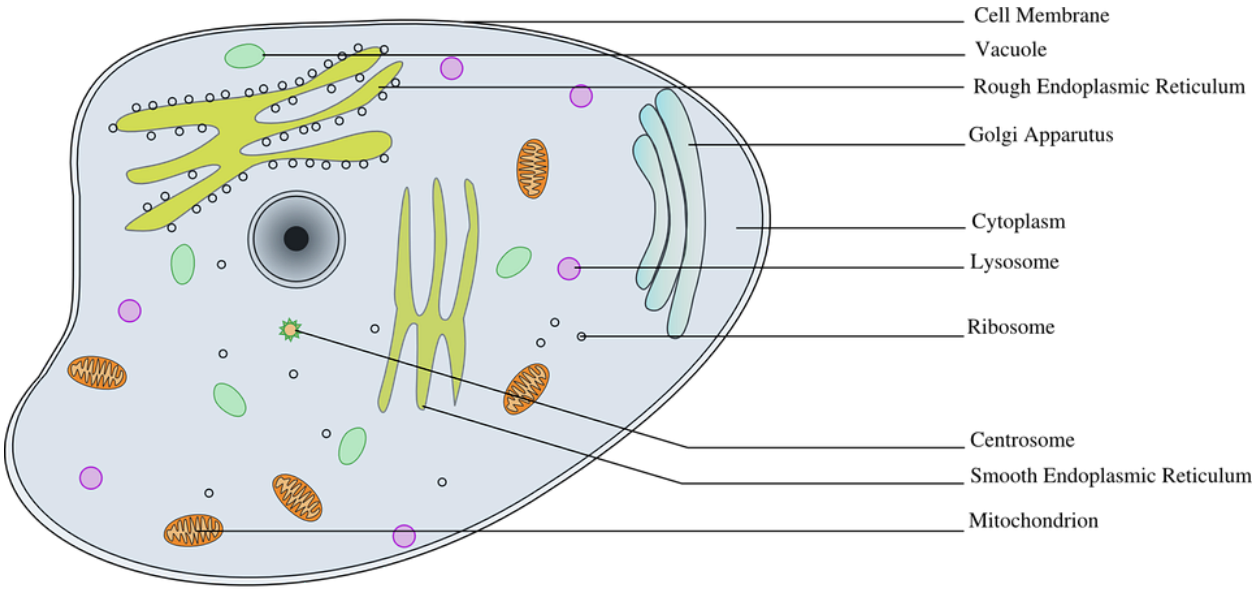

Cross Section of an Animal Cell

Animal Cell (derived from Free SVG)

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Plant Cells:

- Eukaryotic cell
- **Parts of this cell:**
    - Cell wall
        - Outer layer
        - Rigid, strong, stiff
        - Non-living
        - Protects and supports the cell
    - Cell membrane
        - Controls what comes in and out of the cell
        - Outer Layer
    - Nucleus
        - Has a round shape
        - Surrounded by the organelles
        - Controls the cell's activities
    - Cytoplasm
        - Clear, gel-like fluid
        - Surrounds all organelles
    - Mitochondria
        - Bean shaped
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        - Produce proteins
    - Golgi bodies
        - Flattened sacs or tubes
        - Receives proteins or other materials from the ER, packages them, and redistributes them
    - Vacuoles
        - Fluid filled sacs
        - Storage area for cells
    - Chloroplasts

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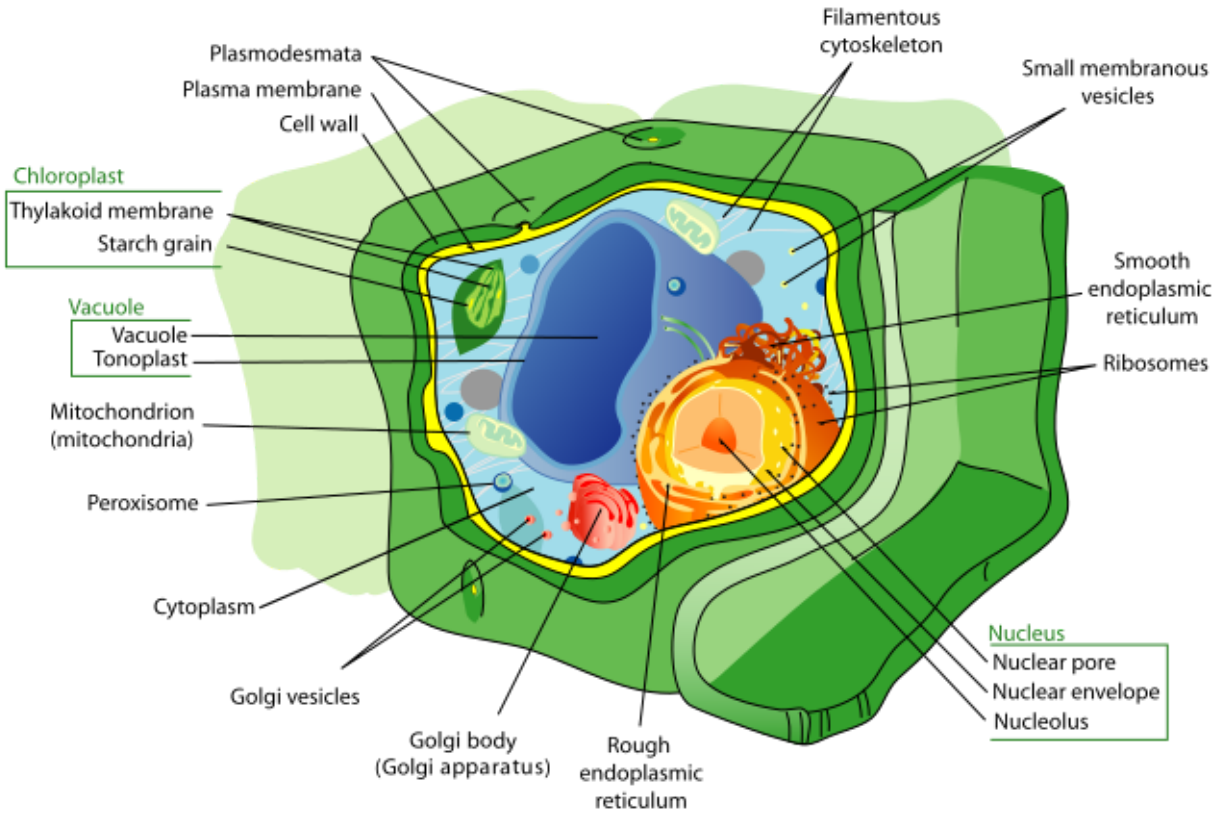
- Green oval structures
- Usually containing chlorophyll
- Allow photosynthesis to occur



Plant cell (derived from wikipedia)

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Cell Substructures:

- **Three substructures:**
    - Hypertonic
        - More solute in solution than cell
        - Water moves out of cell
        - Cell shrinks (crenation)
        - Examples:
            - Saltwater
            - Soda
    - Isotonic
        - Same amount of solute in the solution as there is in the cell
        - Water is in an equilibrium
        - No net change
    - Hypotonic
        - More solute in the cell than in the solution
        - Water goes into the cell and the cell swells up and bursts

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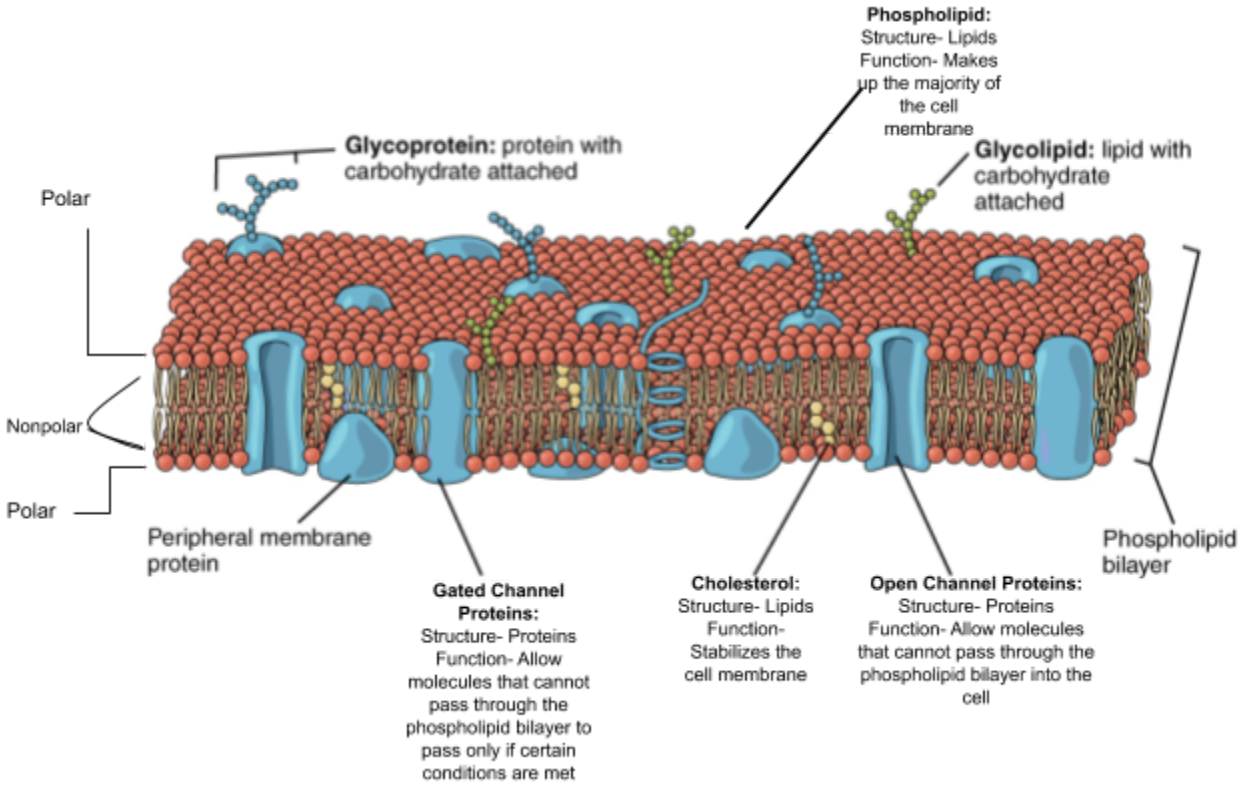
Cell Membrane:

- **Made up of a phospholipid bilayer**
  - Several names for it:
    - Semi-permeable membrane
    - Fluid mosaic model
    - Plasma membrane

- **Phospholipid Bilayer**
  - **Semi-permeable:** some things can move in and out of the cell membrane freely (oxygen or carbon dioxide), while others cannot (polar and large molecules)
  - Maintains **homeostasis**
  - Made up of two parts: **Phospholipids and proteins**



Phospholipid Bilayer from Wikimedia Commons (with edits)

- **Phospholipid**
  - Has a phosphate head and two tails (fatty acid chains).

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Additional Elements/Characteristics:

- **Passive Transport:**
  - Movement of molecules from a high concentration to a low concentration
  - Requires no energy (ATP)
  - Examples:
    - Diffusion
    - Osmosis
    - Facilitated transport
- **Active Transport:**
  - Moving low to high concentration
  - Requires energy (ATP)
  - Against concentration gradient
- **Simple Diffusion**
  - Going with concentration gradient
  - No energy (ATP) needed
  - No protein channel required
  - Example:
    - O_2+CO_2
- **Osmosis**
  - Movement of water from a high concentration to a low concentration
  - Energy (ATP) not required
  - Passive transport
- **Facilitated Transport**
  - Passive from high to low concentration
  - No energy (ATP) needed
  - Needs protein channel
- **Endocytosis**
  - Movement of large molecules into a cell
  - Requires energy (ATP)
  - Moves from low to high
- **Exocytosis**
  - Active transport
  - Requires energy (ATP)
  - Movement of large molecules out of the cell
  - Against the concentration gradient (low to high)

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Mitosis and Meiosis:

Mitosis

Prophase: Chromatin begins condensing into chromosomes. The chromatids are joined together by a centromere.

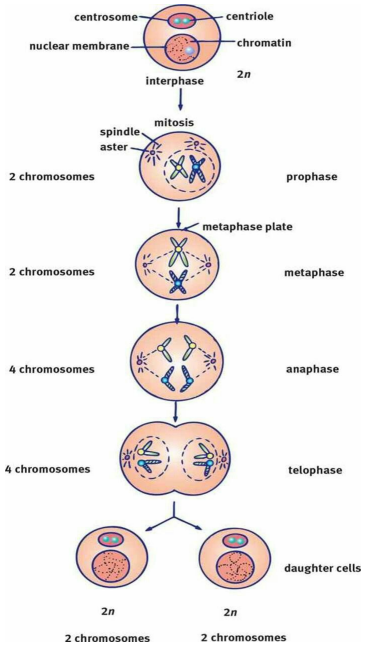
Metaphase: the chromosomes line up in the middle of the cell.

Anaphase: chromosomes break at the centromere and sister chromatids move to opposite ends of the cell.

Telophase: A nuclear membrane forms and chromosomes begin to unwind and separate.

Cytokinesis: The cytoplasm divides and forms two new cells.

Meiosis is the same thing, but it just **happens one more time**, resulting in **four daughter cells** instead of two.



Mitosis (derived from wikimedia commons)

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