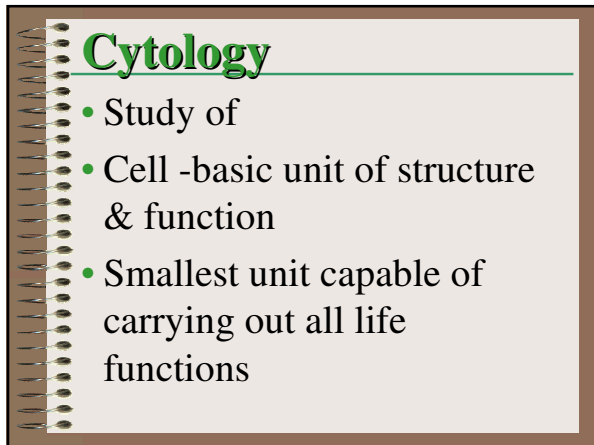


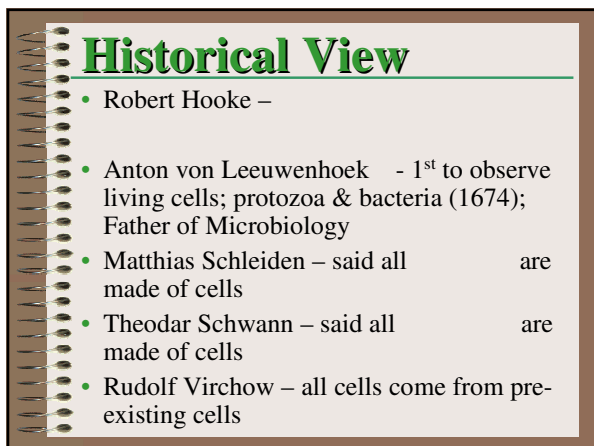
Chapter 3

Cell Structure & Function



Cytology

- Study of
- Cell -basic unit of structure & function
- Smallest unit capable of carrying out all life functions



Historical View

- Robert Hooke –
- Anton von Leeuwenhoek - 1st to observe living cells; protozoa & bacteria (1674); Father of Microbiology
- Matthias Schleiden – said all _____ are made of cells
- Theodar Schwann – said all _____ are made of cells
- Rudolf Virchow – all cells come from pre-existing cells

Historical View



Hooke's simple microscope from 1665

Cork cells



Cell theory

- Cells are the basic unit of life
- All organisms composed of cells
- Cells arise from pre-existing cell

(1836)

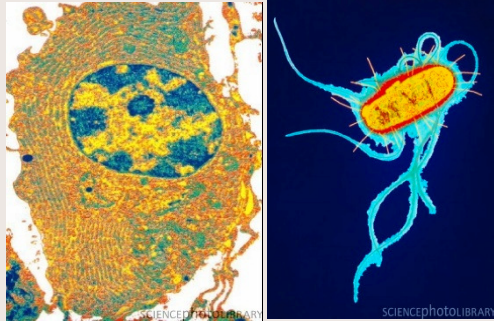
Tools Used By Biologist

- Study of cells progressed w/invention of microscopes in the 17th century.
- Microscopes vary in magnification & resolving power.
 - **Magnification** - the ratio of an object's image to its real size. (eyepiece X objective)
 - **Resolving power** is the ability to distinguish 2 points that are close together as separate points.
- **Light microscope (LMs)** - light passes through specimen & through lens.

Microscopes

- Light microscope can't resolve many of the organelles.
- To resolve smaller structures we use an **electron microscope (EM)**, which focuses a beam of electrons through the specimen
- **1. Transmission electron microscopes (TEM)** are used mainly to study the
 - A TEM aims an electron beam through a thin section of the specimen.

TEM Images



Human cell

E. coli bacteria

Microscopes

- **2. Scanning electron microscopes (SEM)** are used to study
- The SEM creates an image that seems 3-D



Microscopes

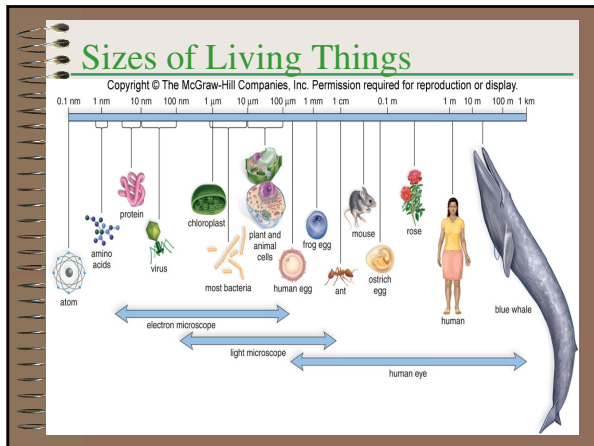
- Light microscopes don't have high resolution, but can be used to study live cells.
- Electron microscopes can only be used on dead cells.

Limited Cell Size

- Nucleus can only control a certain amt. of cytoplasm
- Cell function limits its size
- High surface area to volume ratio facilitates exchange of materials between cells & the environment
 - As a cell increases in size its volume \uparrow faster than its surface area.
 - Smaller objects have a greater ratio of surface area to volume.

Limited Cell Size

- Eukaryotic cells are bigger than prokaryotic cells
 - Most bacteria are 1-10 μm in diameter.
 - Eukaryotic cells are typically 10-100 μm in diameter.
 - Largest cell is ostrich egg or zygote - about 10 cm



2 Types of Cells

- **Prokaryotes** – cells
 - Smallest & most abundant cells
 - **EX.** bacteria
- **Eukaryotes** – cells with a nucleus & membrane bound organelles
 - **EX.** All life except bacteria

Cell Differences

- A major difference between prokaryotic & eukaryotic cells is the location of chromosomes.
- Eukaryotes - chromosomes are contained in a membrane-enclosed organelle, the **nucleus**.
- Prokaryotes - DNA is conc. in the _____ w/out a membrane separating it from the rest of the cell.

Cell Differences

- Within the cytoplasm of eukaryotic cells are membrane-bounded **organelles** with a specific function.
 - Mostly absent in prokaryotes.
- Ribosome - only organelle in prokaryotic cells

Common Cell Characteristics

- Prokaryotic & eukaryotic are alike in that...
- All cells have a **plasma membrane**.
- The semifluid substance w/in the membrane is the **cytosol or cytoplasm**.
- All cells contain **DNA** which have units that determine specific traits (**genes**).
- All cells also have **ribosomes**, tiny organelles that make proteins.

Prokaryotic Characteristics

- Lack membrane nucleus
- Nucleoid – single chromosome
- Plasmids –
- Cell wall – outer most layer, chemical composition determines type of bacteria
- Slime capsule –
- Flagella – long filament used for movement
- Pili or fimbriae- short, sticky appendages used for attachment
