

## **Chpt 3: Life is Cellular**

This unit will begin with the **Cell Theory**

### **1-the cell is the basic unit of life**

the unit of structure and function of all living things

### **2-all organisms are made of 1 or more cells**

### **3-all cells come from pre-existing cells**

**Contributors to Cell Theory:** 200 years of research, many scientists contributed

**Robert Hooke**      1665      British  
discovered cells in cork, gave name "cell"

**Anton van Leeuwenhoek**    1695    Dutch  
ground lenses for living, he observed microorganisms swimming in water

**Robert Brown**      1830's      British  
discovered & named nucleus, dense center of cell

**Matthias Schleiden**    1830's    German  
botanist, used MS to examine plant tissues, he stated "all plants are made up of cells"

**Theodor Schwann**    1830's    German  
zoologist, used MS to examine animal tissues, stated "all animals are made up of cells"

**Rudolph Virchow**    1850's    Russian  
physicist & biologist, he saw cells dividing- "cells come from pre-existing cells"

**Cytology:** study of cells

**tools:** the development of the microscope (MS) has been one of the most important tools to a biologist

**Compound Light MS:** can magnify up to 1000 times, our maximum in class 400 times (x400)  
sends stream of light through object to focus image

**Electron MS:** developed in 1950's  
can magnify up to 600,000 times  
sends stream of electrons through specimens to make image, image is seen on computer  
downside: specimens must be specially prepared, no longer living

2 types Electron MS

**-Transmission Electron MS (TEM)**  
transmits electrons through tissues to get image of inside

**-Scanning Electron MS (SEM)**  
sends electrons to specimen & they bounce back creating a 3D image, this gives info about shape of cells

**Electron micrographs:** pictures from EM

## **Comparison of Prokaryotic and Eukaryotic cells**

- all cells are surrounded by cell membrane
- all cells filled with jellylike substance, cytoplasm
- all cells have chromosomes carrying genes in form of DNA
- all cells have ribosomes

## **Differences between Prokaryotic and Eukaryotic Cells**

<b>Prokaryotic Cells</b>	<b>vs</b>	<b>Eukaryotic Cells</b>
only found in bacteria		found in protists, fungi, plants, animals
no nucleus, DNA is found in nucleoid region		true nucleus, DNA is found here
usually single chromosome		many chromosomes
have cell wall: made of lipids, proteins		fungi: cell walls of chitin
no cellulose		plants: cell walls of cellulose
have no cellular organelles except ribosomes		have many cellular organelles
size: extremely small 1-5 micrometers		size: 10-100 um

**Eukaryotic cells have 4 major parts:**

cell membrane, nucleus, cytoplasm, & cellular organelles

**-Cell Membrane:** outer boundary of cell, regulates what comes in & what goes out of the cell  
we will talk about structure next semester

**-Nucleus:** control center of cell  
usually a large dense body in center of cell  
most cells have 1 nucleus, some multinucleated  
surrounded by nuclear membrane with pores  
pores allow communication btw nucleus & rest of cell  
contains genetic material: DNA in form of chromosomes  
contains 1 or more nucleoli  
smaller round bodies made of RNA, make ribosomes

**-Cytoplasm:** "living soup of cell"  
mostly water, but also proteins, carbs, lipids, nucleic acids, & cellular organelles  
nucleoplasm: cytoplasm w/in nucleus  
  
2 components to cytoplasm: cytosol & cytoskeleton  
cytosol: water component  
cytoskeleton: network of very fine protein fibers that give organization & support to cell  
a change in protein fibers allows cell to move or change shape

**-Cellular Organelles:** "little organs" w/in cell, each w/ specific job  
mitochondria, ER, ribosomes, Golgi apparatus, lysosomes, vacuoles, centrioles, chloroplasts

<b>Plant Cells</b>	<b>Vs</b>	<b>Animal Cells</b>
<ul style="list-style-type: none"> <li>*cell wall               <ul style="list-style-type: none"> <li>rigid outer structure</li> <li>made of cellulose</li> <li>thick .1-10<math>\mu</math>m</li> <li>gives shape &amp; support</li> </ul> </li> </ul>		<ul style="list-style-type: none"> <li>*no cell wall</li> </ul>
<ul style="list-style-type: none"> <li>*cell membrane               <ul style="list-style-type: none"> <li>just inside cell wall</li> <li>same structure in both, much thinner than cell wall: .004-.005<math>\mu</math>m thick</li> <li>same function: controls what goes in &amp; out of cell</li> </ul> </li> </ul>		<ul style="list-style-type: none"> <li>*cell membrane               <ul style="list-style-type: none"> <li>outer boundary</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>*regular shape               <ul style="list-style-type: none"> <li>rectangular, square</li> <li>hexagonal</li> </ul> </li> </ul>		<ul style="list-style-type: none"> <li>*irregular shape               <ul style="list-style-type: none"> <li>roundish, flexible</li> <li>star-shaped</li> </ul> </li> </ul>
<p>plant cells maintain shape by cell walls &amp; vacuoles</p> <p>animal cells maintain shape by cytoskeleton</p>		
<ul style="list-style-type: none"> <li>*large central vacuole               <ul style="list-style-type: none"> <li>mainly filled w/H<sub>2</sub>O to maintain shape &amp; rigidity</li> <li>supports plant</li> <li>also serves as storage</li> <li>area for proteins, ions, wastes</li> </ul> </li> </ul>		<ul style="list-style-type: none"> <li>*small vacuole</li> </ul>
<ul style="list-style-type: none"> <li>*plastids: organelles that               <ul style="list-style-type: none"> <li>can make or store food</li> <li>or contain pigments</li> <li>ex. chloroplasts, chromoplasts</li> </ul> </li> </ul>		<ul style="list-style-type: none"> <li>*no plastids</li> </ul>