

Honors Biology – Unit 2 – Chapter 4
"A TOUR OF THE CELL"

1. light microscope
2. scanning electron microscope vs. transmission electron microscope
3. surface area to volume ratio
4. prokaryotic cell vs. animal cell vs. plant cell
5. protein synthesis pathway:
 - nucleus, nuclear envelope, nucleolus, ribosomes
6. endo-membrane system:
 - rough ER, smooth ER, transport vesicle, Golgi apparatus, cell membrane
7. storage and degradation:
 - lysosome, peroxisome, central vacuole
8. energy transformation:
 - mitochondrion, chloroplast
9. structure, support, and movement:
 - cytoplasm, cytoskeleton, cell wall, extracellular matrix, cilia, flagellum

Honors Biology – Chapter 4 Word Roots
"A TOUR OF THE CELL"

centro- = **center** (*centriole*: an animal cell structure composed of cylinders of microtubule triplets; within the cell's centrosome, a pair of centrioles function in cell division)

chloro- = green; **-plast** = molded (*chloroplast*: the site of photosynthesis in plants and algae)

cili- = hair (*cilium*: a short hair-like cellular appendage with a microtubule core, specialized for locomotion)

cyto- = cell; **-plasm** = fluid (*cytoplasm*: everything inside a cell between the plasma membrane and the nucleus, consisting of a semifluid medium and organelles)

-ell = small (*organelle*: a membrane-enclosed structure with a specialized function within a cell)

endo- = inner (*endomembrane system*: the system of membranes within a cell that includes the nuclear envelope, endoplasmic reticulum, Golgi apparatus, lysosomes, vacuoles, and the plasma membrane)

endo- = inner; **sym-** = together; **bios-** = living (*endosymbiosis*: when one organism lives inside another organism; the process by which the mitochondria and chloroplasts of eukaryotic cells probably evolved)

eu- = true; **karyo-** = nucleus (*eukaryotic cell*: a cell with a membrane-enclosed nucleus and other membrane-enclosed organelles)

extra- = outside (*extracellular matrix*: the substance in which animal tissue cells are embedded)

flagell- = whip (*flagellum*: a long whip-like cellular appendage specialized for locomotion)

glyco- = sweet (*glycoprotein*: a macromolecule consisting of one or more polypeptides linked to short chains of sugars)

lyso- = loosen (*lysosome*: a digestive organelle containing hydrolytic enzymes used by eukaryotic cells to digest food and wastes)

Honors Biology – Chapter 4 Word Roots
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micro- = small; **-tubul** = a little pipe (*microtubule*: a straight, hollow tube of globular proteins in the cytoskeleton of eukaryotic cells that support the structure and movement of cilia and flagella)

micro- = small; **-graphy** = a picture (*micrograph*: a photograph taken through a microscope)

nucle- = nucleus; **-oid** = like (*nucleoid*: a dense region of DNA in a prokaryotic cell)

pro- = before; (*prokaryotic cell*: a cell that has no nucleus)

-soma = a body (*chromosome*: the structure carrying the genetic material found in the nucleus of a eukaryotic cell; also, the main gene-carrying structure of a prokaryotic cell; *ribosome*: a cell structure consisting of RNA and protein organized into two subunits and functioning as the site of protein synthesis in the cytoplasm; *peroxisome*: an organelle containing enzymes that transfer hydrogen from various substrates to oxygen, producing and then degrading hydrogen peroxide)

thylaco- = sac or pouch (*thylakoid*: a flattened membranous sac inside the chloroplast that serves as the site of the light reactions of photosynthesis)

trans- = across; **-port** = a harbor; **vesic-** = sac or bladder (*transport vesicle*: a membranous compartment used to enclose and transport materials from one part of a cell to another)

vacu- = empty (*vacuole*: a membrane-enclosed sac that is part of the endomembrane system of a eukaryotic cell)

| |
|--------------|
| PROPERTY OF: |
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HONORS BIOLOGY – UNIT 2 – CHAPTER 4 NOTES

A TOUR OF THE CELL

Microscopes

Light microscope = magnifies objects using light

PRO = cheap, easy to use, color

CON = cannot magnify images very much

Scanning electron microscope = magnifies the outer surface of an object using electron beams

PRO = provides a lot of detail

CON = expensive, black and white

Transmission electron microscope = magnifies the inner portion of an object using electron beams

PRO = provides a lot of detail

CON = expensive, black and white

3 Important Cell Types

- bacterial cell (prokaryotic)
- animal cell (eukaryotic)
- plant cell (eukaryotic)

Cell Pathways

- Protein Synthesis Pathway
- Endo-Membrane System
- Storage and Degradation
- Energy Transformation
- Structure, Support, and Movement

The Endo-Symbiotic Theory

- symbiosis = a close relationship between 2 organisms in which at least one benefits from the other
- The symbiotic theory explains how prokaryotic cells (bacteria) evolved into eukaryotic cells (Protista)
- First, the cell membrane of a large prokaryotic cell folded inward. This formed the nuclear envelope. Additional infoldings produced the rough ER, smooth ER, and Golgi apparatus.
- Second, the large prokaryotic cell “ate” a primitive mitochondrion.
- Third, the large prokaryotic cell “ate” a primitive chloroplast.
- MORE ABOUT THE ENDO-SYMBIOTIC THEORY IN CHAPTER 17!

PROPERTY OF:

THE 20 MAJOR ORGANELLES

PROTEIN SYNTHESIS PATHWAY

| <i>Organelle</i> | <i>Structure</i> | <i>Function</i> | <i>Plant? Animal?</i> |
|-------------------------|---|--|----------------------------------|
| Nucleus | Chromatin, Chromosomes | Contains the DNA and regulates cell activities | Plant Animal |
| Nuclear Envelope | Phospholipid Bilayer | Contains the nucleus and has pores to let materials out | Plant Animal |
| Nucleolus | Dark region within the nucleus | Creates ribosomes | Plant Animal |
| Ribosome | Small spheres in the cytoplasm or on the Rough ER | Creates proteins | Plant Animal |

ENDO-MEMBRANE SYSTEM

| <i>Organelle</i> | <i>Structure</i> | <i>Function</i> | <i>Plant? Animal?</i> |
|-------------------------|---|---|----------------------------------|
| Rough ER | Flattened sacs of membranes with ribosomes | Creates proteins to be exported from the cell | Plant Animal |
| Smooth ER | Flattened sacs of membranes without ribosomes | Creates lipids and carbohydrates to be exported from the cell | Plant Animal |
| Transport Vesicle | Small membrane- bound sac | Moves chemicals from ER to Golgi or from Golgi to the cell membrane | Plant Animal |
| Golgi Apparatus | Flattened sacs of membranes without ribosomes | Modifies and distributes chemicals to be exported from the cell | Plant Animal |
| Cell Membrane | Phospholipid Bilayer | Creates a barrier around the cell and regulates what enters and leaves the cell | Plant Animal |

STORAGE AND DEGRADATION

| <i>Organelle</i> | <i>Structure</i> | <i>Function</i> | <i>Plant? Animal?</i> |
|------------------|--------------------------|--|---------------------------|
| Lysosome | Small membrane-bound sac | Contains enzymes that digest chemicals that are no longer needed | Plant Animal |
| Peroxisome | Small membrane-bound sac | Contains enzymes that break down chemical poisons such as peroxide and alcohol | Plant Animal |
| Central Vacuole | Large membrane-bound sac | Stores water, sugars, and other important chemicals | Plant |

ENERGY TRANSFORMATION

| <i>Organelle</i> | <i>Structure</i> | <i>Function</i> | <i>Plant? Animal?</i> |
|------------------|---|---|---------------------------|
| Mitochondrion | Double membrane-bound sac with a highly folded inner membrane | Production of ATP (energy) | Plant Animal |
| Chloroplast | Double membrane-bound sac with flattened sacs inside | Production of glucose during photosynthesis | Plant |

STRUCTURE, SUPPORT, AND MOVEMENT

| <i>Organelle</i> | <i>Structure</i> | <i>Function</i> | <i>Plant? Animal?</i> |
|----------------------|---|---|---------------------------|
| Cytoplasm | Fluid inside a cell | Contains dissolved nutrients, ions, and other chemicals | Plant Animal |
| Cytoskeleton | Dissolved structural proteins in the cytoplasm | Maintains the cell's shape and structure | Plant Animal |
| Cell Wall | Made of cellulose or other water-insoluble polysaccharides | Protects the cell, maintains its shape and structure, and lets cells stick together | Plant |
| Extracellular Matrix | Structural proteins located on the outside of the cell membrane | Allows cells to stick together even though they do not have a cell wall | Animal |
| Cilia | Hair-like structures made of contractile proteins on the cell membrane | Moves substances across the surface of the cell | Animal |
| Flagellum | Thread-like structure made of contractile proteins on the cell membrane | Allows the cell to "swim" | Animal |