Cells: Prokaryote vs Eukaryote

Comparing size of cells
http://learn.genetics.utah.edu/content/begin/cells/scale/

Cells have evolved two different architectures:

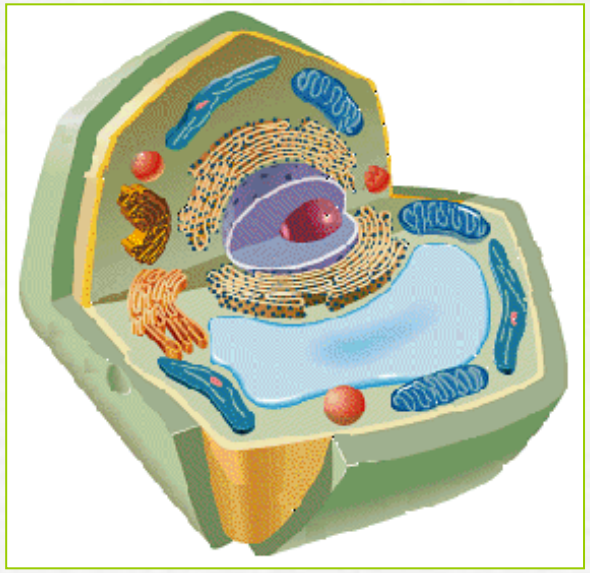
- Prokaryote “style”
- Eukaryote “style”

Cells are the basic unit of structure and function in the human body and other organisms. (they can be specialized to do many things)

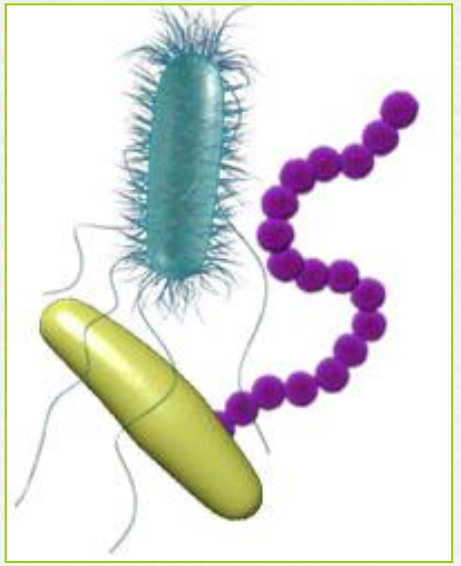
Cells can only be observed under microscope

Basic types of cells:

Animal Cell



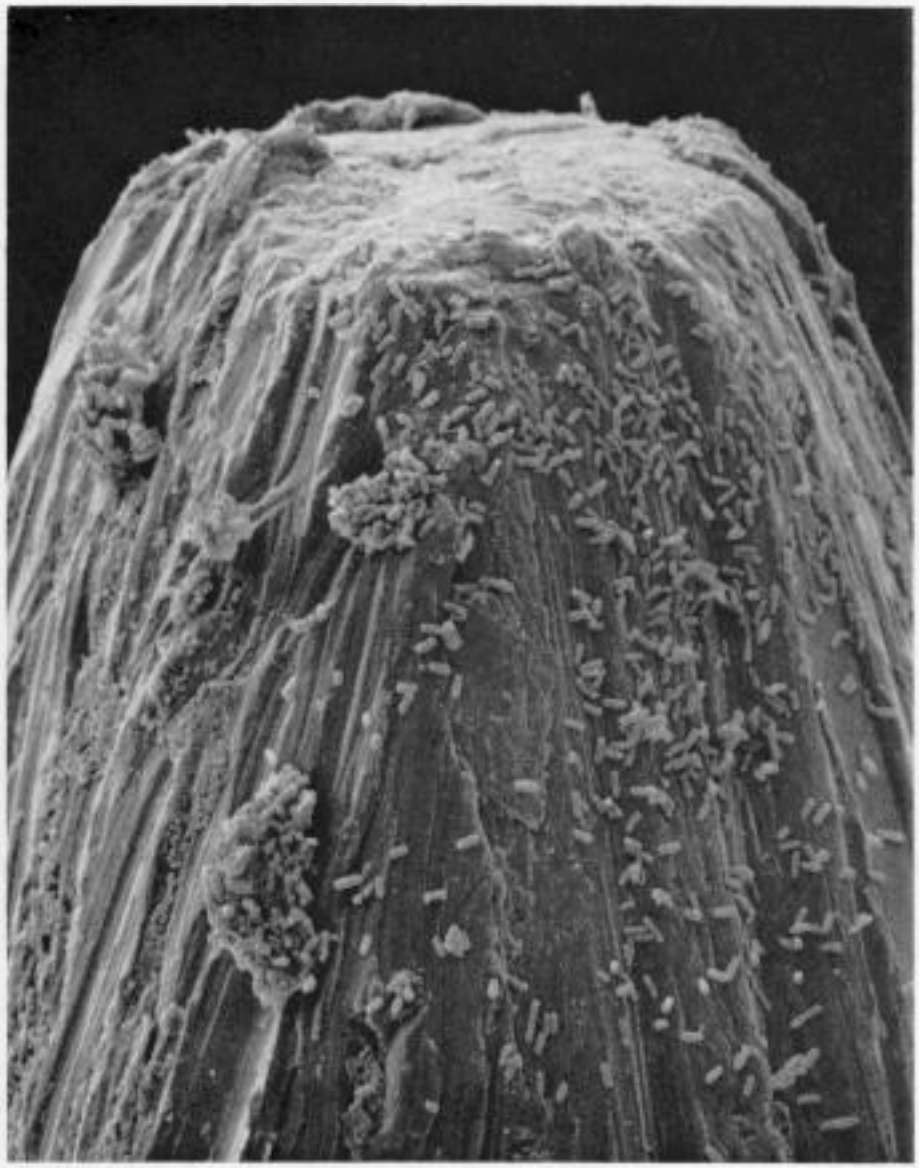
Plant Cell



Bacterial Cell

Prokaryote cells are smaller and simpler

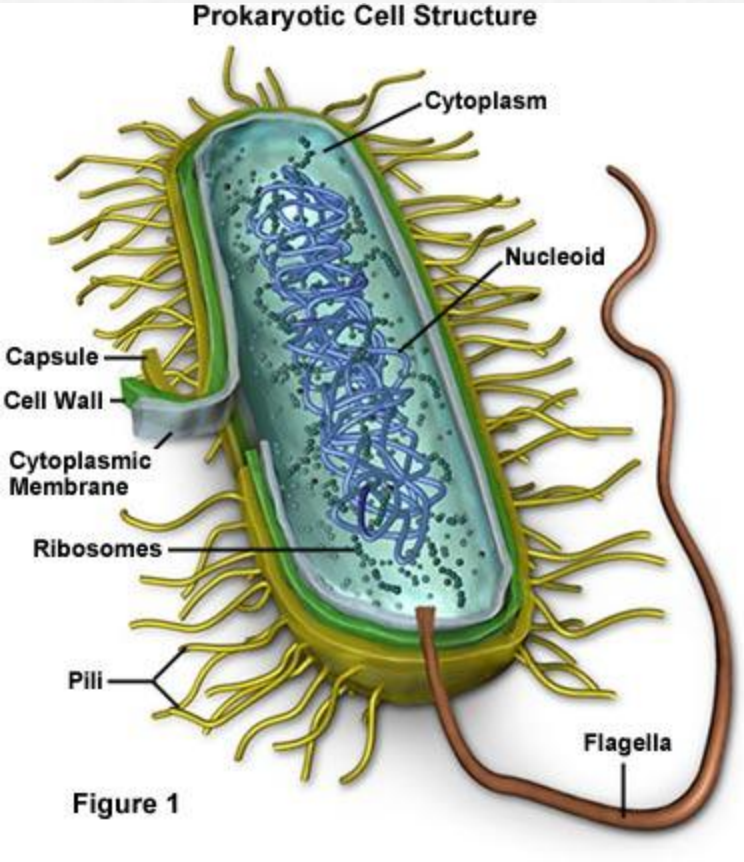
- Commonly known as bacteria
- 10-100 microns in size
- Single-celled(unicellular) or
- Filamentous (strings of single cells)



These are prokaryote E. coli bacteria on the head of a steel pin.

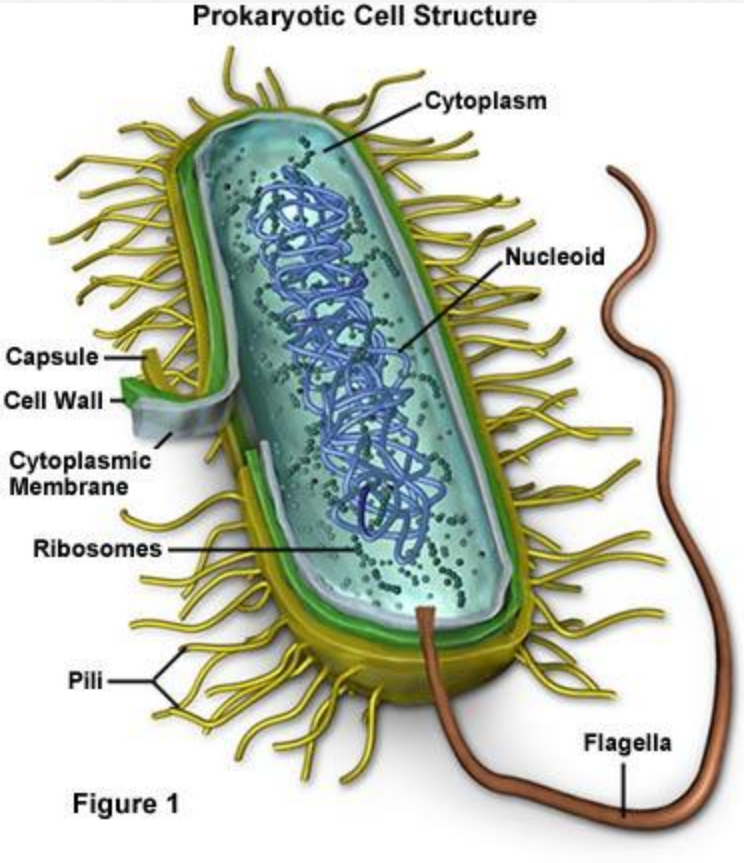
Prokaryote cells are simply built (example: E. coli)

- capsule: slimy outer coating
- cell wall: tougher middle layer
- cell membrane: delicate inner skin



Prokaryote cells are simply built (example: E. coli)

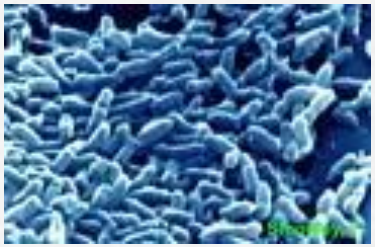
- cytoplasm: inner liquid filling
- DNA in one big loop
- pilli: for sticking to things
- flagella: for swimming
- ribosomes: for building proteins



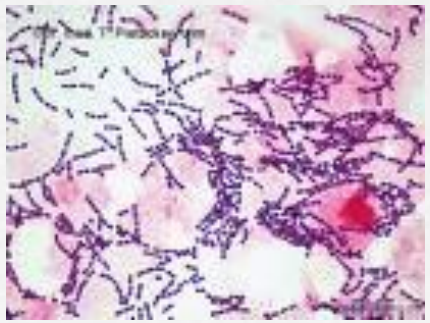
Prokaryote lifestyle

- unicellular: all alone

- colony: forms a film



- filamentous: forms a chain of cells



Prokaryote Feeding

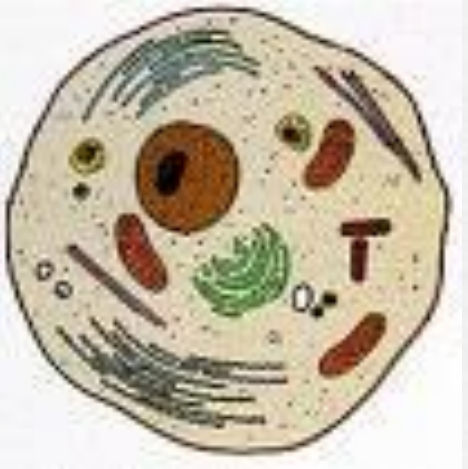
- Photosynthetic: energy from sunlight
- Disease-causing: feed on living things
- Decomposers: feed on dead things

Eukaryotes are bigger and more complicated

- Have organelles
- Have chromosomes
- can be multicellular
- include animal and plant cells

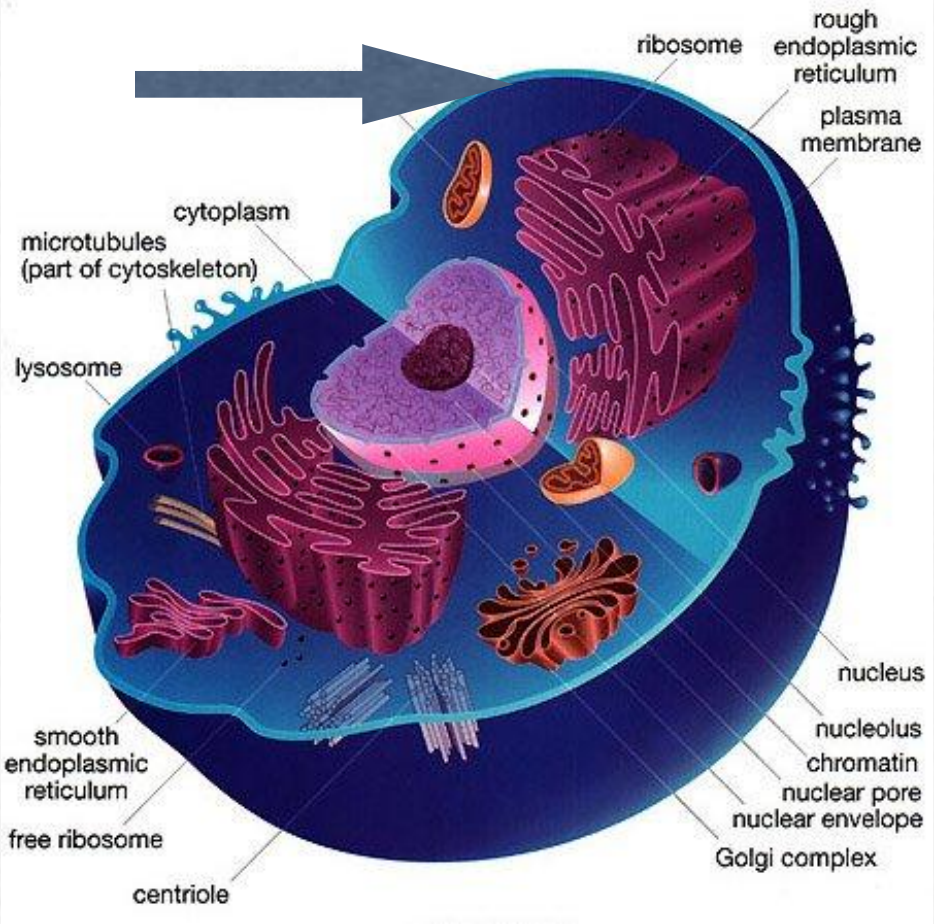
Organelles are membrane-bound cell parts

- Mini “organs” that have unique structures and functions
- Located in cytoplasm

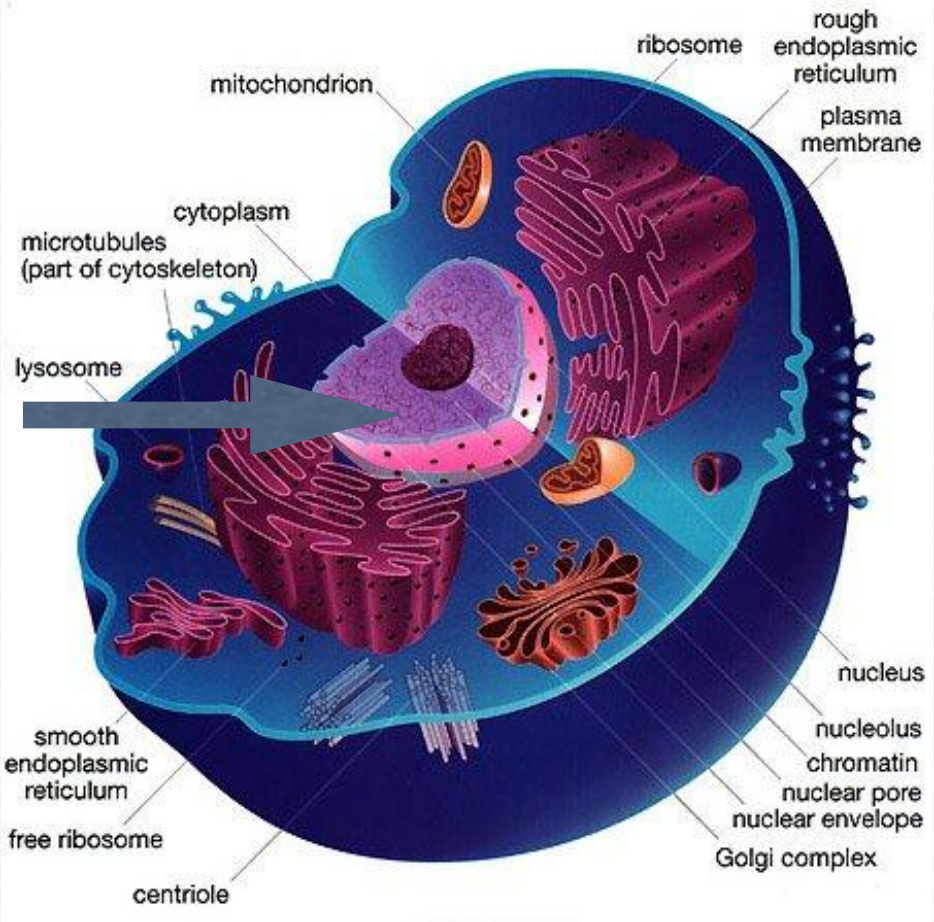


Cell Structures

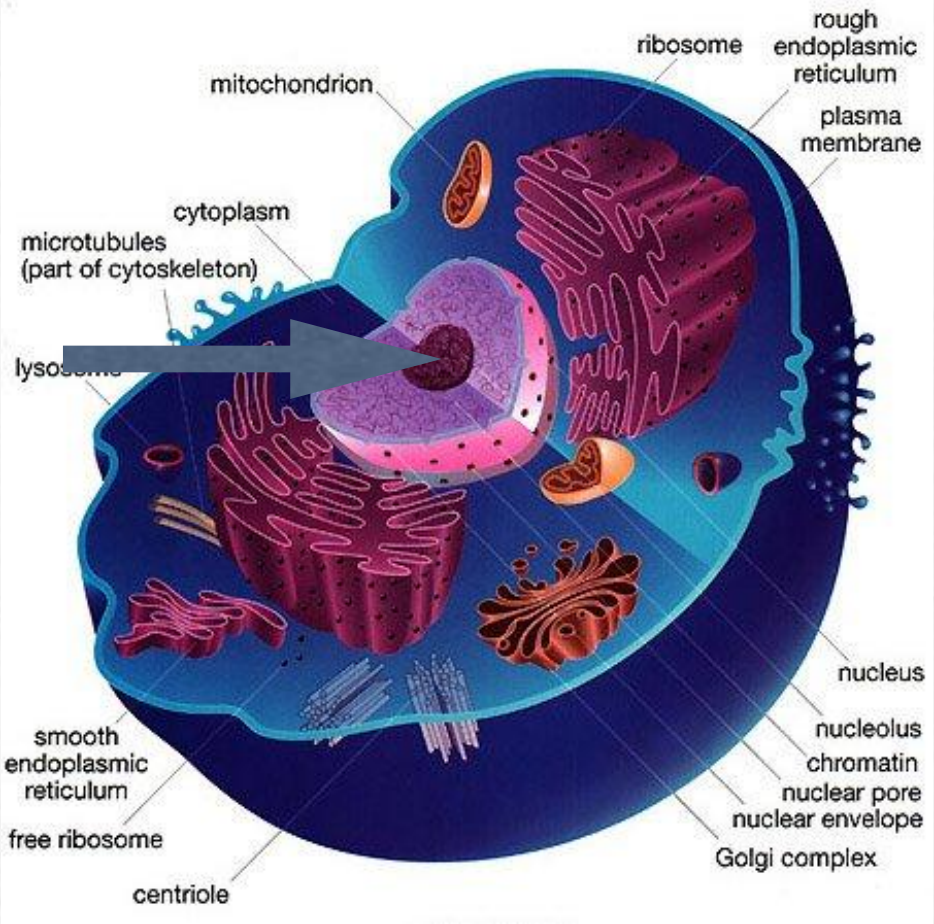
- Cell membrane
  - delicate lipid and protein skin around cytoplasm
  - found in <u>all</u> cells



- Nucleus “The Control Center”or the Brain of the cell.
  - a membrane-bound sac evolved to store the cell’s chromosomes(DNA)
  - has pores: holes



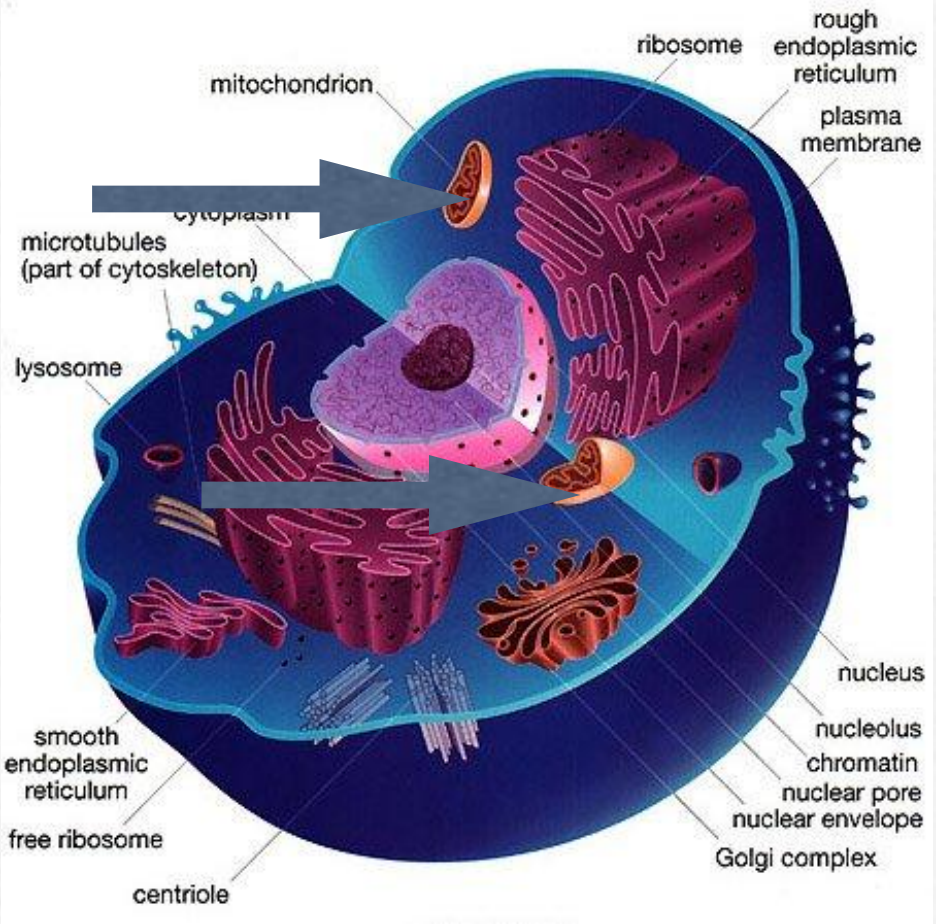
- Nucleolus
  - inside nucleus
  - location of ribosome factory
  - made or RNA
  - **Disappears when cell divides**



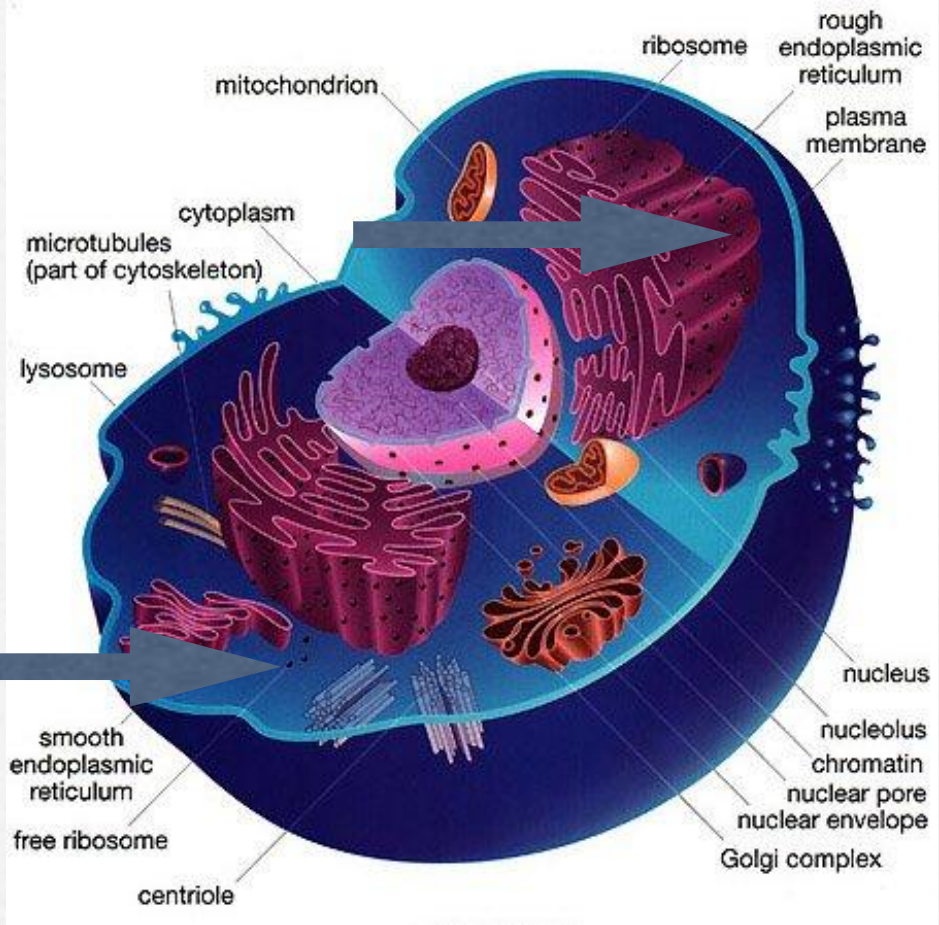
Mitochondrion

Nickname: "The Powerhouse"

- Function: Energy formation
- Breaks down food to make ATP
  - ATP: is the major fuel for all cell activities that require energy
  - **a double membrane, where cellular respiration takes place. Burn sugar (glucose) to make energy (ATP)**



- Ribosomes
  - build proteins from amino acids in cytoplasm
  - may be free-floating, or
  - may be attached to ER
  - made of RNA

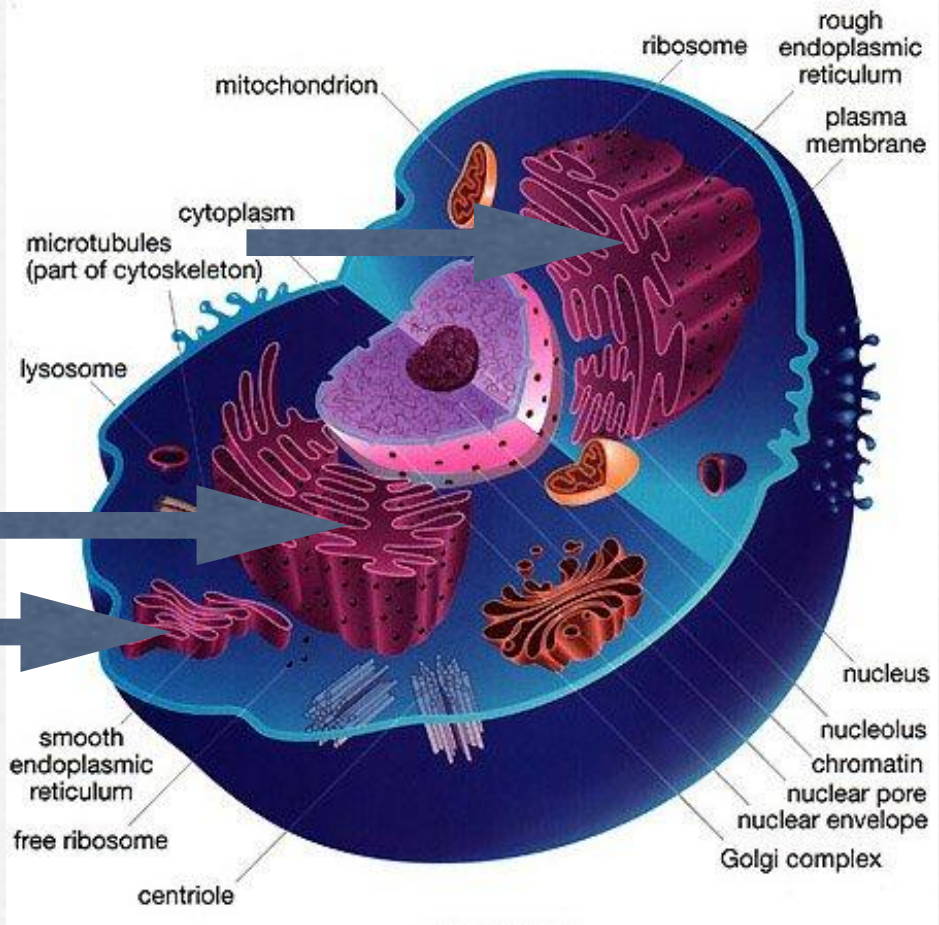


- Endoplasmic reticulum
  "Roads"

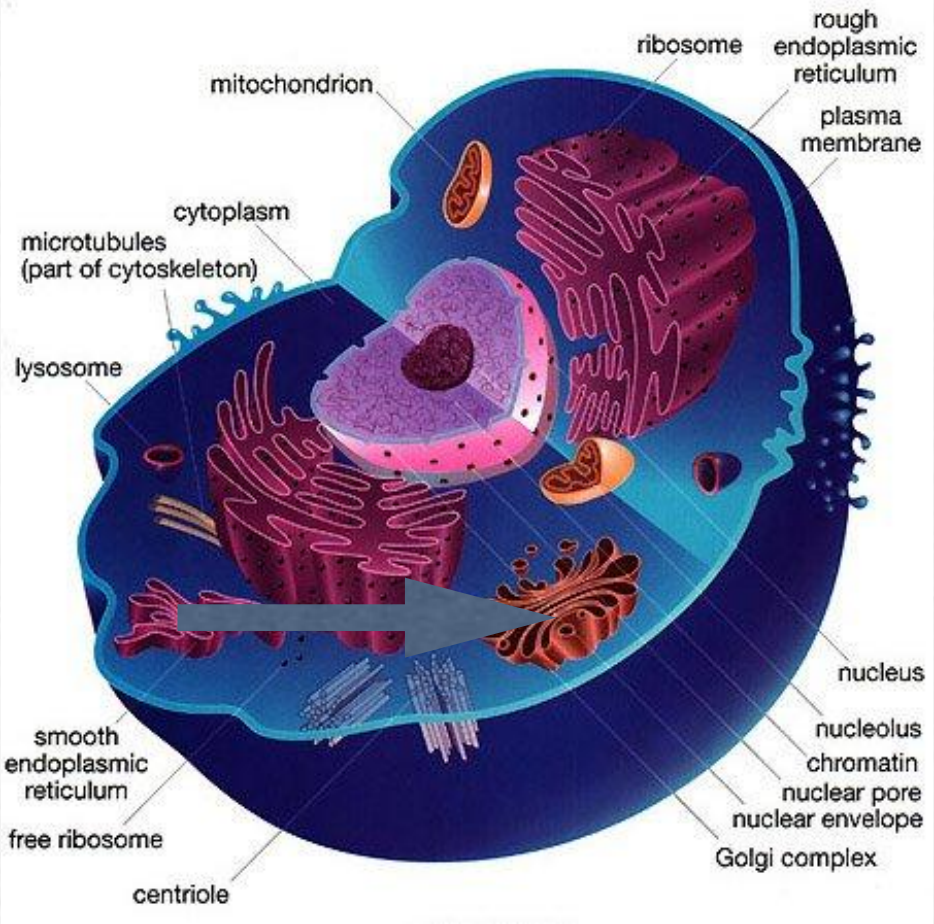
- Function: The internal delivery system of the cell **passageways made from membranes that transports proteins around the cell.**

  - may be smooth: builds lipids and carbohydrates

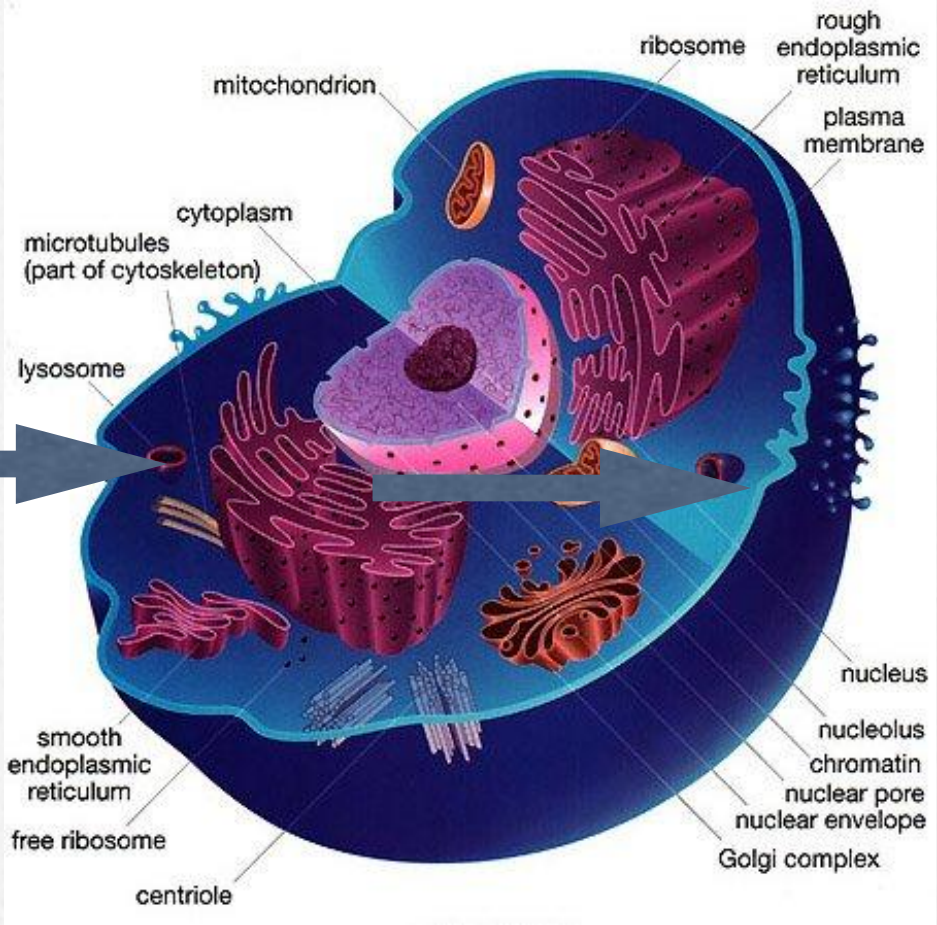
  - may be rough: stores proteins made by attached ribosomes



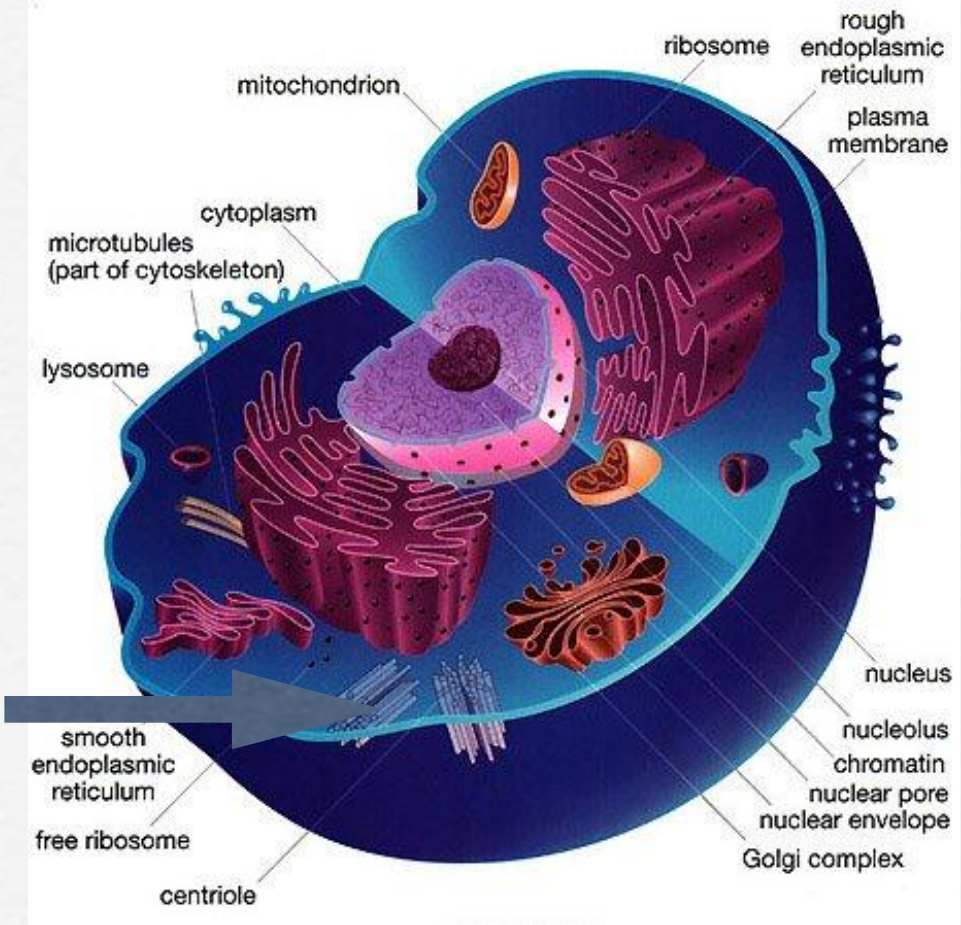
- Golgi Complex packages, modifies, and transports materials or proteins to different location inside/outside of the cell
  - takes in sacs of raw material from ER
  - sends out sacs containing finished cell products



- Lysosomes clean up crew
- sacs filled with digestive enzymes
  - digest worn out cell parts
  - digest food absorbed by cell
  - Lysosomes also come in and take over when your body is done fighting foreign objects.

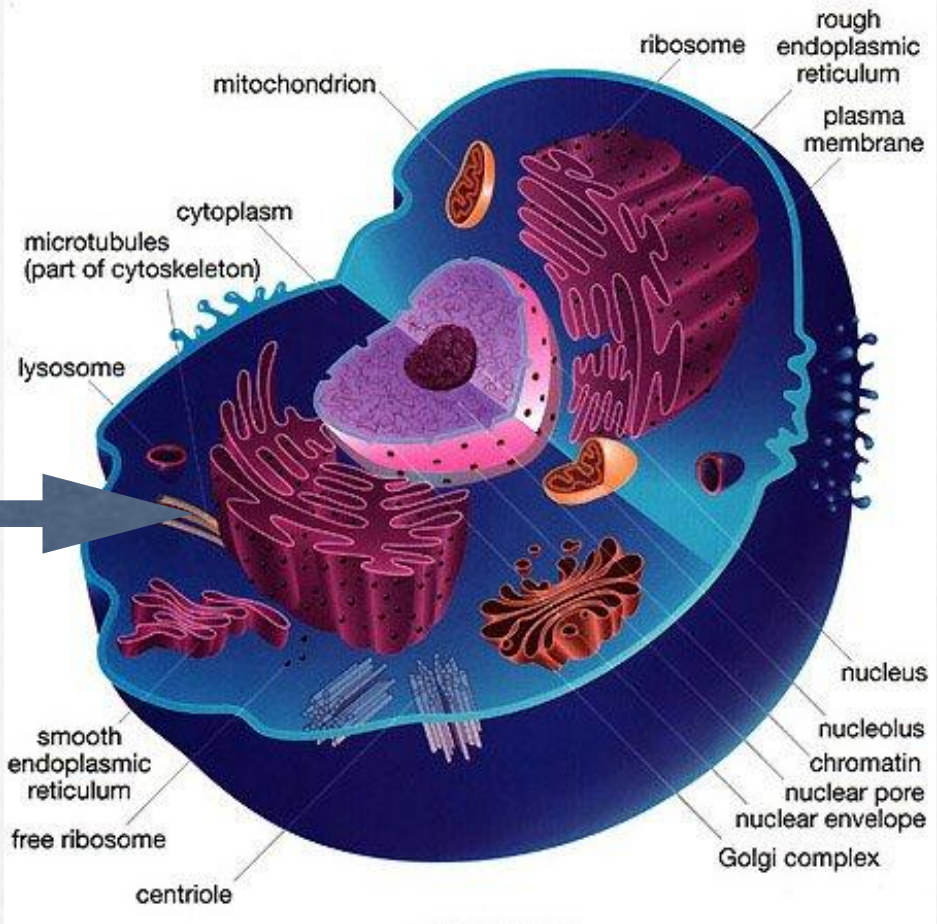


- Centrioles
  - pair of bundled tubes
  - organize cell division



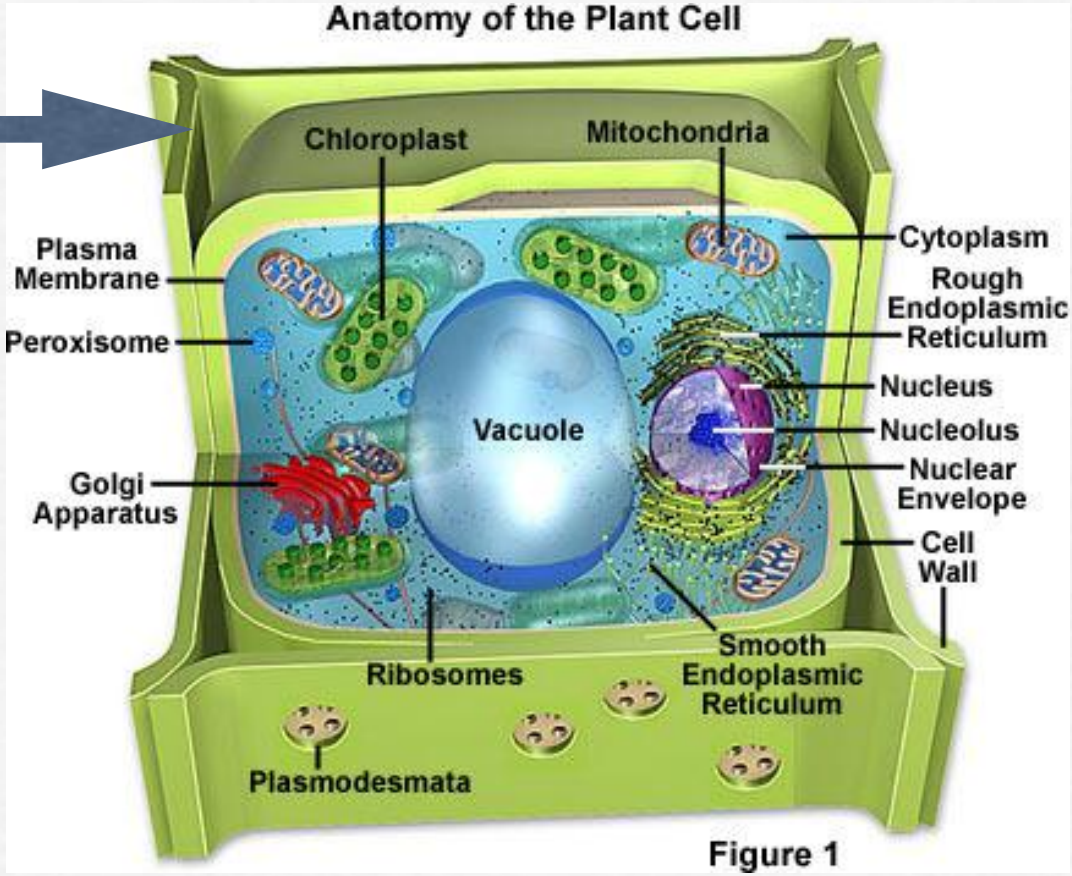
Cytoskeleton

- made of microtubules
- found throughout cytoplasm
- gives shape to cell & moves organelles around inside.

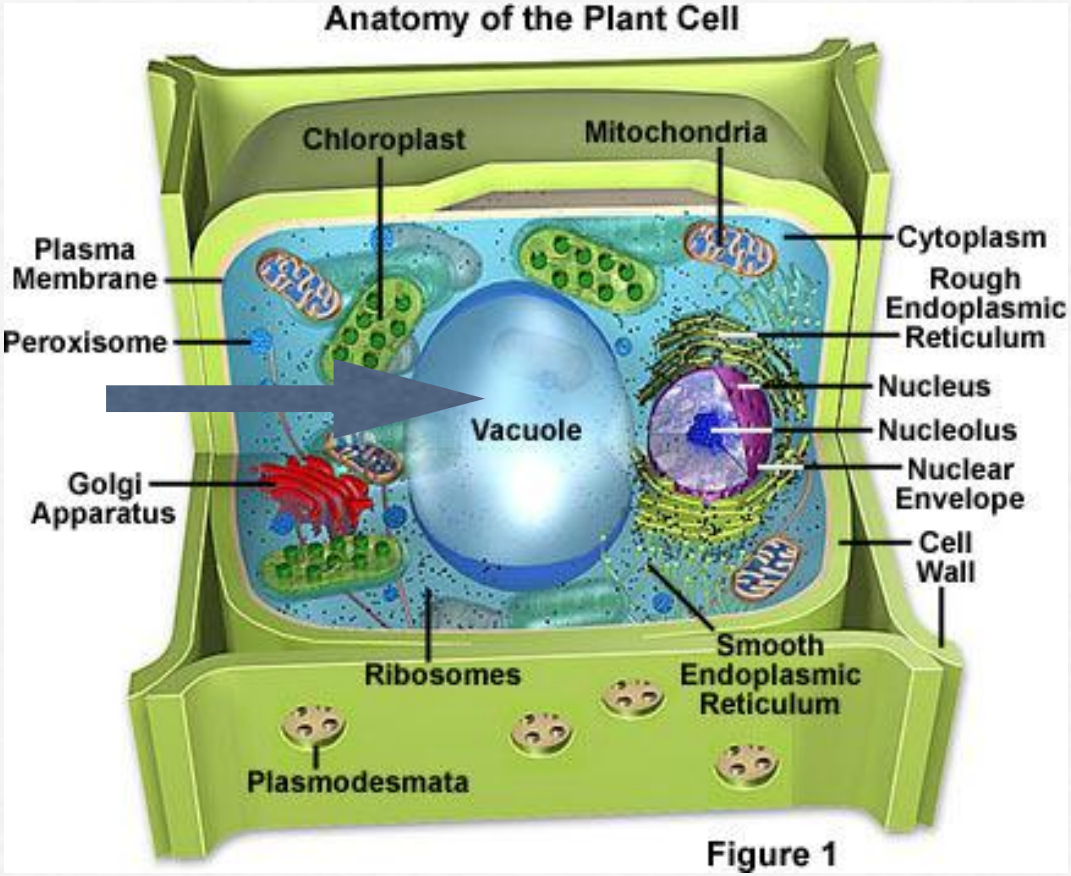


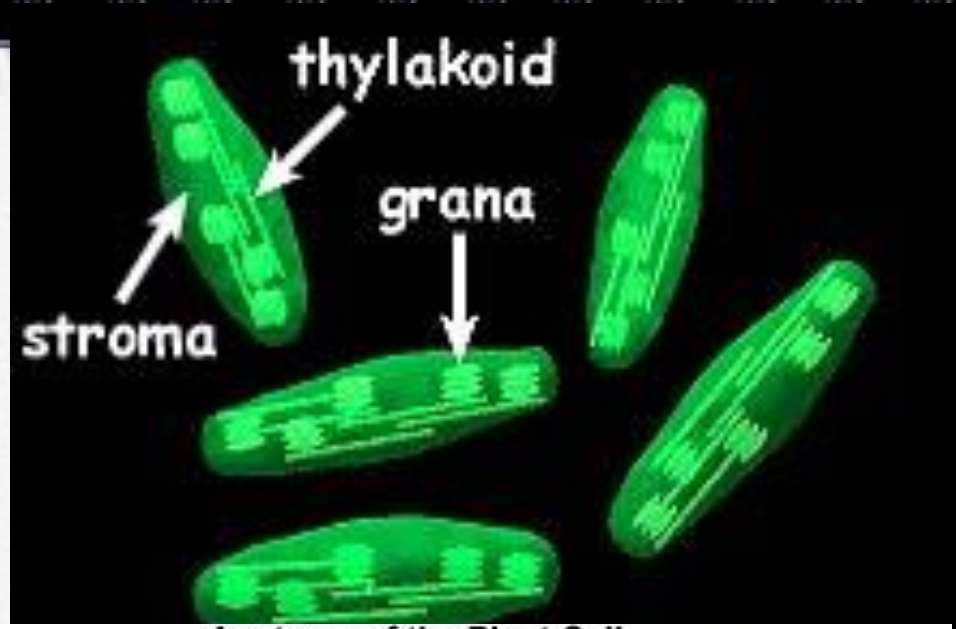
Structures found in plant cells

- Cell wall
  - very strong
  - made of cellulose
  - protects cell from rupturing
  - glued to other cells next door

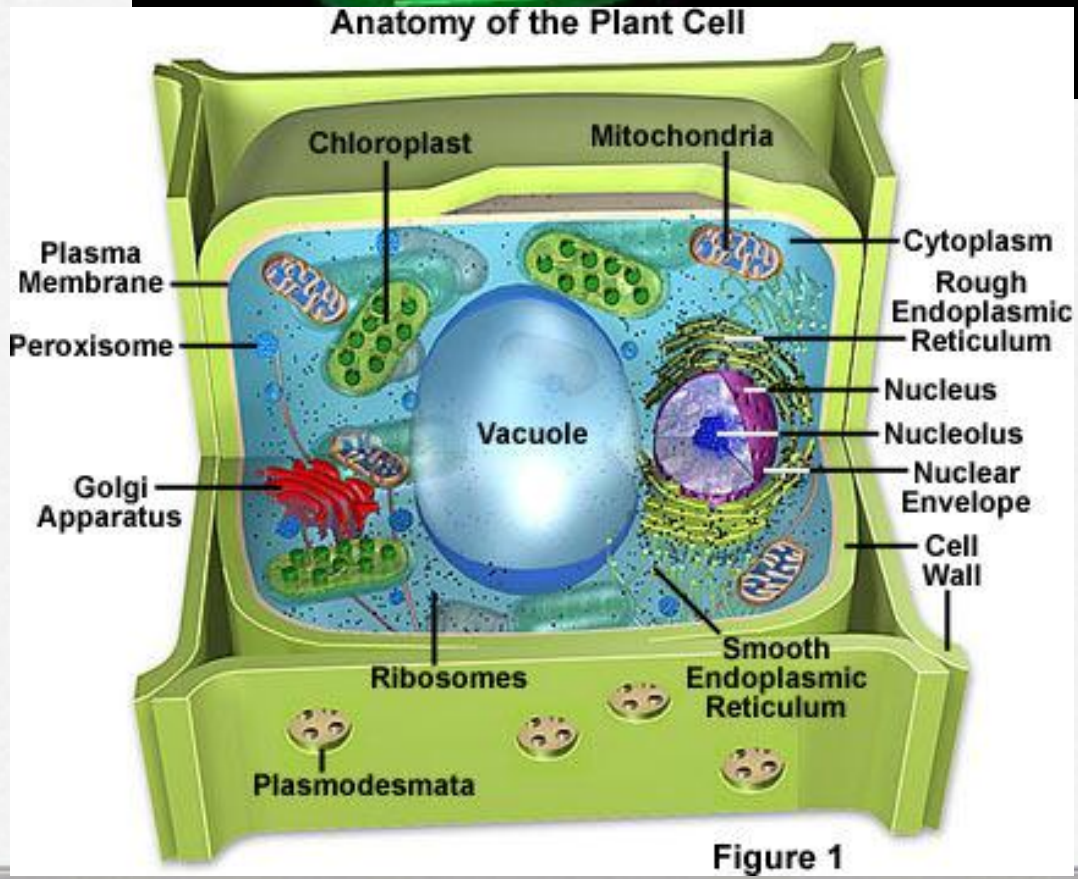


- Vacuole
  - huge water-filled sac
  - keeps cell pressurized
  - stores starch

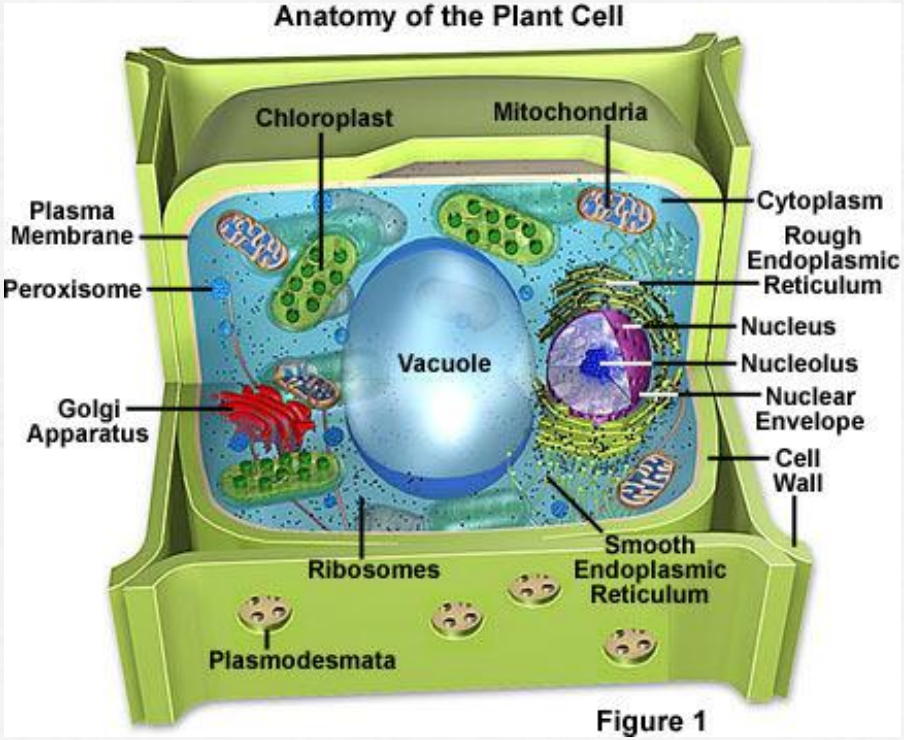


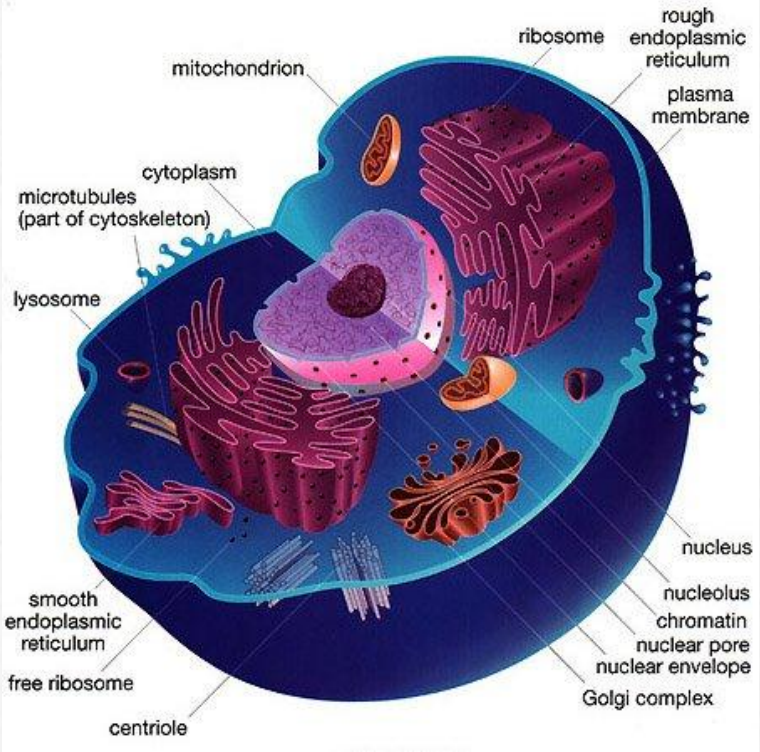


- Chloroplasts
  - filled with chlorophyll
  - turn solar energy into food energy

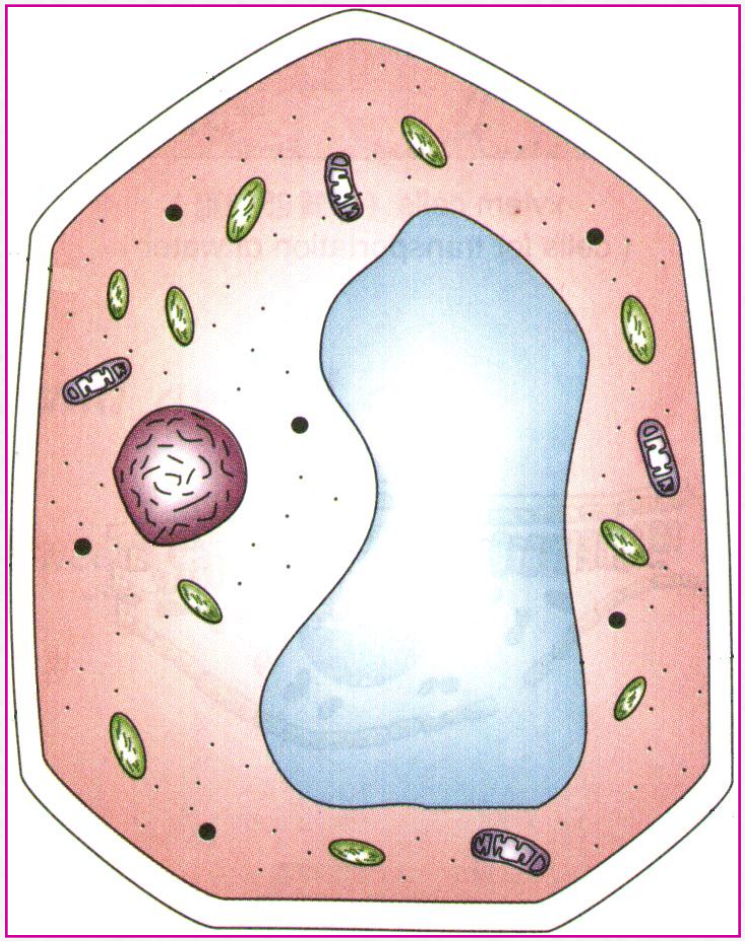


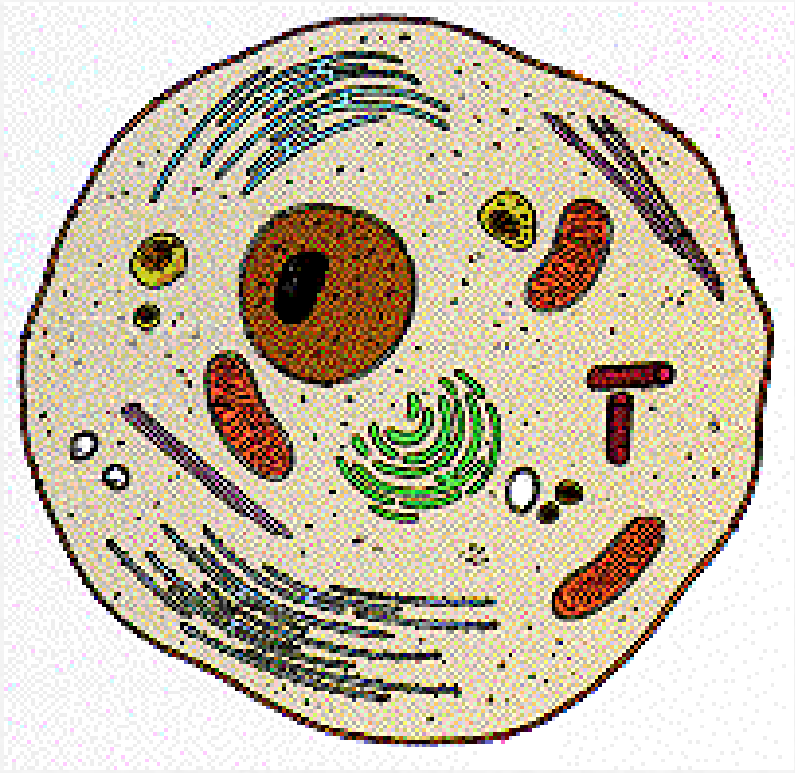
How are plant and animal cells different?





Examples of pics on test





Structure	Animal cells	Plant cells
cell membrane	Yes	yes
nucleus	Yes	yes
nucleolus	yes	yes
ribosomes	yes	yes
ER	yes	yes
Golgi	yes	yes
centrioles	yes	no
cell wall	no	yes
mitochondria	yes	yes
cholorplasts	no	yes
One big vacuole	no	yes
cytoskeleton	yes	Yes

Eukaryote cells can be multicellular

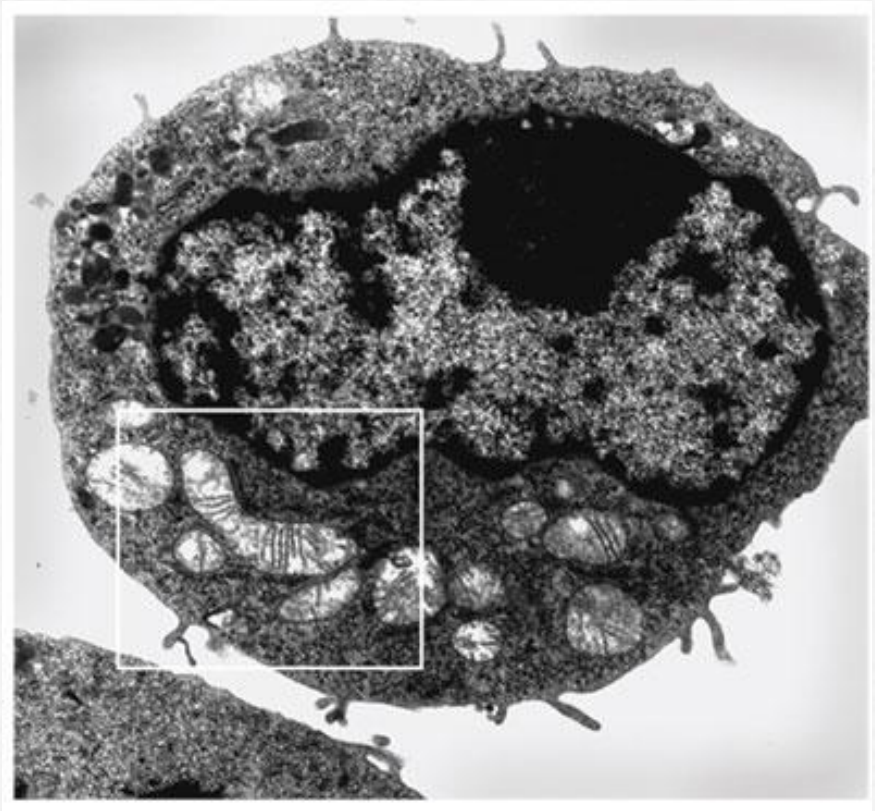
- The whole cell can be specialized for one job
- cells can work together as tissues
- Tissues can work together as organs

Advantages of each kind of cell architecture

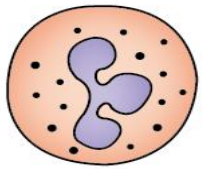
Prokaryotes	Eukaryotes
simple and easy to grow	can specialize
fast reproduction	multicellularity
all the same	can build large bodies

Examples of specialized euk. cells

- liver cell: specialized to detoxify blood and store glucose as glycogen.

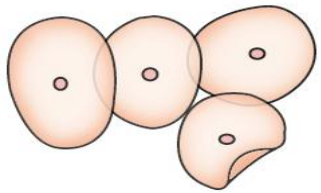


Different kinds of animal cells

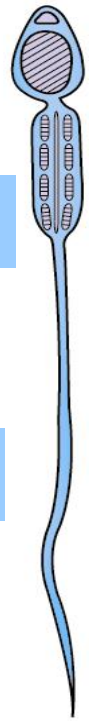


white blood cell

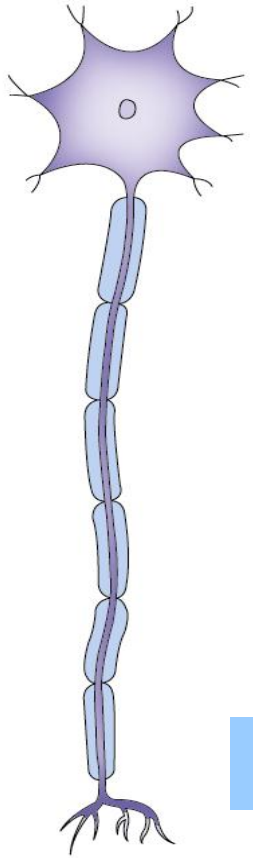
red blood cell



cheek cells

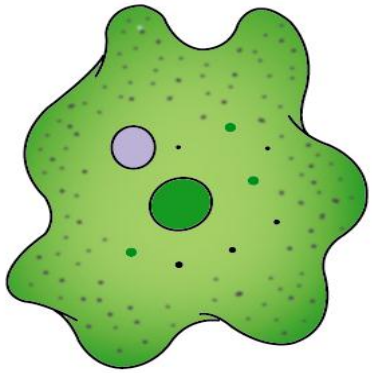


sperm

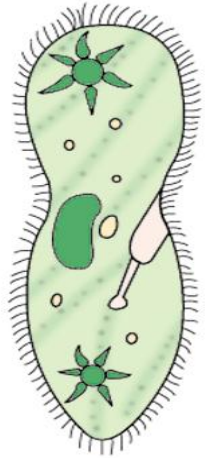


nerve cell

muscle cell

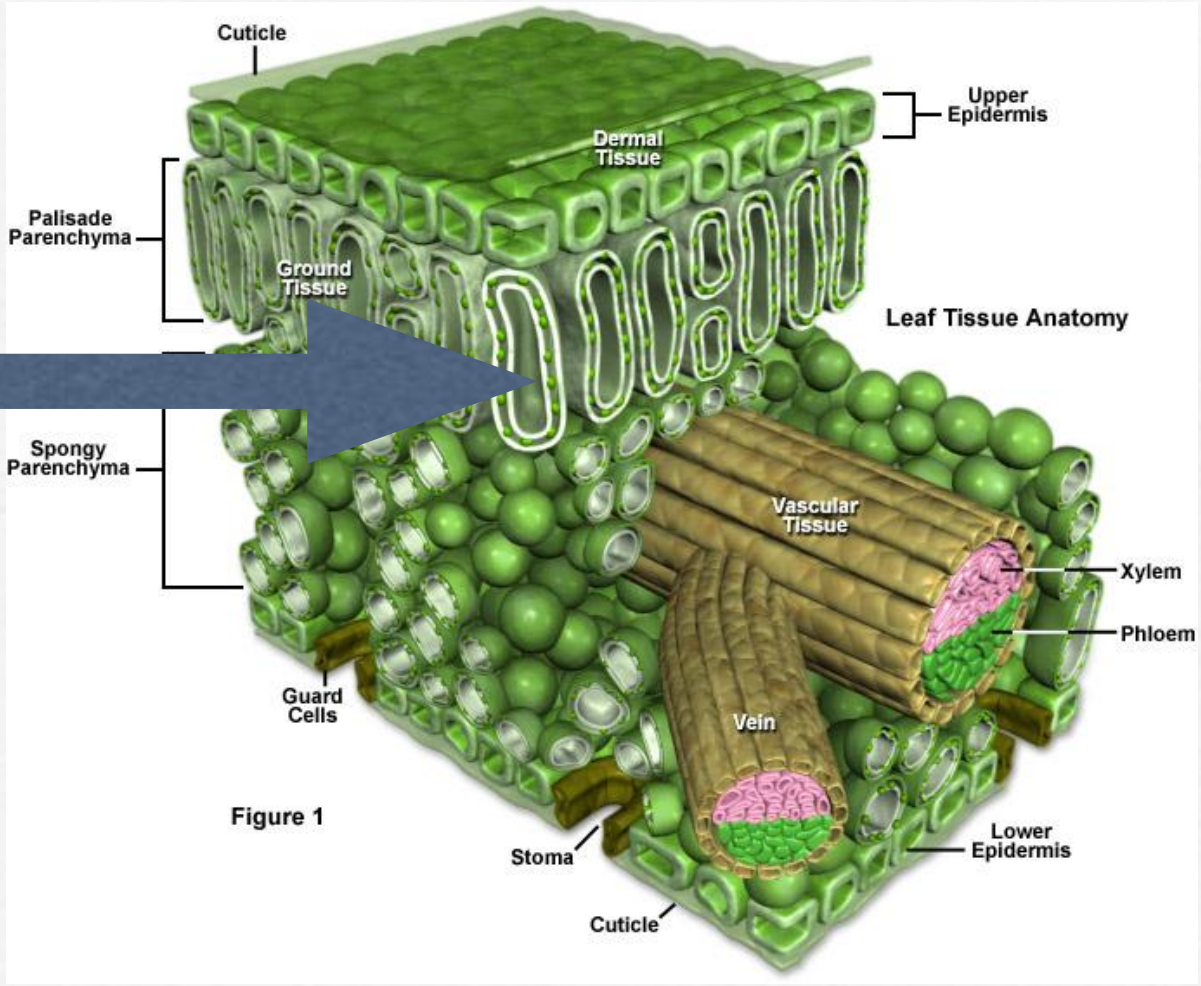


Amoeba



Paramecium

- Mesophyll cell
  - specialized to capture as much light as possible
  - inside a leaf

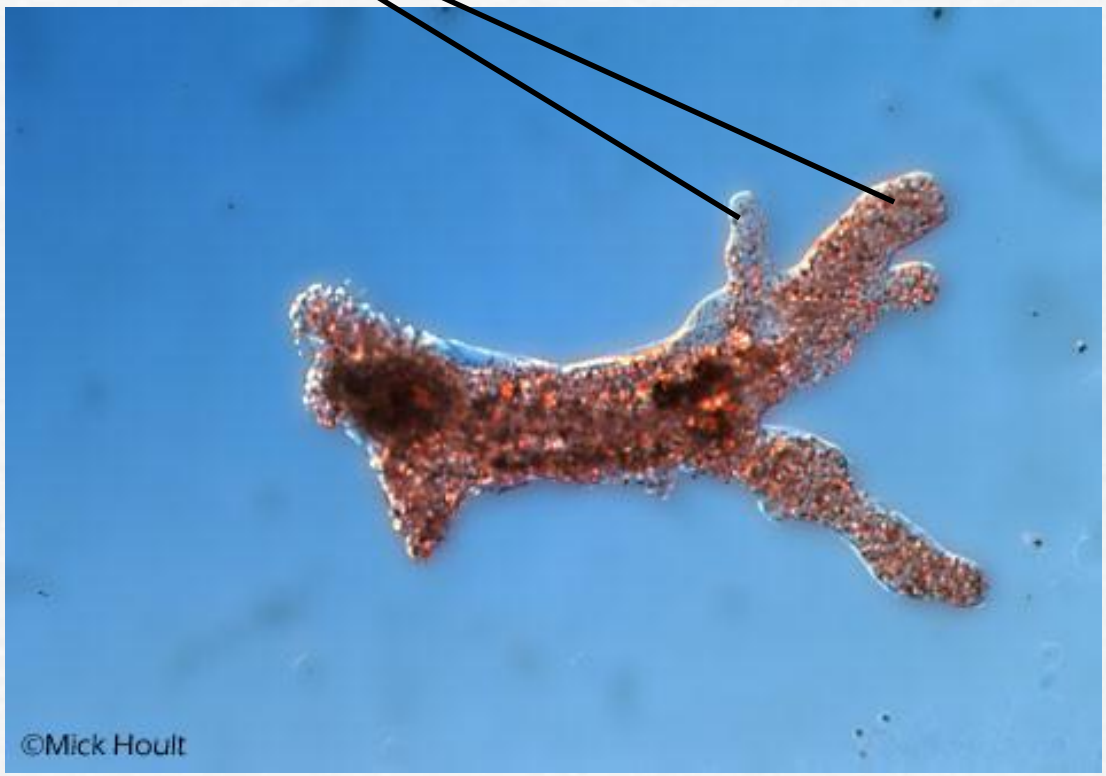


How do animal cells move?

- Some can crawl with pseudopods
- Some can swim with a flagellum
- Some can swim very fast with cilia

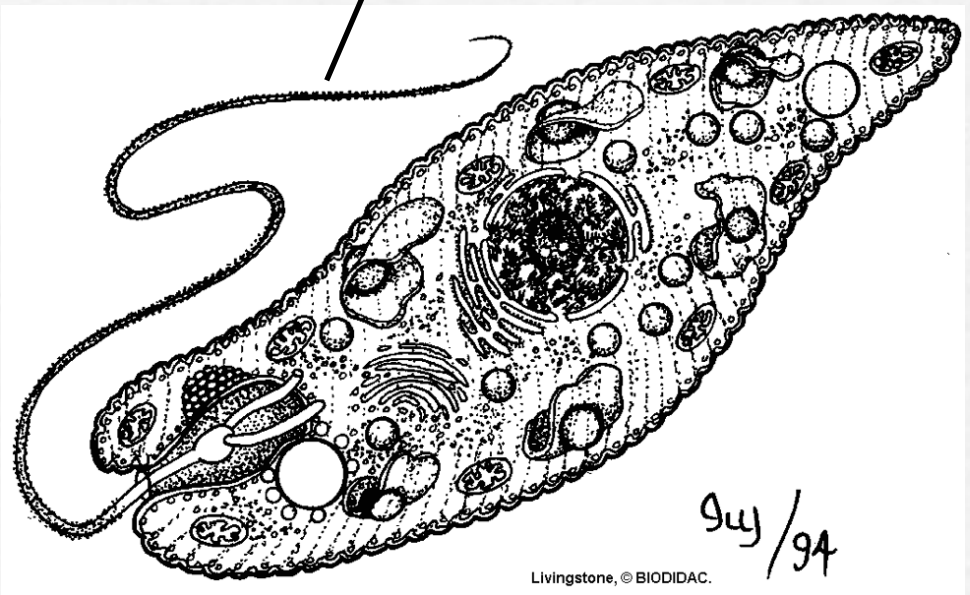
Pseudopods

- means “fake feet”
- extensions of cell membrane
- example: ameoba



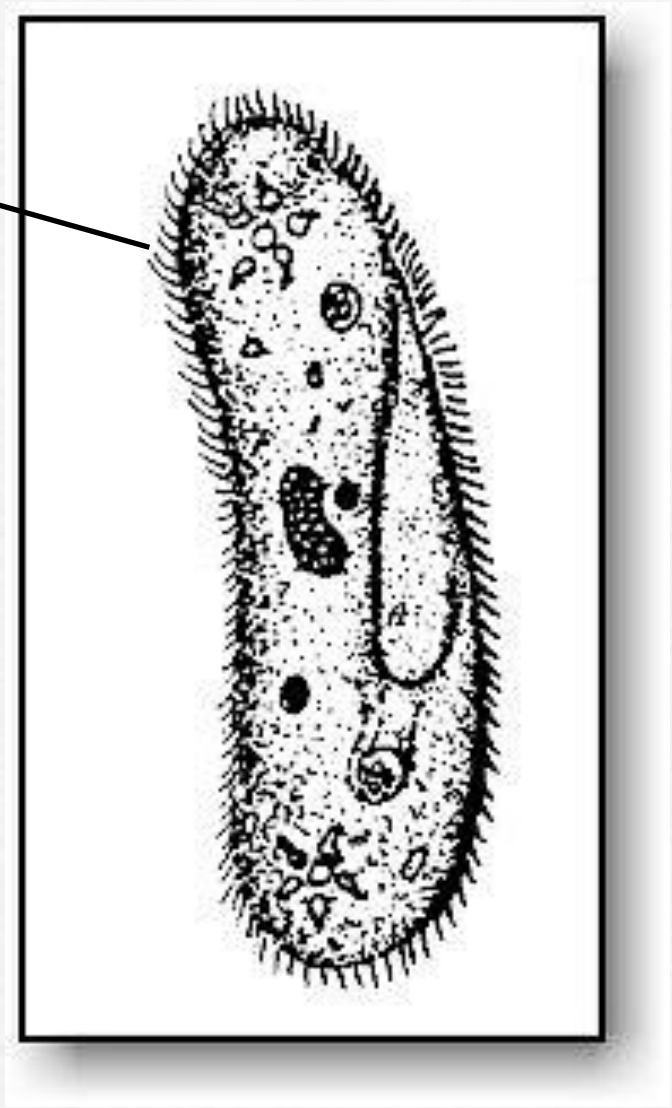
Flagellum/flagella

- large whiplike tail
- pushes or pulls cell through water
- can be single, or a pair



Cilia

- fine, hairlike extensions
- attached to cell membrane
- beat in unison



How did organelles evolve?

- many scientists theorize that eukaryotes evolved from prokaryote ancestors.
- in 1981, Lynn Margulis popularized the “endosymbiont theory.”

Endosymbiont theory:

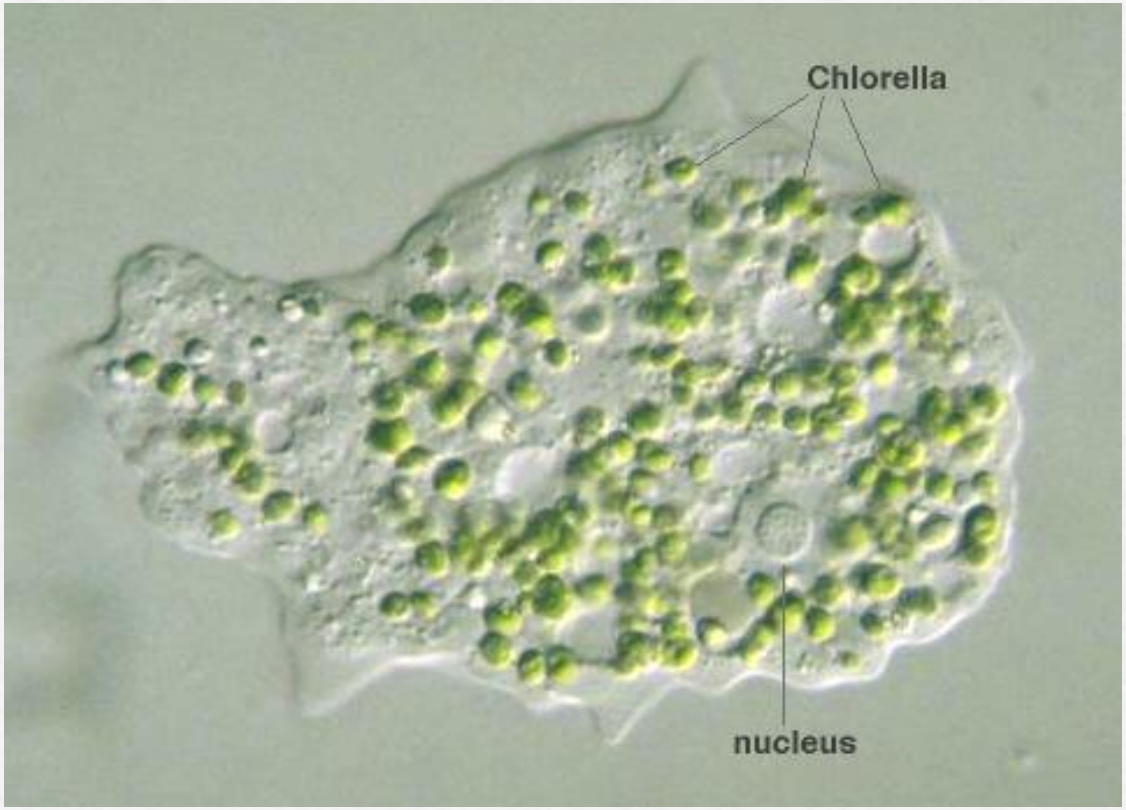
- a prokaryote ancestor “eats” a smaller prokaryote
- the smaller prokaryote evolves a way to avoid being digested, and lives inside its new “host” cell kind of like a pet.

Endo = inside

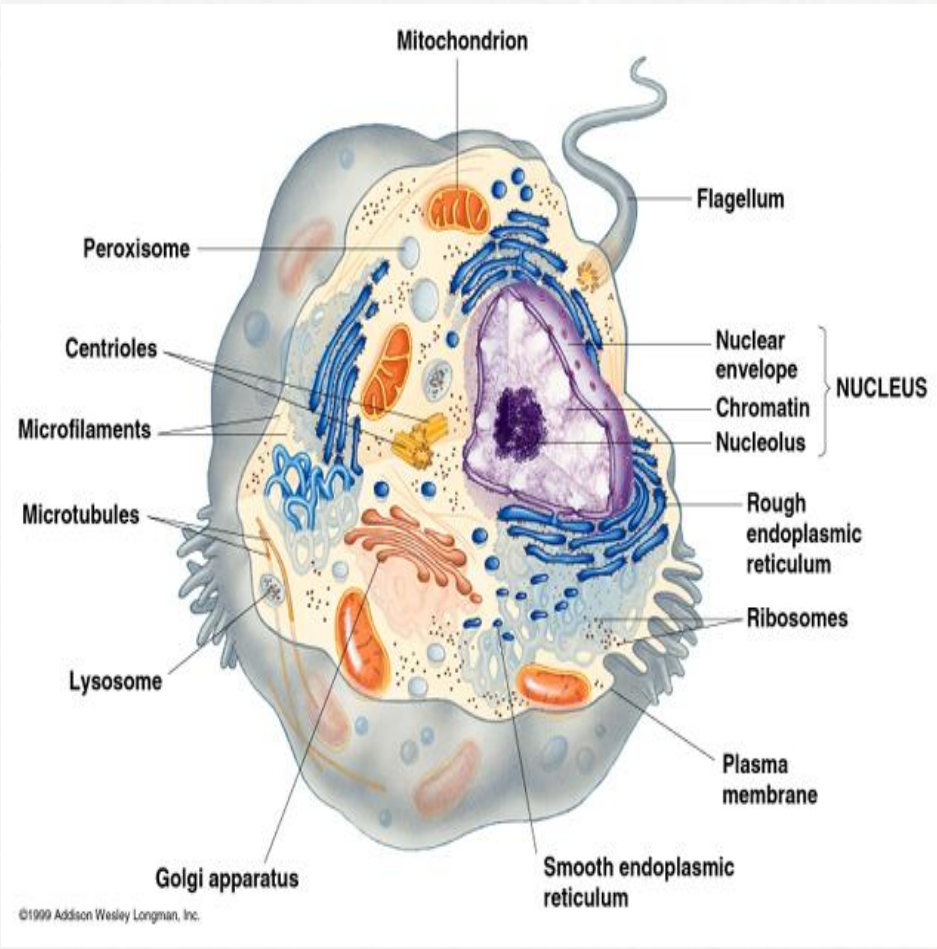
Symbiont = friend

- the small prokaryotes that can do photosynthesis evolve into chloroplasts, and “pay” their host with glucose.
- The smaller prokaryotes that can do aerobic respiration evolve into mitochondria, and convert the glucose into energy the cell can use.
- Both the host and the symbiont benefit from the relationship

- Chlorella are tiny green cells that live inside some amoeba... endosymbiosis may still be evolving today!



A Cell's Organelles are like



The goal of Santa's shop is to make toys

The goal of a Cell is to make proteins