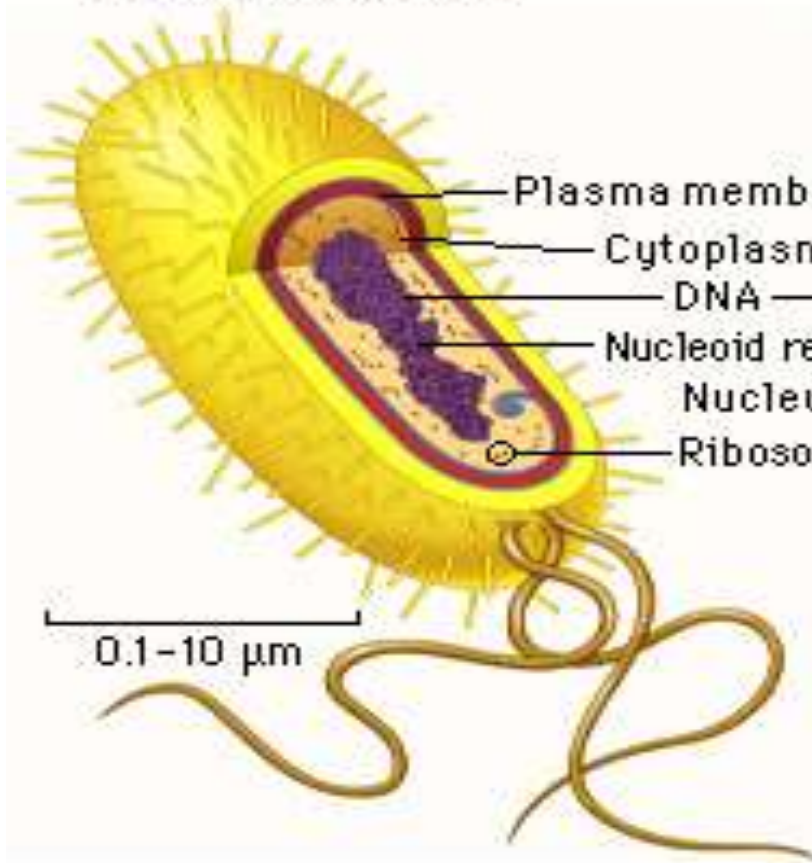
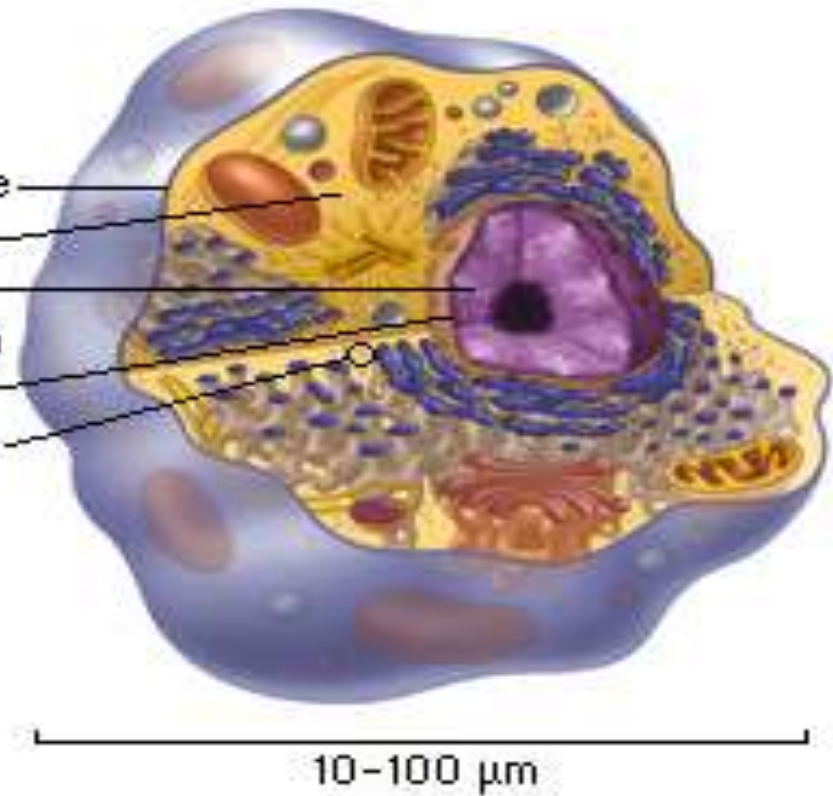


# Cells: Prokaryote vs Eukaryote

Prokaryotic cell



Eukaryotic cell



Plasma membrane

Cytoplasm

DNA

Nucleoid region

Nucleus

Ribosomes

0.1-10 μm

10-100 μm

# Cells have evolved two different architectures:

- Prokaryote “style”
- Eukaryote “style”

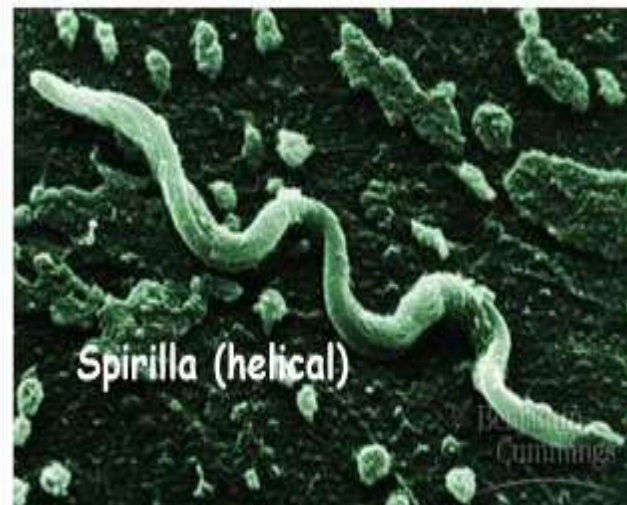
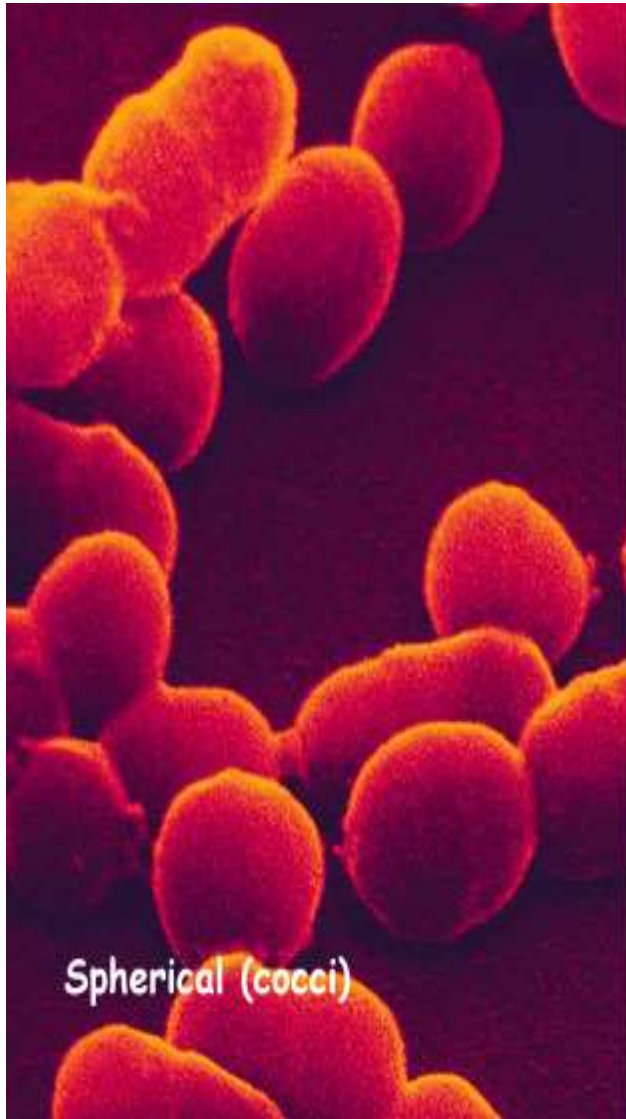
- **Prokaryotic cells** were here first and for billions of years were the only form of life on Earth. All **prokaryotic** organisms are **unicellular**
  
- **Eukaryotic cells** appeared on earth long after **prokaryotic cells** but they are much more advanced. **Eukaryotic** organisms unlike **prokaryotic** can be **unicellular** or **multicellular**.

# Characteristics of Prokaryotes

- Prokaryotes are the simplest type of cell.
- Oldest type of cell appeared about four billion years ago.
- Prokaryotes are the largest group of organisms
- Prokaryotes unicellular organisms that are found in all environments.

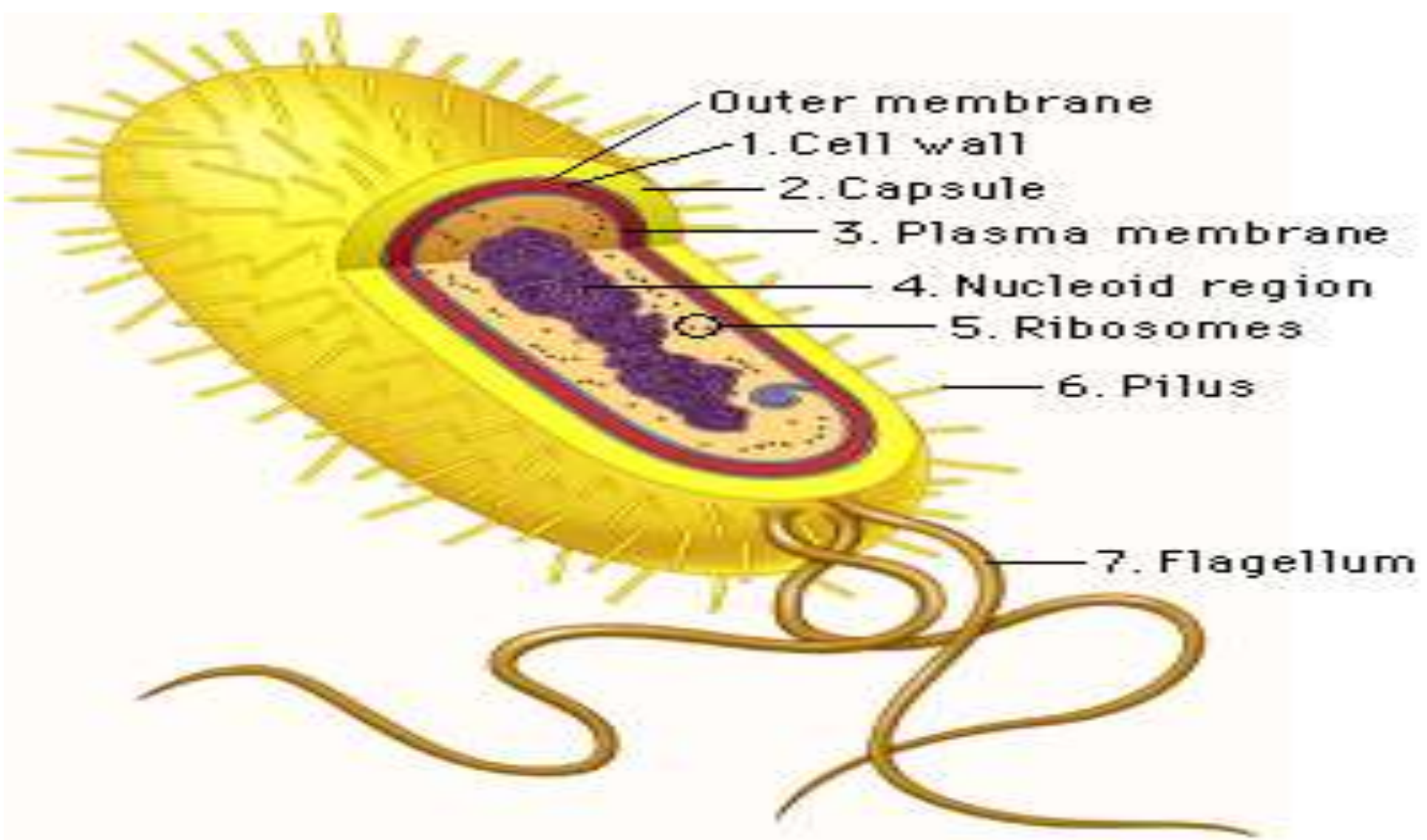
- Prokaryotes do not have a nuclear membrane. Their circular shaped genetic material dispersed throughout cytoplasm.
- Prokaryotes do not have membrane-bound organelles.
- Prokaryotes have a simple internal structure.
- Prokaryotes are smaller in size when compared to Eukaryotes.

# Shapes of Prokaryotes



- Cocci = spherical (round)
- Bacillus = (rod shaped)
- Spirilla = helical (spiral)



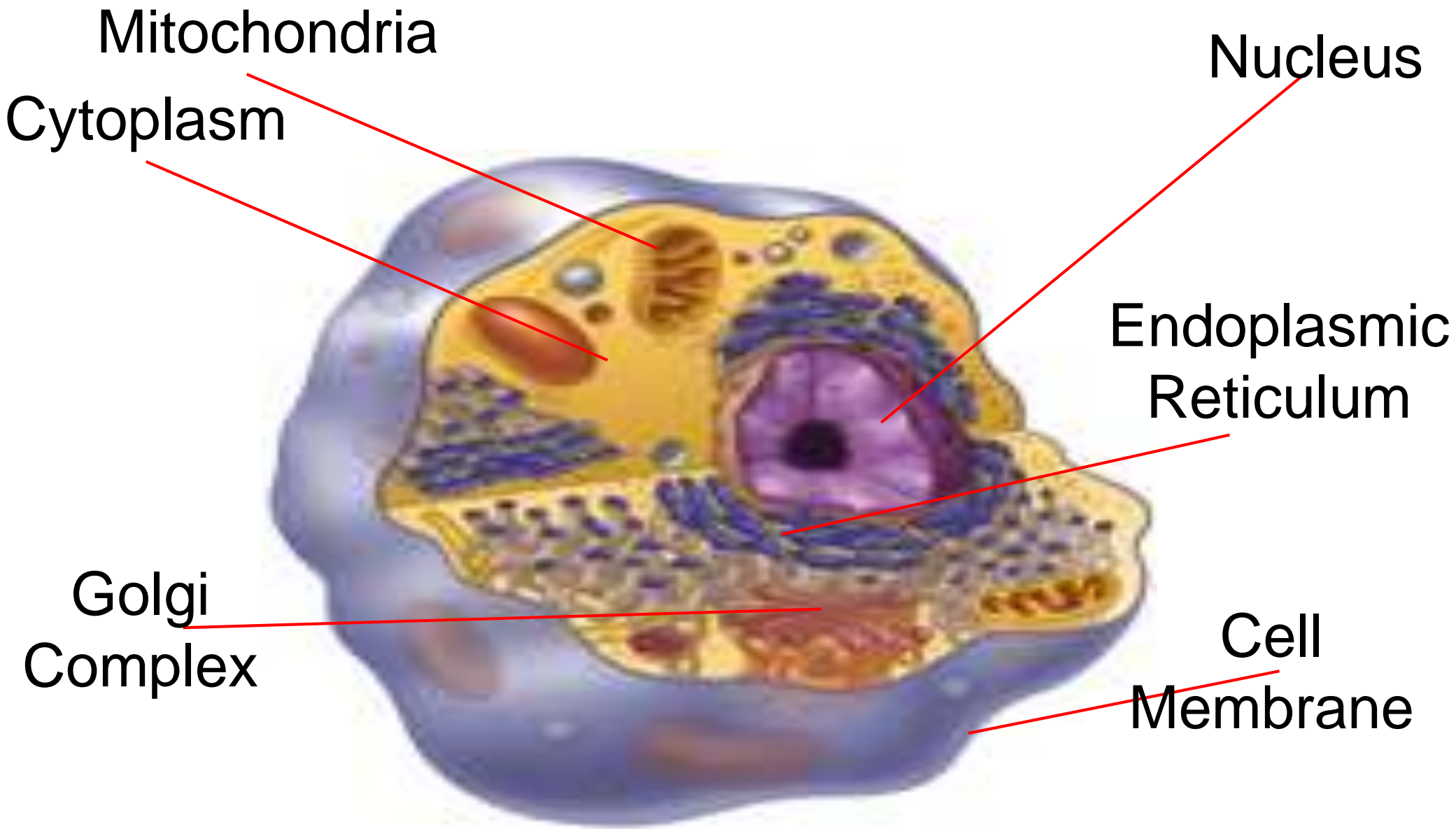


# Characteristics of eukaryotes

- Eukaryotic cells appeared approximately one billion years ago
- Eukaryotes are generally more advanced than prokaryotes
- Nuclear membrane surrounds linear genetic material (DNA)



- Unlike prokaryotes, eukaryotes have several different parts.
- Prokaryote's organelles have coverings known as membranes.
- **Eukaryotes** have a complex internal structure.
- Eukaryotes are larger than prokaryotes in size .



# Differences

## Prokaryotes

- Organelles lack a membrane
- Ribosomes are the only organelles
- Genetic material floats in the cytoplasm (DNA and RNA)

## Eukaryotes

- Organelles covered by a membrane
- Multiple organelles including ribosomes
- Membrane covered Genetic material

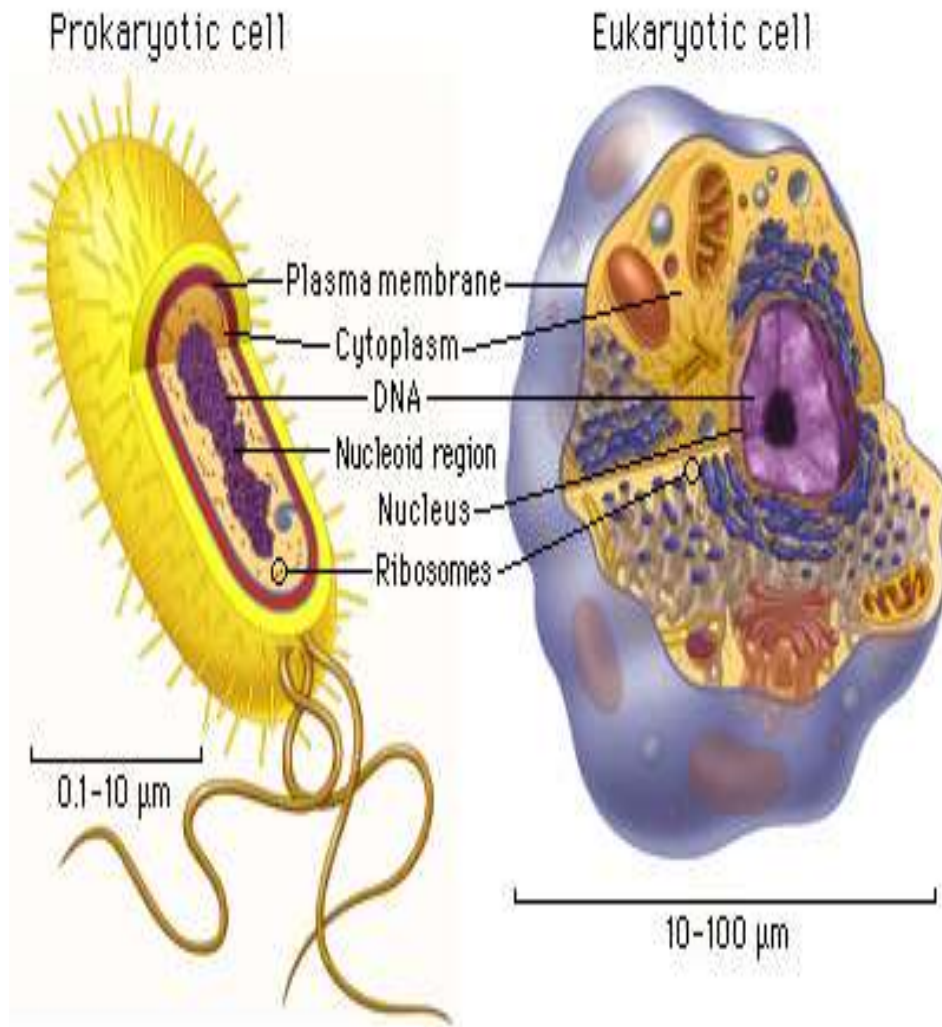
## **Prokaryotes**

- Circular DNA
- Unicellular
- Cells are smaller in size
- Has larger number of organisms
- Appeared 4 billion years ago

## **Eukaryotes**

- Linear DNA
- May be multicellular or unicellular
- Cells are larger in size
- Has smaller number of organisms
- Appeared 1 billion years ago

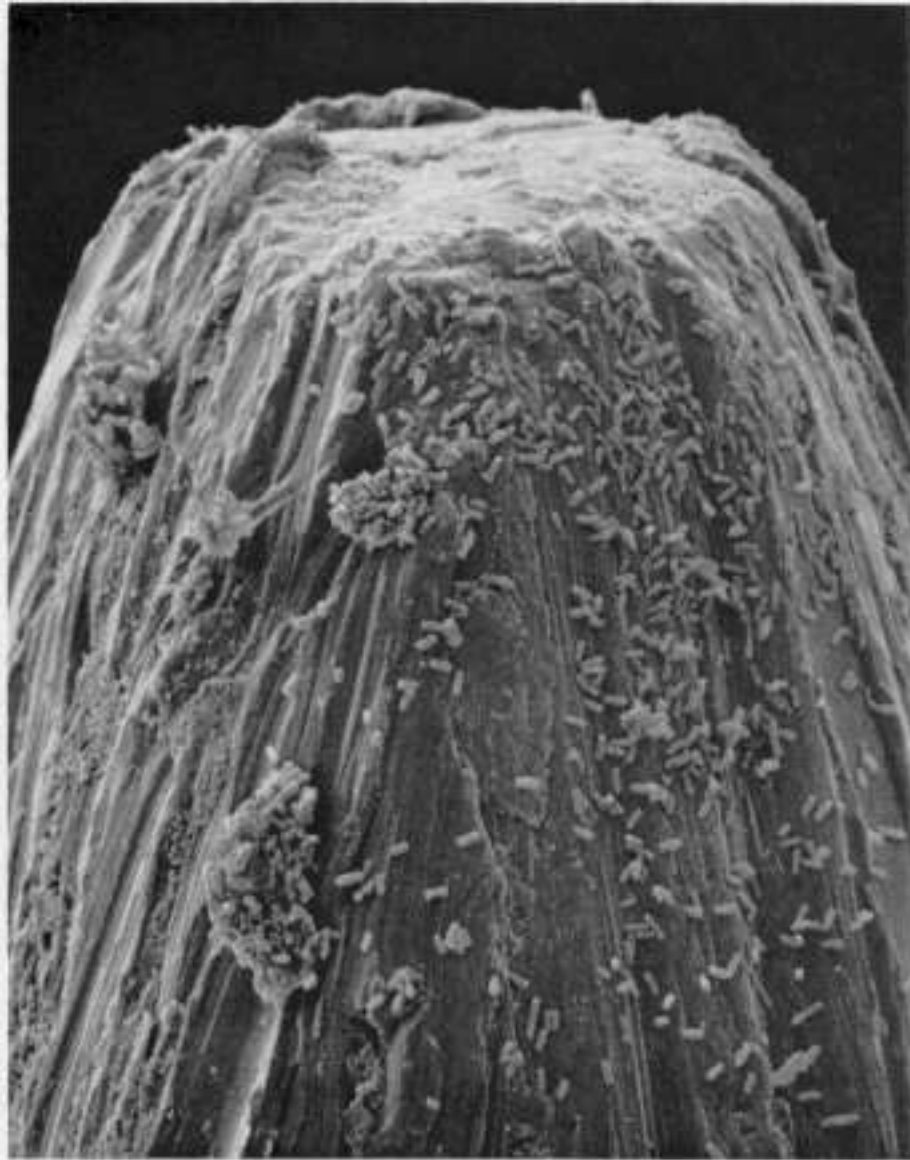
# Similarities



- Both types of cells have cell membranes (outer covering of the cell)
- Both types of cells have ribosomes
- Both types of cells have DNA
- Both types of cells have a liquid environment known as the cytoplasm

# **Prokaryote cells are smaller and simpler**

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



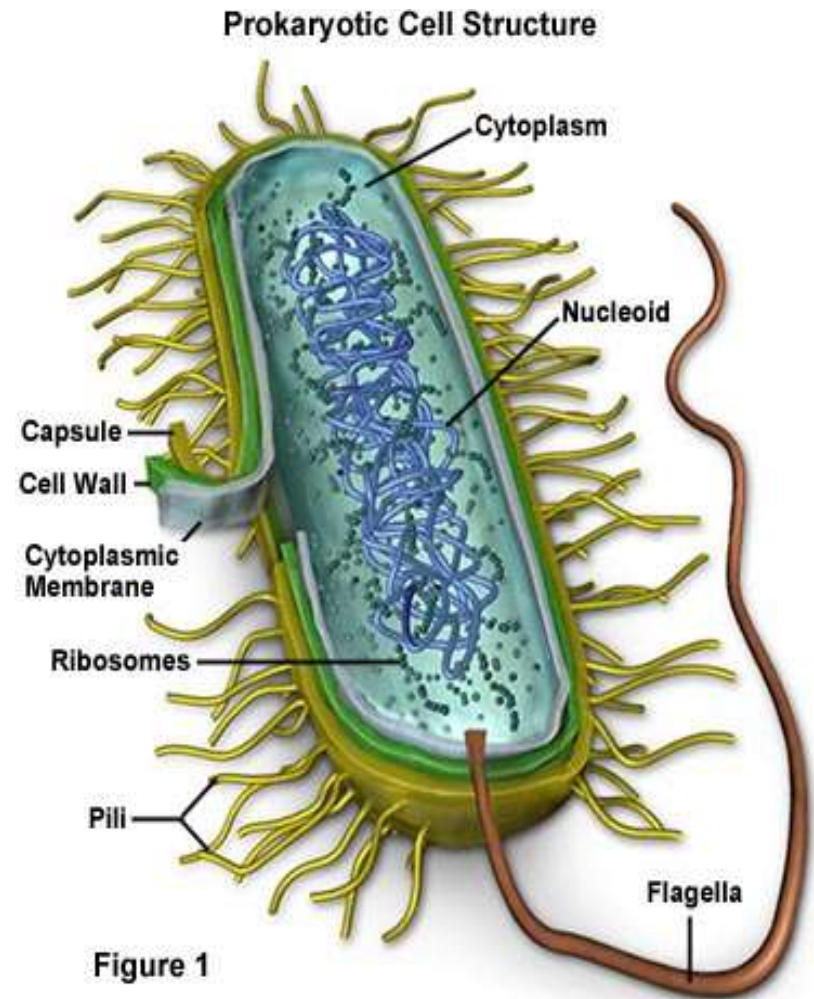
These are  
prokaryote  
E. coli bacteria on  
the head of a steel  
pin.





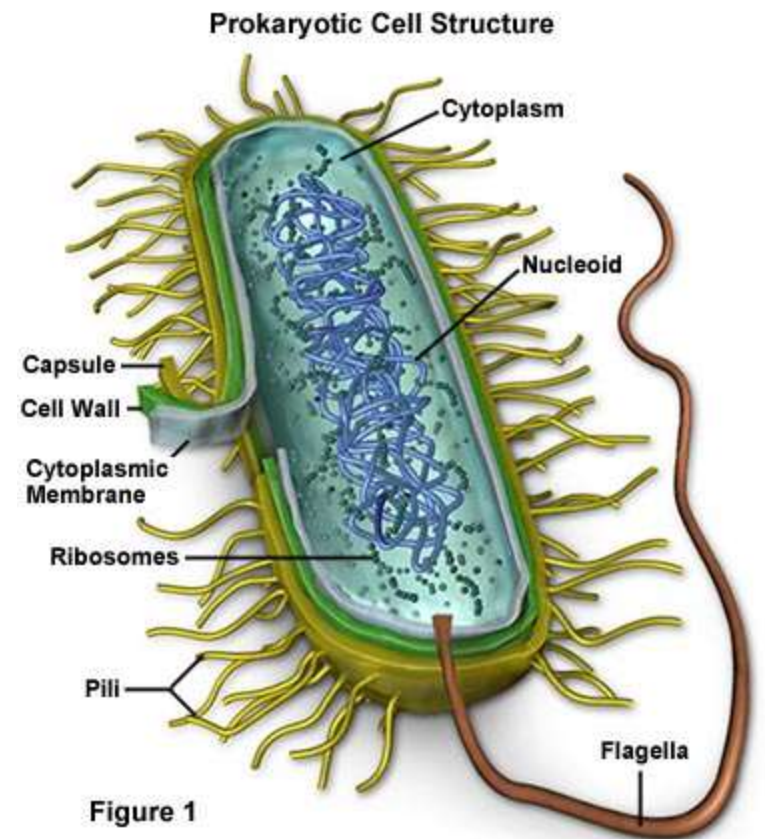
# Prokaryote cells are simply built (example: E. coli)

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



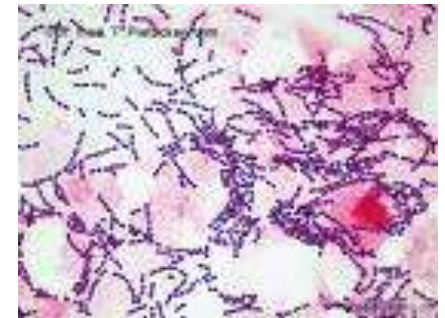
# Prokaryote cells are simply built (example: E. coli)

- **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

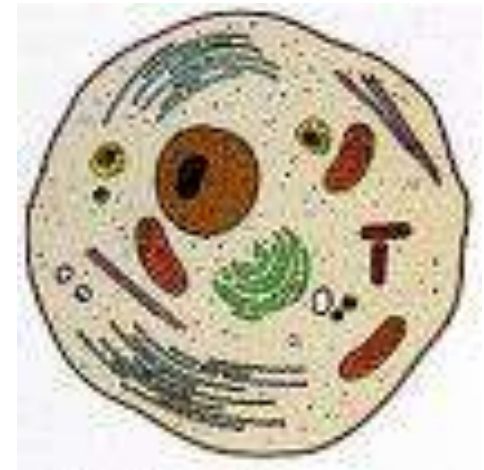
- **Photosynthetic**: energy from sunlight
- **Disease-causing**: feed on living things
- **Decomposers**: feed on dead things

# **Eukaryotes are bigger and more complicated**

- Have **organelles**
- Have **chromosomes**
- can be **multi-cellular**
- include **animal** and **plant** cells

# Organelles are membrane-bound cell parts

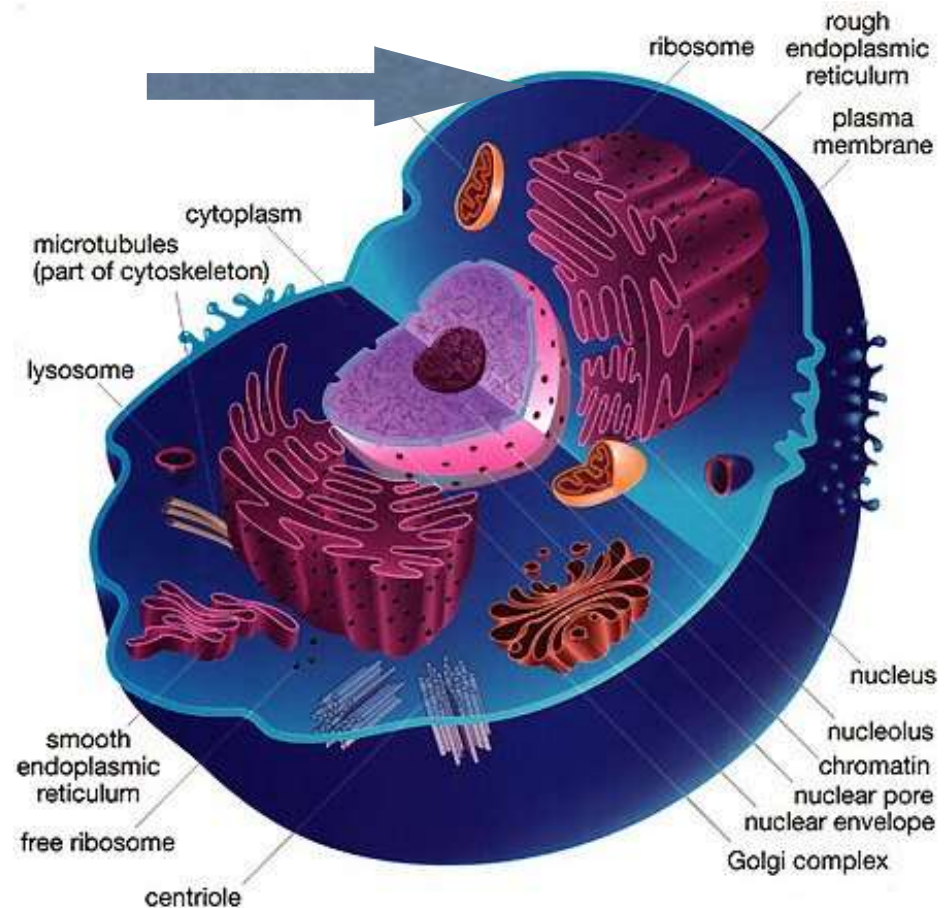
- Mini “organs” that have unique structures and functions
- Located in cytoplasm





# Cell Structures

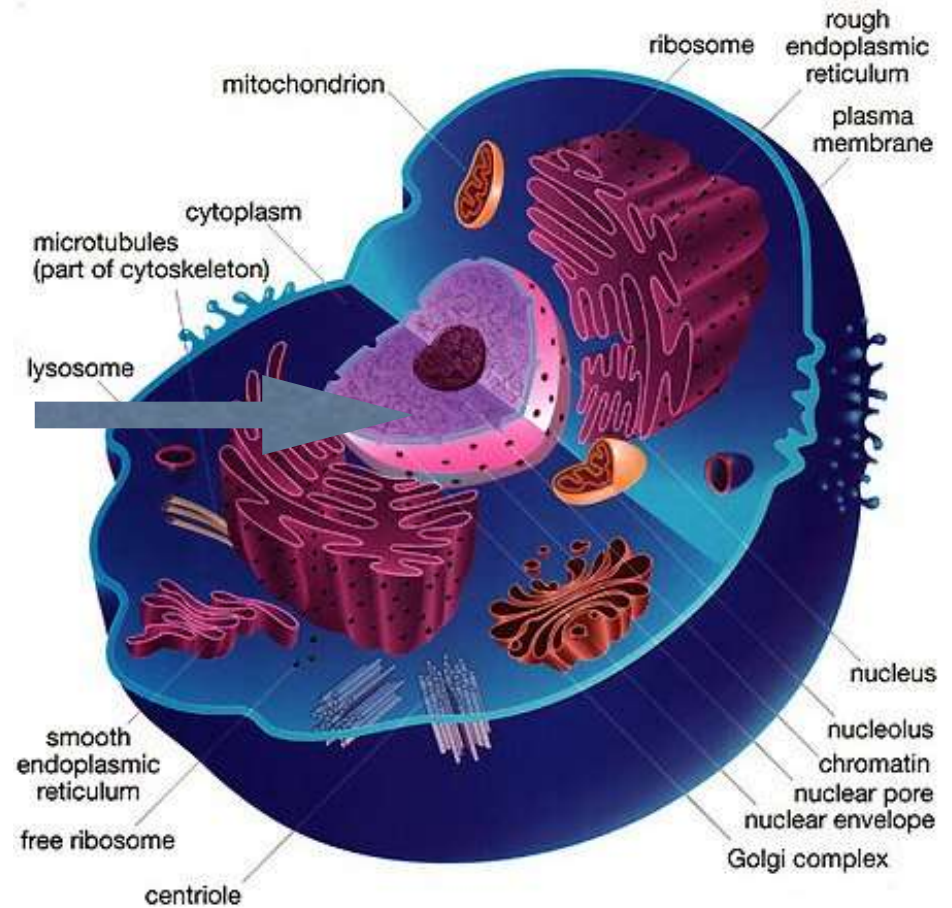
- Cell membrane
  - delicate **lipid** and **protein** skin around cytoplasm
  - found in all cells



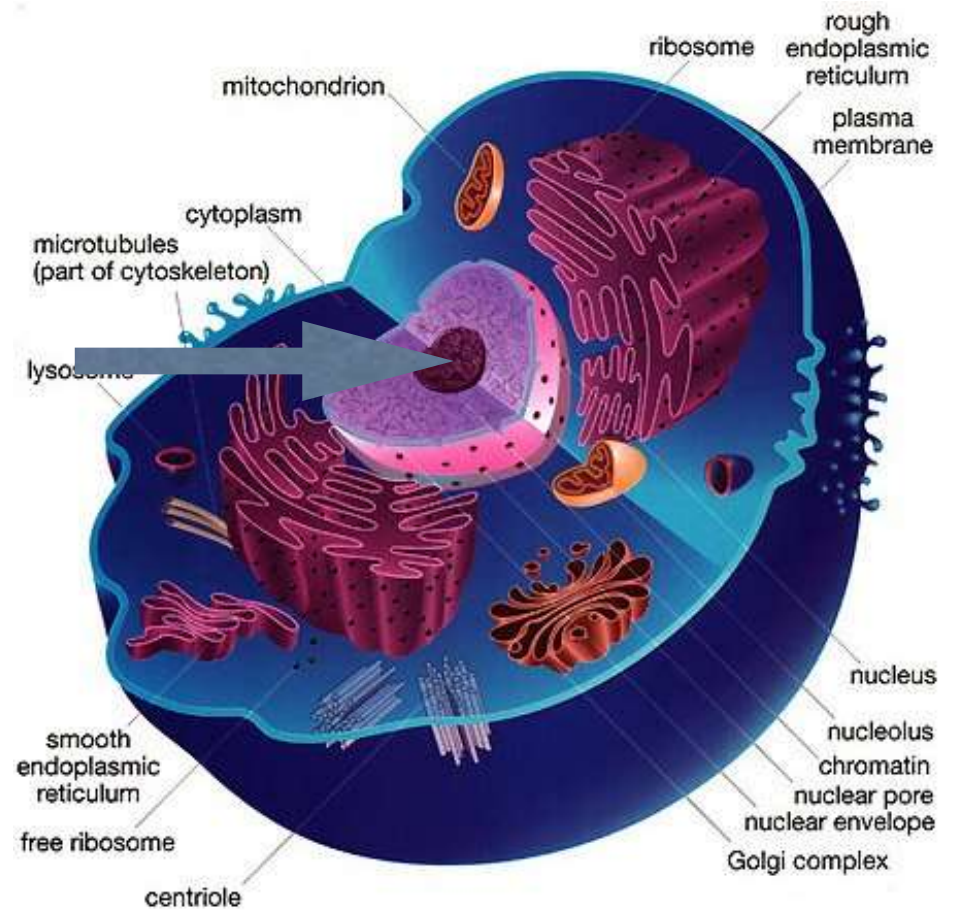


- Nucleus

- a membrane-bound sac evolved to store the cell's chromosomes(DNA)
- has pores: holes

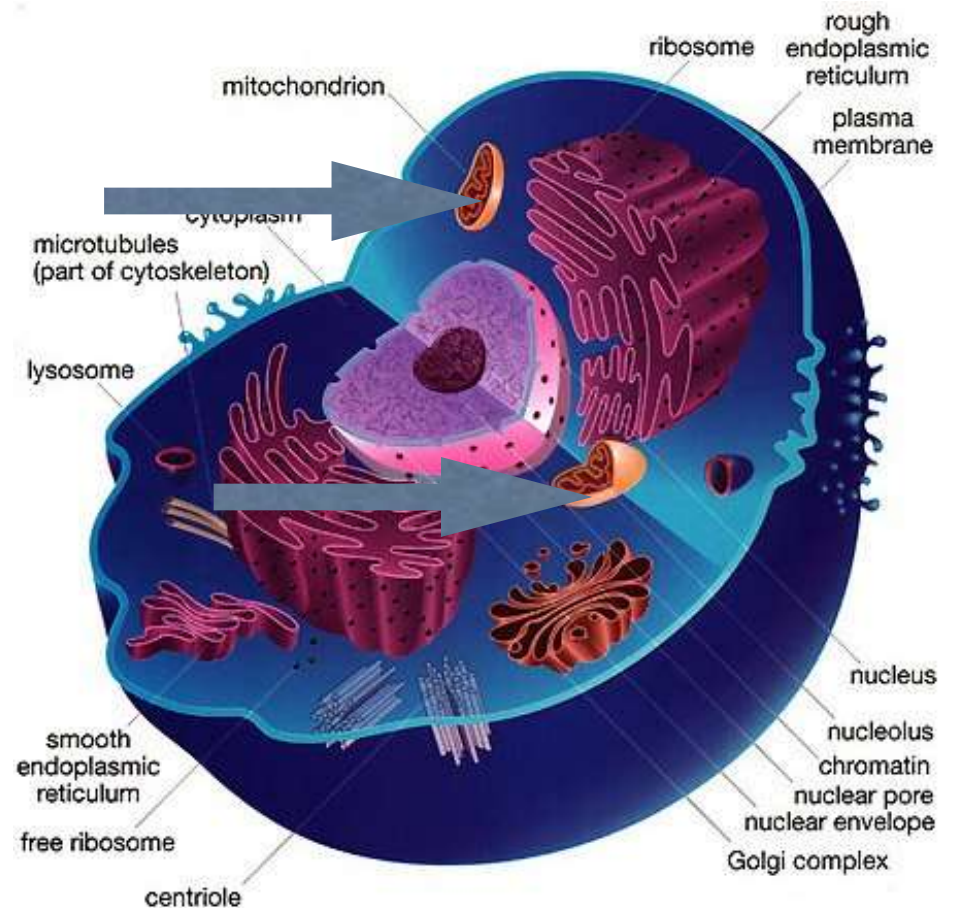


- Nucleolus
  - inside nucleus
  - location of ribosome factory
  - made or RNA



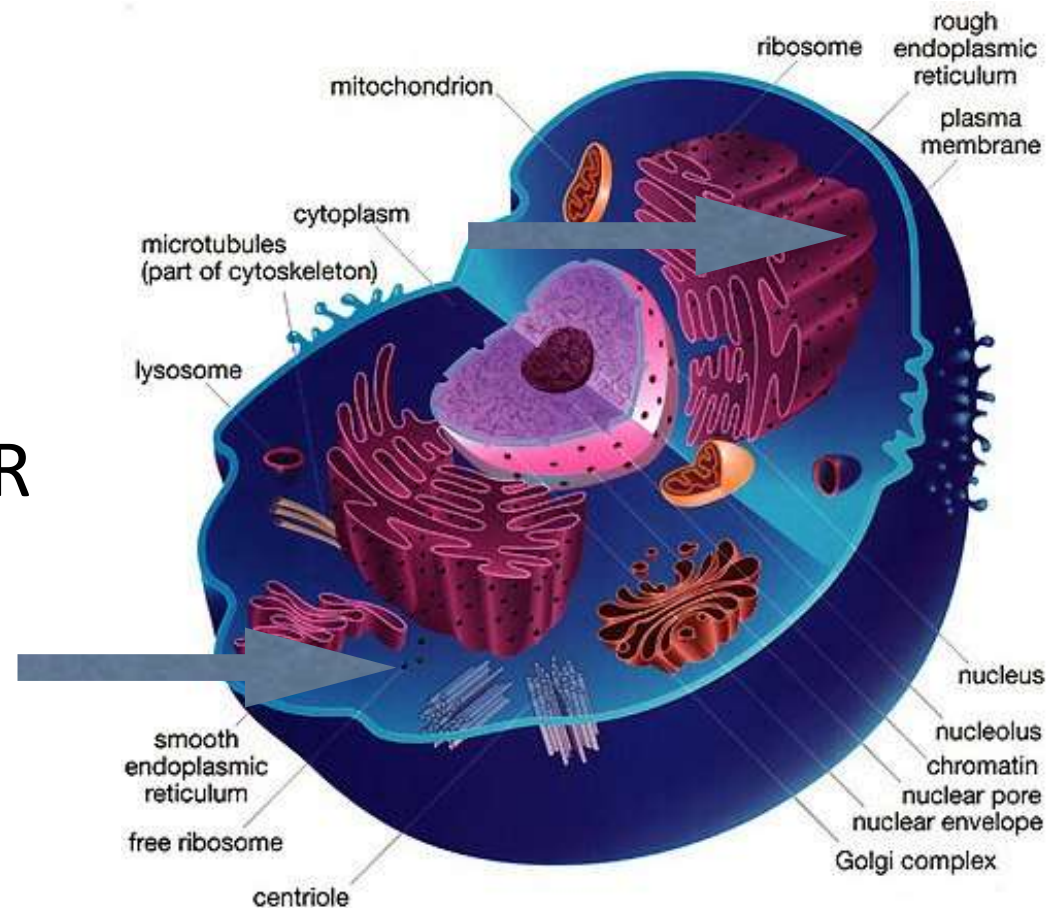
- **Mitochondrion**

- makes the cell's energy
- the more energy the cell needs, the more mitochondria it has



- Ribosomes

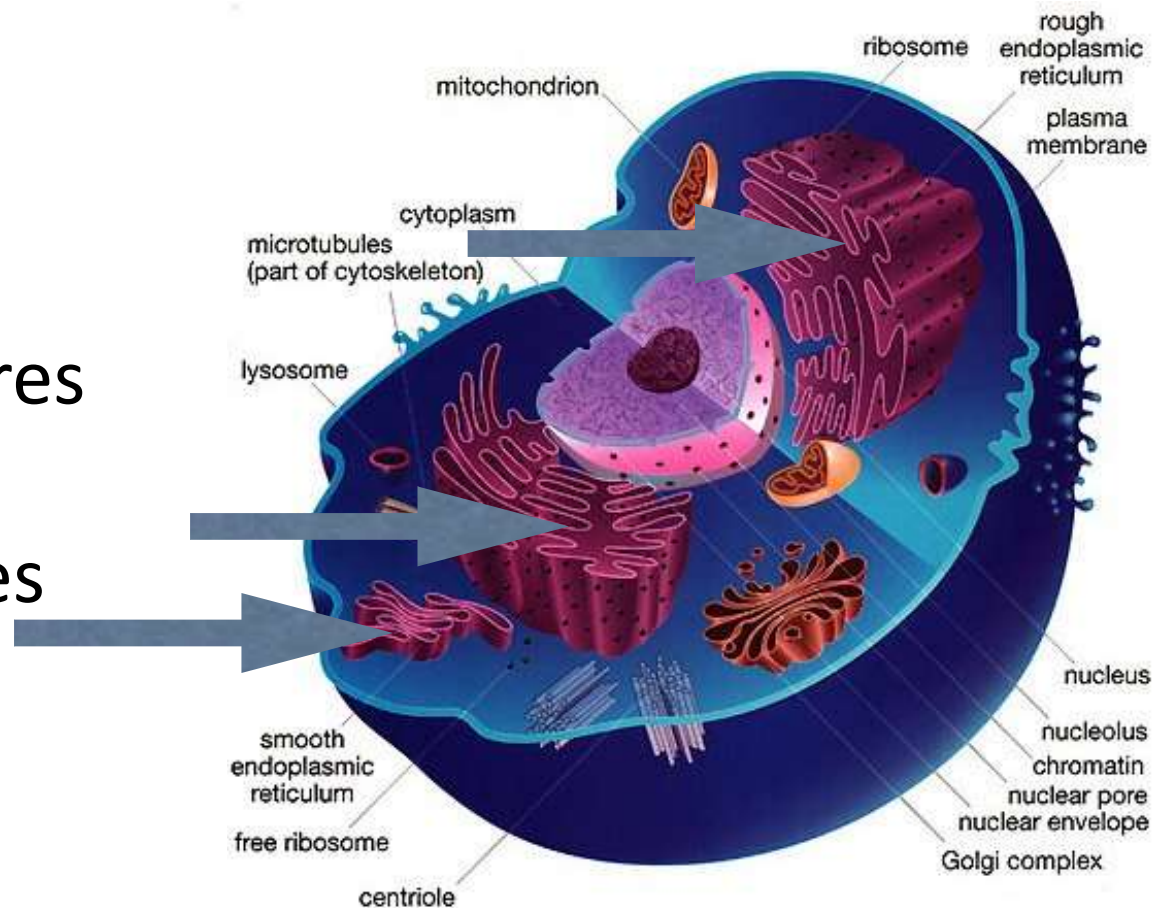
- build **proteins** from amino acids in cytoplasm
- may be free-floating, or
- may be attached to ER
- made of **RNA**



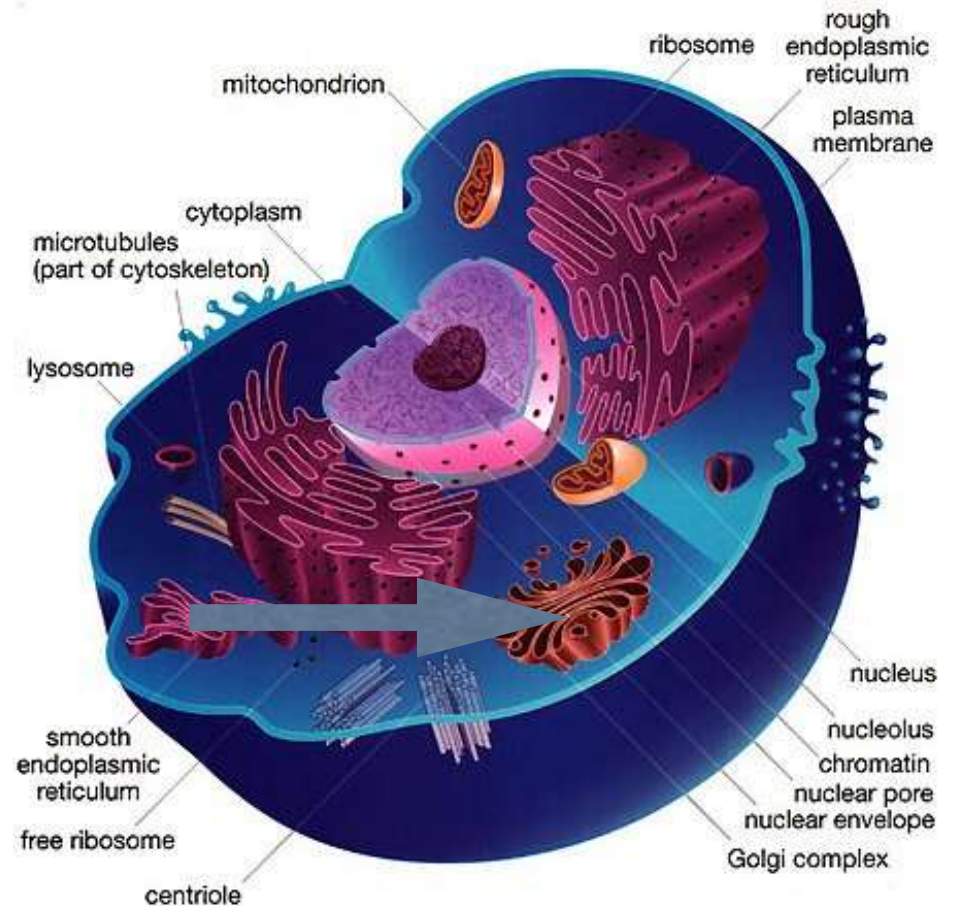


- Endoplasmic reticulum

- may be **smooth**: builds lipids and carbohydrates
- may be **rough**: stores proteins made by attached ribosomes

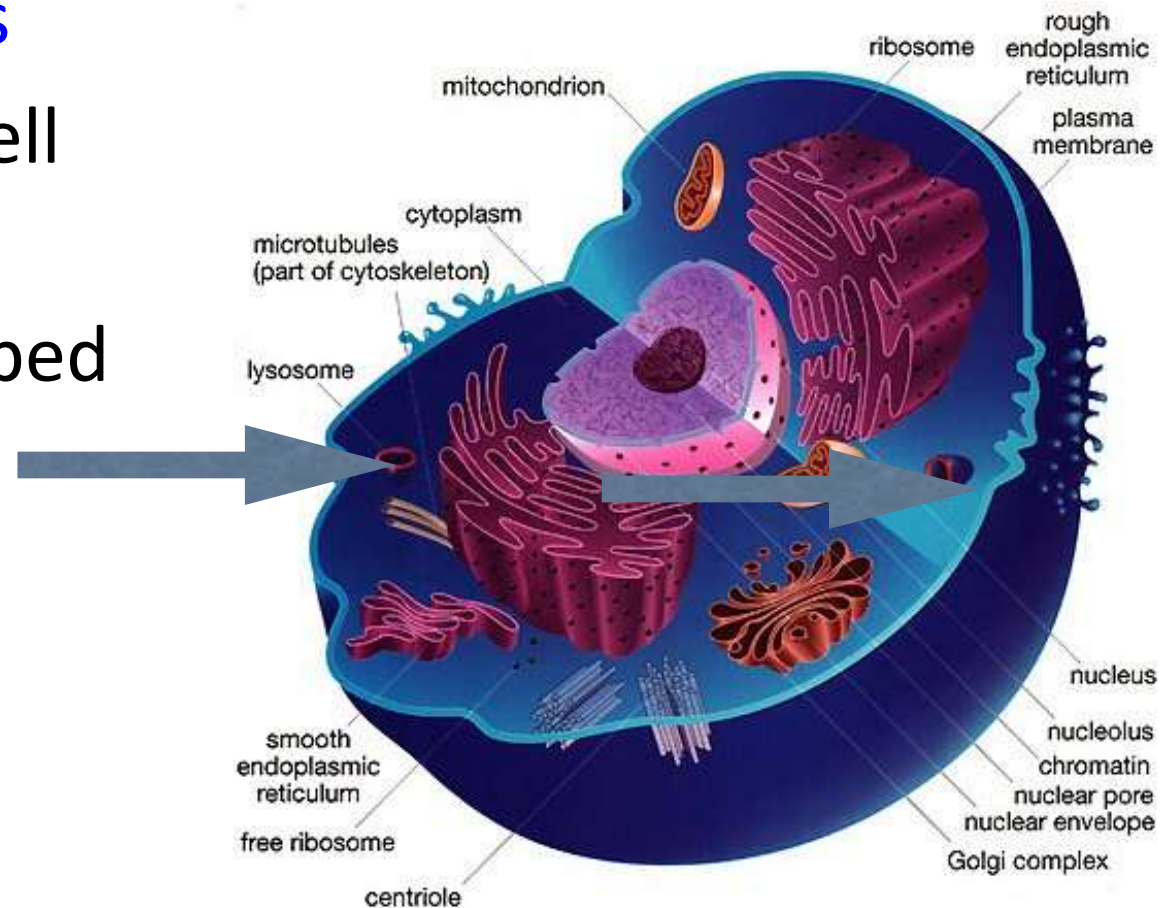


- Golgi Complex
  - takes in sacs of raw material from ER
  - sends out sacs containing finished cell products



- Lysosomes

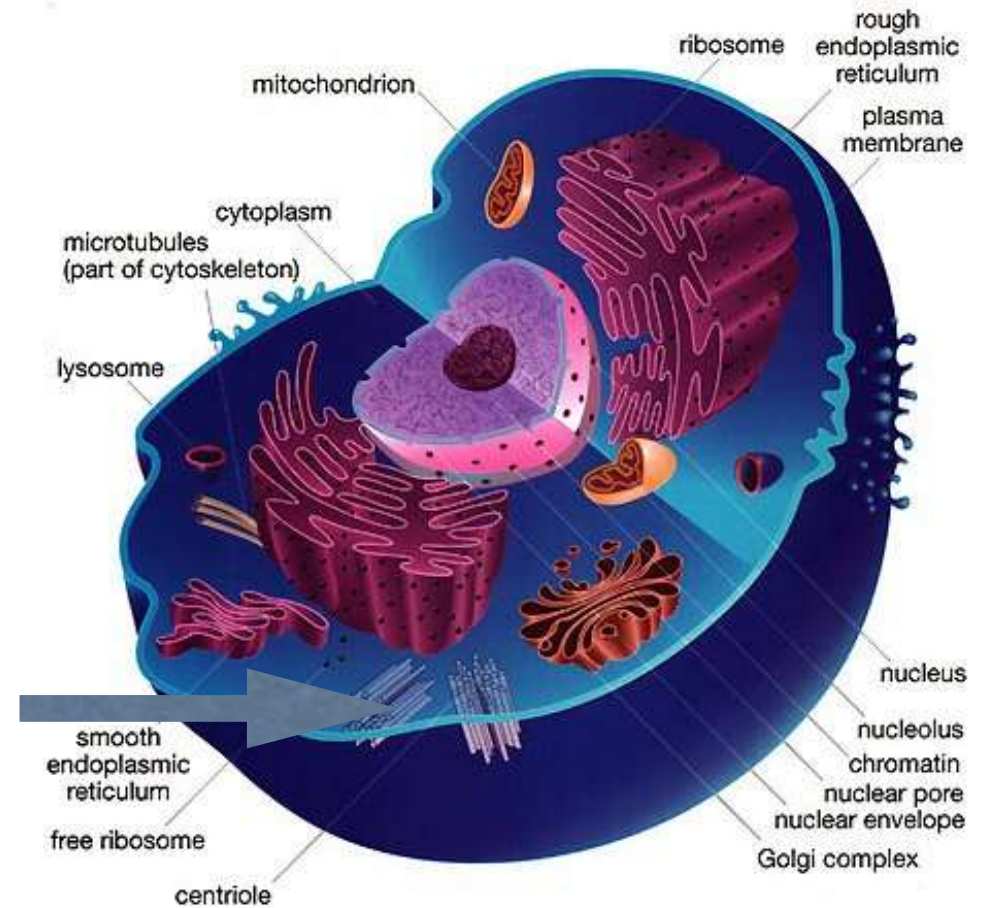
- sacs filled with digestive enzymes
- digest worn out cell parts
- digest food absorbed by cell





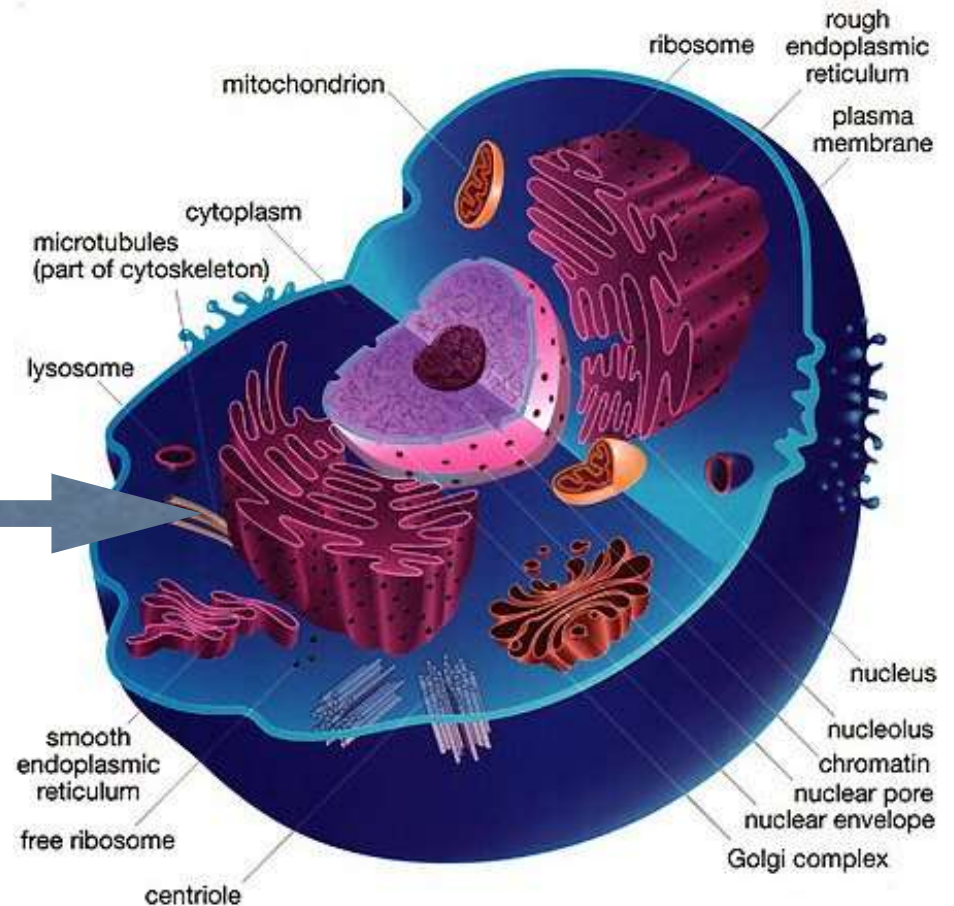
- Centrioles

- pair of bundled tubes
- organize cell division



# Cytoskeleton

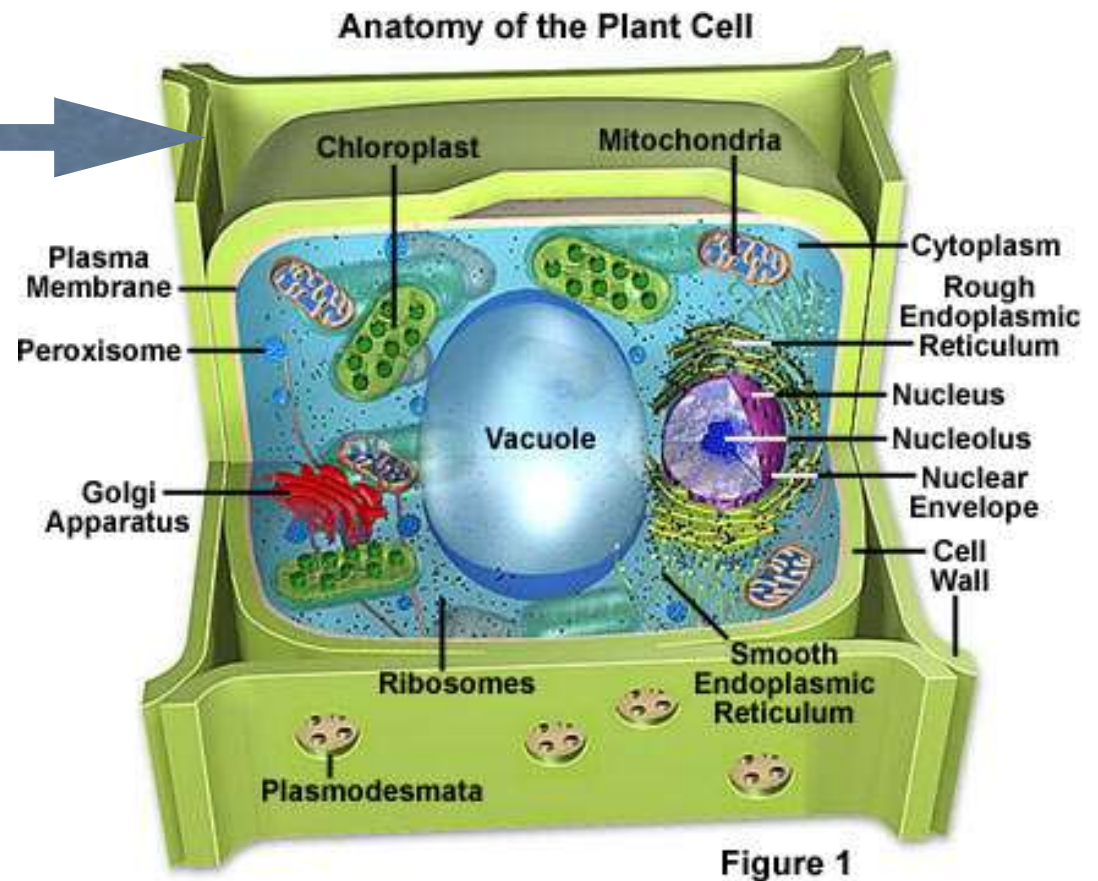
- made of microtubules
- found throughout cytoplasm
- gives shape to cell & moves



# Structures found in plant cells

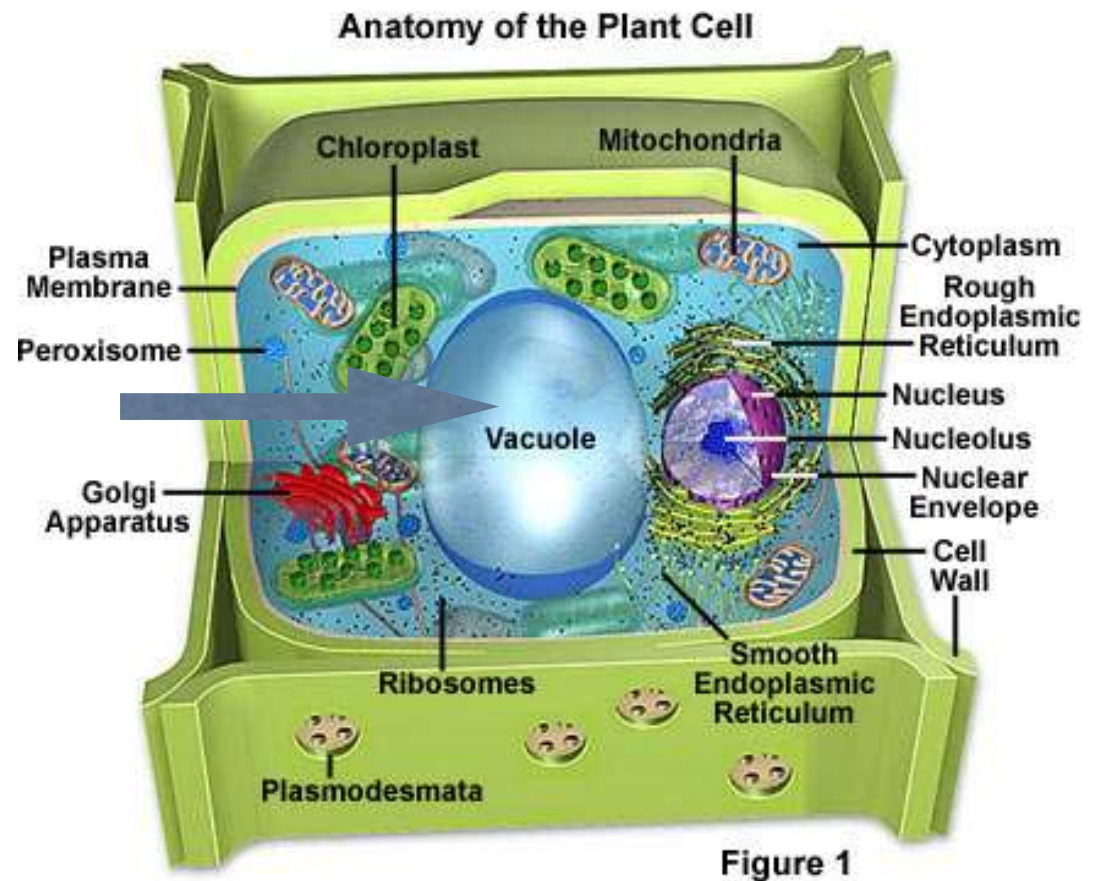
- Cell wall

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



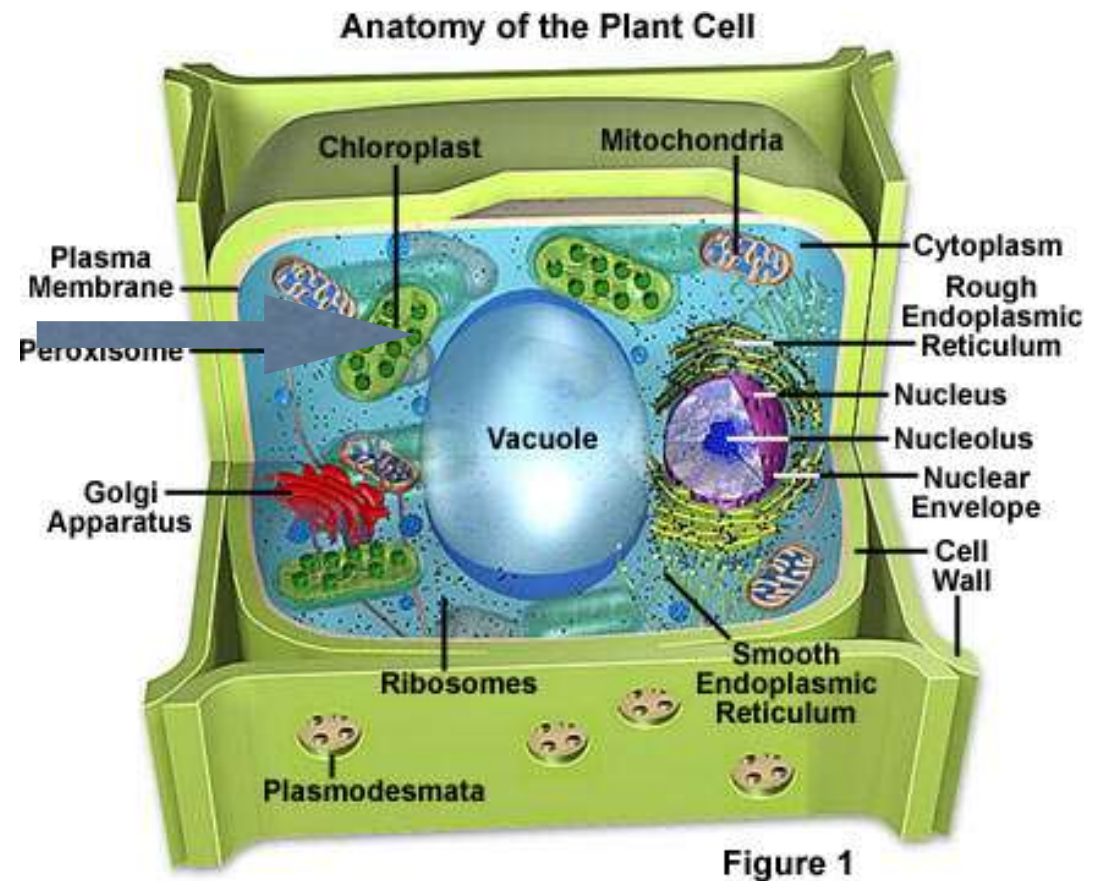
- **Vacuole**

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

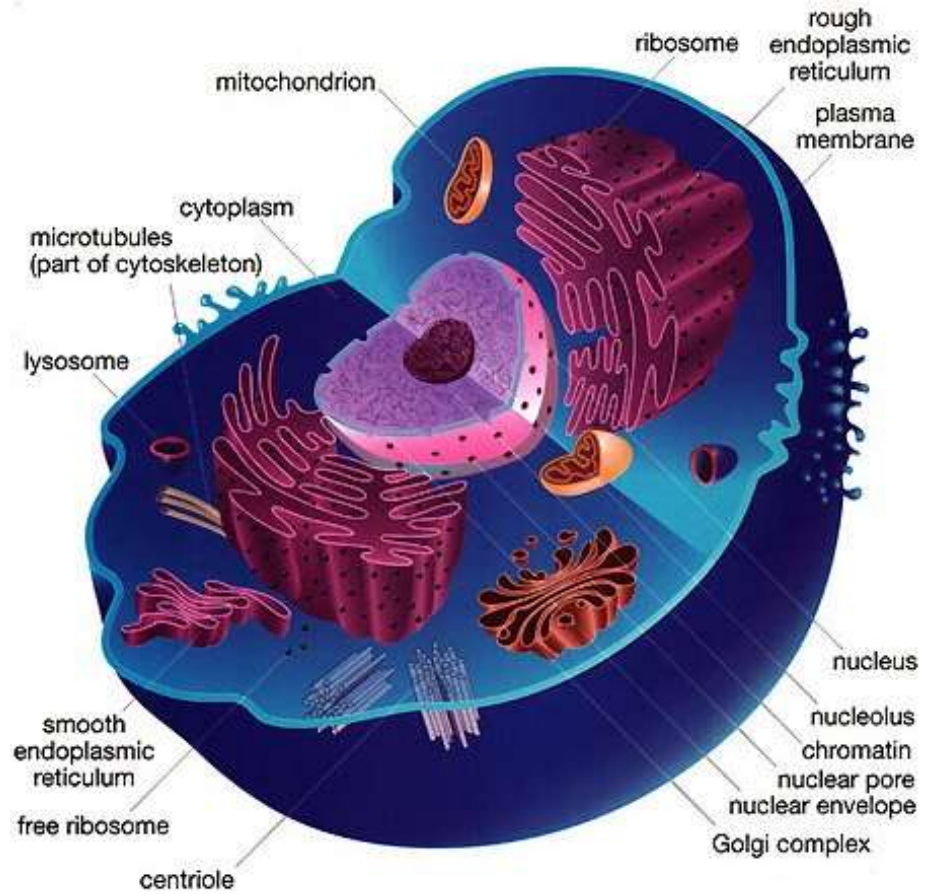
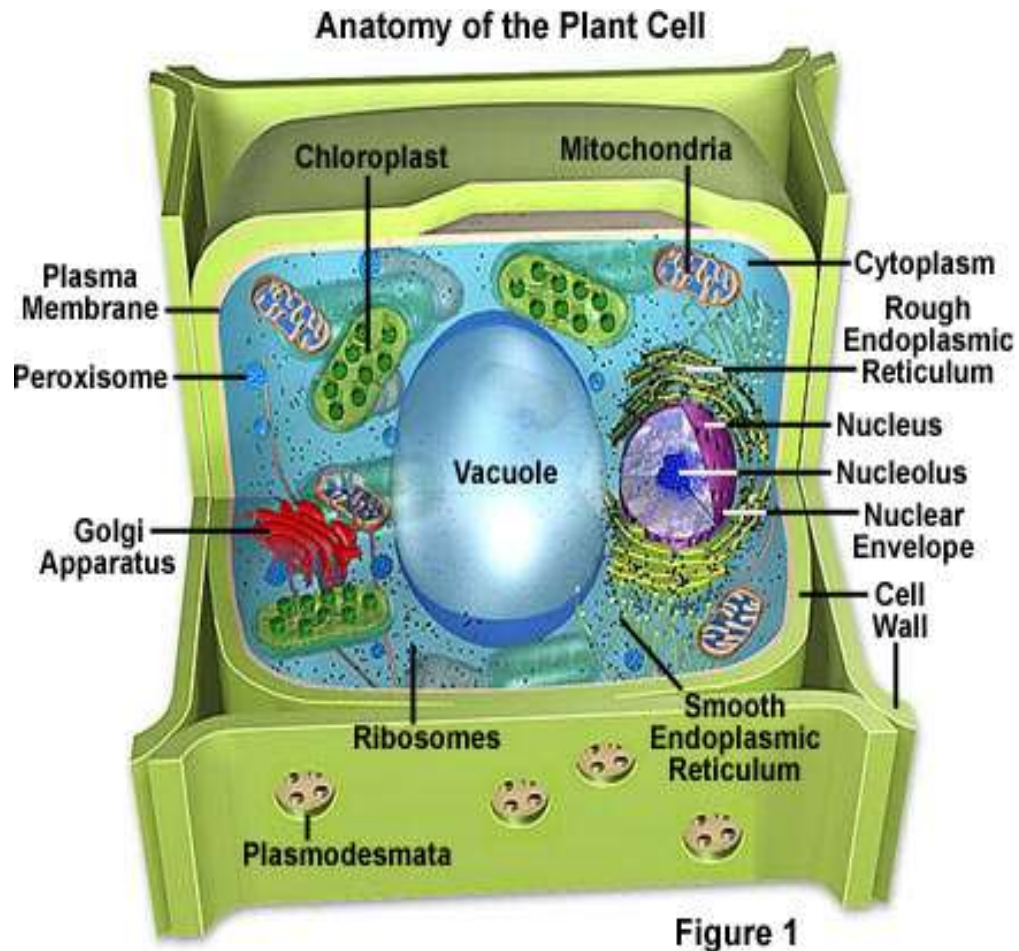




- Chloroplasts
  - filled with chlorophyll
  - turn solar energy into food energy



# Difference between Animal & Plant Cell



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
chloroplasts	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	Multi-cellularity
all the same	can build large bodies