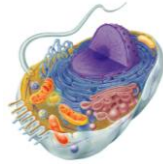
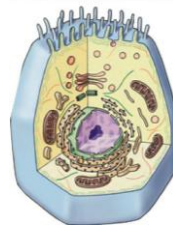


Cells & Cell Organelles

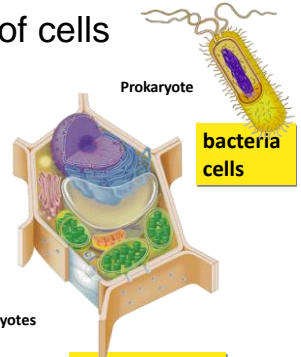
Doing Life's Work



Types of cells



animal cells



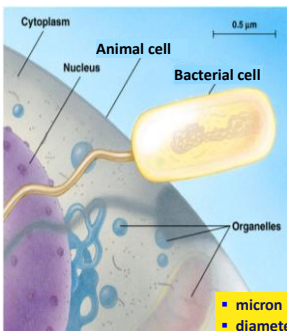
plant cells

Prokaryote

bacteria cells

Eukaryotes

Cell size comparison



most bacteria (prokaryotic)

- 1-10 microns

eukaryotic cells

- 10-100 microns

- micron = micrometer = 1/1,000,000 meter
- diameter of human hair = ~20 microns

The Jobs of Cells

- Cells have 3 main jobs

– make energy

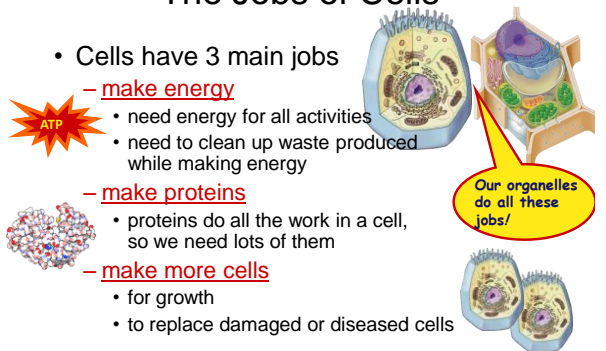
- need energy for all activities
- need to clean up waste produced while making energy

– make proteins

- proteins do all the work in a cell, so we need lots of them

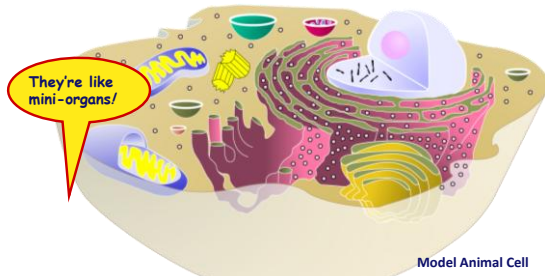
– make more cells

- for growth
- to replace damaged or diseased cells



Organelles

- Organelles do the work of cells
 - each structure has a job to do
 - keeps the cell alive; keeps you alive



Why organelles?

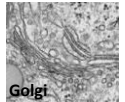
- Specialized structures
 - specialized functions
 - cilia or flagella for locomotion
- Containers
 - partition cell into compartments
 - create different local environments
 - separate pH, or concentration of materials
 - distinct & incompatible functions
 - lysosome & its digestive enzymes
- Membranes as sites for chemical reactions
 - unique combinations of lipids & proteins
 - embedded enzymes & reaction centers
 - chloroplasts & mitochondria



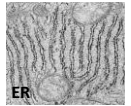
mitochondria



chloroplast



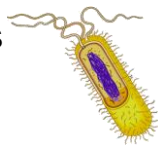
Golgi



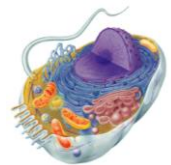
ER

Prokaryotic Cells

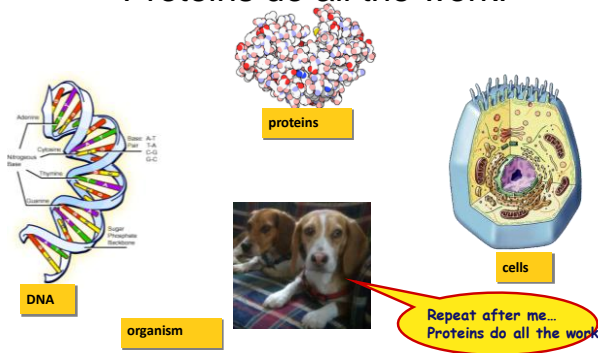
- No organelles!
 - make energy
 - Cell membrane
 - make proteins
 - Free ribosomes in cytosol
 - make more cells
 - DNA is stored in the nuclear area (nucleoid)



Building Proteins

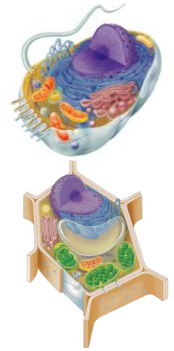


Proteins do all the work!



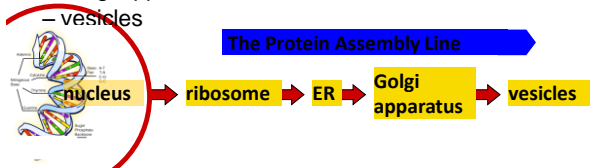
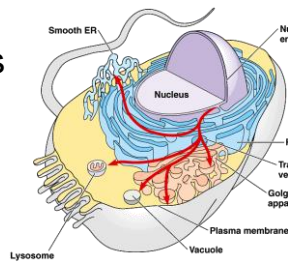
Cells functions

- Building proteins
 - read DNA instructions
 - build proteins
 - process proteins
 - folding
 - modifying
 - removing amino acids
 - adding other molecules
 - » e.g. making glycoproteins for cell membrane
- address & transport proteins



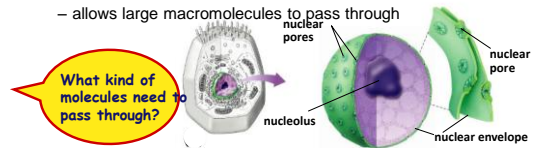
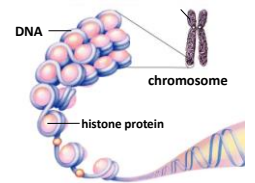
Building Proteins

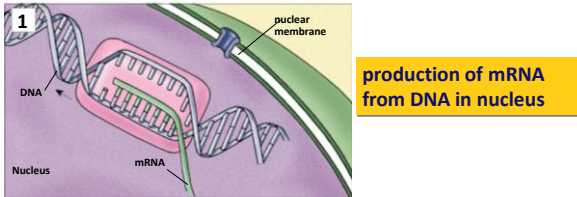
- Organelles involved
 - nucleus
 - ribosomes
 - endoplasmic reticulum (ER)
 - Golgi apparatus
 - vesicles



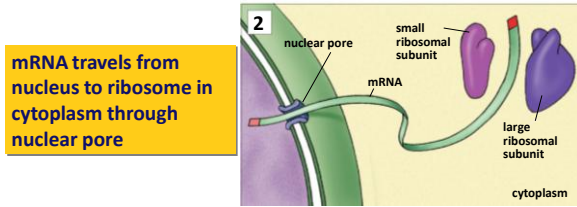
Nucleus

- Function
 - protects DNA
- Structure
 - nuclear envelope
 - double membrane
 - membrane fused in spots to create pores
 - allows large macromolecules to pass through

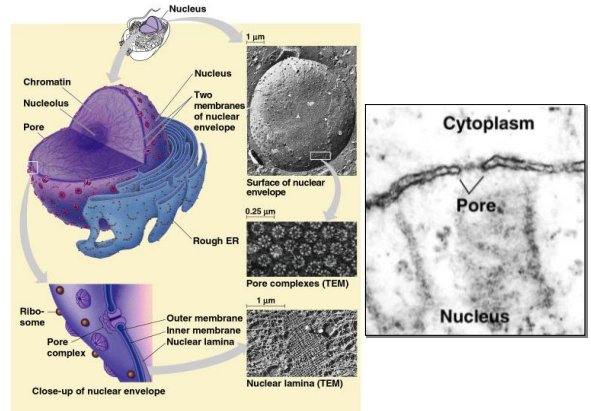




production of mRNA from DNA in nucleus



mRNA travels from nucleus to ribosome in cytoplasm through nuclear pore

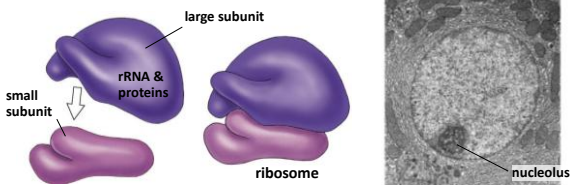


Nucleolus

• Function

– ribosome production

- build ribosome subunits from rRNA & proteins
- exit through nuclear pores to cytoplasm & combine to form functional **ribosomes**



Ribosomes

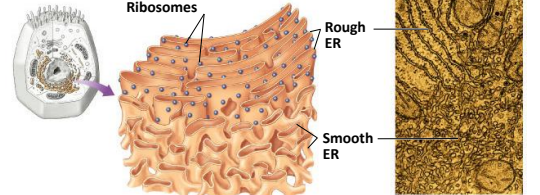
• Function

– protein production

• Structure

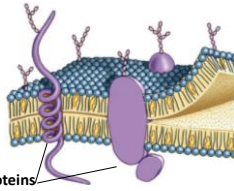
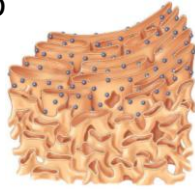
– rRNA & protein

– 2 subunits combine



Types of Ribosomes

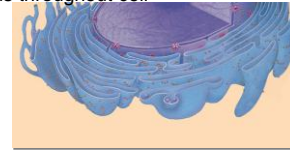
- **Free** ribosomes
 - suspended in cytosol
 - synthesize proteins that function in cytosol
- **Bound** ribosomes
 - attached to **endoplasmic reticulum**
 - synthesize proteins for export or for membranes



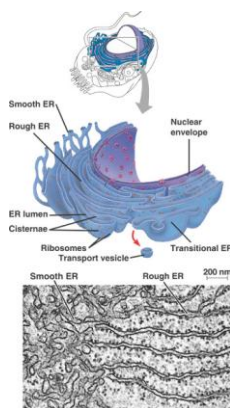
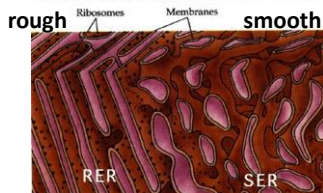
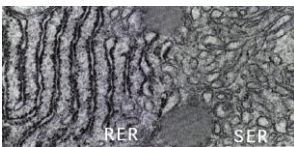
membrane proteins

Endoplasmic Reticulum

- Function
 - **processes proteins**
 - manufactures membranes
 - synthesis & hydrolysis of many compounds
- Structure
 - membrane connected to nuclear envelope & extends throughout cell



Types of ER

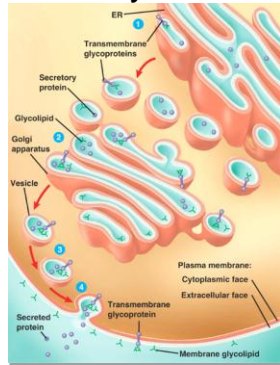


Smooth ER function

- Membrane production
- Many metabolic processes
 - synthesis
 - synthesize lipids
 - oils, phospholipids, steroids & sex hormones
 - hydrolysis
 - **hydrolyze glycogen** into glucose
 - in liver
 - **detoxify drugs** & poisons
 - in liver
 - ex. alcohol & barbiturates

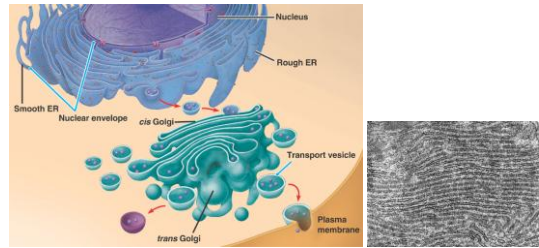
Membrane Factory

- Build new membrane
 - synthesize phospholipids
 - builds membranes
 - ER membrane expands
 - bud off & transfer to other parts of cell that need membranes



Rough ER function

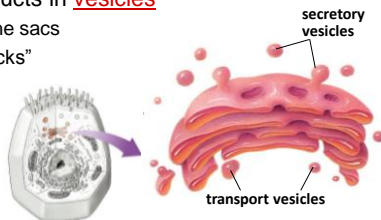
- Produce proteins for export out of cell
 - protein **secreting** cells
 - packaged into **transport vesicles** for export



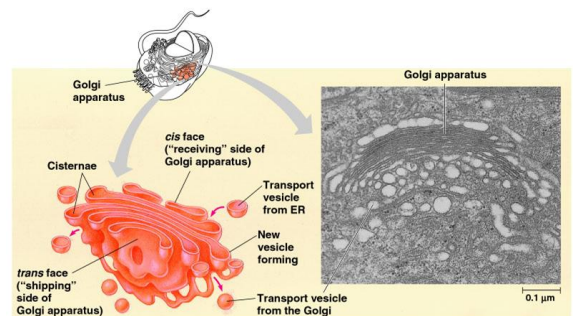
Golgi Apparatus



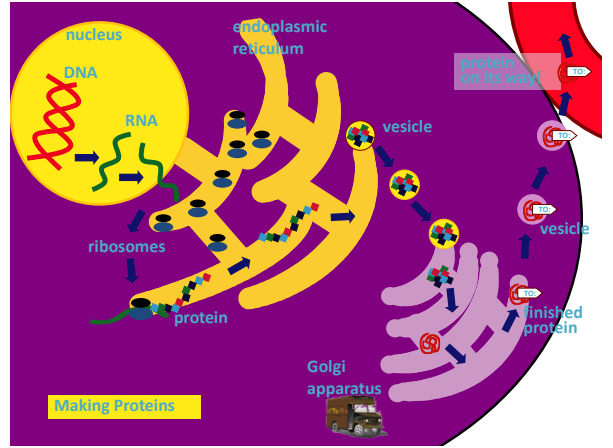
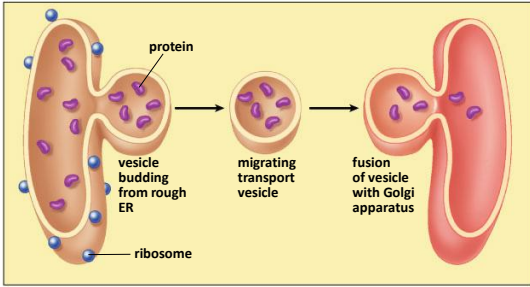
- Function
 - finishes, sorts, tags & ships cell products
 - like “UPS shipping department”
 - ships products in **vesicles**
 - membrane sacs
 - “UPS trucks”



Golgi Apparatus



Vesicle transport



Putting it together... Making proteins

