Organelles in prokaryotes and eukaryotes

- Plasma membrane
- Cell wall (in prokaryotes, plants, fungi, some protists)
- Ribosomes
- Nucleoid/nucleus
- Mitochondria
- Plastids

(Please activate your clickers)
Osmosis

Because the plasma membrane is differentially permeable, allowing water to cross more easily than solutes, water moves from the side with the lowest solute concentration to the side with the highest concentration.
How do cells survive changes in osmotic concentration of their surroundings?

Plants, fungi, most protists and bacteria have cell walls
- Cell wall limits growth in hypotonic solution by exerting pressure on contents and thus protects membrane.
- In hypertonic solution, get plasmolysis (bad), but cells produce or take up solutes to balance outside solution

Animal cells and other cells without cell walls
- Animal cells stay in salt water, or keep their surroundings at isotonic solute concentration
- Also, animal cells have “cytoskeleton” inside, which connects to inside of plasma membrane and keeps it from expanding; some protists have “pellicle” (sort of inner cell wall)
**Endoplasmic reticulum (E.R.)** ("network between organelles")

Interconnected flattened or tubular sacs, cisterna(e)

Closed membranes: lumen (inside space) separated from outside cytoplasm

Functions: synthesis and packaging
- Rough: proteins
- Smooth, cell wall carbohydrates, glycogen (starch), glycoproteins, steroid hormones.

Found in all eukaryotic cells
Golgi apparatus (dictyosome, in plants)

Dense complex of cisternae; several per cell

Functions:
♦ synthesis of carbohydrates on proteins (glycoproteins),
♦ transport of proteins to different compartments in cell

Found in all eukarotic cells
**Vesicles**

Small sacs

Single membrane

Functions:
- storage, isolation (lysosome, peroxisome)
- transport

**Vacuoles**

Larger sacs

Single membrane

In protists, these are storage organs, digestive organs; “contractile vacuole” related to water pumping

In plants and fungi, these are large storage organs for salts, sugars, red and blue pigments in flowers, wastes, strange chemicals (poisons)
**Cytoskeleton**

**Microtubules**

Stiff helical rods of protein (tubulin); 25 nm diam

Functions:
- Structural support (e.g. mammalian nerve cell).
- Support for movement (e.g., vesicles, cilia, flagella, spindles).

Motor proteins:
- Kinesin toward + end
- Dynein toward - end
**Microfilaments**

Flexible rods of protein (actin); 7 nm thick

Functions:
- Structural support
- Amoebic pseudopod extension
- With motor protein (myosin), support for movement (e.g., muscles, streaming, cytokinesis).

**Intermediate filaments**

Stiff protein rods, 8-12 nm thick

Function: hold organelles in place
Different filaments can be linked together to form a strong, resilient network.
Dynamic relationships between membranous organelles

- E.R. formed by outbudding of nuclear envelope
- E.R. produces vesicles: substances produced in E.R. (e.g. proteins, tagged with carbohydrates; glycoproteins) appear in vesicles
- Golgi accepts materials from E.R.
- Golgi cisternae modify materials (e.g. altered glycogroups), which appear in Golgi vesicles
- Golgi vesicles can (a) stay as storage vesicles (e.g. lysosomes), (b) fuse with plasma membrane to secrete their substance, (c) fuse with another membrane (e.g. vacuolar membrane) to transfer material into an organelle.
- Secretion vesicles can be “constitutive” or “regulated”—Golgi targets different materials into each.
Rough endoplasmic reticulum

Inside of cell

Golgi apparatus

cis region

trans region

Cisternae

Proteins for use within the cell

Flow of material

Plasma membrane

Proteins for use outside the cell

Outside of cell

LIFE: THE SCIENCE OF BIOLOGY, Seventh Edition, Figure 4.12 The Golgi Apparatus
### Cells in various organisms

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<th>Plasma membrane</th>
<th>Cell wall</th>
<th>Nucleus; nucleoid</th>
<th>Ribosome</th>
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