The Cell

ORGANELLES
Organelles

- “Little organs”
- Specialized cellular compartments
- Specialized functions
  - Construction and management of proteins
- Most are bound by membranes
  - Endomembrane system
Figure 3.2

Secretion being released from cell by exocytosis

- Peroxisome
- Ribosomes
- Rough endoplasmic reticulum
- Nucleolus
- Nucleus
- Plasma membrane
- Nuclear envelope
- Chromatin
- Nucleus
- Smooth endoplasmic reticulum
- Mitochondrion
- Cytosol
- Lysosome
- Centrioles
- Centrosome
- Matrix
- Cytoskeletal elements
  - Microtubule
  - Intermediate filaments
- Golgi apparatus
- Secretion being released from cell by exocytosis
- Peroxisome
Organelles

- Mitochondria
- Ribosomes
- Endoplasmic reticulum (rough and smooth)
- Golgi complex
- Lysosomes
- Nucleus
Mitochondria

- Very active in cells that require a lot of ATP
  - Muscle
  - Liver
  - Kidney
- Only significant site of oxygen use within cell
- Site of most ATP synthesis
Mitochondria

- Enclosed by a double membrane
- “Power plants”
Ribosomes

- Sites of protein synthesis
  - “Factories”
- Free in cytoplasm or attached to membranes
- Composed of RNA and protein
- Two subunits
Endoplasmic Reticulum

- Two distinct types
  - Smooth
    - Site of lipid and steroid synthesis, calcium regulation and drug detoxification
  - Rough
    - Protein synthesis
- Continuous with nuclear membrane
- “Highways”
(a) Diagrammatic view of smooth and rough ER
Golgi Complex

- Stacks of flattened sacs
- Associated with ER
- Functions
  - Process molecules
  - Sort proteins
  - Deliver proteins
  - “Shipping and receiving”
Golgi Complex

- Very active in
  - Pancreas
  - Cells that secrete antibodies
Lysosomes

- Round membranous sacks
  - Bud off of the Golgi Complex
- Contain digestive enzymes
  - “waste disposal service”
Lysosomes

- Phagocytosis
  - “cellular eating”
  - Endocytosed vesicle is fused with a lysosome
Endocytosis

1. Coated pit ingests substance.
2. Protein-coated vesicle detaches.
3. Coat proteins detach and are recycled to plasma membrane.
4. Uncoated vesicle fuses with a sorting vesicle called an endosome.
5. Transport vesicle containing membrane components moves to the plasma membrane for recycling.
6. Fused vesicle may (a) fuse with lysosome for digestion of its contents, or (b) deliver its contents to the plasma membrane on the opposite side of the cell (transcytosis).

Extracellular fluid
- Plasma membrane
- Cytoplasm
- Lysosome
- Transport vesicle
- Endosome

(a) (b)
Lysosomes

- **Other roles**
  - Formation of fingers
  - “suicide packets”
  - Diseases
    - Tay Sachs
    - Rheumatoid arthritis
Figure 3.2

Secretion being released from cell by exocytosis

Peroxisome

Ribosomes

Rough endoplasmic reticulum

Nucleus

Nuclear envelope

Nucleolus

Plasma membrane

Smooth endoplasmic reticulum

Mitochondrion

Cytosol

Lysosome

Centrioles

Centrosome

matrix

Cytoskeletal elements

- Microtubule
- Intermediate filaments

Golgi apparatus

Secretion being released from cell by exocytosis

Peroxisome

Rough endoplasmic reticulum

Ribosomes

Golgi apparatus

Secretion being released from cell by exocytosis

Peroxisome
Nucleus

- “city hall”
- Membrane bound = regulation
- Contains
  - Chromatin
  - Nucleolus