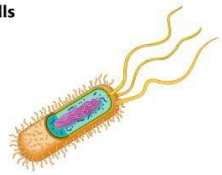
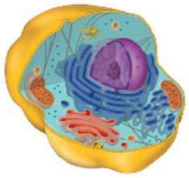
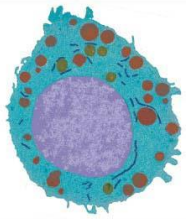
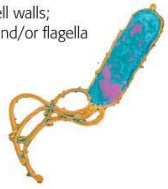
Review

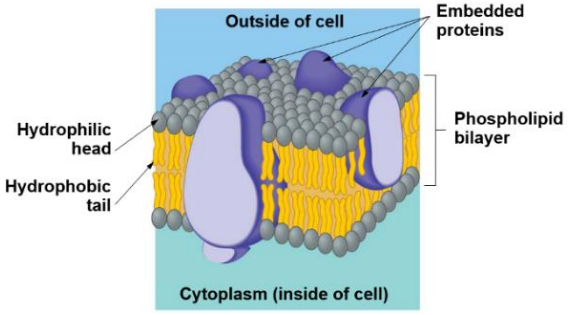
Chapter 4. A tour of the cell

- **Two major categories of cells:** prokaryotic cells, eukaryotic cells

Table 4.1 Comparing Prokaryotic and Eukaryotic Cells

Prokaryotic cells	Eukaryotic cells
	
Plasma membrane of identical structure	
Cytoplasm occupies entire interior of cell	Cytoplasm occupies the region between the nucleus and the plasma membrane
Single circular chromosome in nucleoid region	One or more linear chromosomes in nucleus 
Both have ribosomes, but structure differs slightly	
First evolved approximately 3.5 billion years ago	First evolved approximately 2.1 billion years ago
Smaller, simpler	Larger, more complex
No membrane-bound organelles	Membrane-bound organelles (for example, nucleus, ER)
Most are surrounded by cell walls; some have capsules, pili, and/or flagella 	Plant cells surrounded by cell walls; animal cells surrounded by extracellular matrix

- **Organelles:** membrane-enclosed structures that perform specific functions.
- **Membrane structure**



1) Phospholipids: is composed of two distinct regions—a "head" with a negatively charged phosphate group and two nonpolar fatty acid "tail".

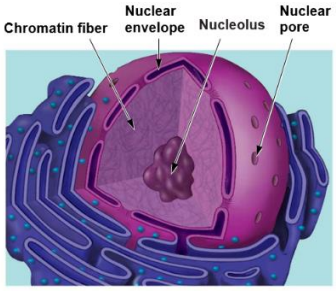
2) Phospholipid bilayer: the phospholipid's hydrophilic heads are arranged to face outward, exposed to the aqueous solutions on both sides of a membrane. Their hydrophobic tails are arranged inward, mingling with each other and shielding from water.

3) Fluid mosaic: fluid because the molecules can move freely past one another and

mosaic because of the diversity of proteins that float like icebergs in the phospholipid sea.

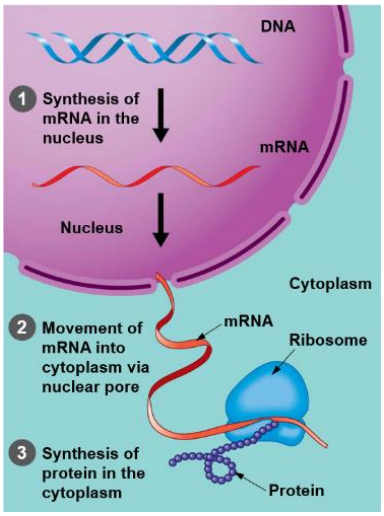
- **Genetic control of the cell:** the nucleus, ribosomes

1) The nucleus: an envelope consisting of two membranes encloses the nucleus. Within the nucleus, DNA and proteins make up chromatin fibers; each very long fiber is a single chromosome. The nucleus also contains the nucleolus, which produces components of ribosomes.



2) Ribosomes: produce proteins in the cytoplasm using messages produced by the DNA.

- **How DNA directs protein production**

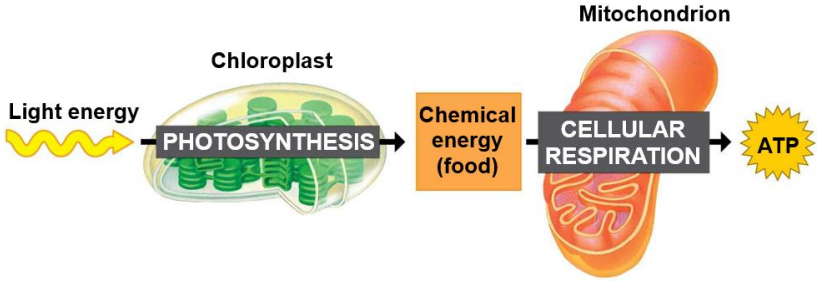


- **The endomembrane system:** manufacturing and distributing cellular products

The Endoplasmic Reticulum(ER) 内质网	✧ Consists of membrane-enclosed tubes and sacs within the cytoplasm. ✧ Two type of ER: rough ER, smooth ER 1) rough ER named because of the ribosomes attached to its surface, makes membrane and secretory proteins; 2) the function of smooth ER: lipid synthesis, detoxification
The Golgi Apparatus 高尔基体	✧ Consists of a stack of membrane plates. ✧ Receives, refines, stores certain ER products and packages them in transport vesicles targeted for other organelles or export from the cell.

Lysosomes 溶酶体	✧ A membrane-enclosed sac of digestive enzymes found in animal cells, developed from vesicles that bud off from the Golgi apparatus. ✧ Contain digestive enzymes, aid digestion and recycling within the cell. ✧ Functions: 1) nourish the cell; 2) destroy harmful bacteria; 3) continually renew the cell; 4) sculpting functions in embryonic development ✧ Typical disease: Tay-Sachs disease
Vacuoles 液泡	✧ Large sacs made of membrane that bud off from the ER or Golgi apparatus. ✧ Functions: 1) Food vacuole; 2) Contractile vacuoles; 3) Central vacuoles that store organic nutrients.

- **Energy transformations:** chloroplasts, mitochondria



- **The cytoskeleton:** cell shape and movement

Maintaining cell shape	✧ Cytoskeleton fibers: 1) microtubules; 2) intermediate filaments; 3) microfilaments.
Cilia and flagella	✧ Aid in movement. ✧ They are made primarily of microtubules; ✧ Differences: 1) Cilia: short, numerous, move the cell via coordinated beating. 2) Flagella: long, often occur singly, propel a cell with whiplike movement.