Inside the Eukaryotic Cell
Section 7-2

THE FRAMEWORK OF THE CELL

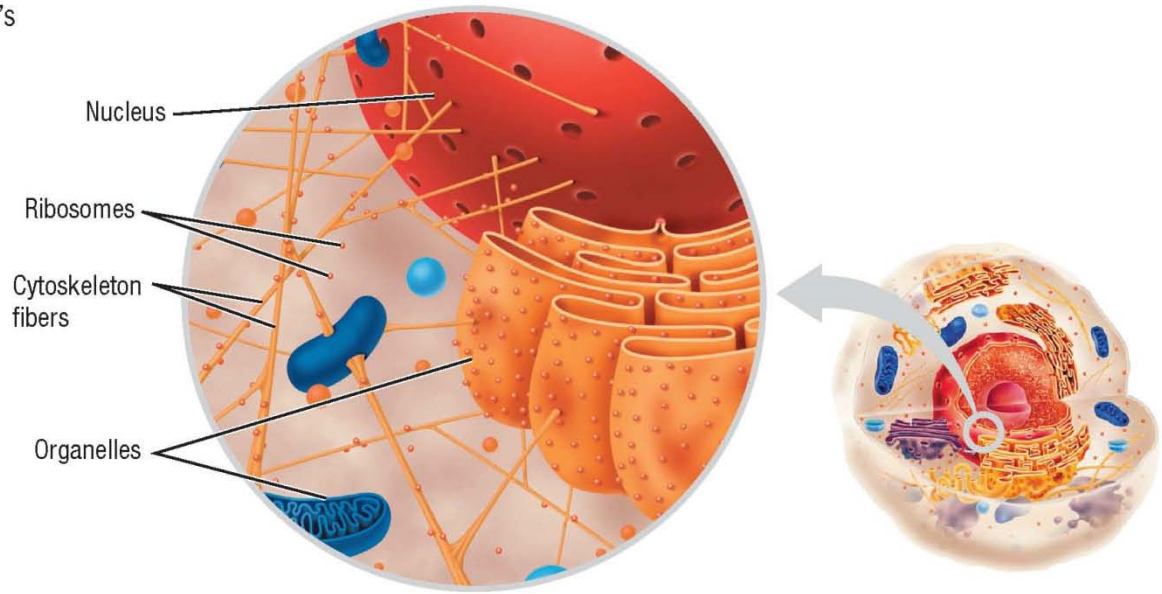
Key Idea: The cytoskeleton helps the cell move, keep its shape and organize parts.

THE FRAMEWORK OF THE CELL

- An intricate network of protein provides the interior framework of the cell.
- There are three types of cytoskeleton fibers:
  - Microfilaments
  - Microtubules
  - Intermediate fibers

CYTOSKELETON

Figure 3 The cytoskeleton's network of protein fibers anchors cell organelles and other components of the cytoplasm.



DIRECTING CELLULAR ACTIVITY

Key Idea: DNA instructions are copied as RNA messages, which leave the nucleus. In the cytoplasm, ribosomes use the RNA messages to assemble proteins.

The word assemble means to fit together parts or pieces to build.

NUCLEUS

- DNA is stored in the nucleus.
- *Nuclear envelope* surrounds the nucleus.
- *Nucleolus* is within the nucleus where ribosome parts are made.

THE NUCLEUS

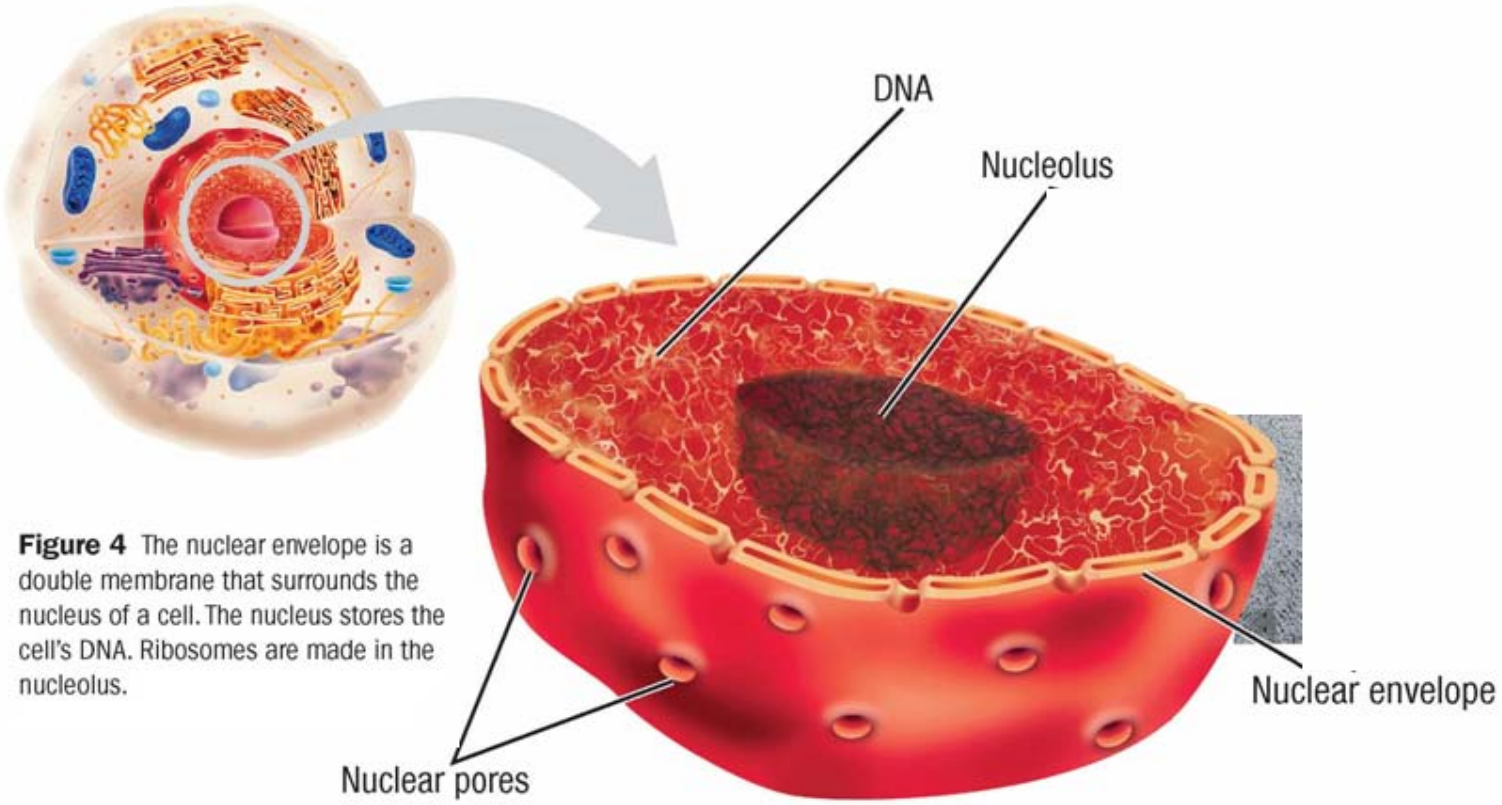


Figure 4 The nuclear envelope is a double membrane that surrounds the nucleus of a cell. The nucleus stores the cell's DNA. Ribosomes are made in the nucleolus.

RIBOSOMES

- Each ribosome in a cell is made of RNA and many different proteins.
- "free" ribosomes – suspended in the cytosol, make proteins that remain inside the cell.
- "bound" ribosomes – attached to the endoplasmic reticulum, make proteins that are exported from the cell.

PROTEIN PROCESSING

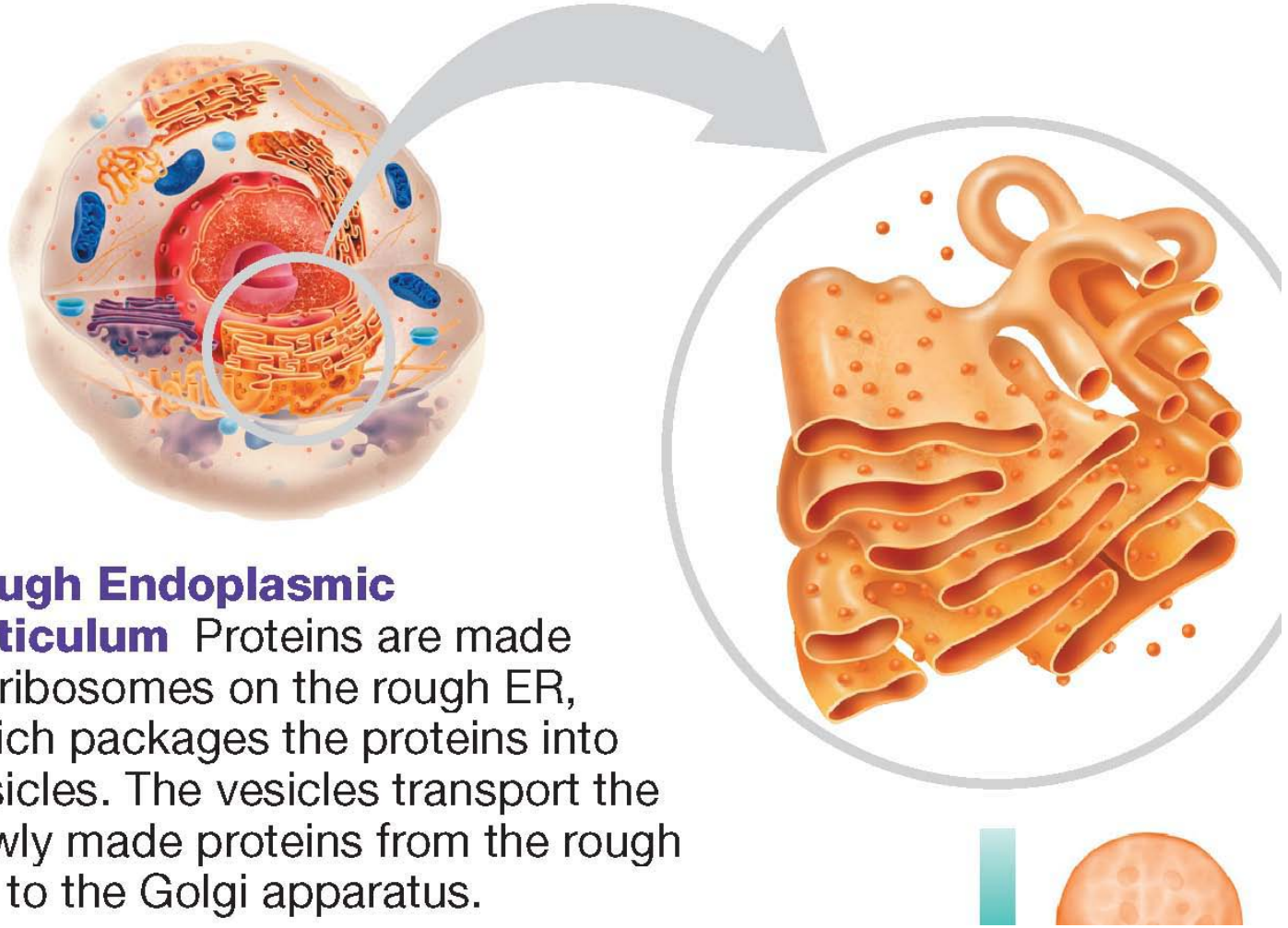
Key Idea: The endoplasmic reticulum and Golgi apparatus are organelles involved in preparing proteins for extracellular export.

- A vesicle is a small, membrane-bound sac that encloses the protein and keeps them separate from the rest of the cytoplasm.
- The endoplasmic reticulum is a extensive system that moves proteins and other substances.
- The Golgi apparatus is a set of flattened, membrane-bound sacs.

ENDOPLASMIC RETICULUM

- Divided into 2 portions: rough ER and smooth ER.
- Rough ER has attached ribosomes and makes proteins
- Smooth ER has no ribosomes and makes lipids and breaks down toxic substances.

ENDOPLASMIC RETICULUM

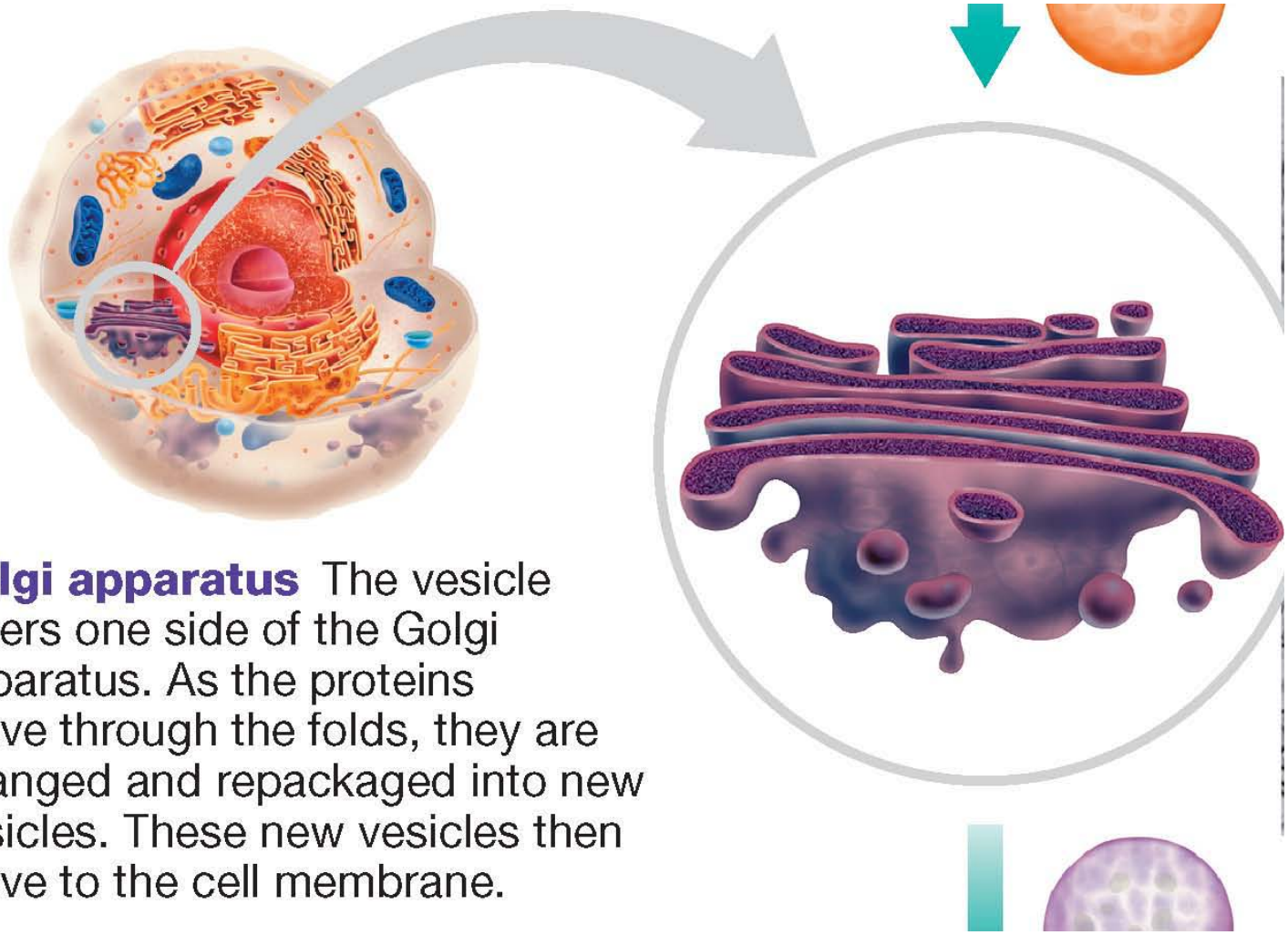


1. **Rough Endoplasmic Reticulum** Proteins are made by ribosomes on the rough ER, which packages the proteins into vesicles. The vesicles transport the newly made proteins from the rough ER to the Golgi apparatus.

GOLGI APPARATUS

- The Golgi apparatus helps modify, sort, and package cell products for distribution.

GOLGI APPARATUS



2 Golgi apparatus The vesicle enters one side of the Golgi apparatus. As the proteins move through the folds, they are changed and repackaged into new vesicles. These new vesicles then move to the cell membrane.

STEPS TO DIGEST FOOD PARTICLES

Step 1: ER membrane pinches off and forms a vesicle around the proteins.

Step 2: Vesicles transport the proteins to the Golgi apparatus, where they are modified by enzymes and repackaged in new vesicles.

Step 3: New vesicles transport the modified proteins to the cell membrane to be released outside the cell.

STORAGE AND MAINTENANCE

Key Idea: The vesicles help maintain homeostasis by storing and releasing a variety of substances as the cell needs them.

A vacuole is a fluid-filled vesicle found in the cytoplasm of many plant cells.

LYSOSOMES

- Lysosomes contain enzymes that recycle old or damaged organelles and digest food particles to provide nutrients for the cell.

CENTRAL VACUOLE

- A central vacuole helps the cell become rigid, allowing a plant to stand up. When the vacuole loses water, the cell shrinks, and the plant dies.

OTHER VACUOLES

- A contractile vacuole pumps excess water out of the cell in order to control the concentration of salts and other substances.
- A food vacuole is formed when the cell membrane surrounds food particles outside the cell and pinches off to form a vesicle inside the cell.

ENERGY PRODUCTION

Key Idea: The energy for cellular functions is produced by chemical reactions that occur in the mitochondria and chloroplasts.

- The chloroplast is an organelle found in plant and algae cells that uses light energy to make carbohydrates from carbon dioxide and water.
- The mitochondrion is a cell organelle that uses energy from organic compounds to make ATP.

CHLOROPLASTS

- They contain chlorophyll which is a green pigment that helps with photosynthesis.

MITOCHONDRIA

- Most of the ATP needed by a cell is produced inside mitochondria. Both animal and plant cells contain mitochondria.