Bio 11

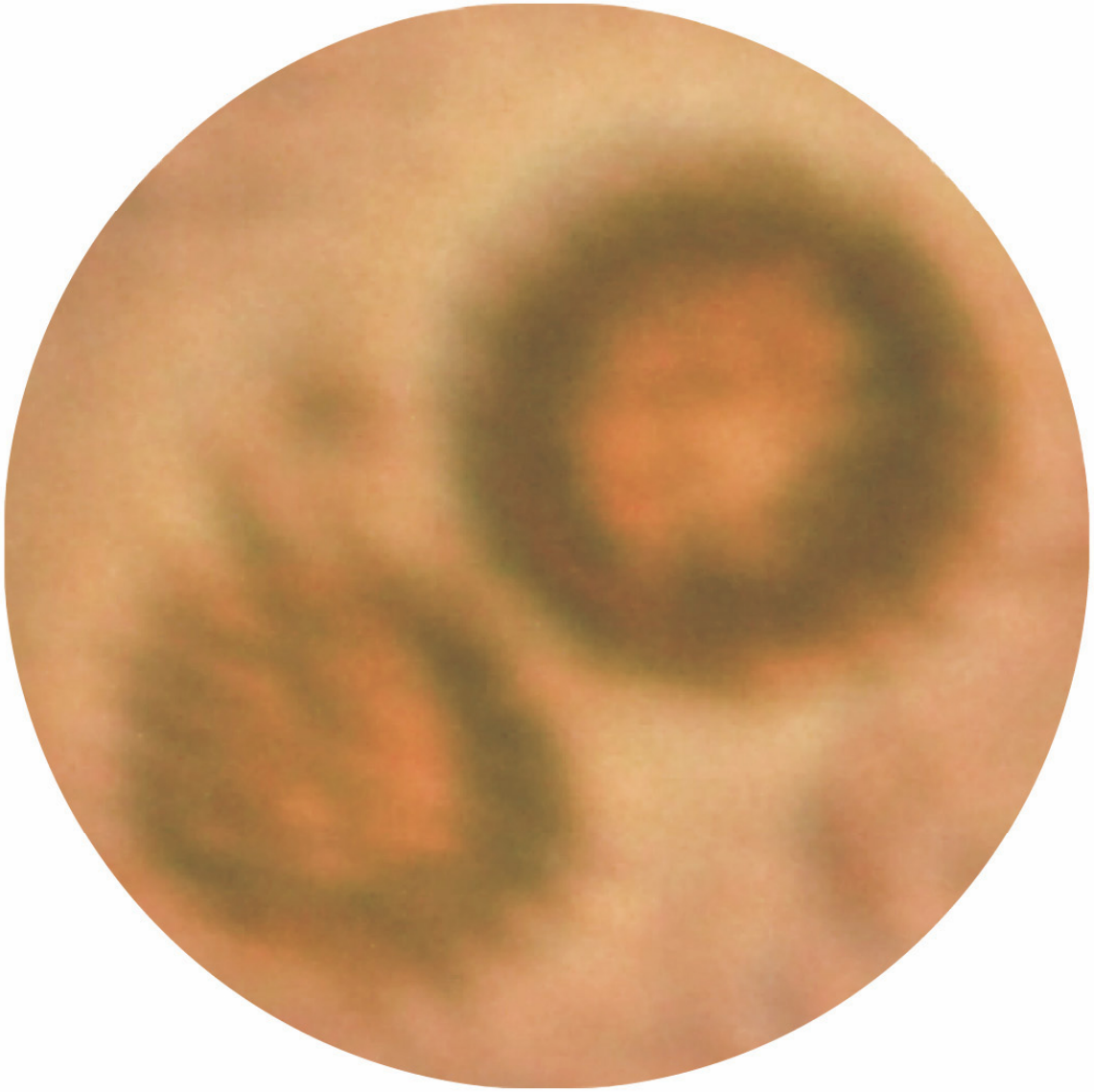
Cells, the Membrane, Diffusion and Osmosis

“Typical” Cells

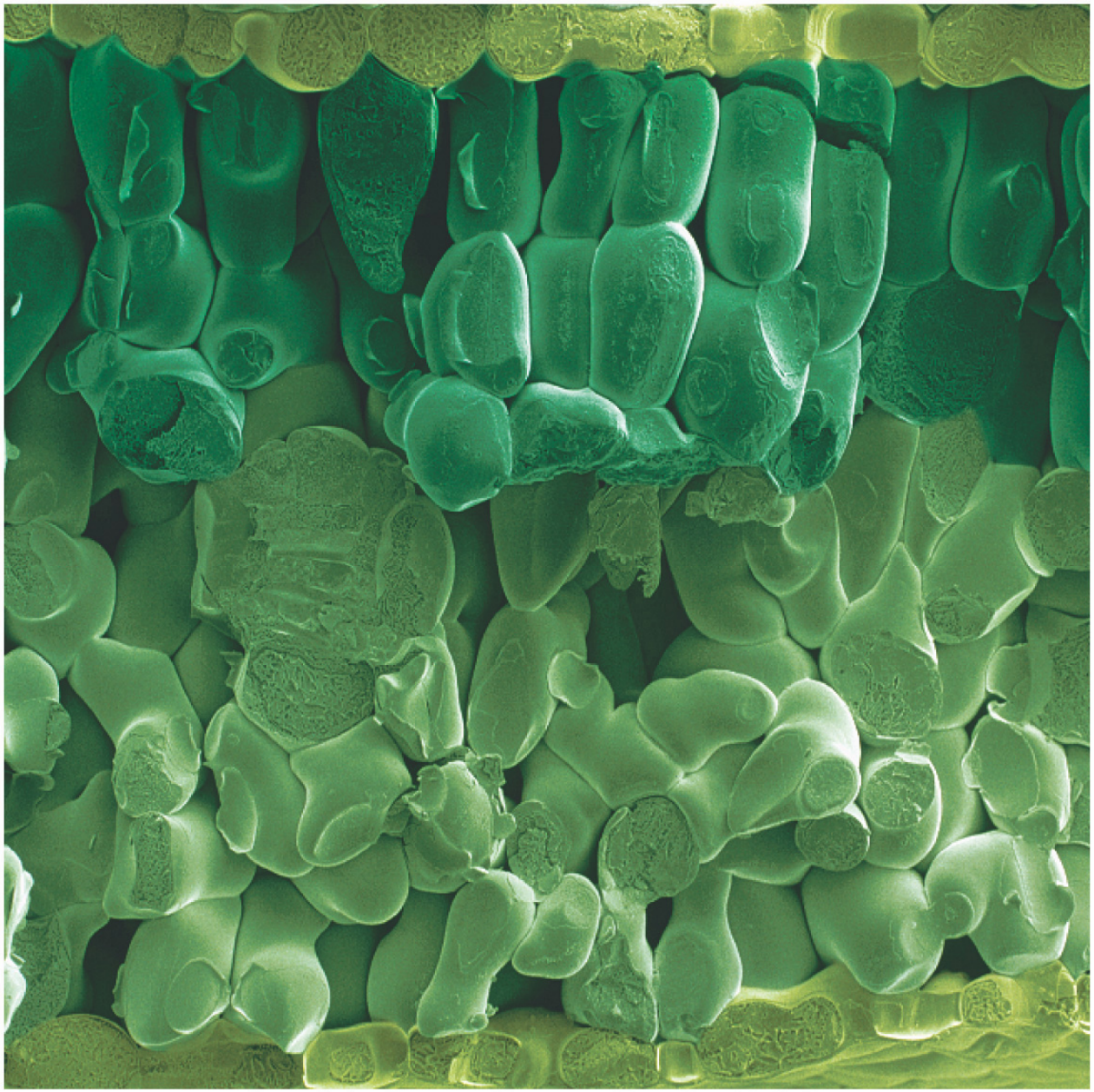
Cell size

- Dictated by the organism and will vary due to the functions the cell must accomplish.
- Smaller cells are more efficient than bigger cells--more area for the nutrients and waste to get in and out.

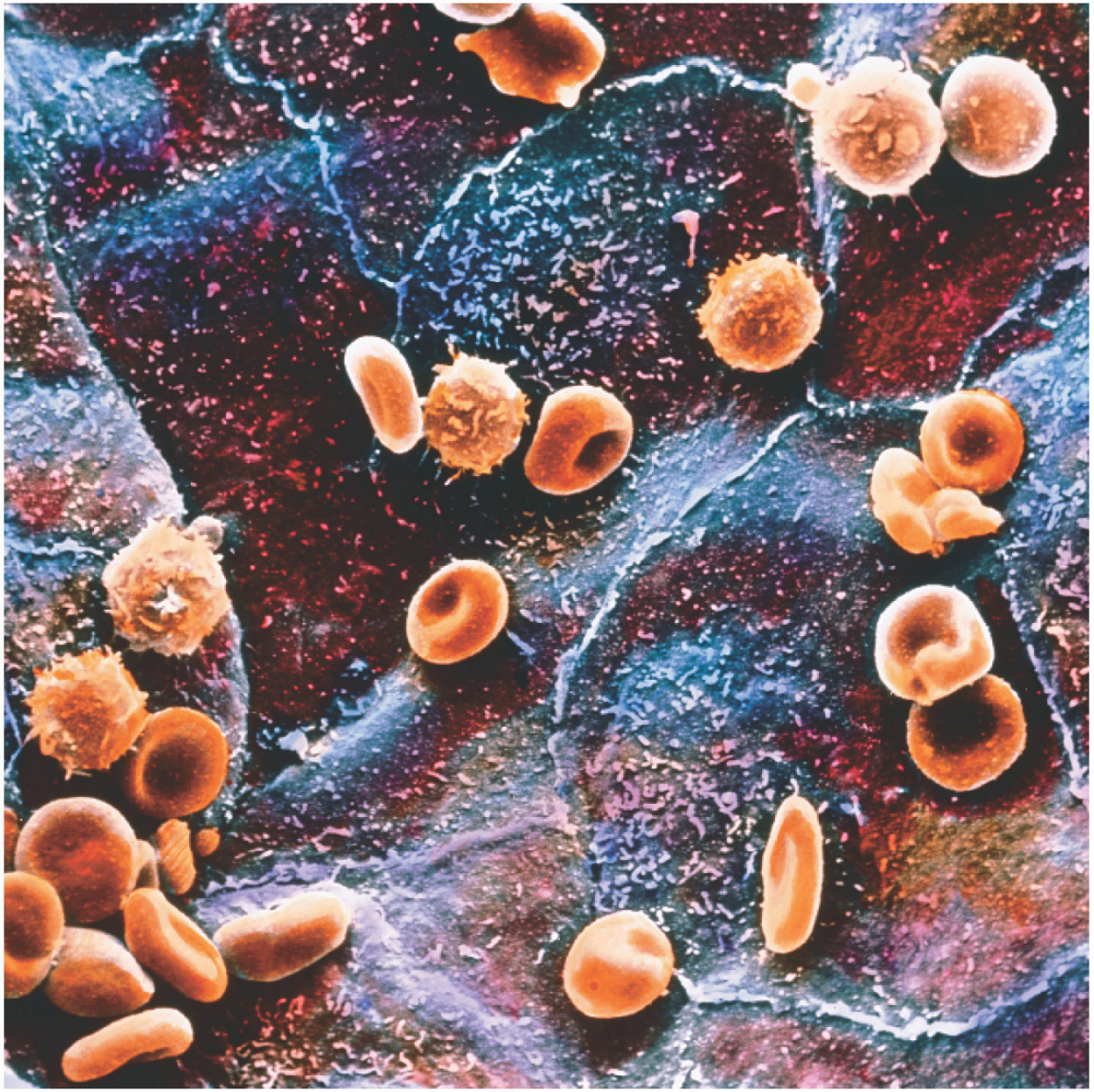
(a) What Leeuwenhoek could see



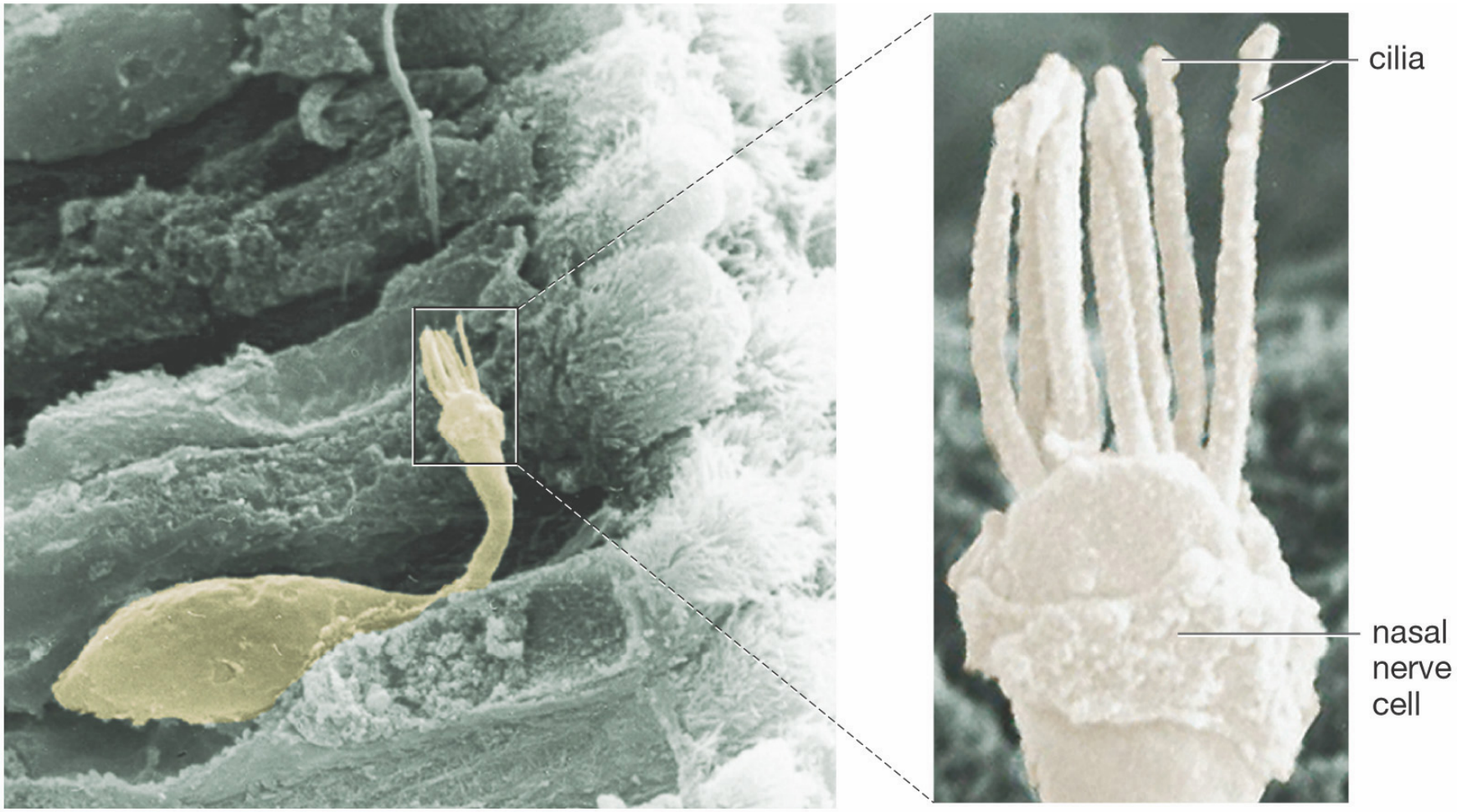
Budding Yeast ---Shmus

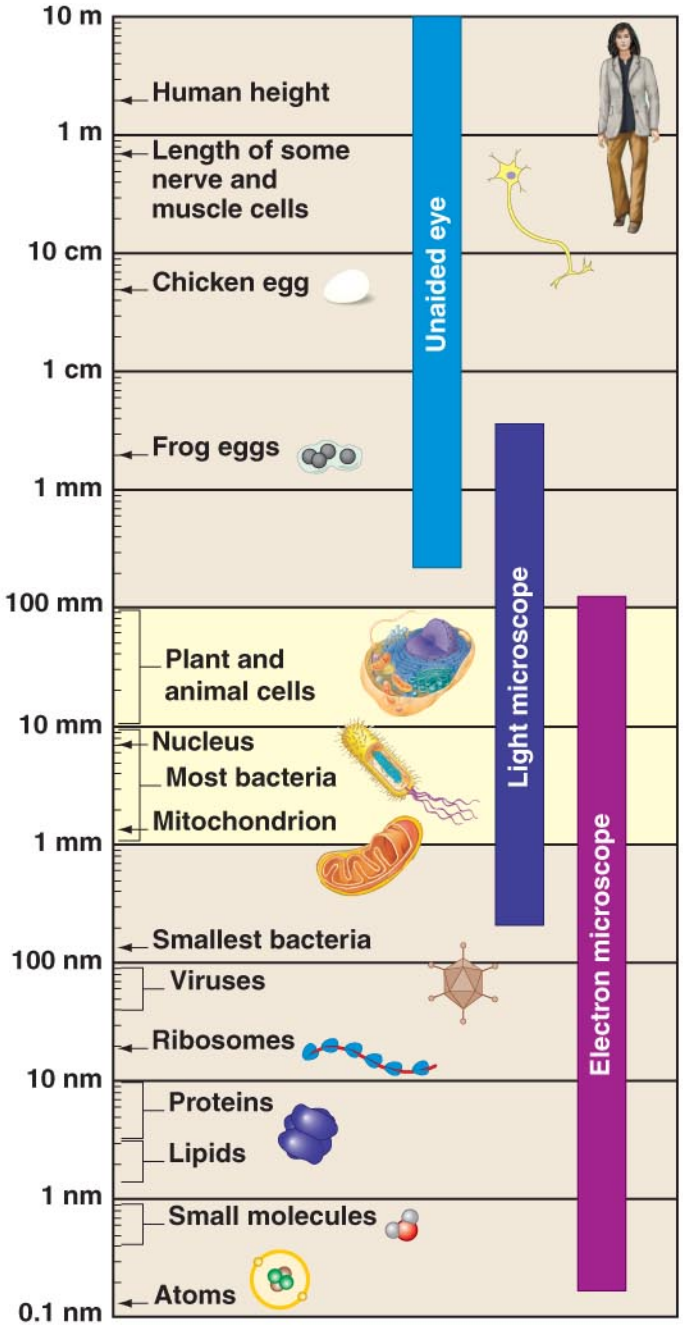


Leaf cross section



White and Red Blood Cells



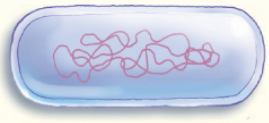
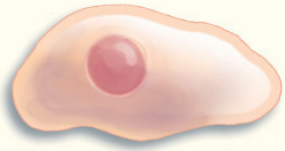
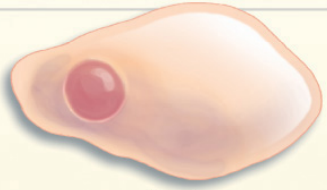
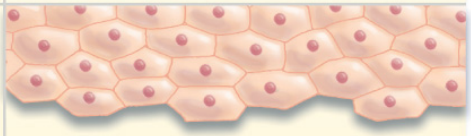
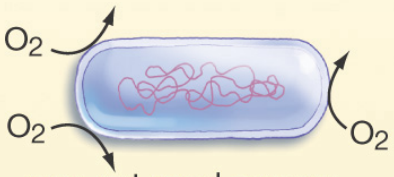
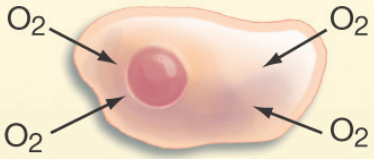
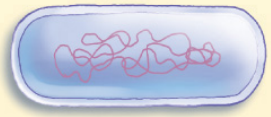
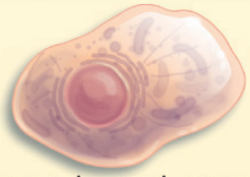


What all cells have in common

- Plasma membrane
- DNA
- RNA
- Ribosomes
- Cytoplasm

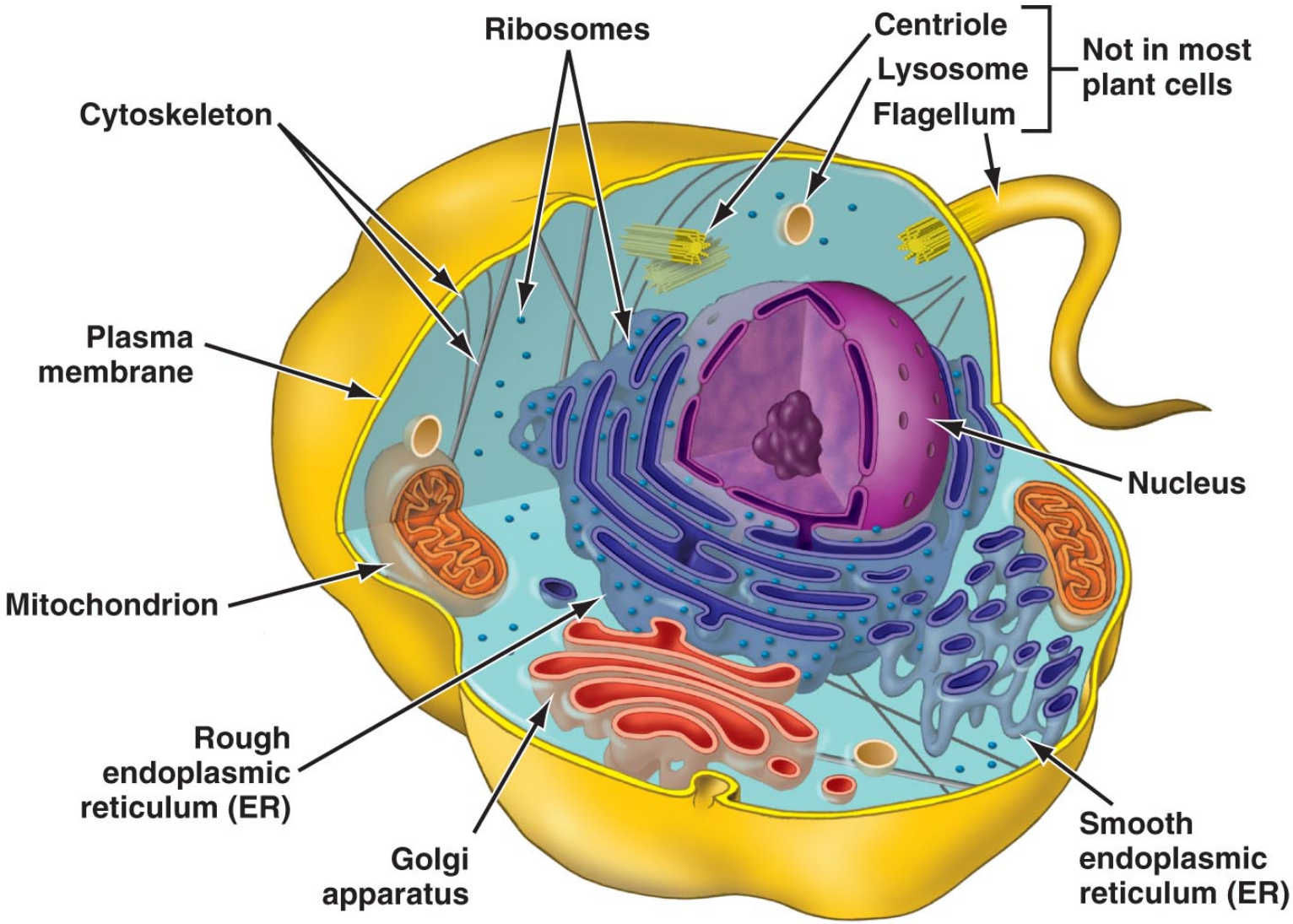
Differences between prokaryotes and eukaryotes

- DNA is circular in prokaryotes and mostly linear in eukaryotes
- DNA is contained in the nucleus of eukaryotes and in the cytoplasm of prokaryotes.
- Eukaryotes have membrane bound organelles, while prokaryotes do not.
- Ribosomes are smaller in prokaryotes than in eukaryotes.

	Prokaryotes	Eukaryotes
DNA	 in " nucleoid" region	 within membrane-bound nucleus
Size	 usually smaller	 usually larger
Organization	 usually single-celled	 often multicellular
Metabolism	 may not need oxygen	 usually need oxygen to exist
Organelles	 no membrane-bound organelles	 membrane-bound organelles

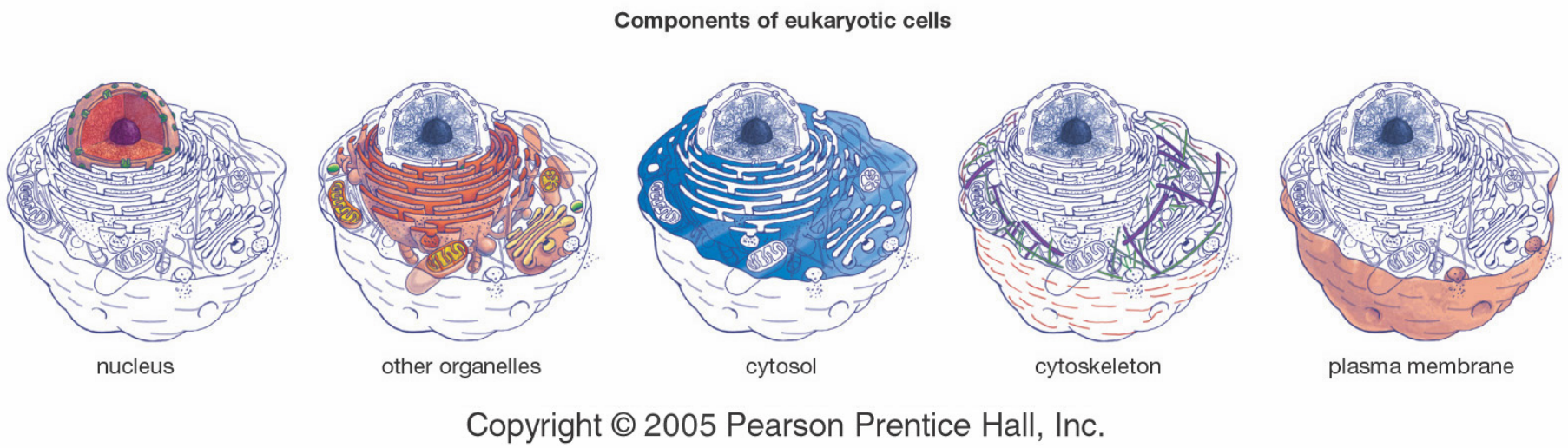
The Animal Cell

Very Complex

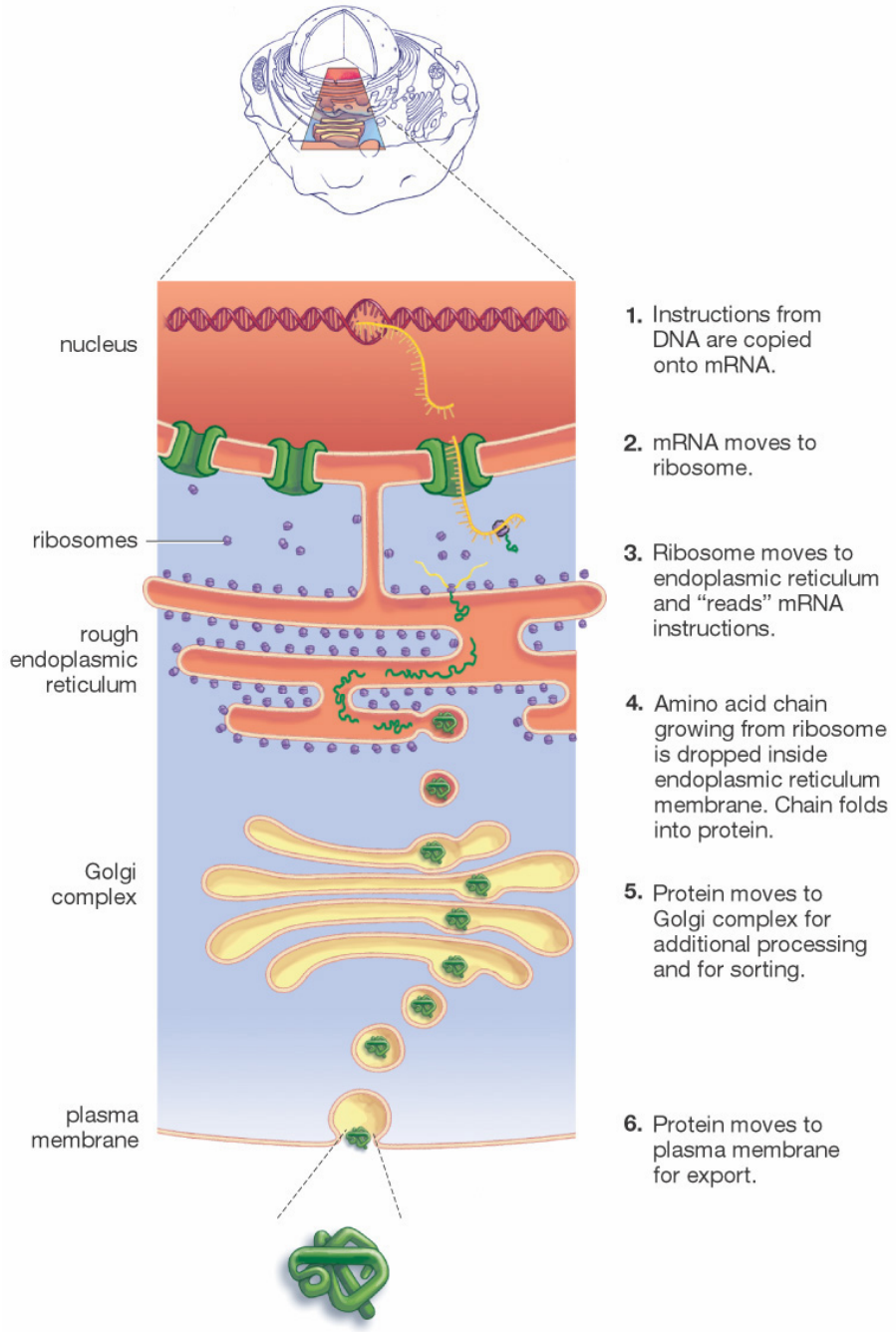


Idealized animal cell

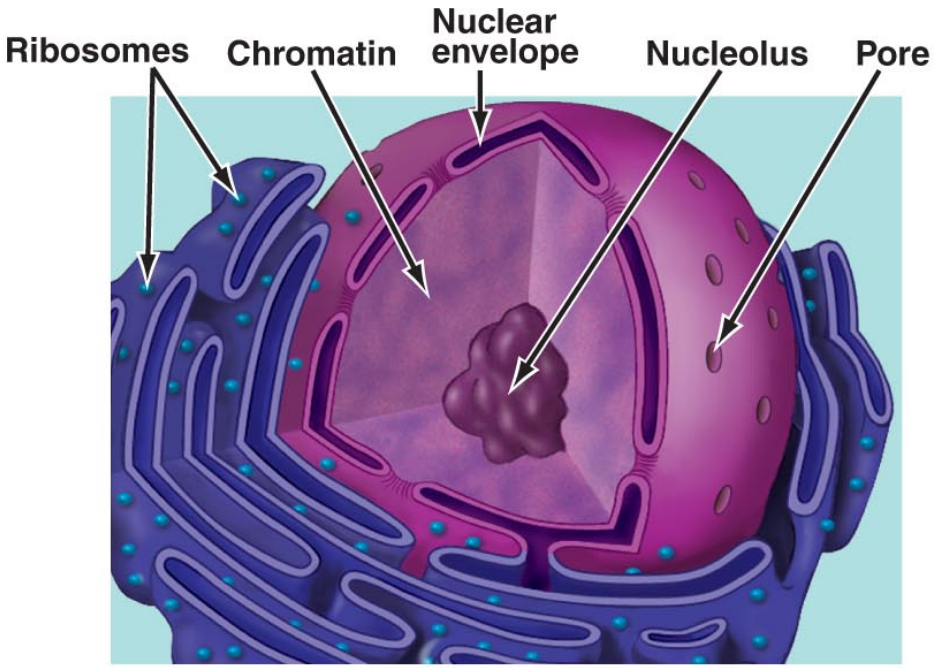
The order we will talk about Animal Cell Components

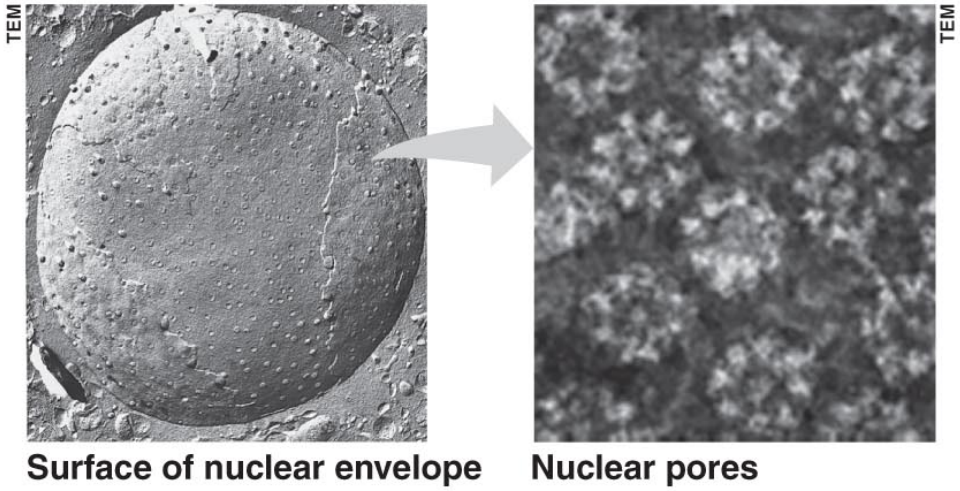


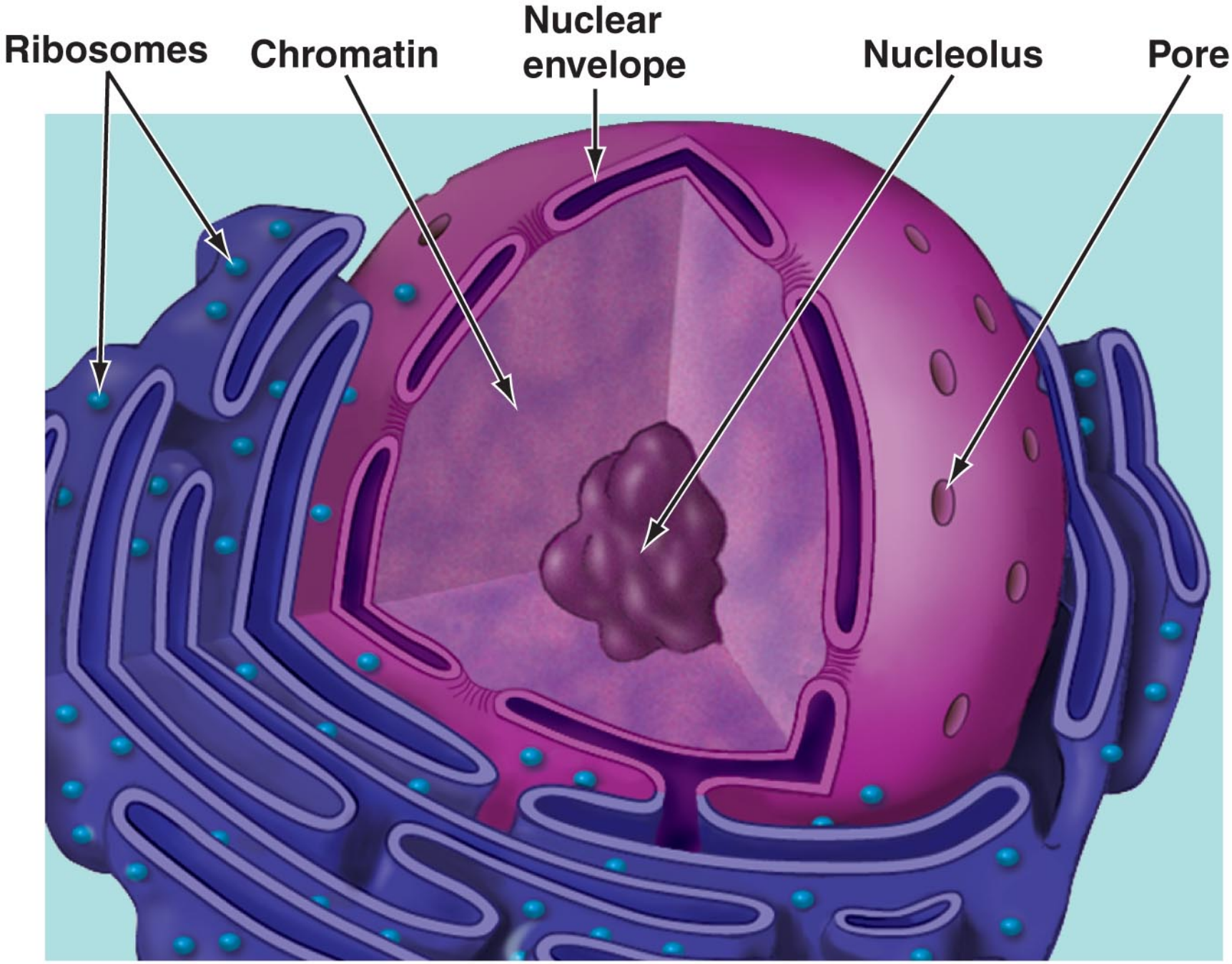
The path of a secreted protein.

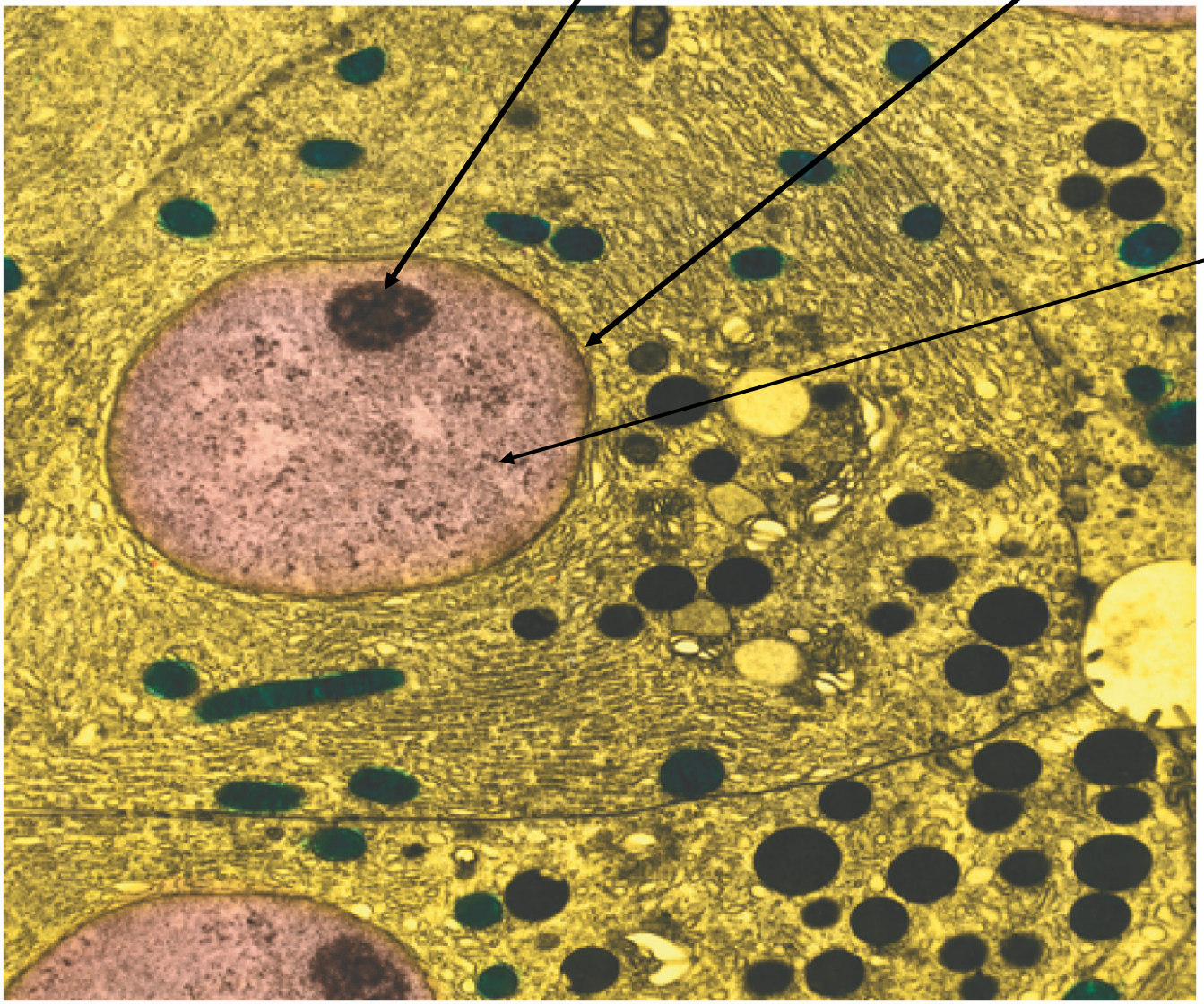


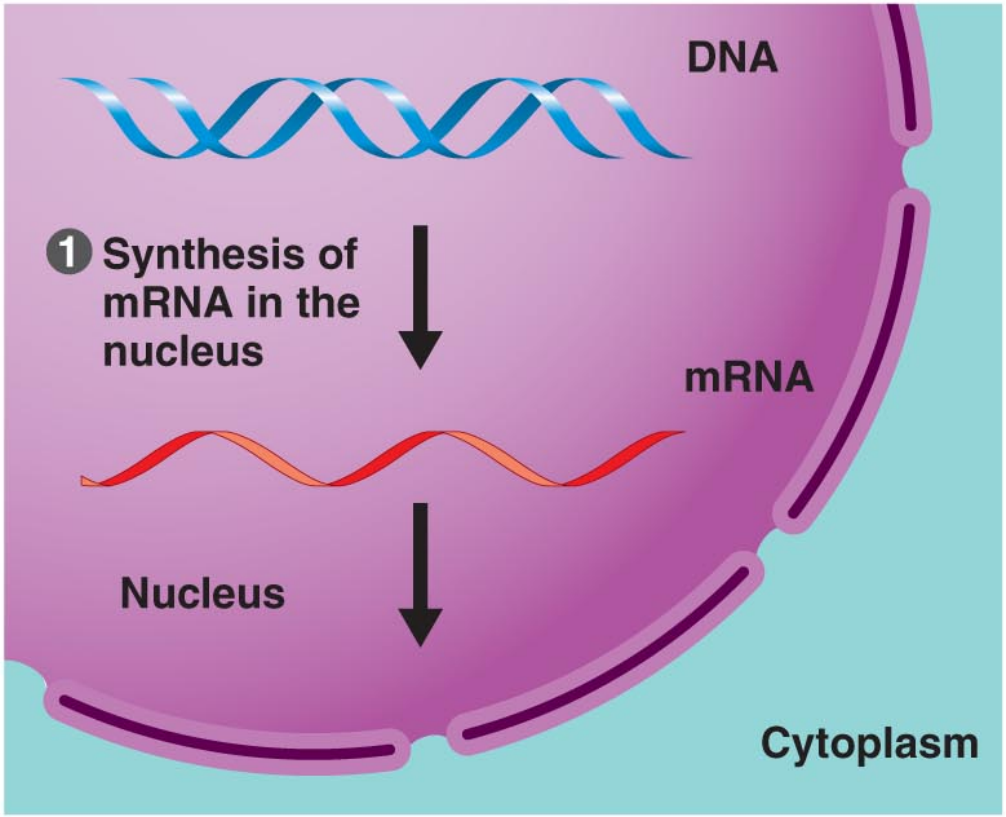
Nucleus- Where the DNA is kept.

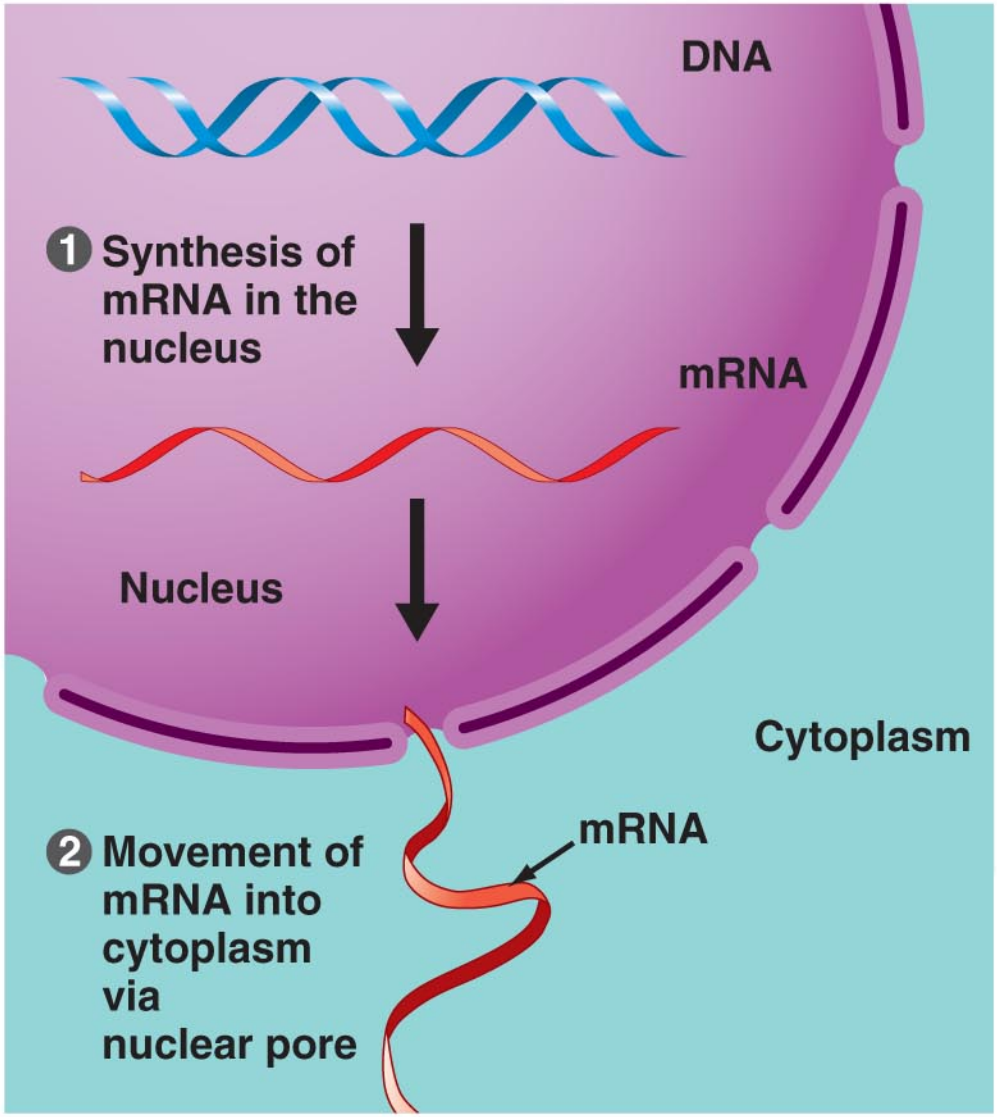




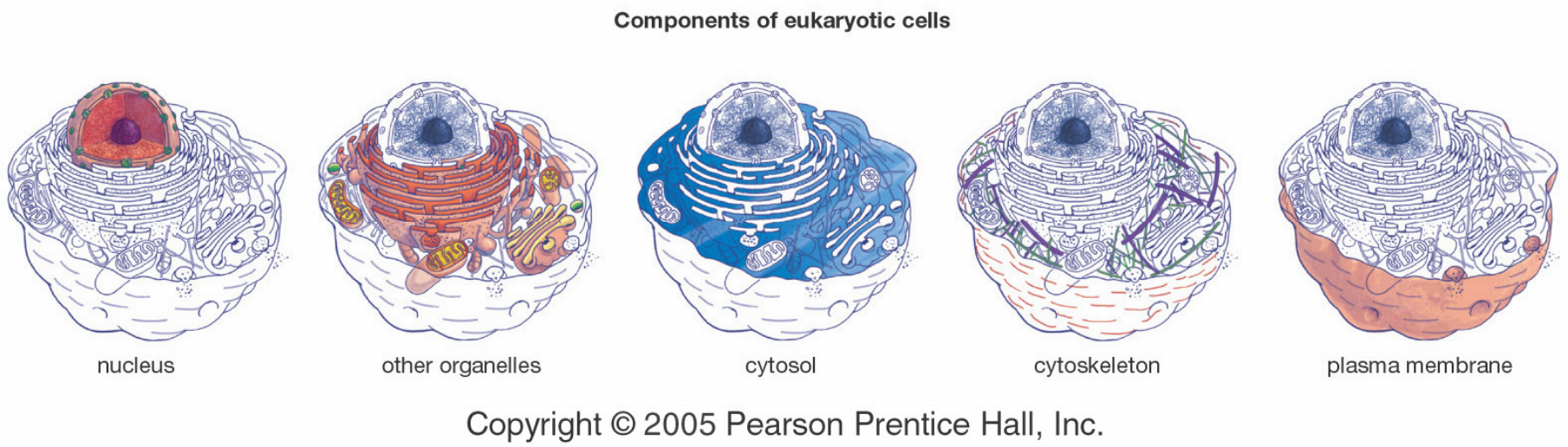


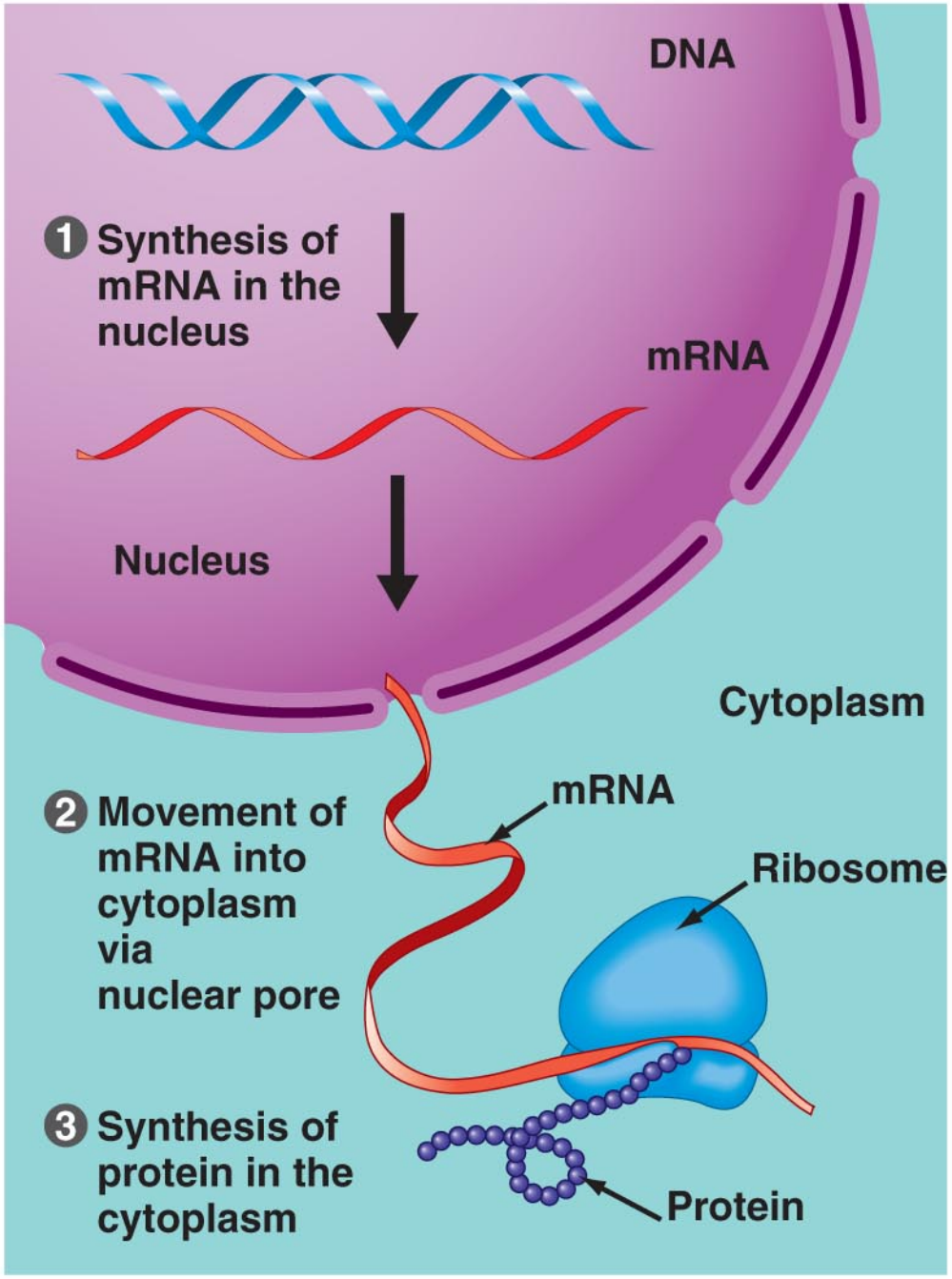


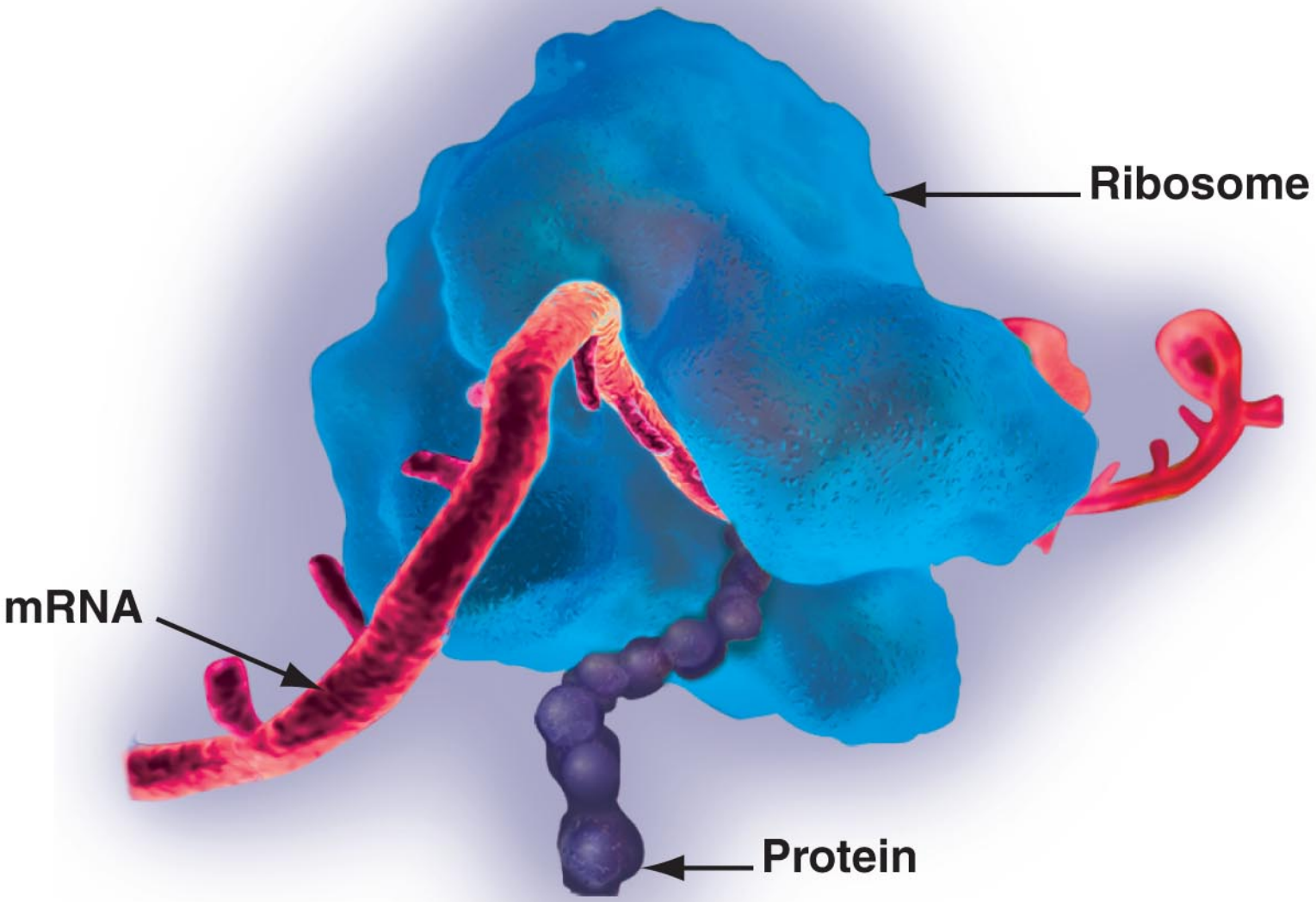


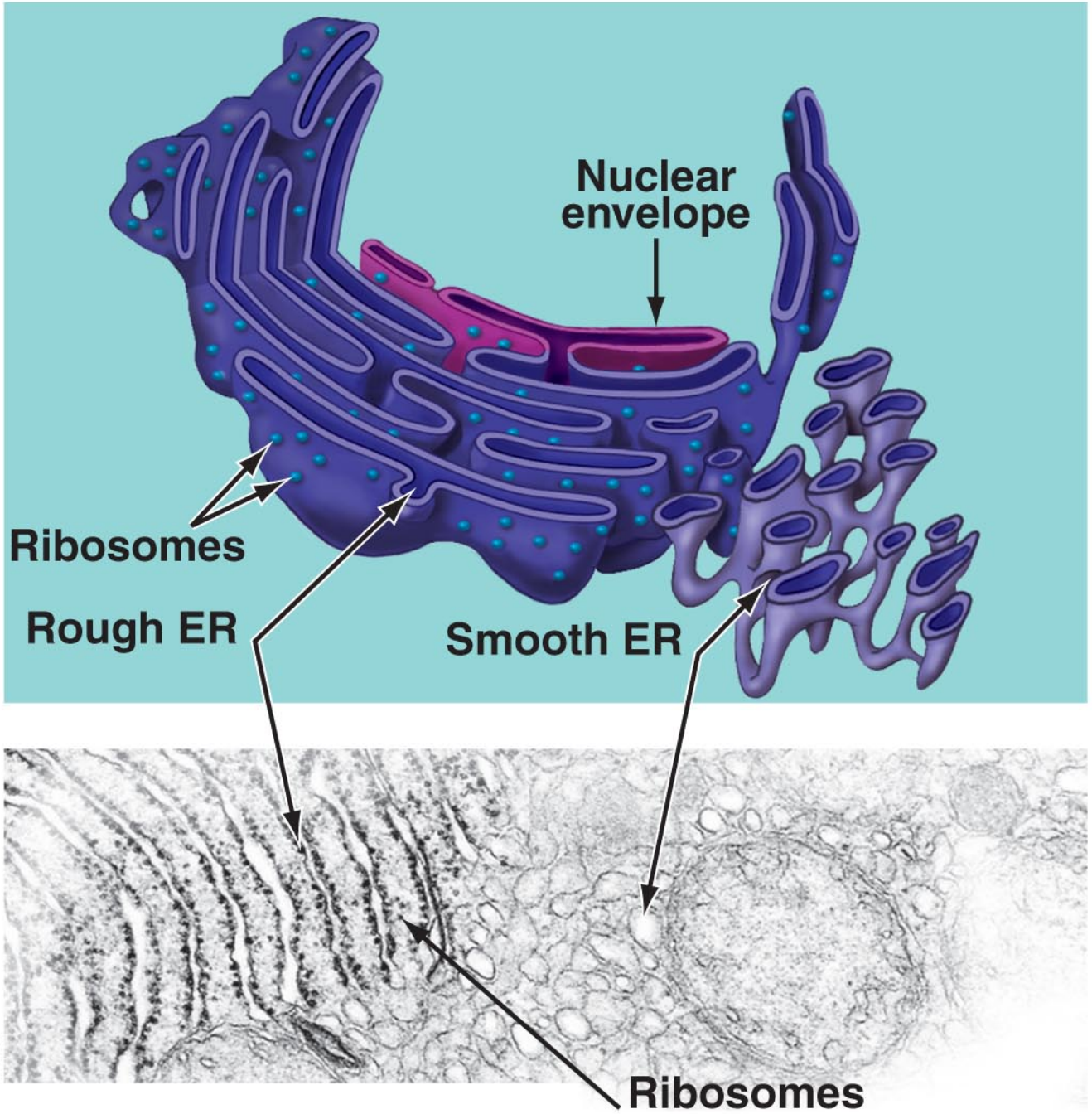


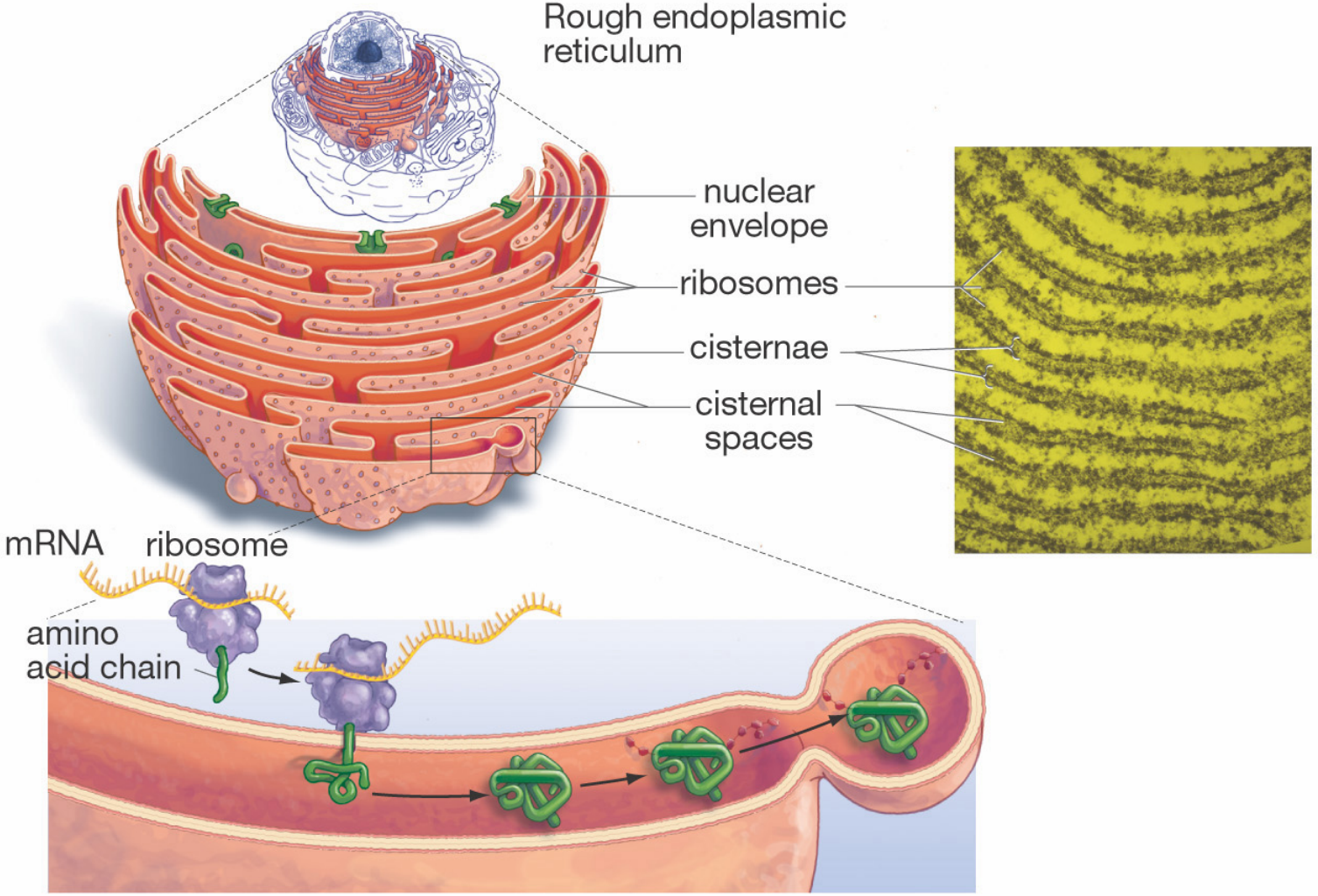
Other organelles



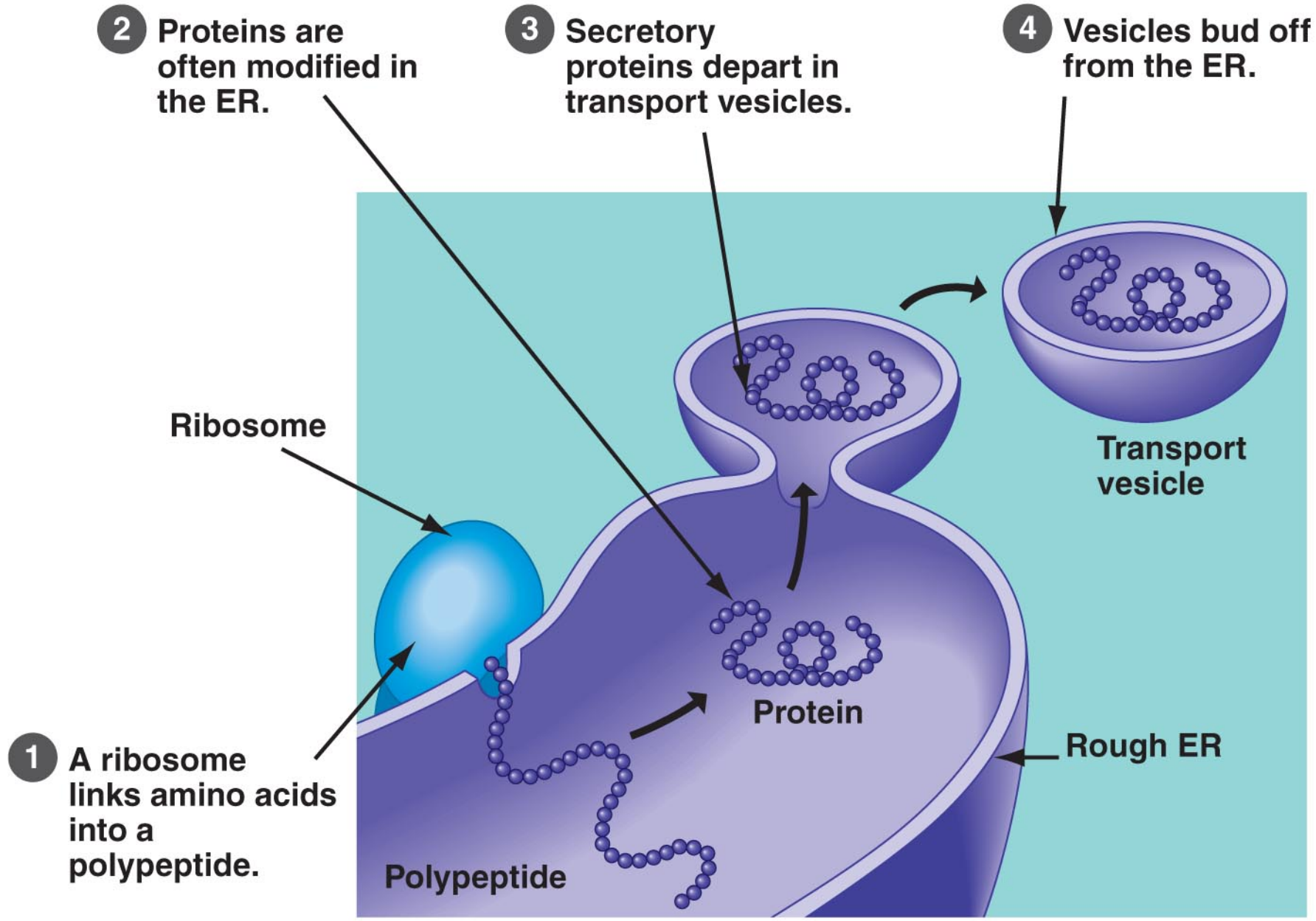


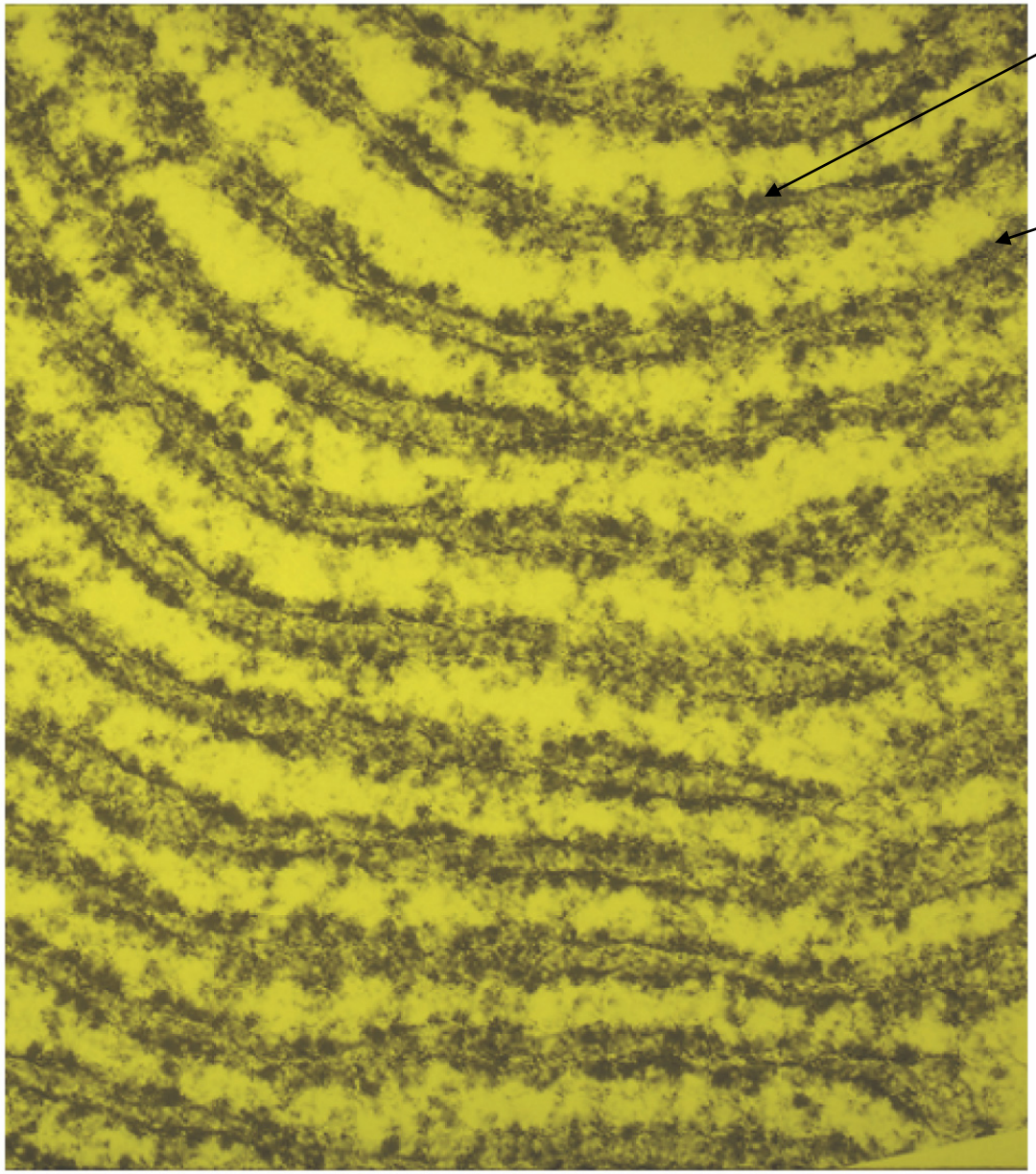


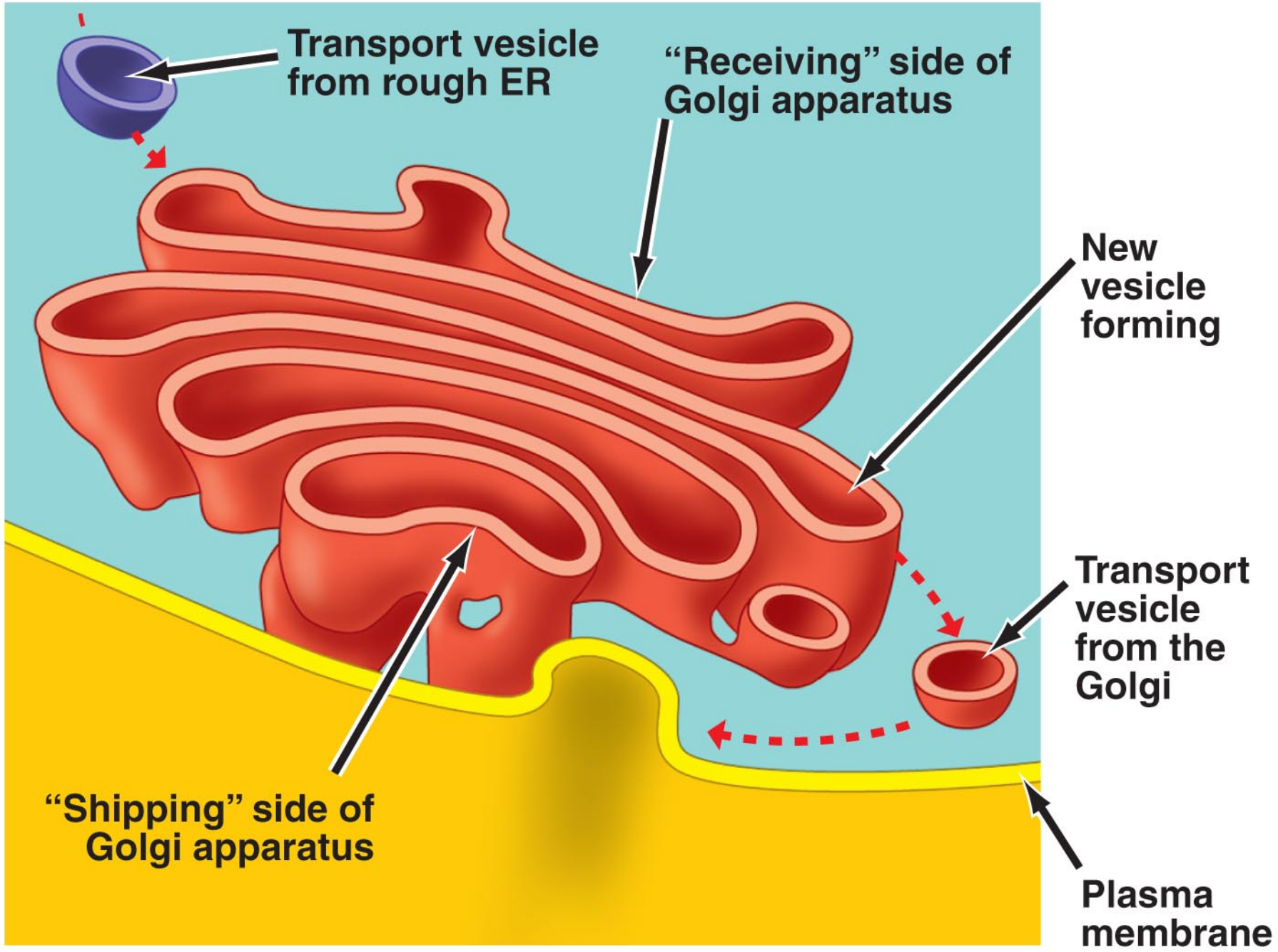


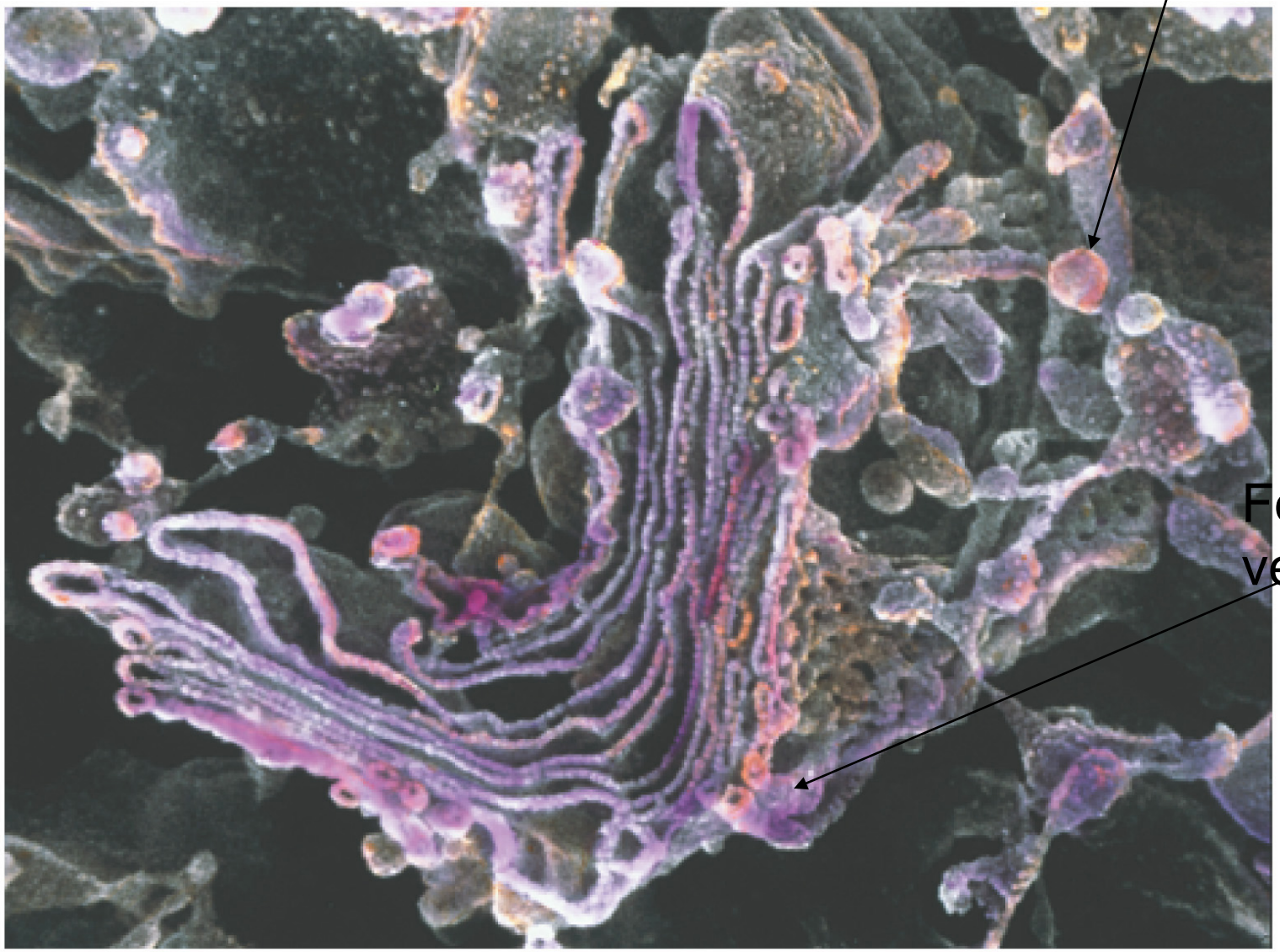


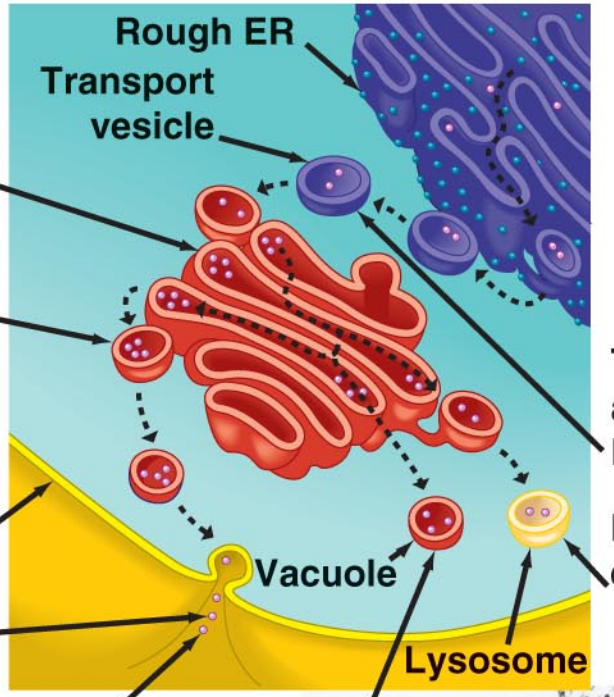
1. mRNA docks on ribosome. Amino acid chain production begins.
2. Ribosome docks on ER. Amino acid chain moves into cisternal space as it is completed.
3. Amino acid chain folds up making a protein.
4. Side chains added to protein.
5. Vesicle formed to house protein while in transport.









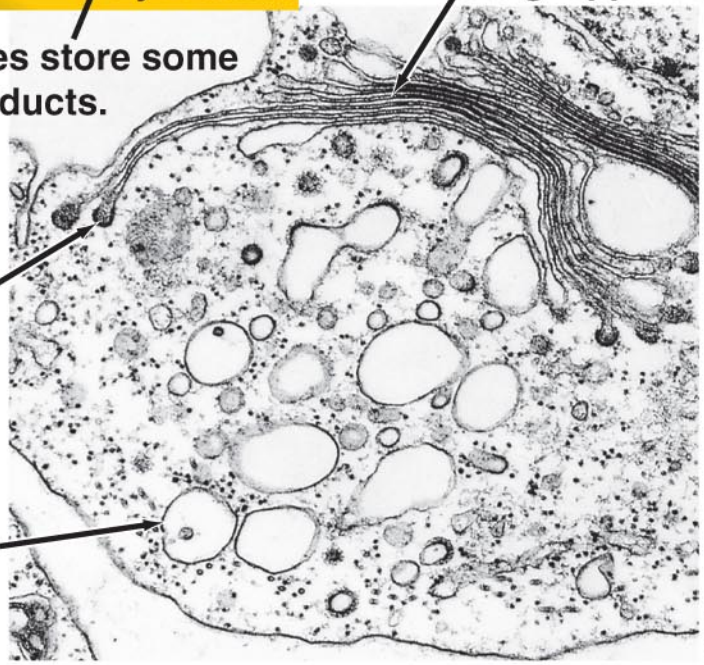


Transport vesicles carry enzymes and other proteins from the rough ER to the Golgi for processing.

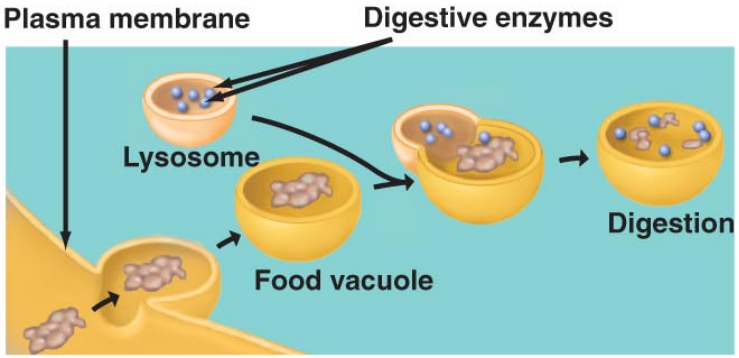
Lysosomes carrying digestive enzymes can fuse with other vesicles.

Some products are secreted from the cell.

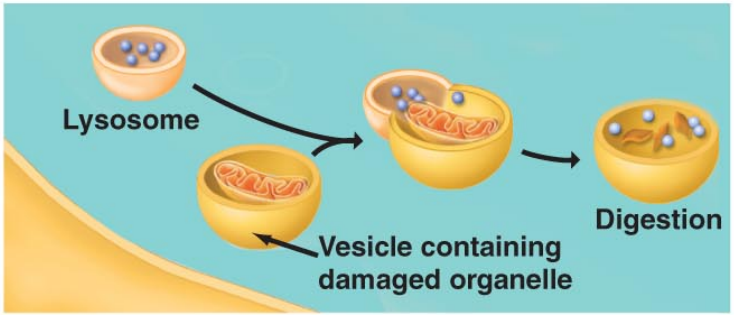
Vacuoles store some cell products.



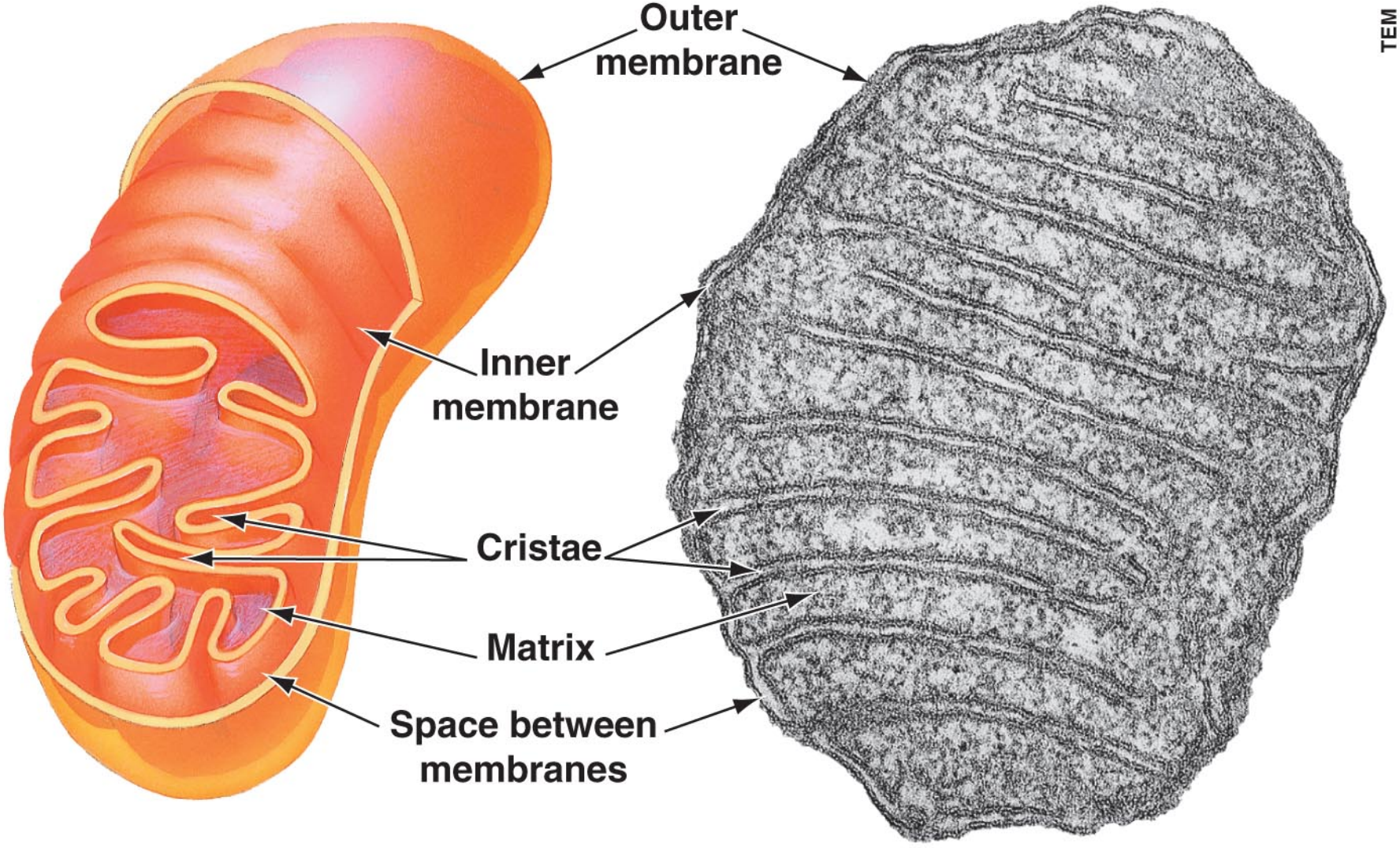
The cell recycles



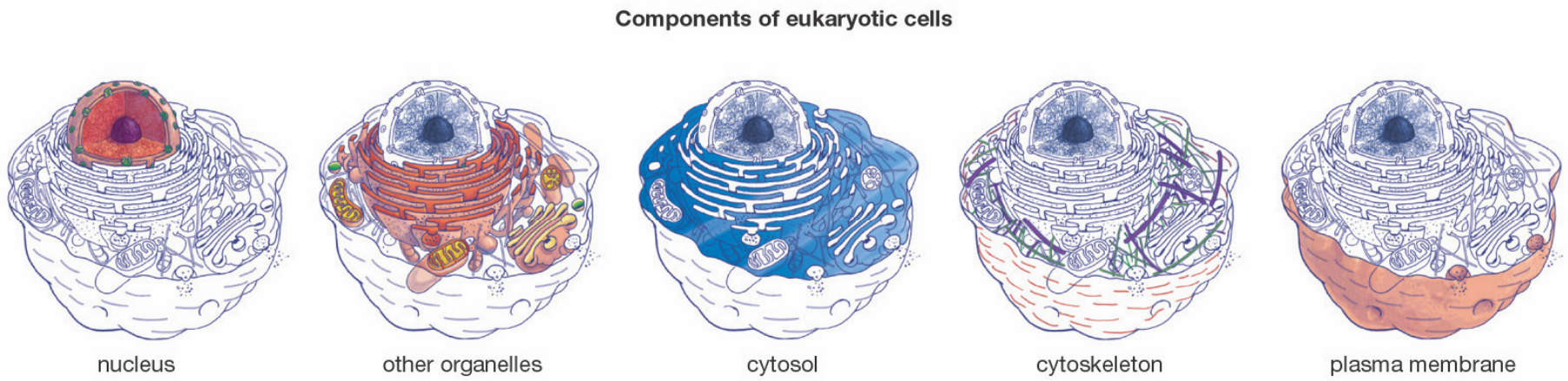
(a) Lysosome digesting food



(b) Lysosome breaking down the molecules of damaged organelles



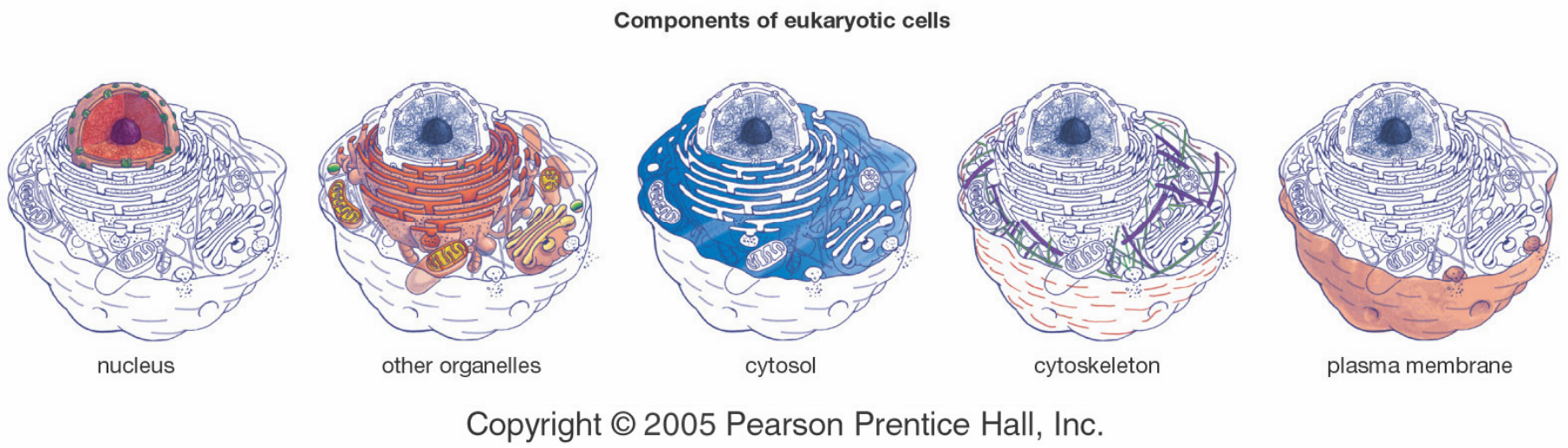
Cytoplasm

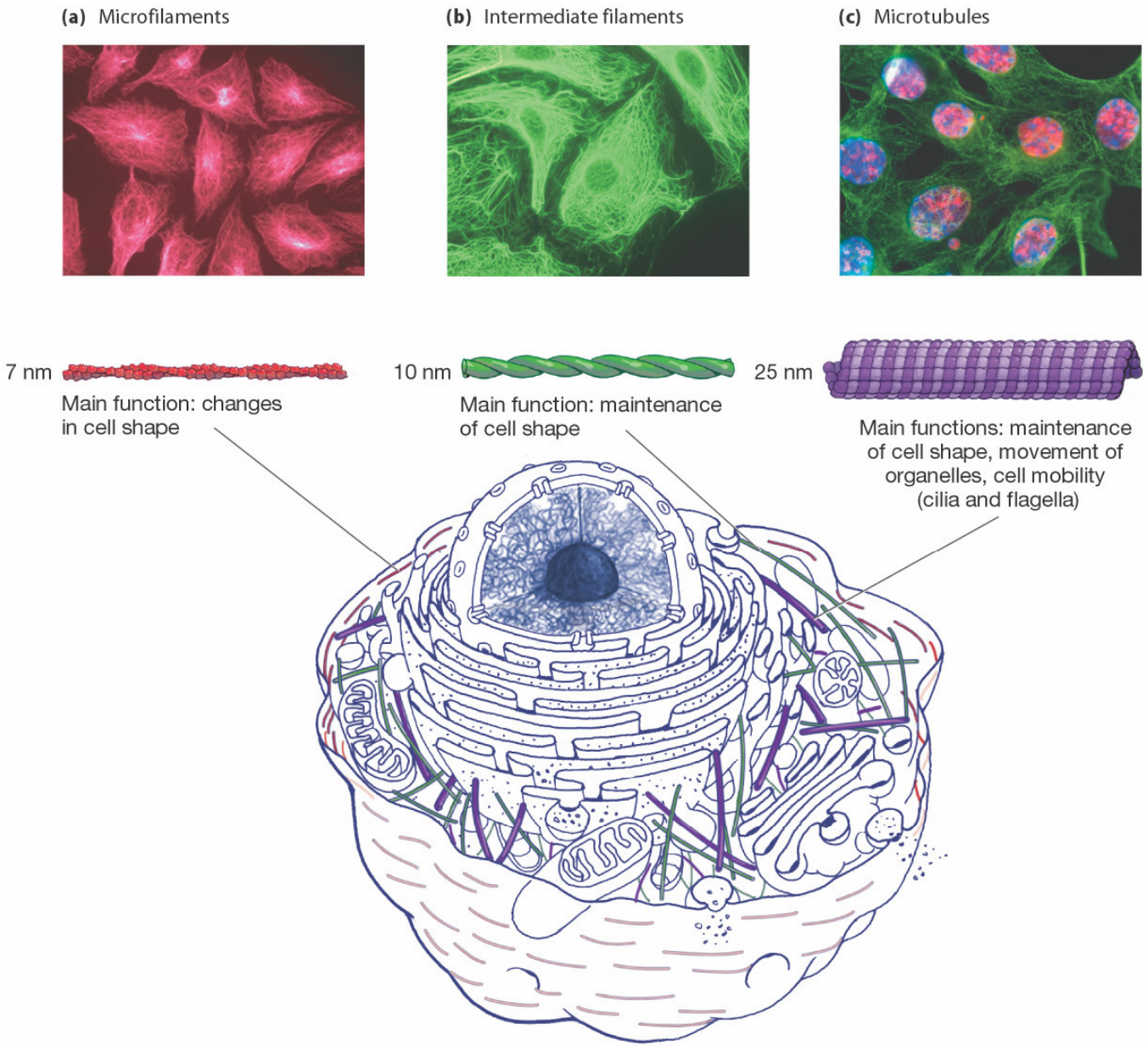


cytoplasm

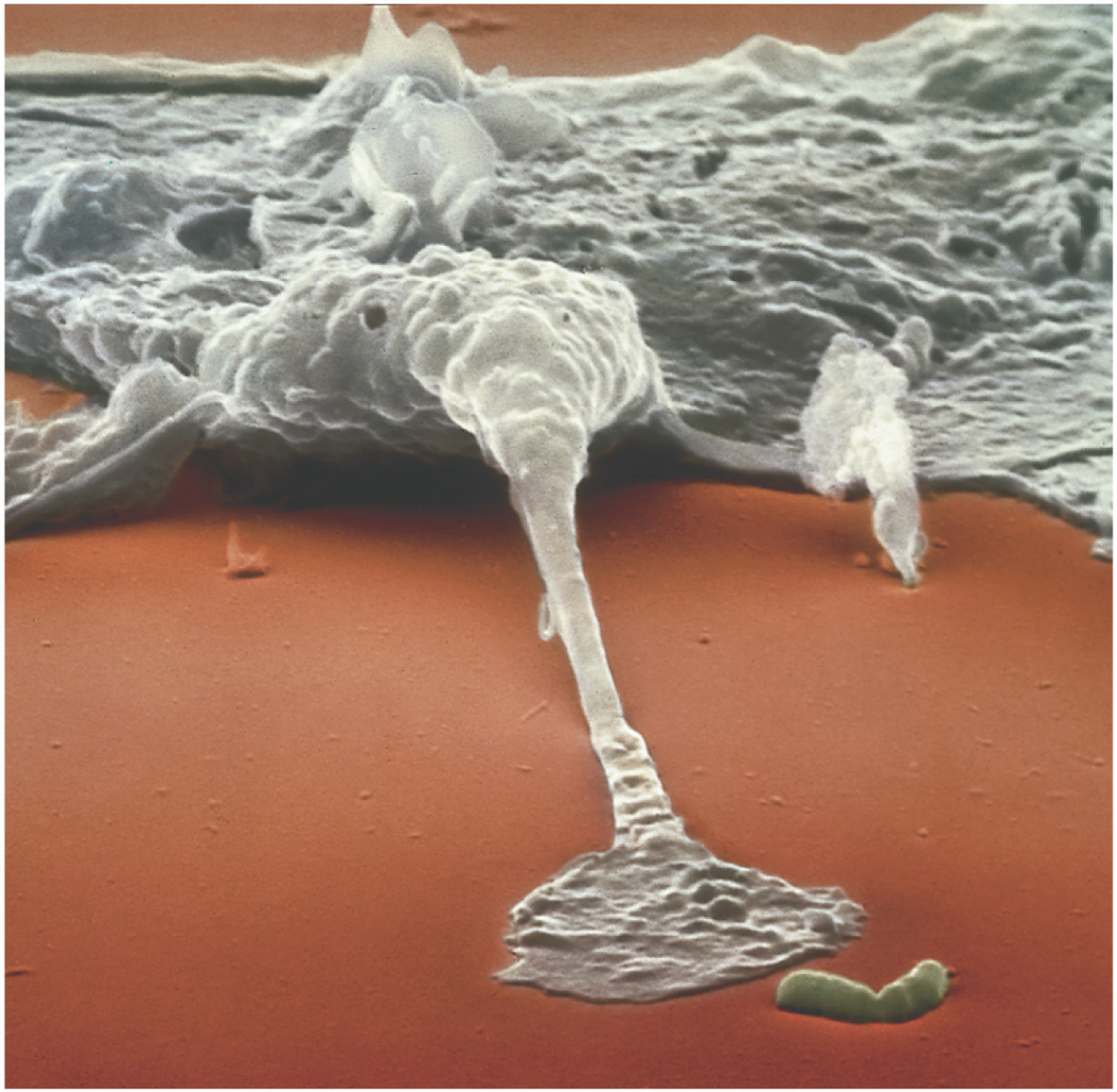
- Ribosomes
- Organelles
- Nutrients
- Amino acids
- Nucleotides
- Small Molecules such as salts and ions
- Glucose

Cytoskeleton

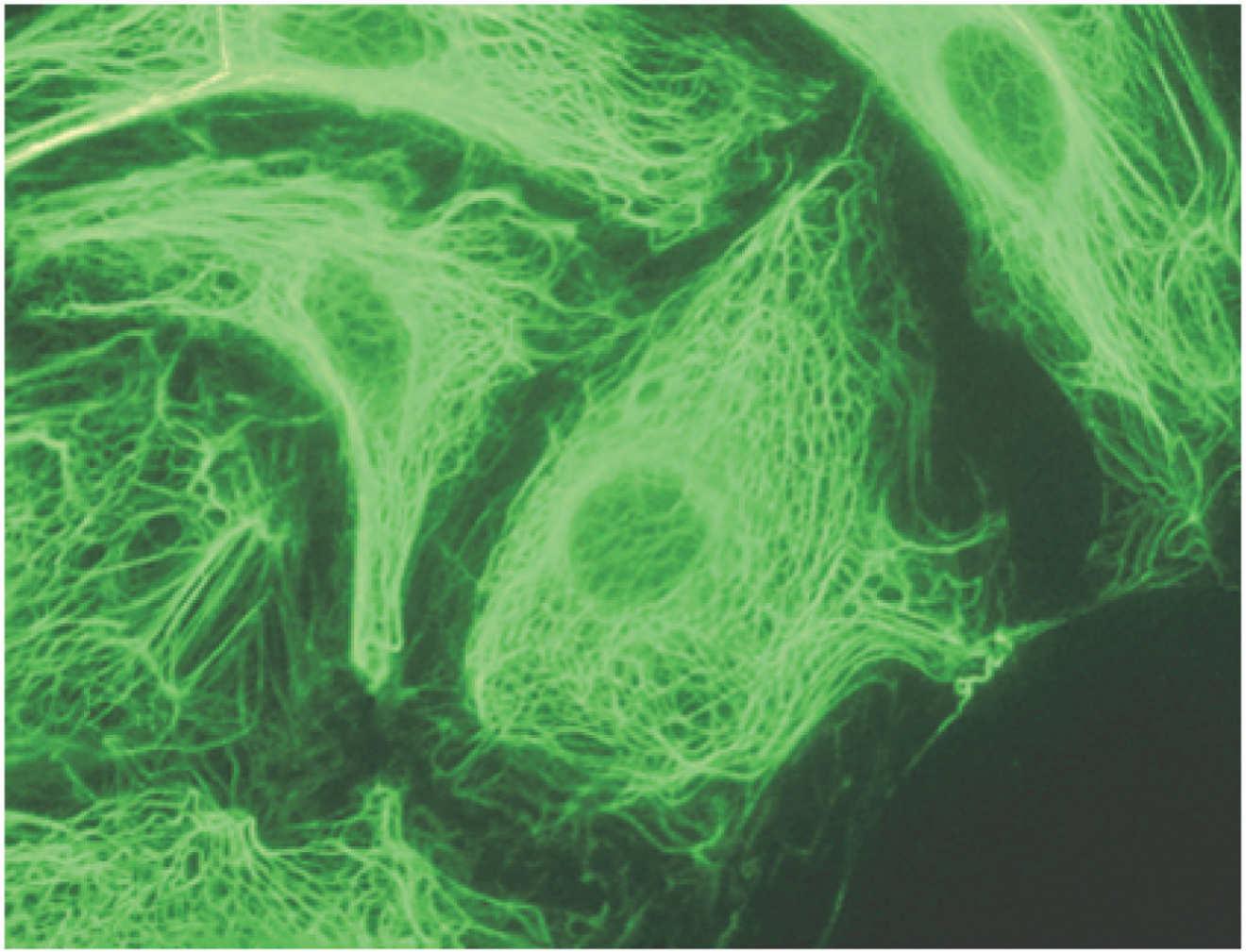


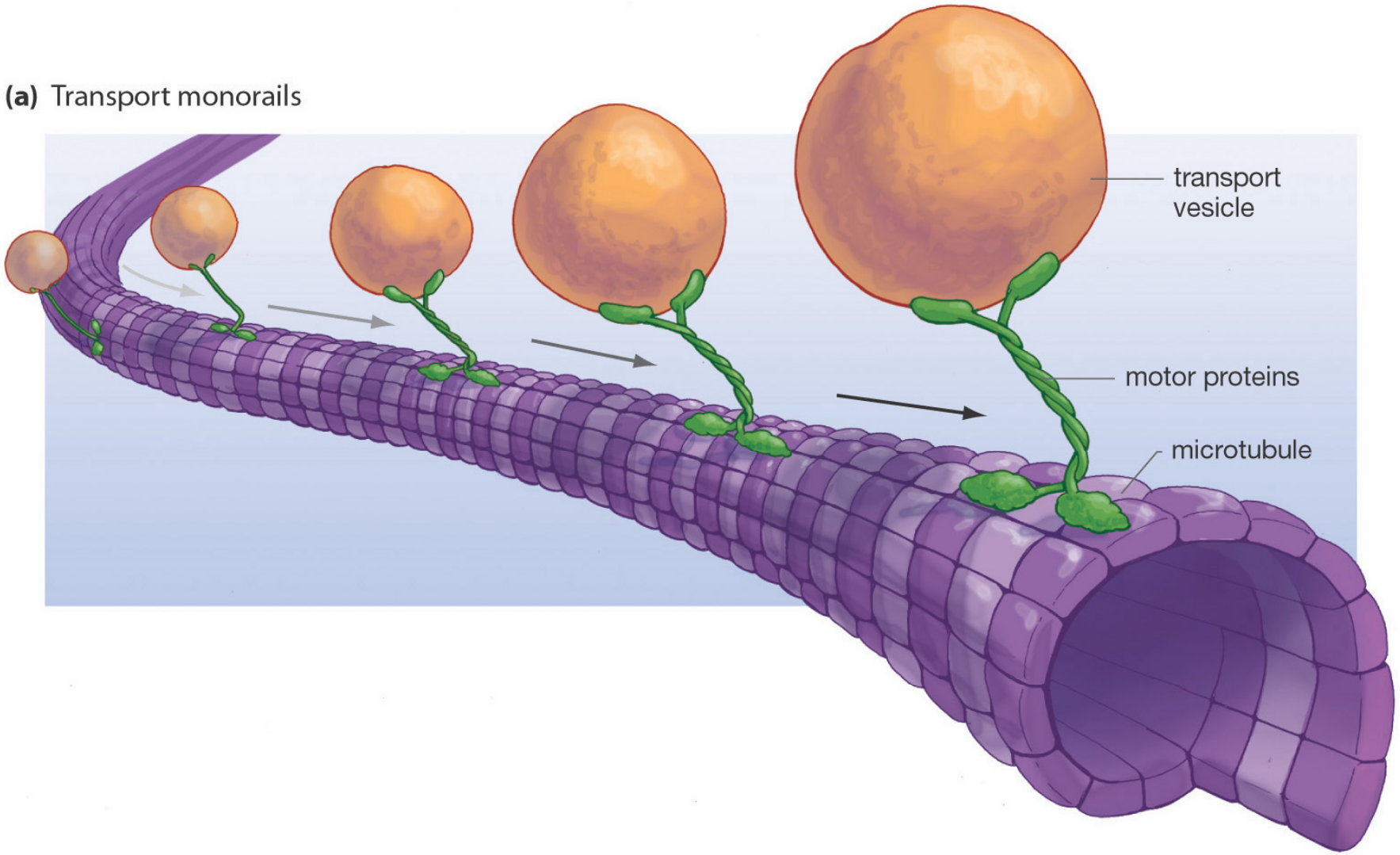


Microfilaments

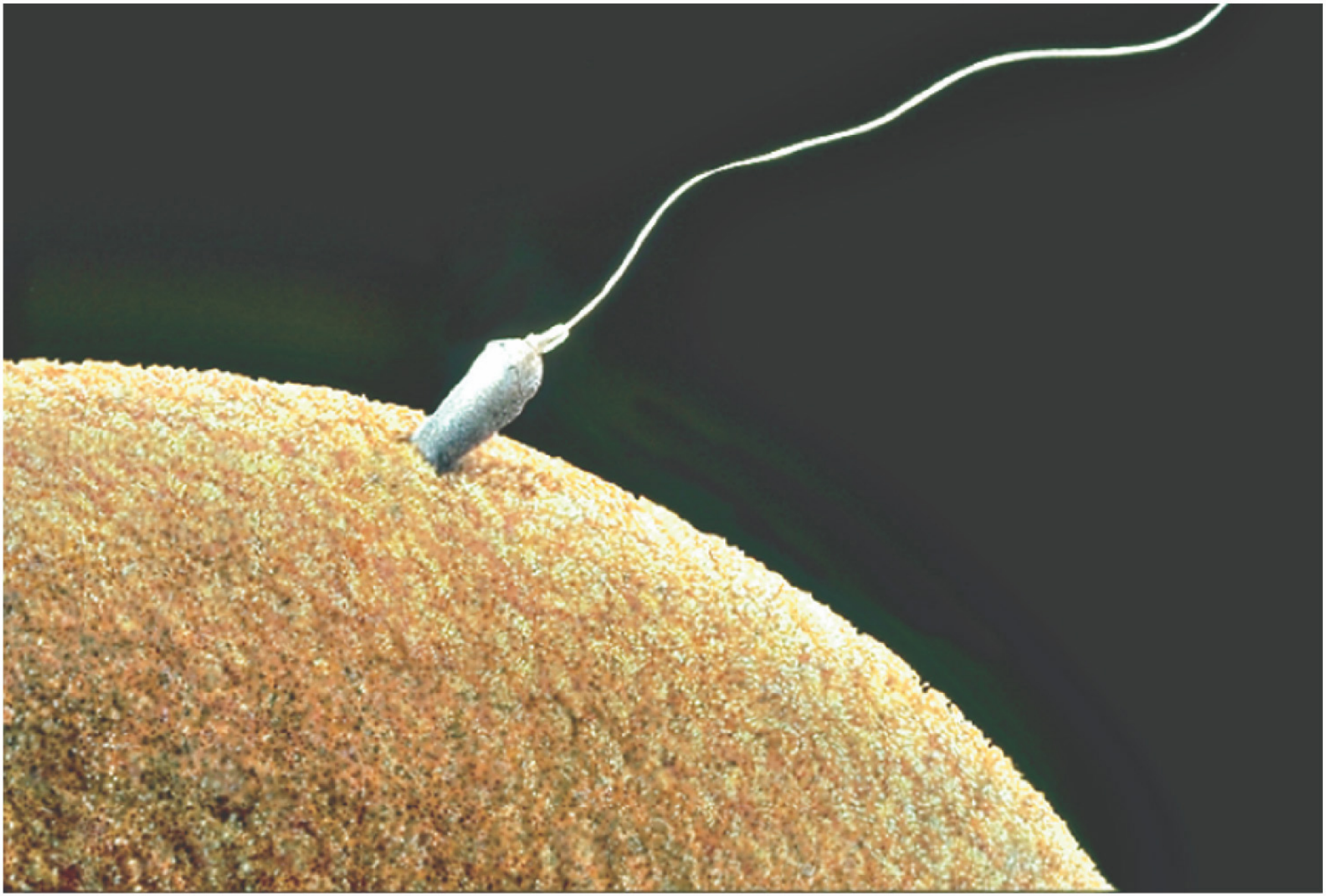


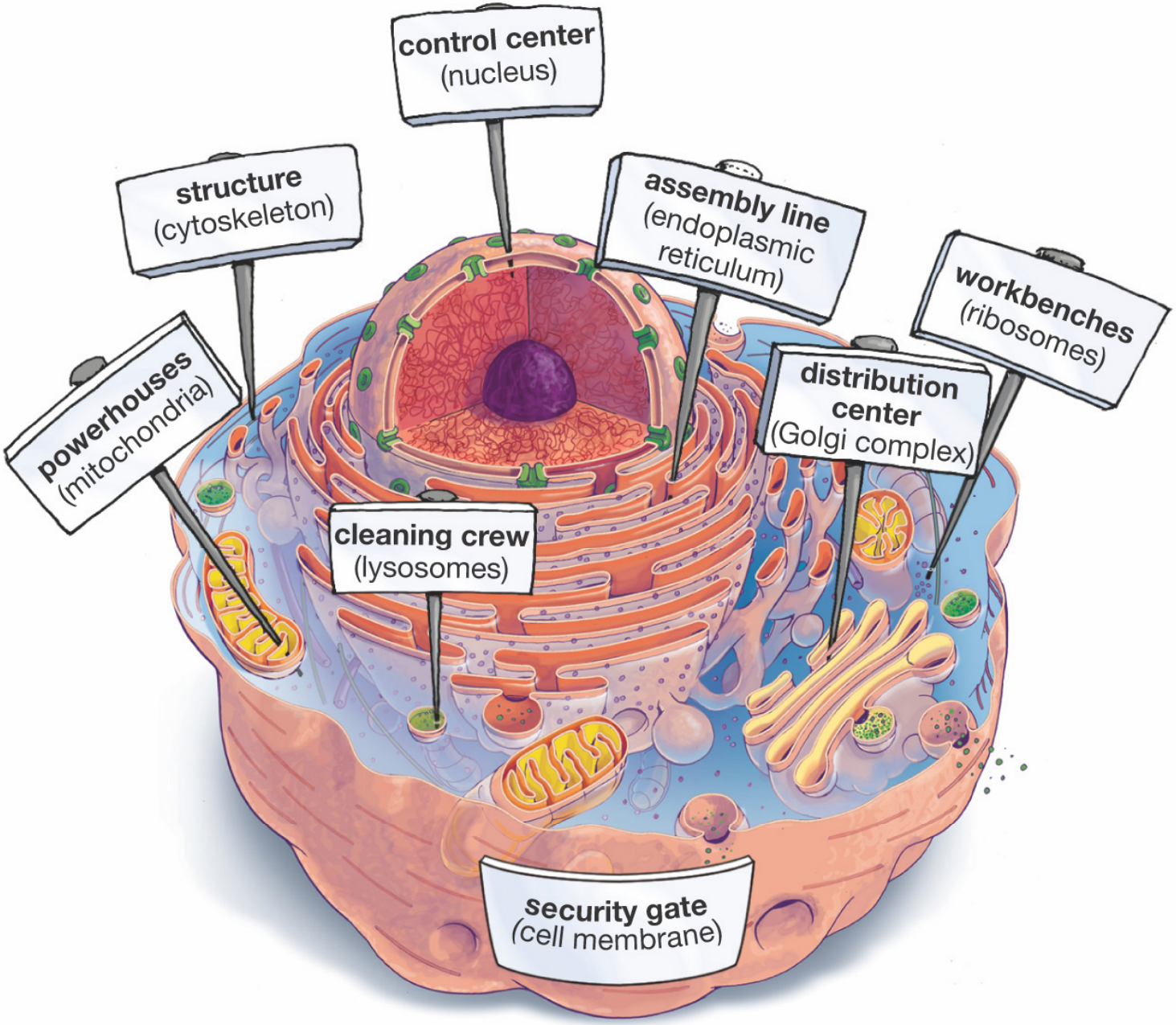
(b) Intermediate filaments



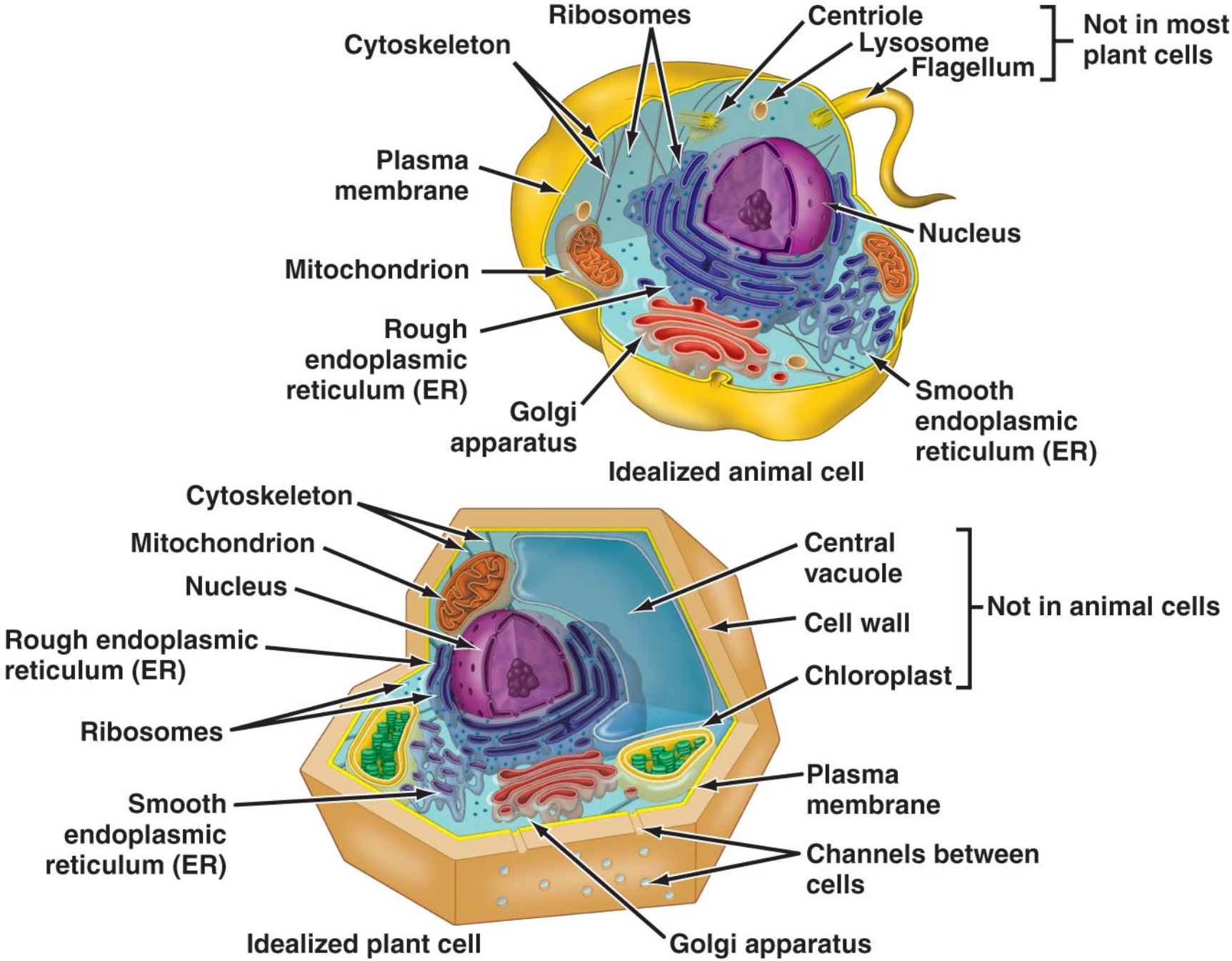


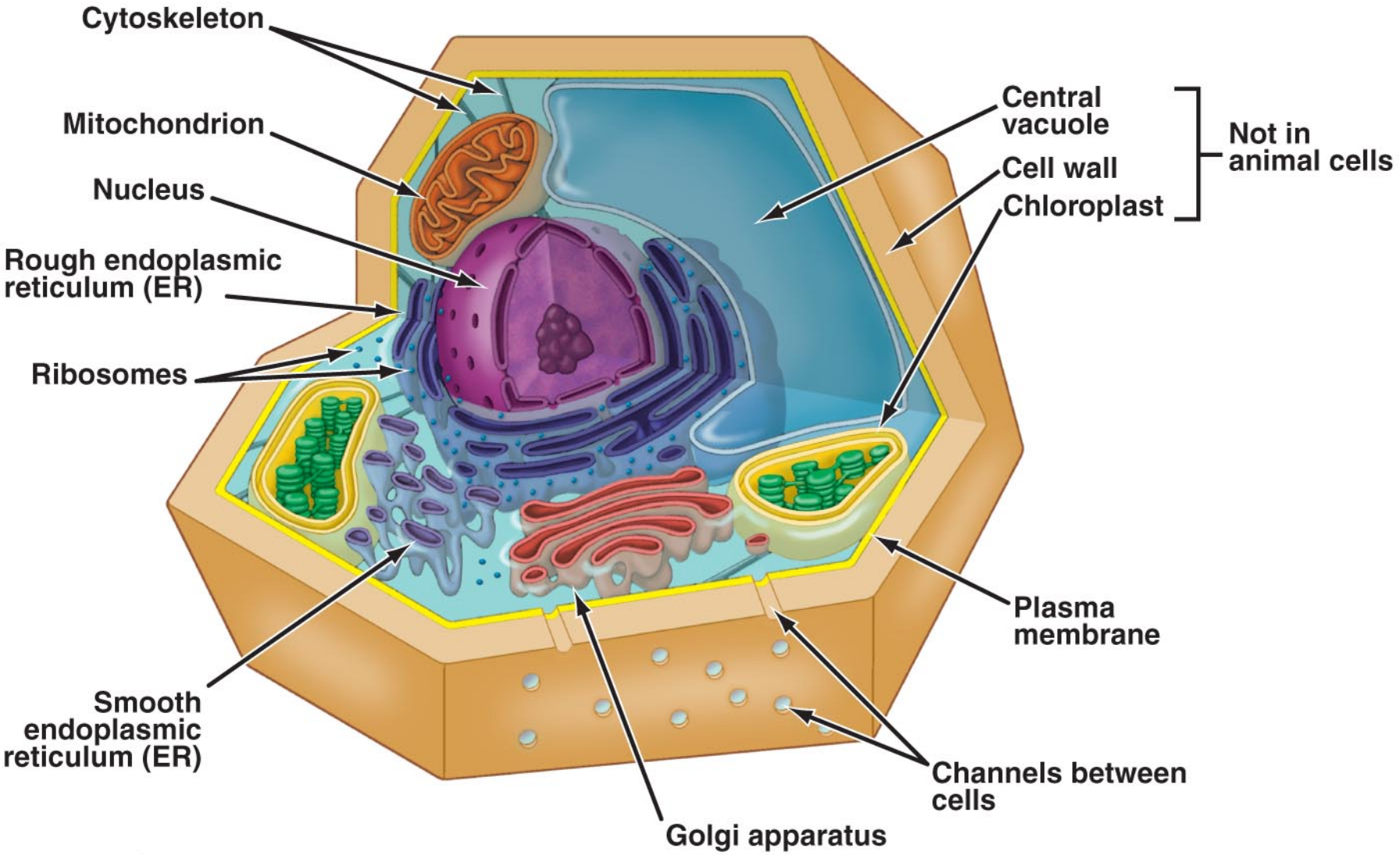
(c) Flagellum





The Plant Cell





Idealized plant cell

Chloroplast

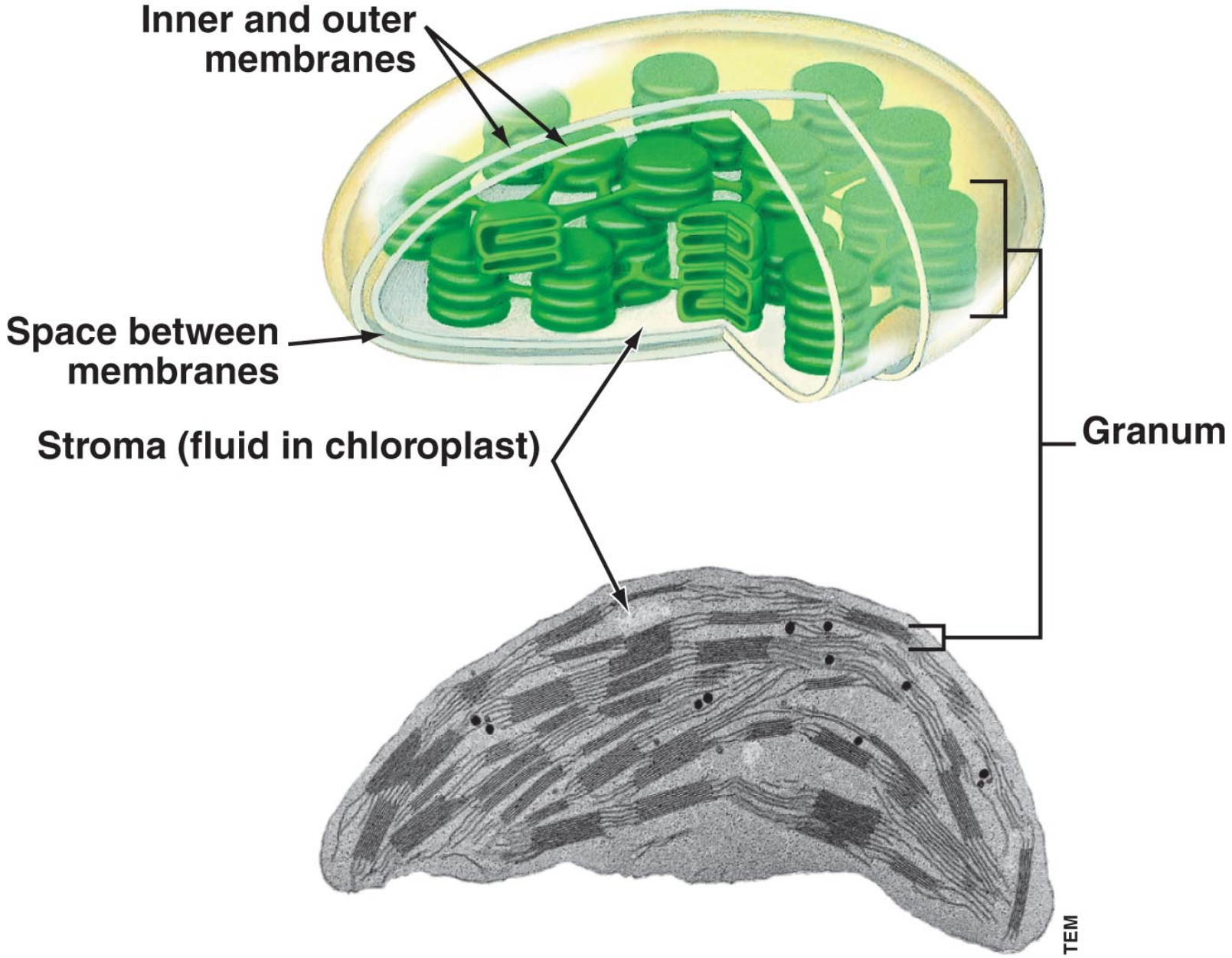
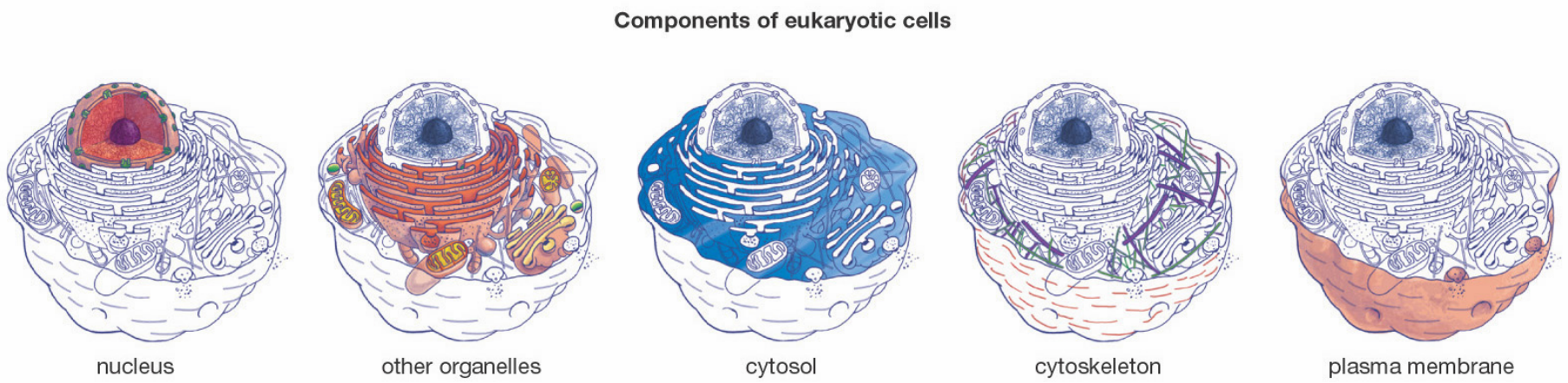


Table 4.1 Structures in Plant and Animal Cells

Name	Location	Function
Cytoskeleton	Cytoplasm	Maintains cell shape, facilitates cell movement and movement of materials within cell
Cytosol	Cytoplasm	Protein-rich fluid in which organelles and cytoskeleton are immersed
Golgi complex	Cytoplasm	Processing, sorting of proteins
Lysosomes (in animal cells only)	Cytoplasm	Digestion of imported materials and cell's own used materials
Mitochondria	Cytoplasm	Transform energy from food
Nucleolus	Nucleus	Synthesis of ribosomal RNA
Nucleus	Inside nuclear envelope	Site of most of the cell's DNA
Ribosomes	Rough ER, Free-standing in cytoplasm	Sites of protein synthesis
Rough endoplasmic reticulum	Cytoplasm	Protein processing
Smooth endoplasmic reticulum	Cytoplasm	Lipid synthesis, storage; detoxification of harmful substances
Vesicles	Cytoplasm	Transport of proteins and other cellular materials
Cell walls (in plant cells only)	Outside plasma membrane	Limit water uptake; maintain cell membrane shape, protect from outside influences
Central vacuole (in plant cells only)	Cytoplasm	Cell metabolism, pH balance, digestion, water maintenance
Plastids (in plant cells only)	Cytoplasm	Nutrient storage, pigmentation, photosynthesis (chloroplasts)

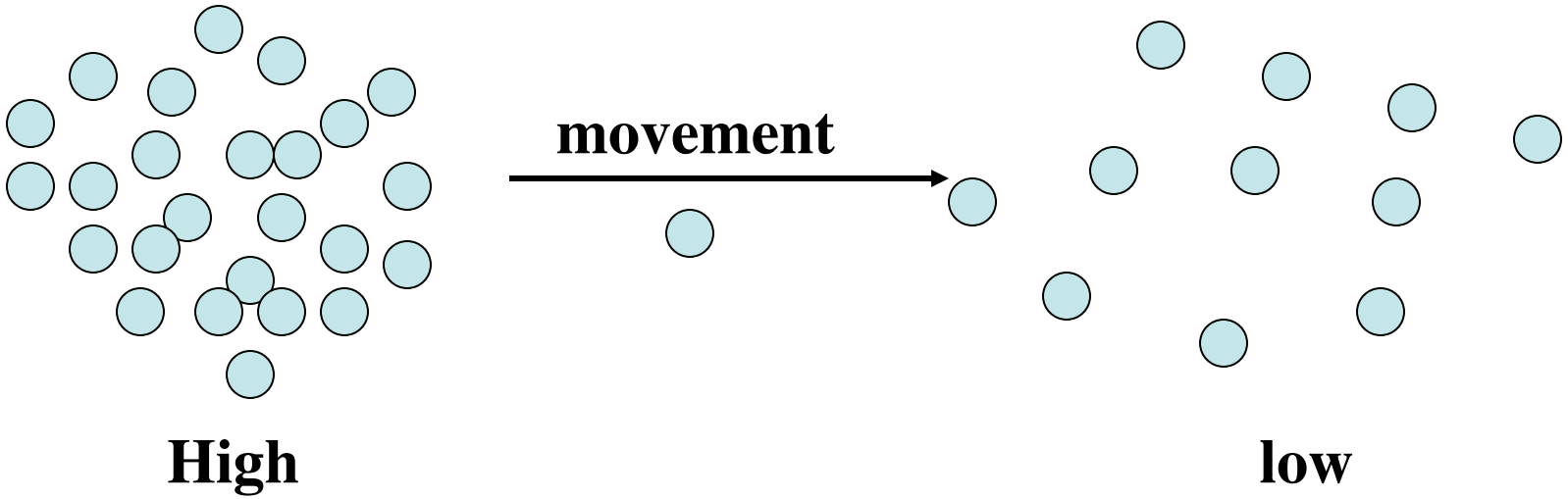
Plasma Membrane

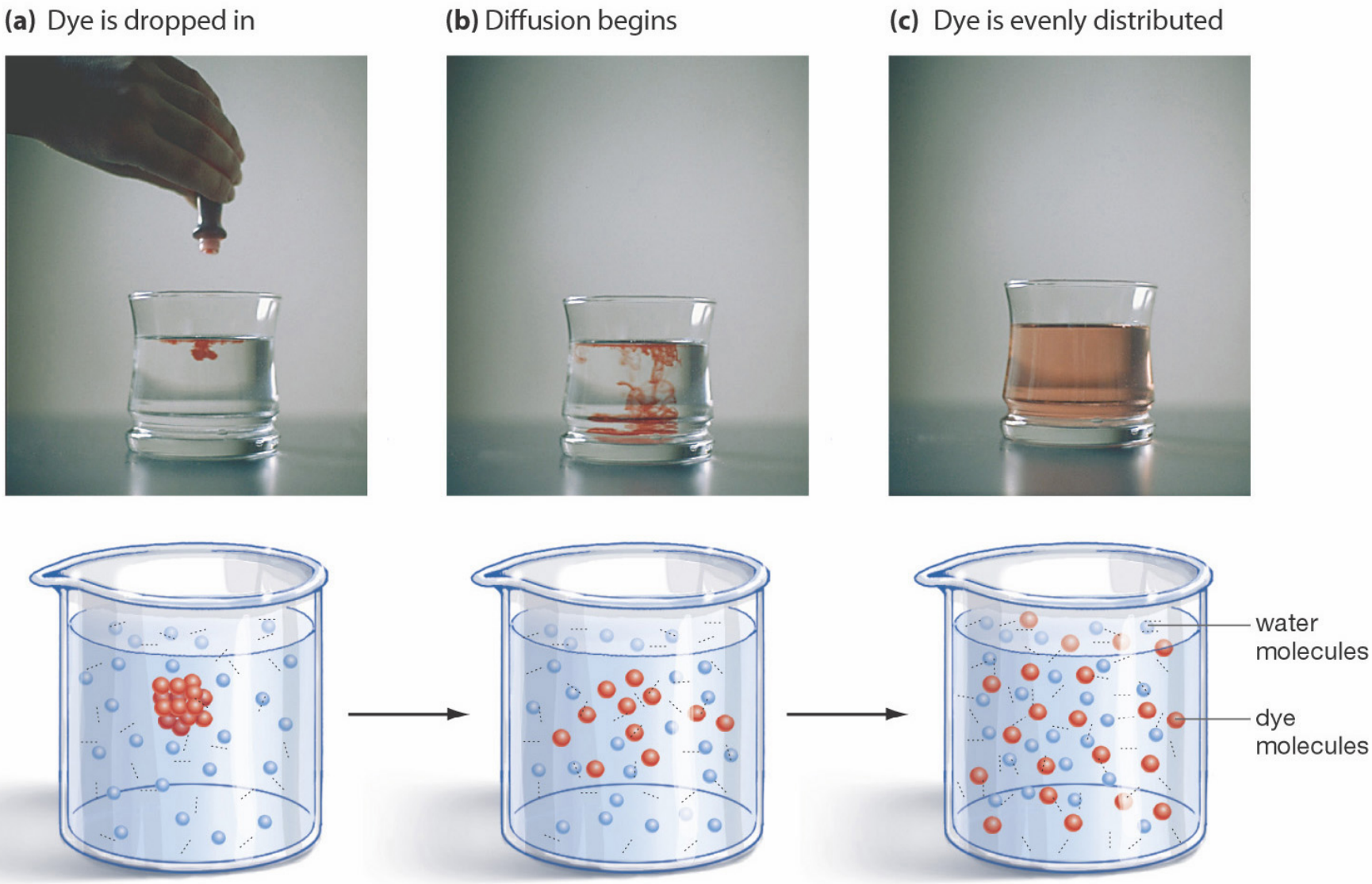


Osmosis and Diffusion

Diffusion

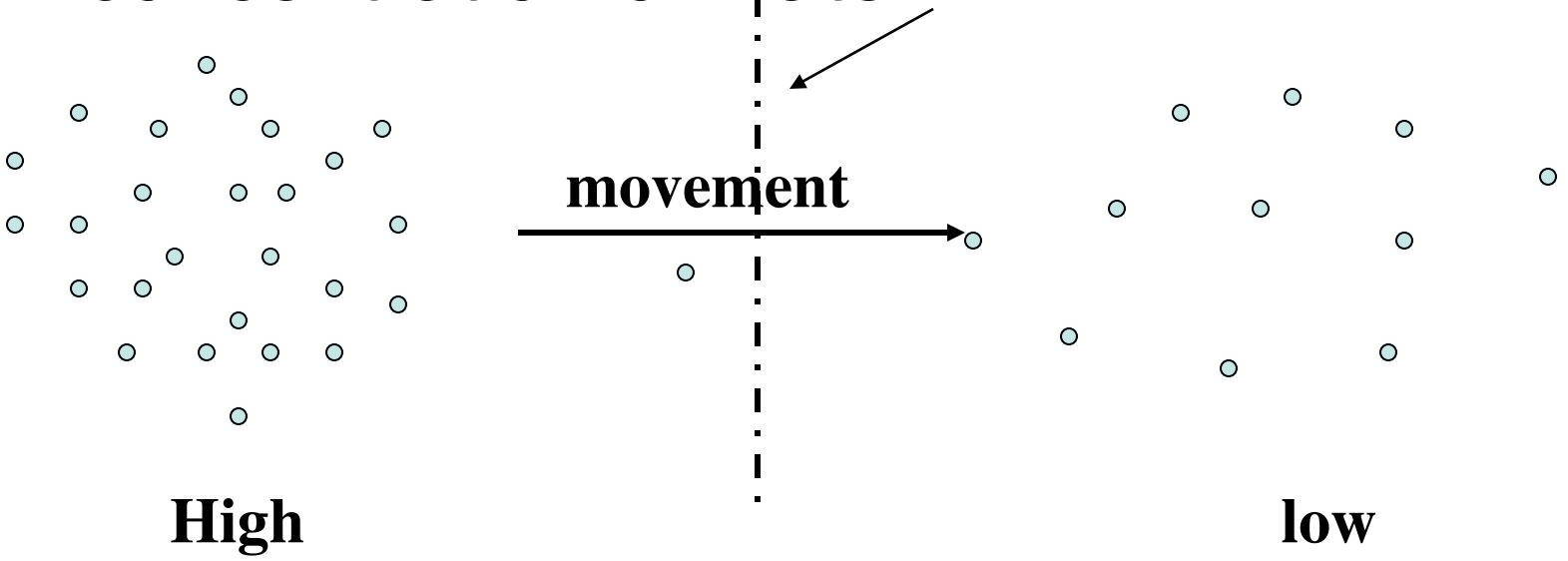
- Diffusion is the movement of molecules from an area of high concentration of that type of molecule to an area of low concentration of that molecule.

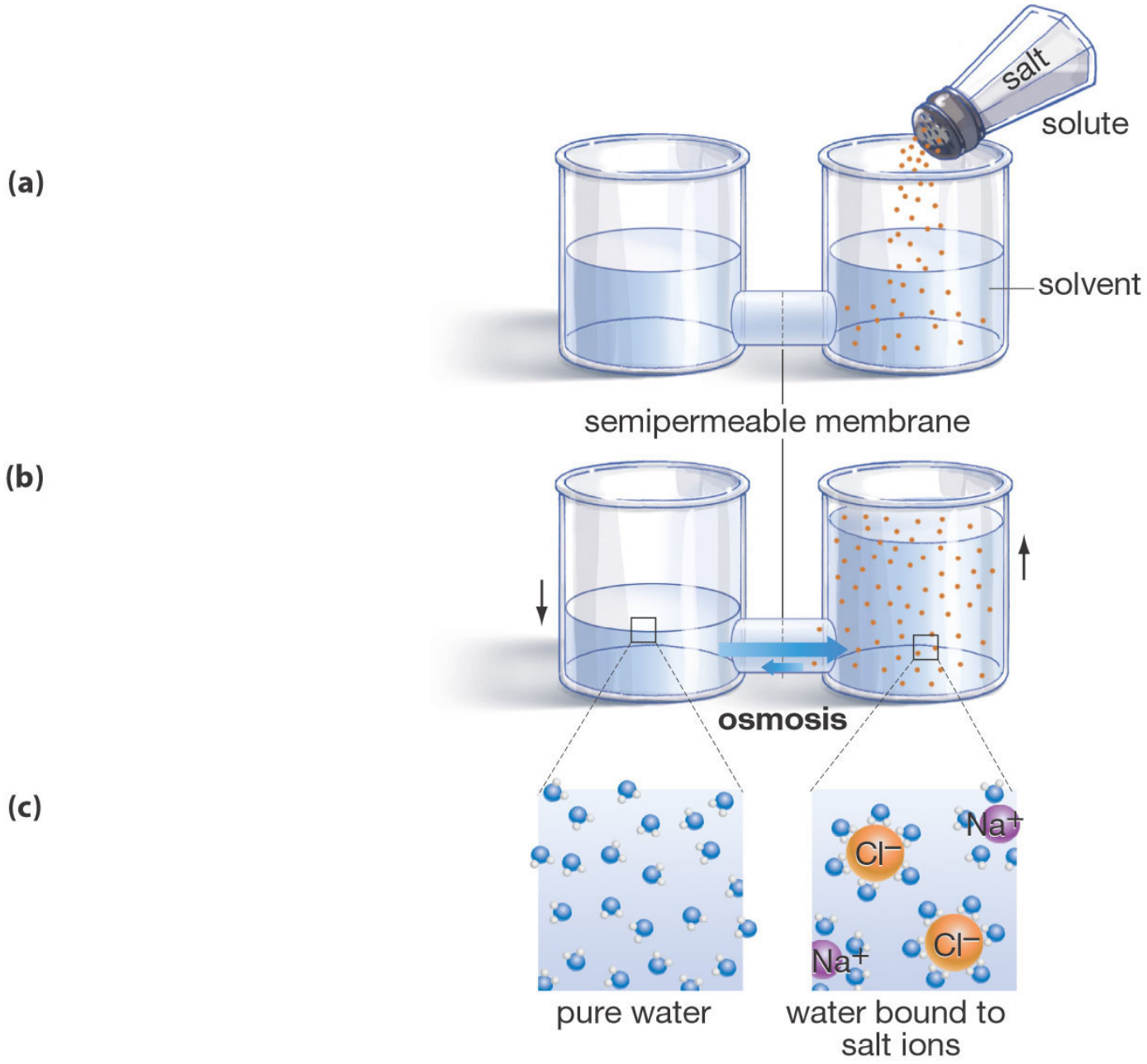




Osmosis

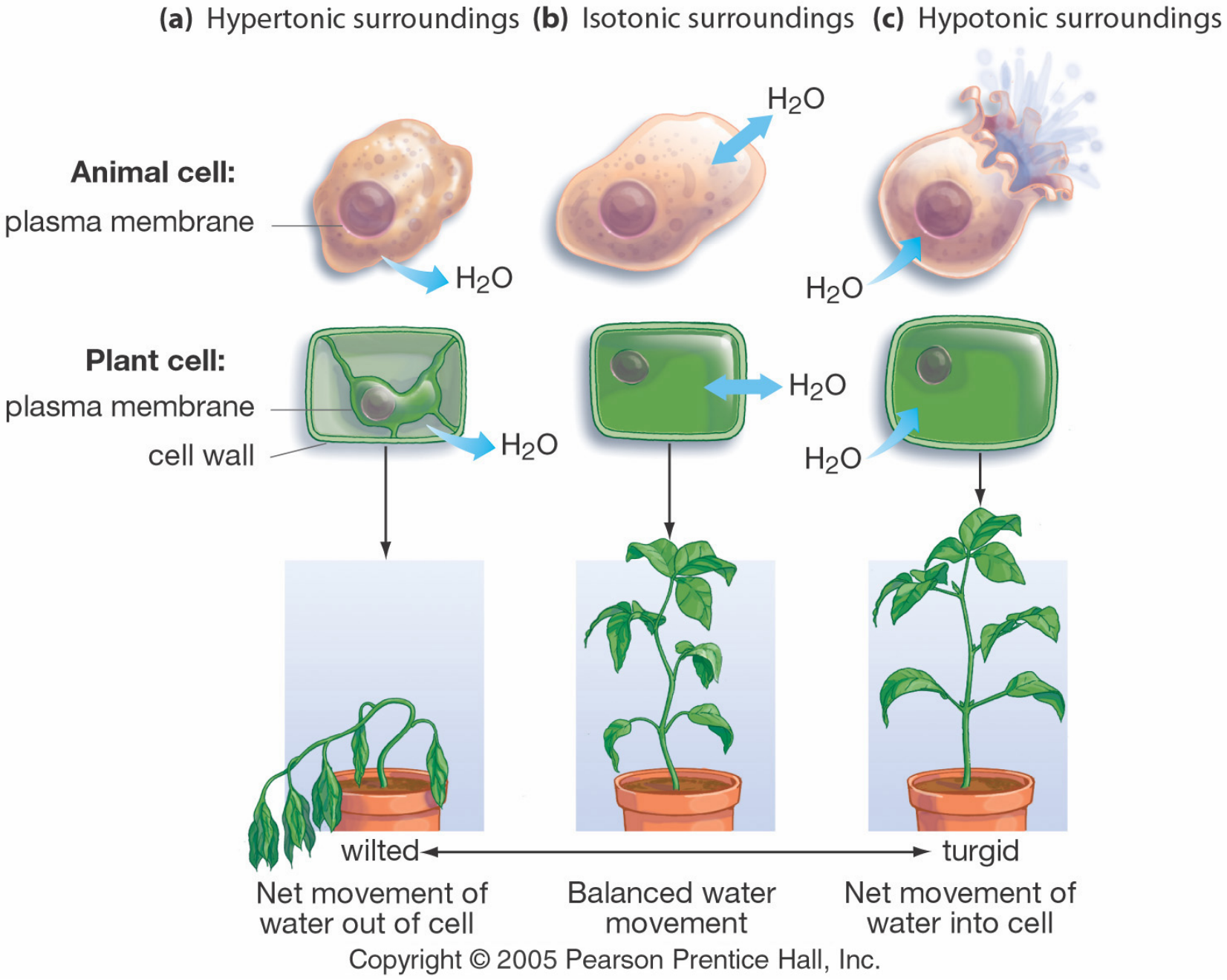
- Osmosis is the diffusion of water across a semi-permeable membrane. Water moves from an area of high concentration of water to a low concentration of water.



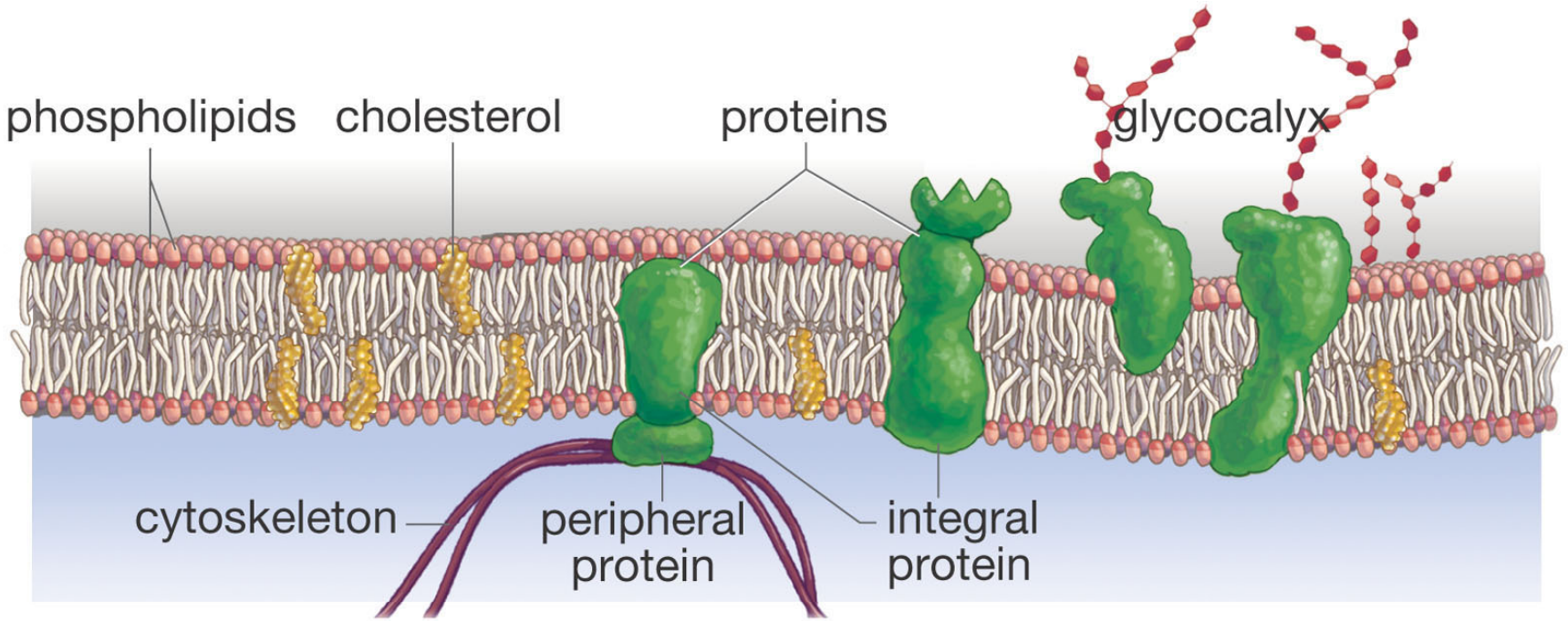


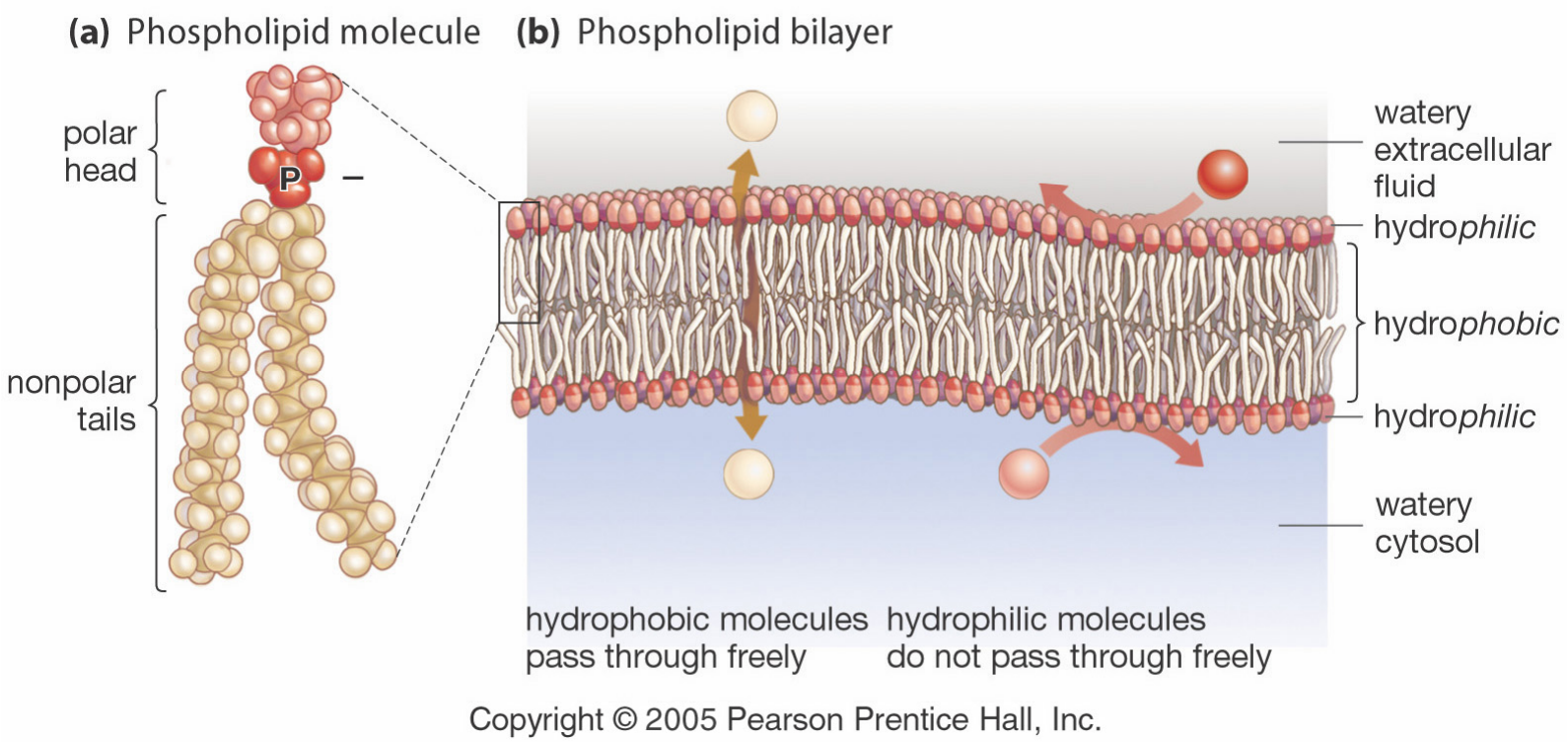
Common Terms

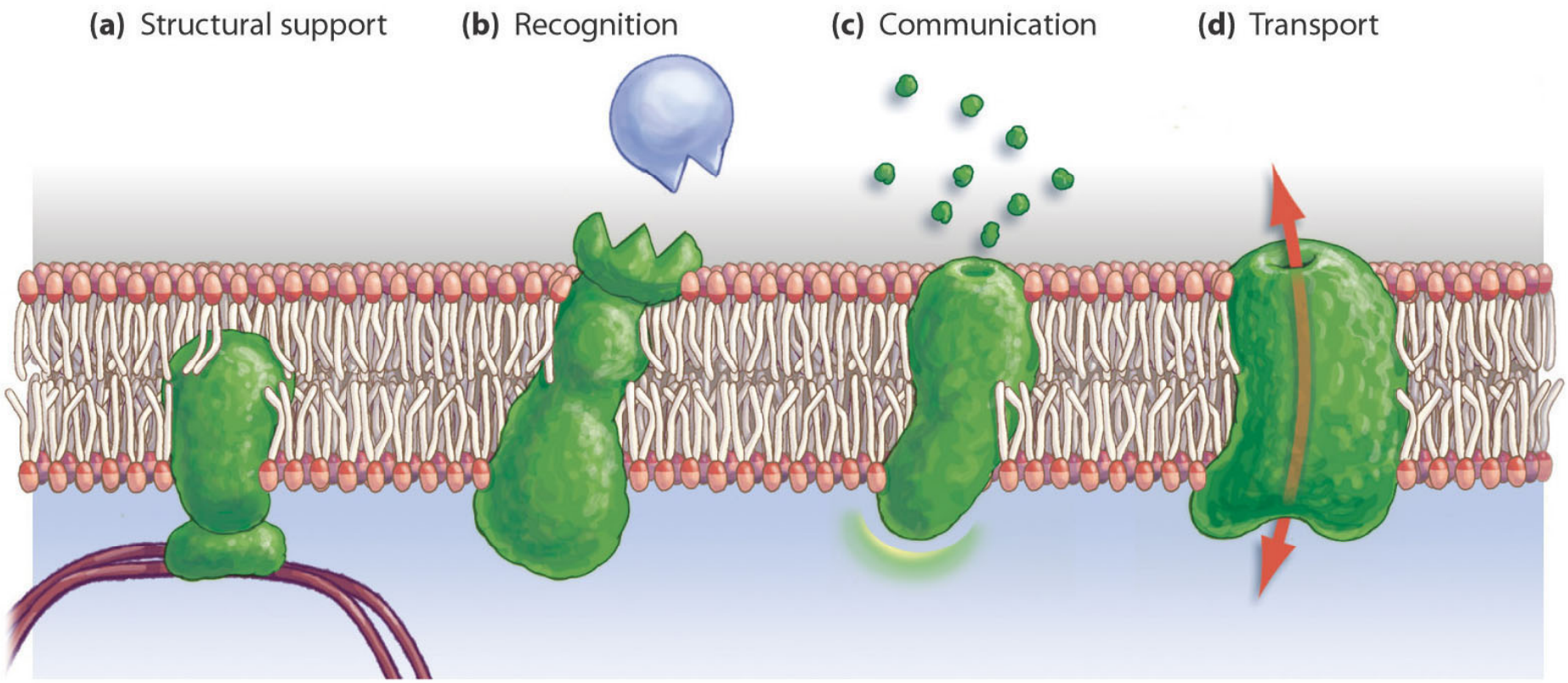
- Hypotonic
- Hypertonic
- Isotonic

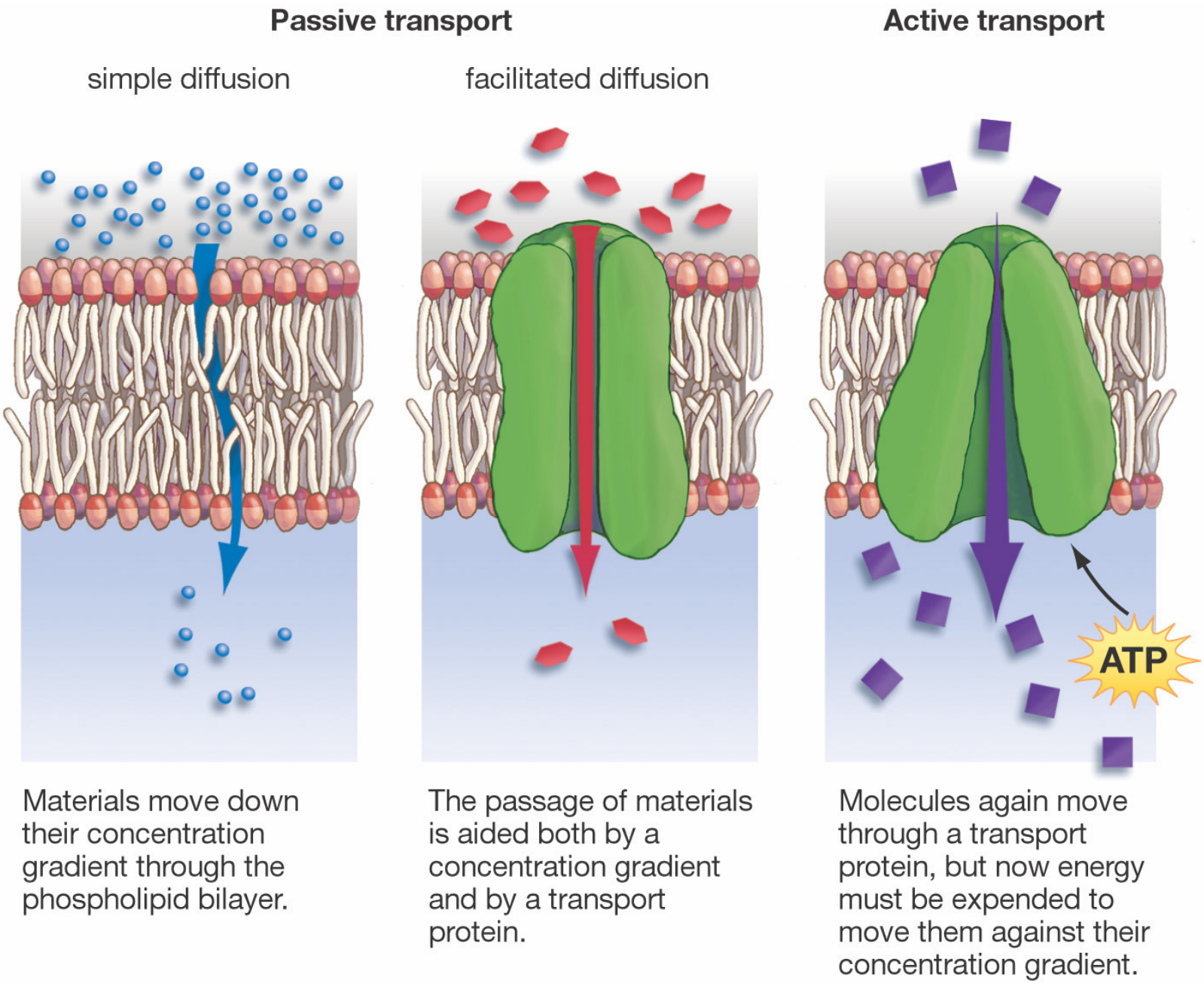


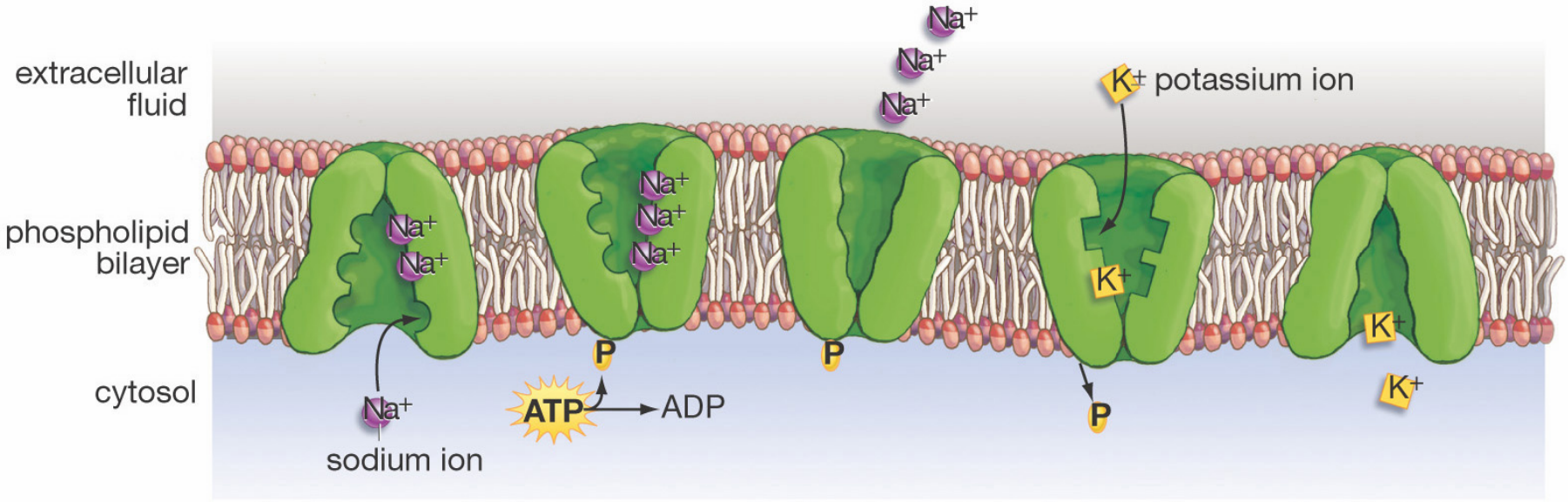
The plasma membrane





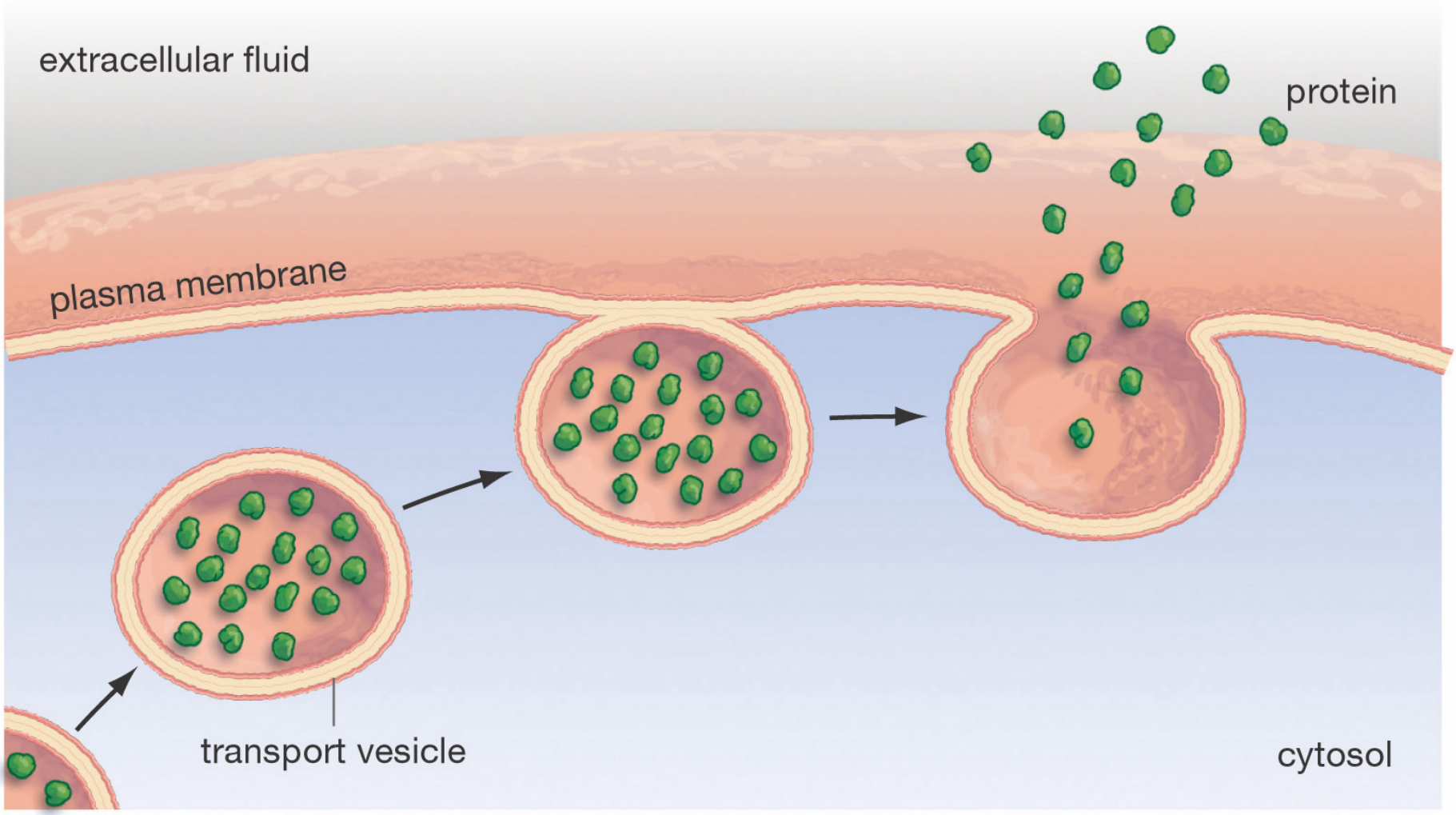




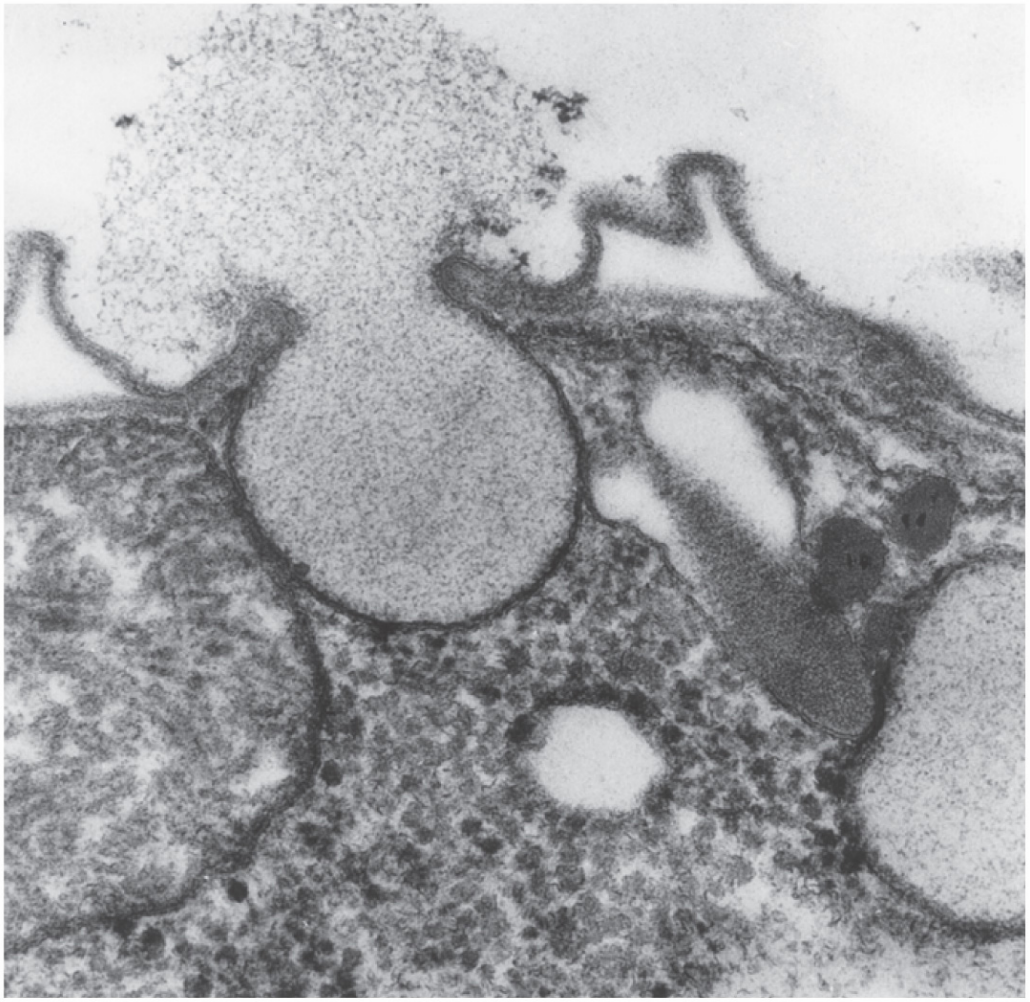


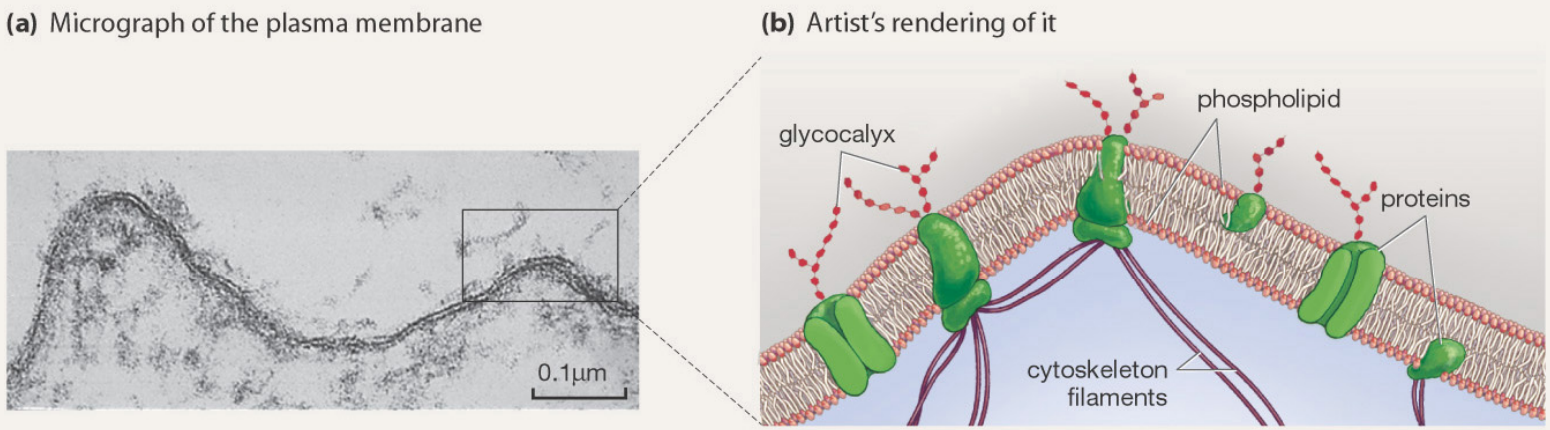
1. Three sodium ions (Na^+) located within the cell's cytoplasm bind with a transport protein.
2. The energy molecule ATP gives up an energetic phosphate group to the transport protein.
3. This binding causes the protein to open its channel to the extracellular fluid; to lose its Na^+ binding sites, thus releasing the ions into the fluid; and to create binding sites for potassium ions (K^+).
4. Two K^+ move into the protein's K^+ binding sites, which brings about the release of the phosphate group.
5. This loss returns the protein to its origin shape, releasing the K^+ into the cytoplasm and readying the protein for binding with another set of Na^+.

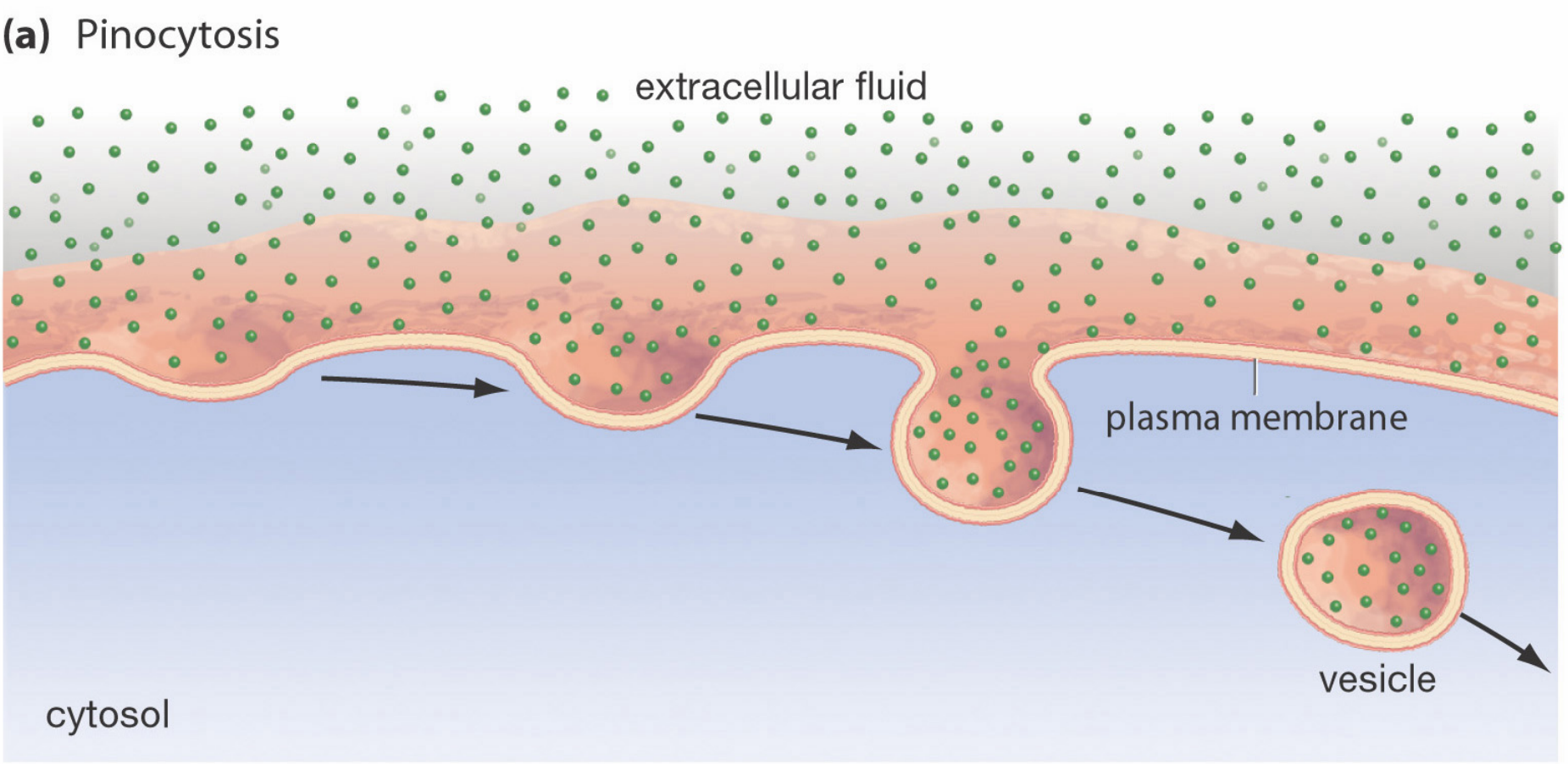
(a) Exocytosis



(b) Micrograph of exocytosis

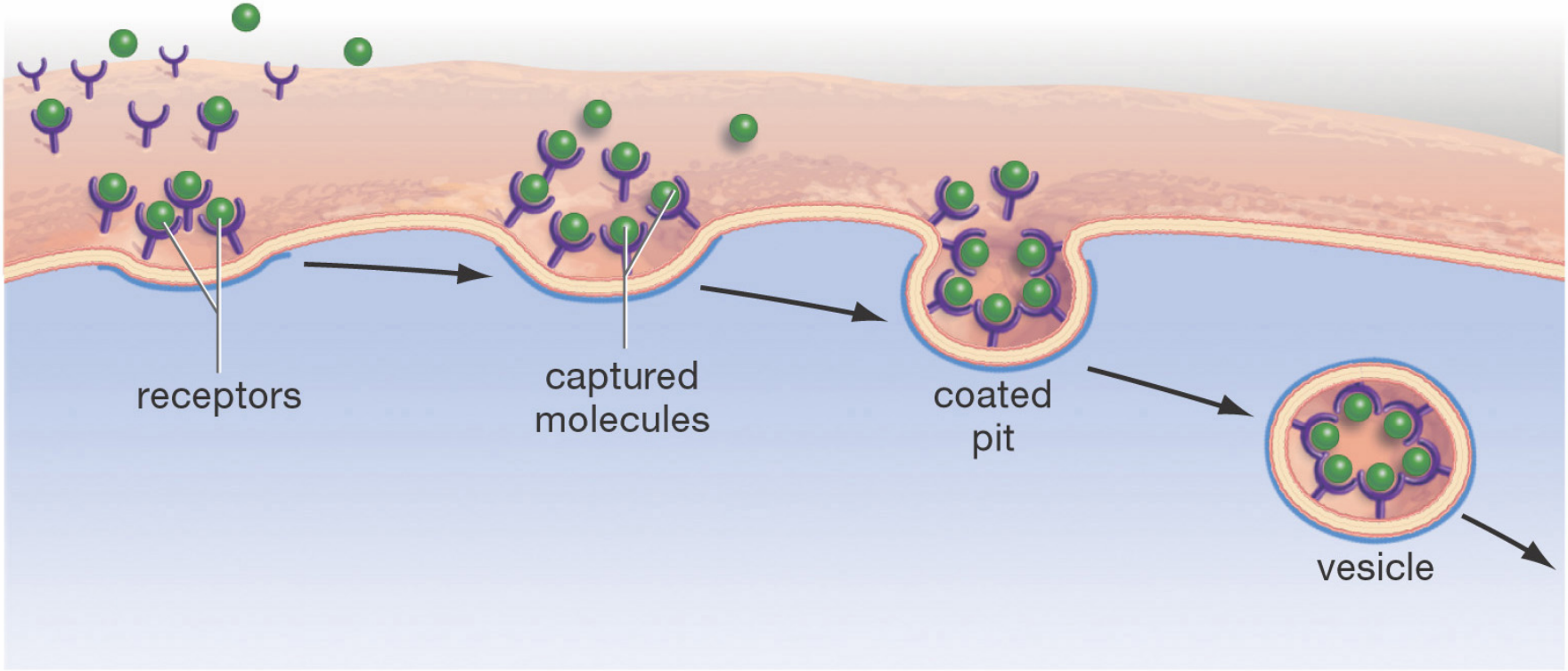




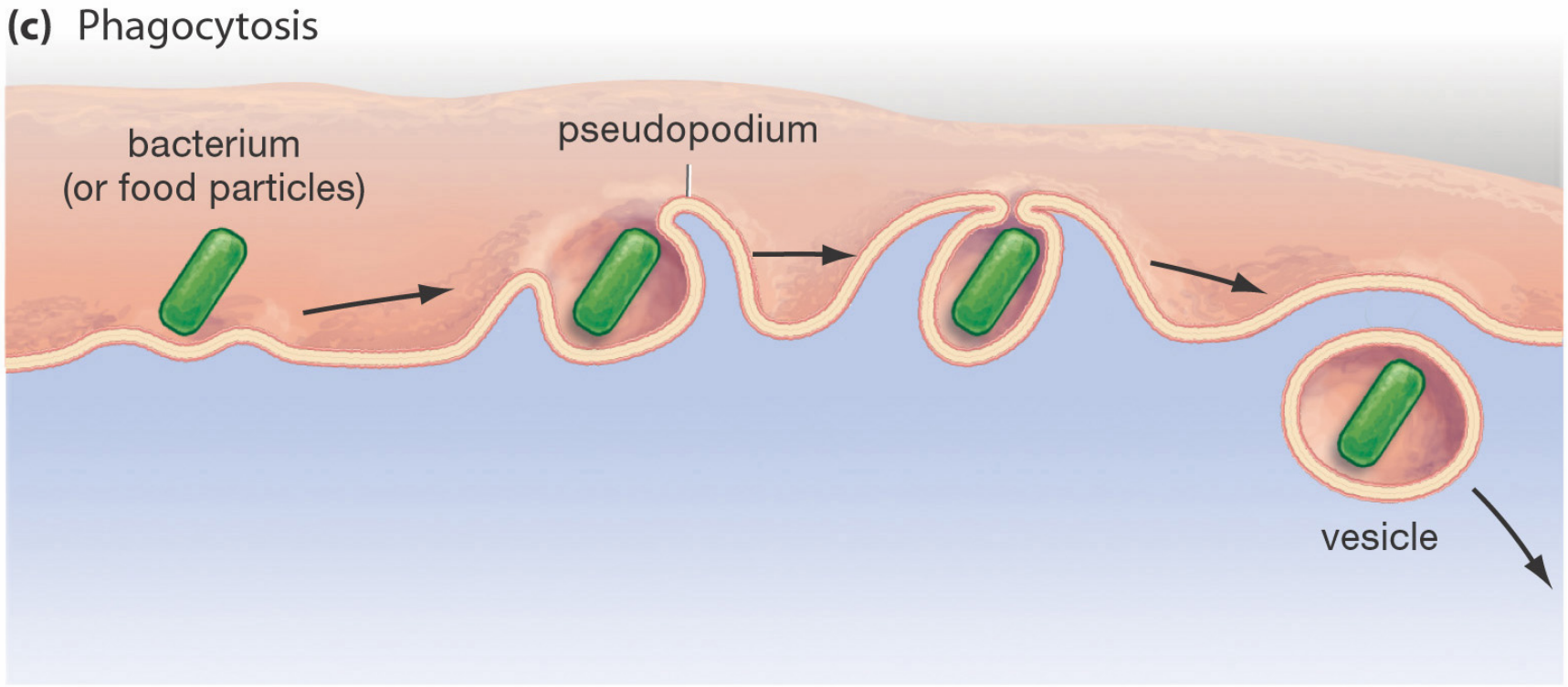


In pinocytosis, the plasma membrane invaginates to create a kind of harbor. The harbor then encloses completely, pinches off as a vesicle, and moves into the cell's cytoplasm, carrying with it whatever material was enclosed.

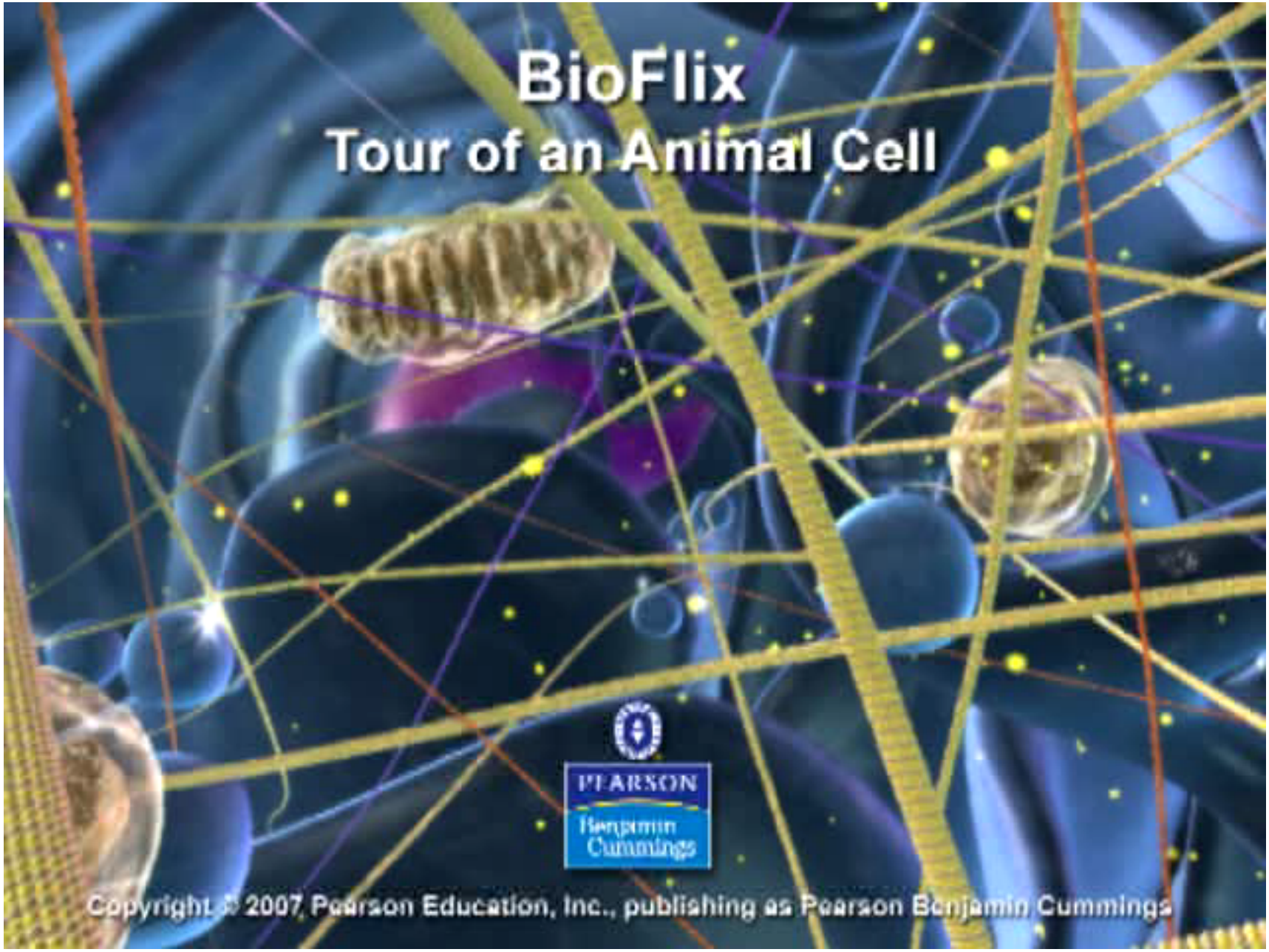
(b) Receptor-mediated endocytosis



In receptor-mediated endocytosis, many receptors bind to molecules. Then, while holding on to the molecules, the receptors migrate laterally through the cell membrane, arriving at a depression called a coated pit. The coated pit pinches off, delivering its receptor-held molecules into the cytoplasm. Micrographs at right: formation of an RME vesicle.



In phagocytosis, food particles—or perhaps whole organisms (such as bacteria)—are taken in by means of "false feet" or pseudopodia that surround the material. Pseudopodia then fuse together, forming a vesicle that moves into the cell's interior with its catch enclosed.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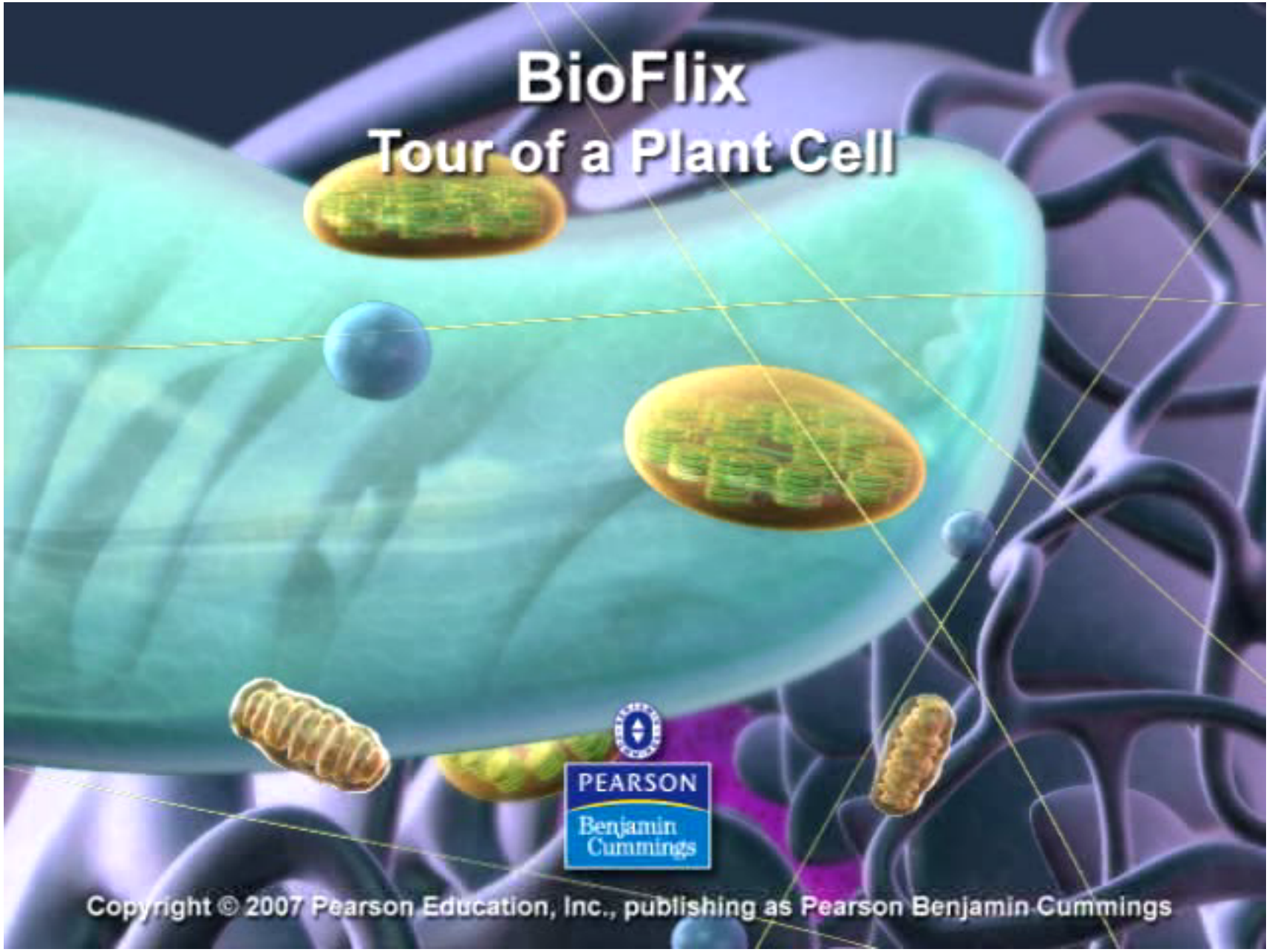
BioFlix
Tour of a Plant Cell
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