



Secretion and Endocytosis

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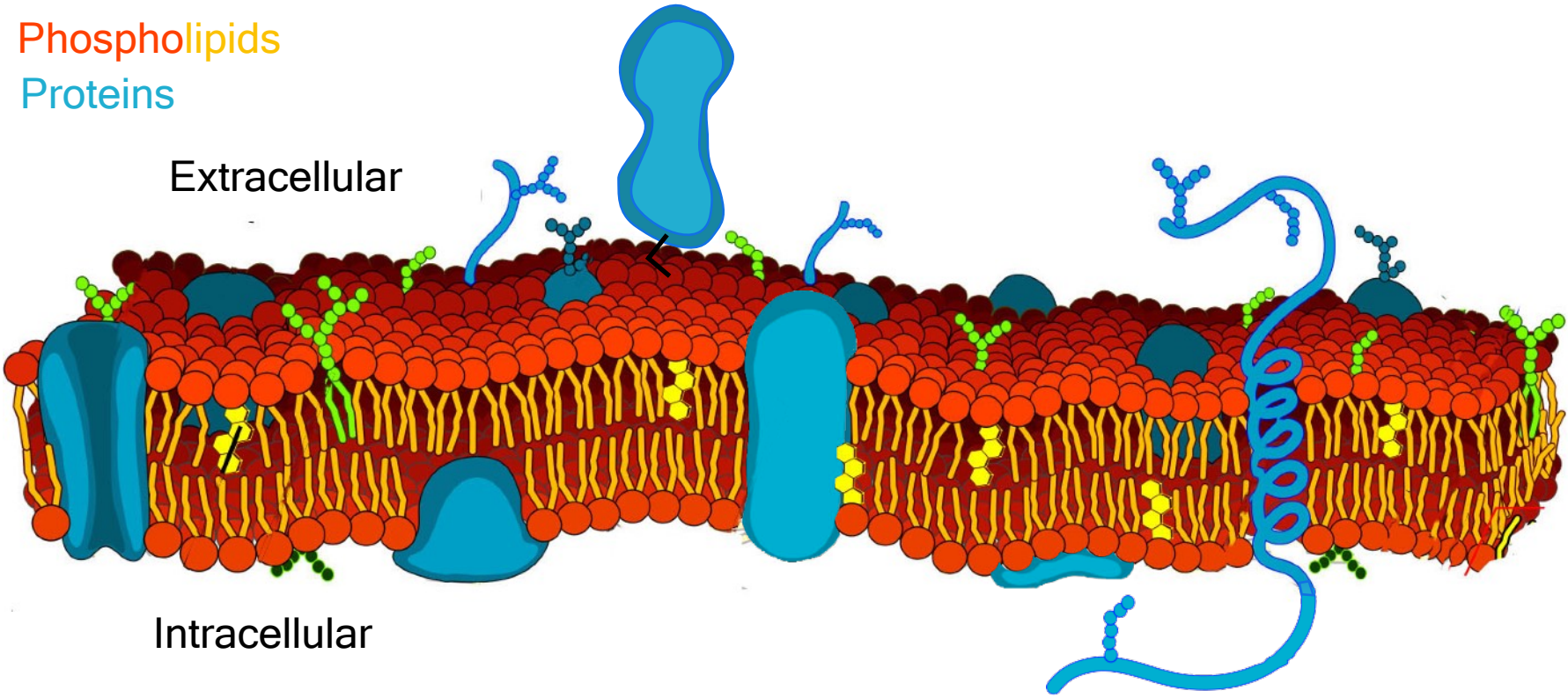
Yale SCHOOL OF MEDICINE

MD CURRICULUM

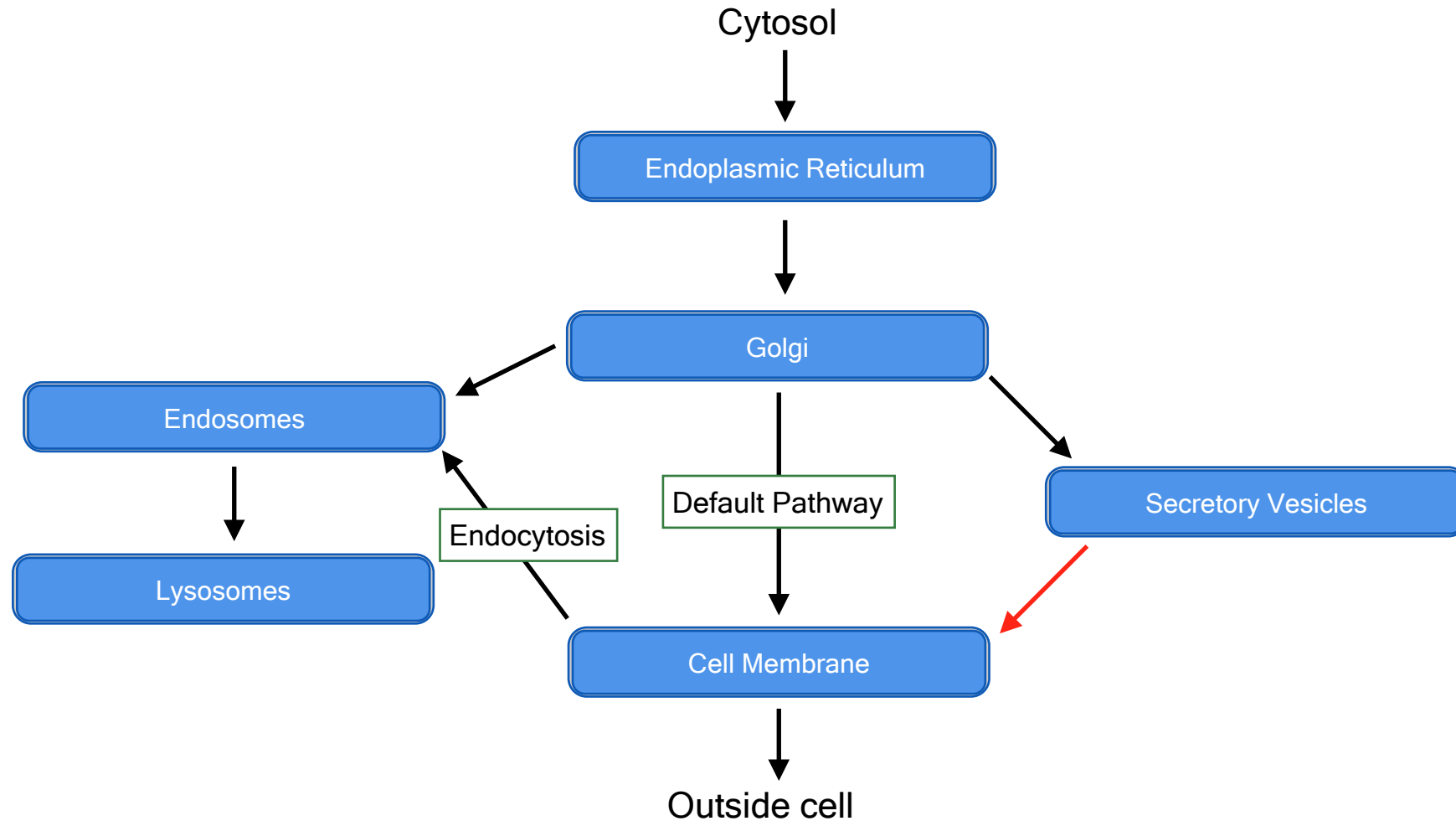
What we'll talk about...

- Delivery of protein and lipids to the cell membrane and organelles
- Protein sorting
- Endocytosis

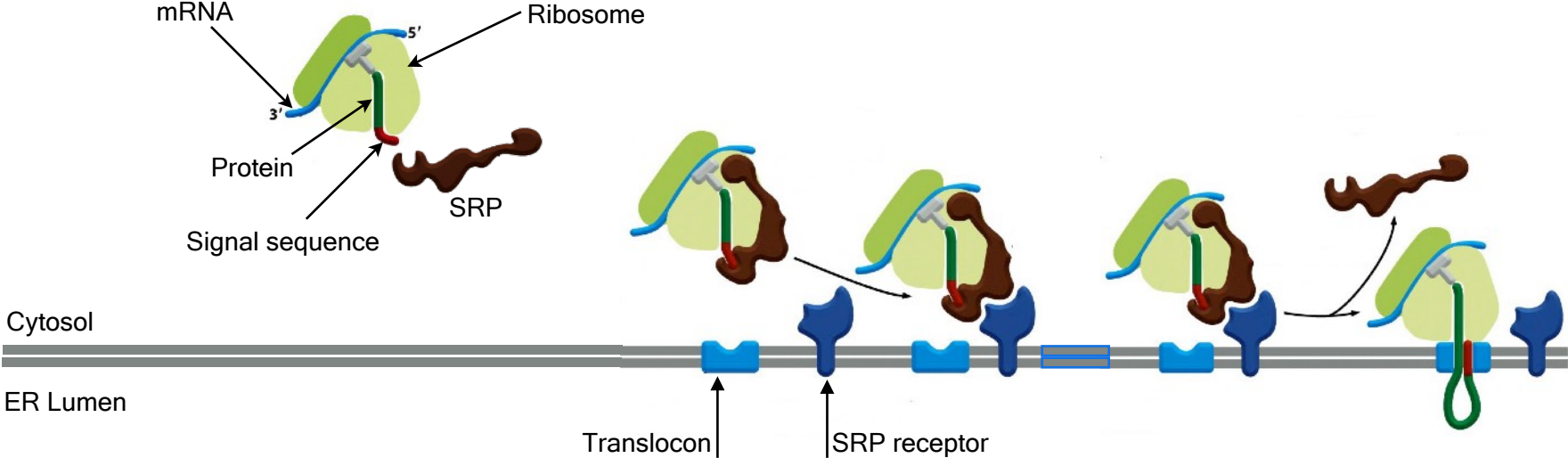
Cell must maintain composition of cell membrane and regulate concentration of specific proteins.



Secretory pathway delivers proteins and lipids to the cell membrane and organelles.

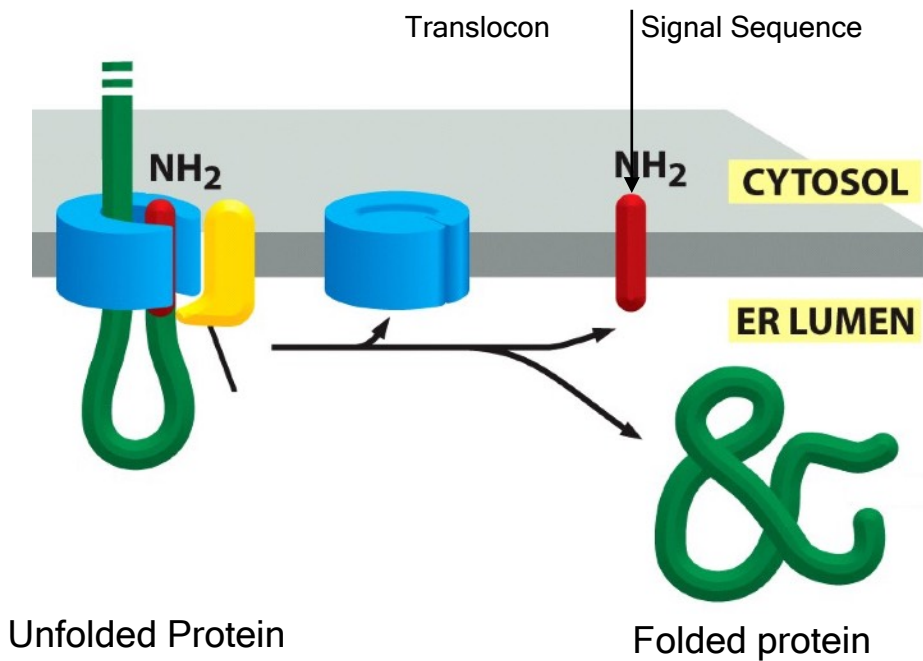


Secretory proteins are translated and translocated across the ER membrane.

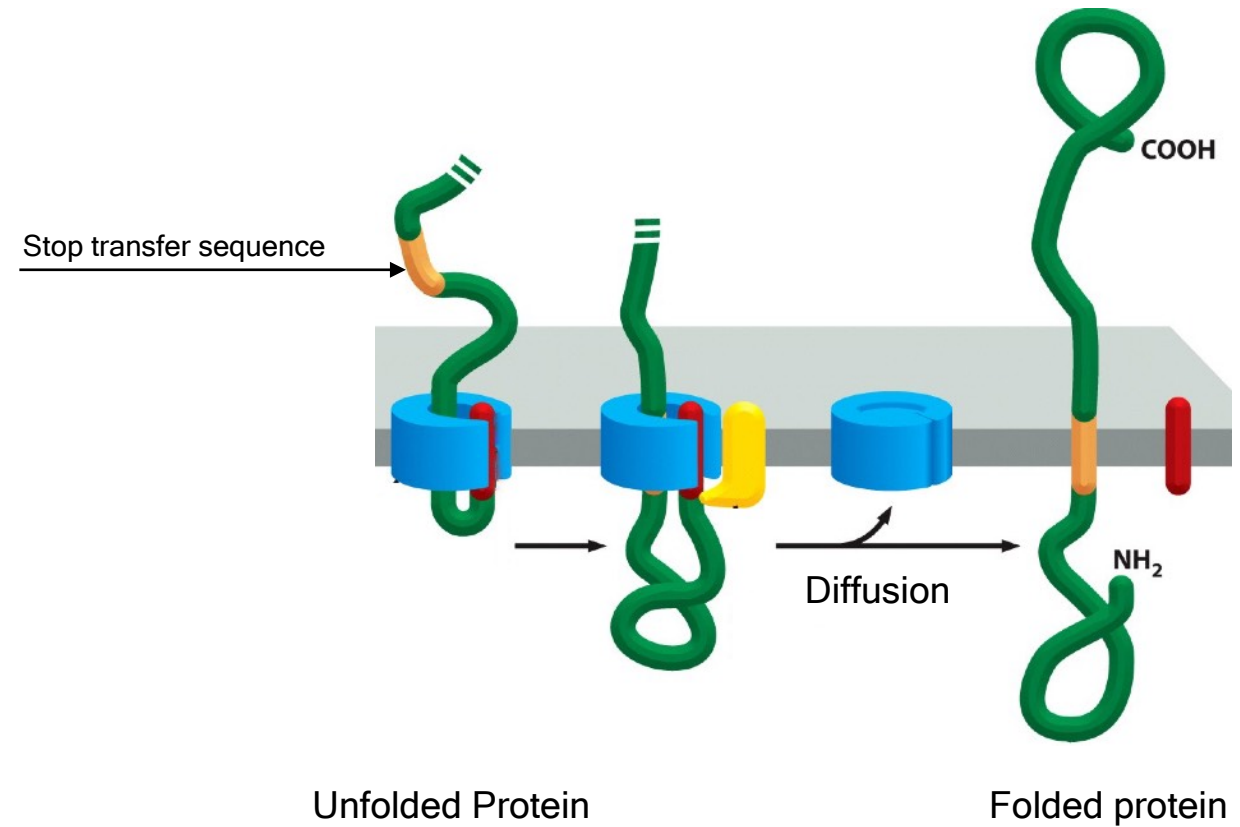


Translocation can generate soluble and integrated membrane proteins.

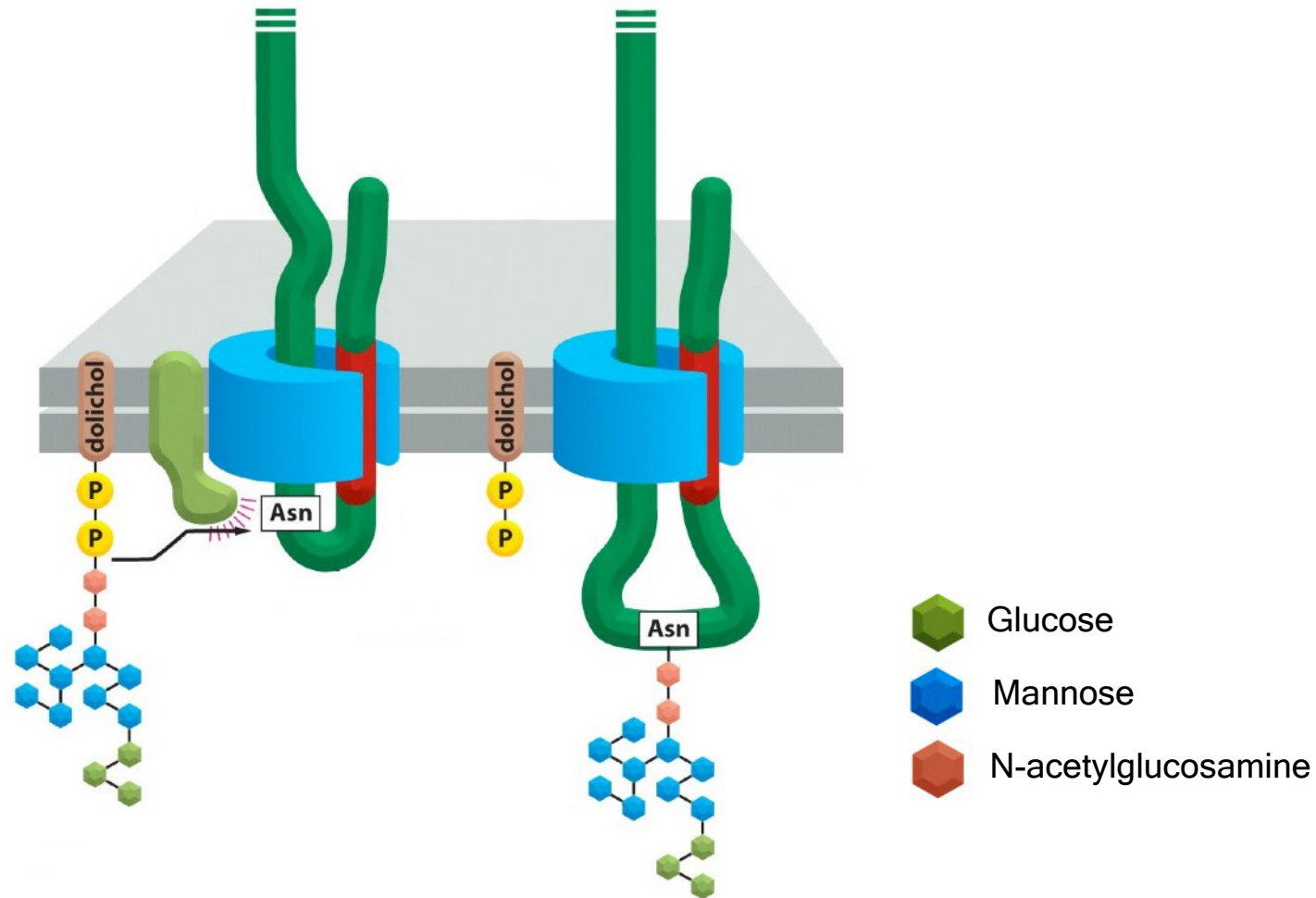
Soluble Protein



Integral Membrane Protein

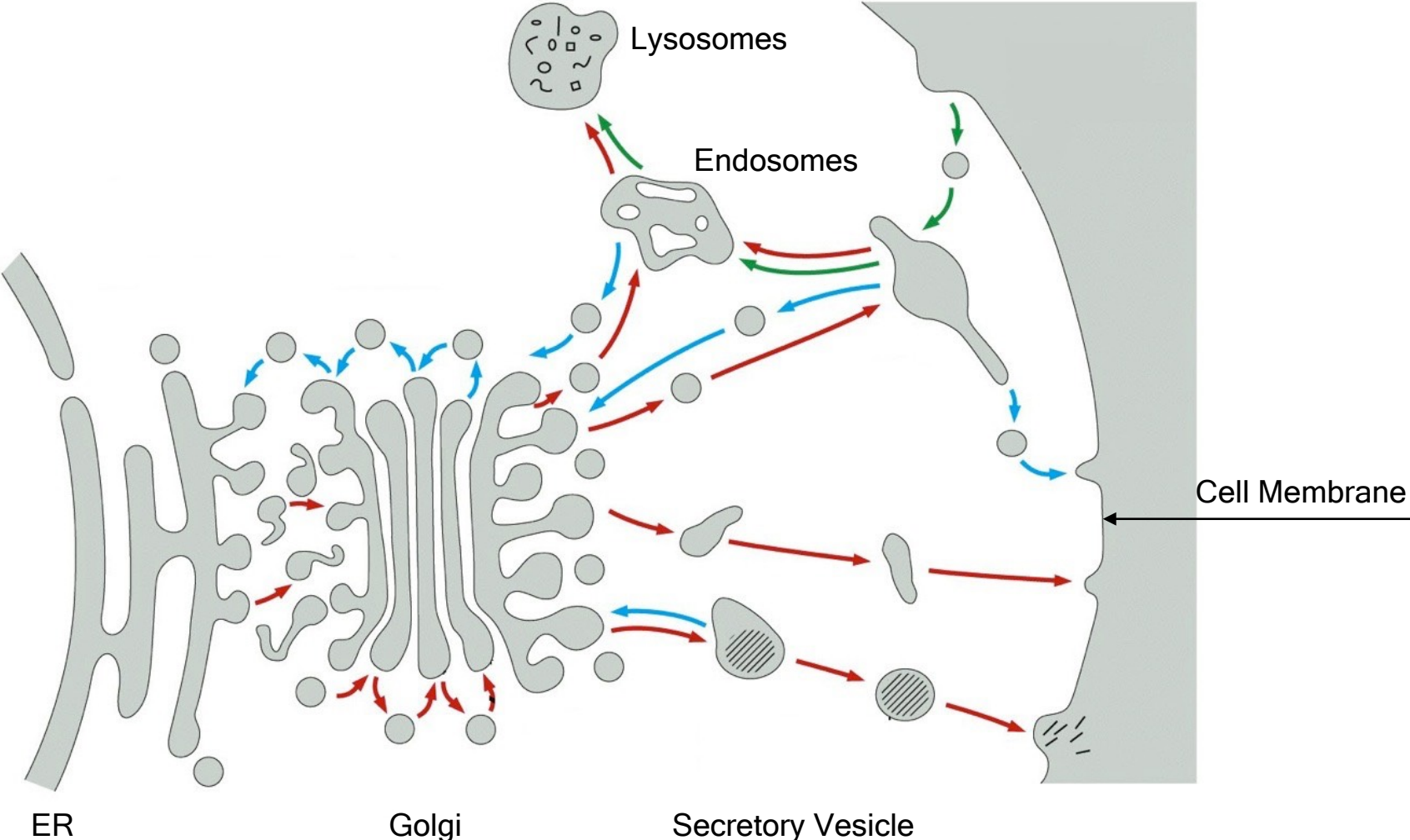


Many proteins are modified through glycosylation in the ER.

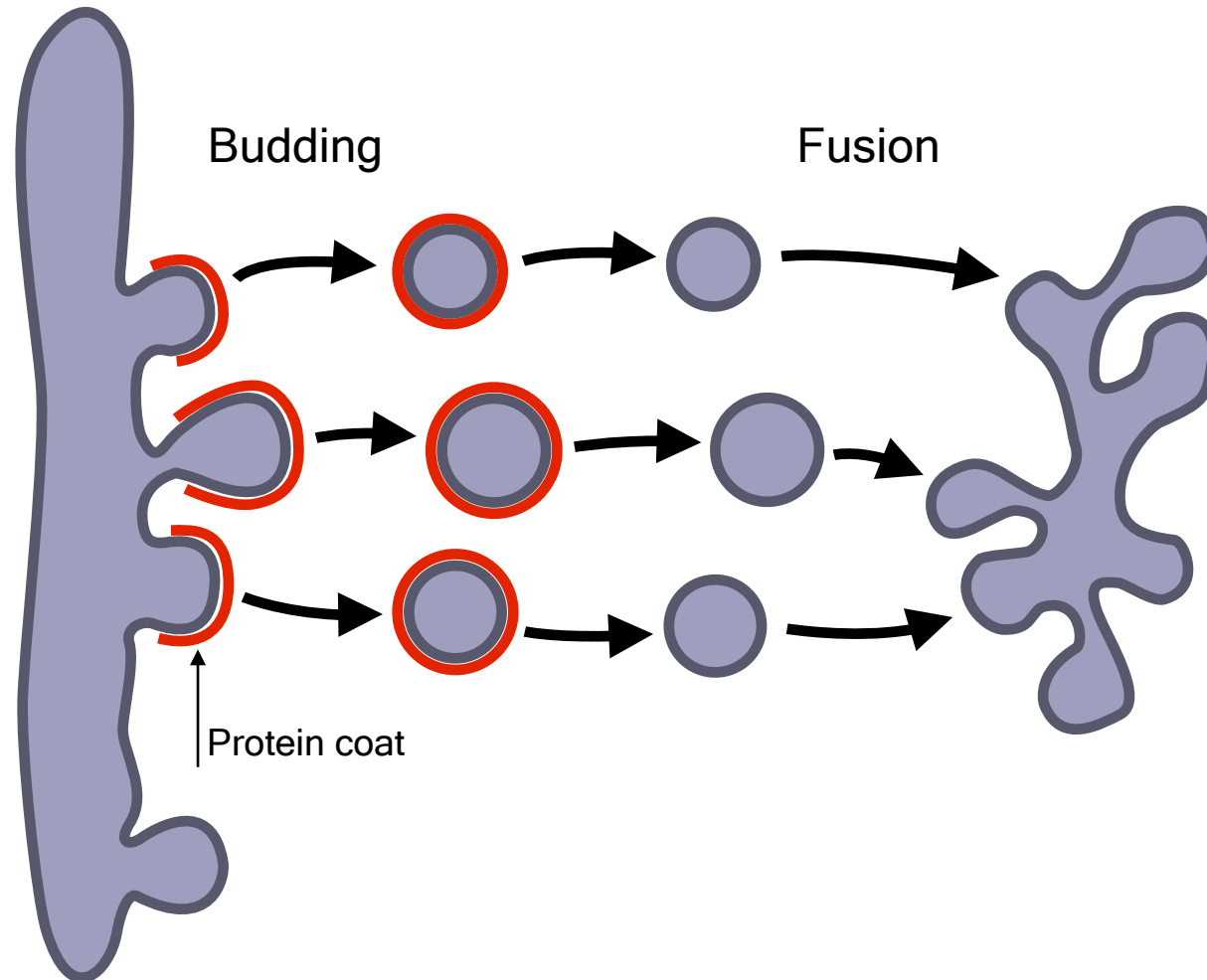


Vesicle Transport

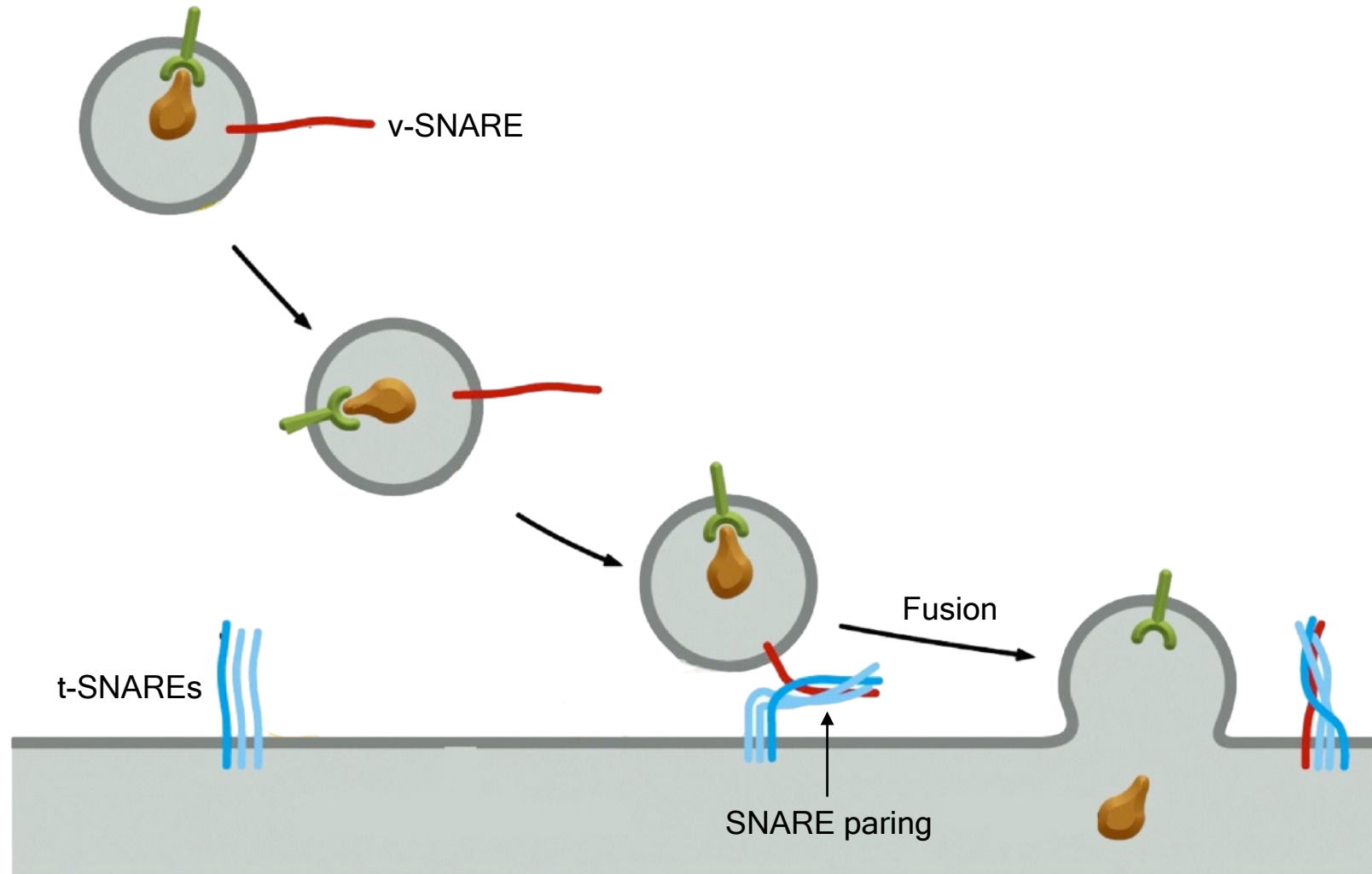
Vesicles mediate transport between membrane-bound compartments.



Vesicular transport consists of budding, targeting and fusion.

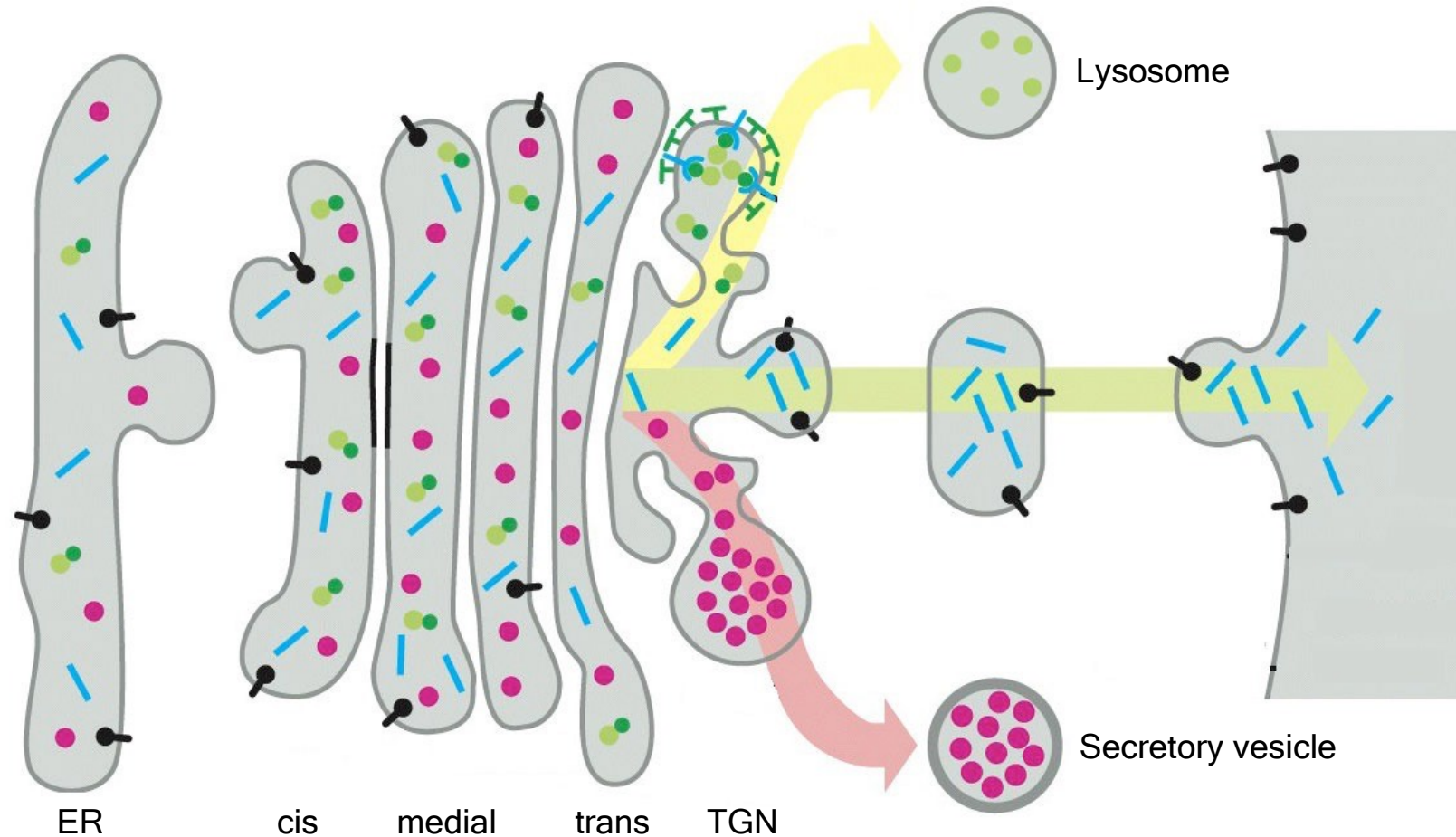


SNAREs target vesicles to their destination and mediate fusion of membranes.

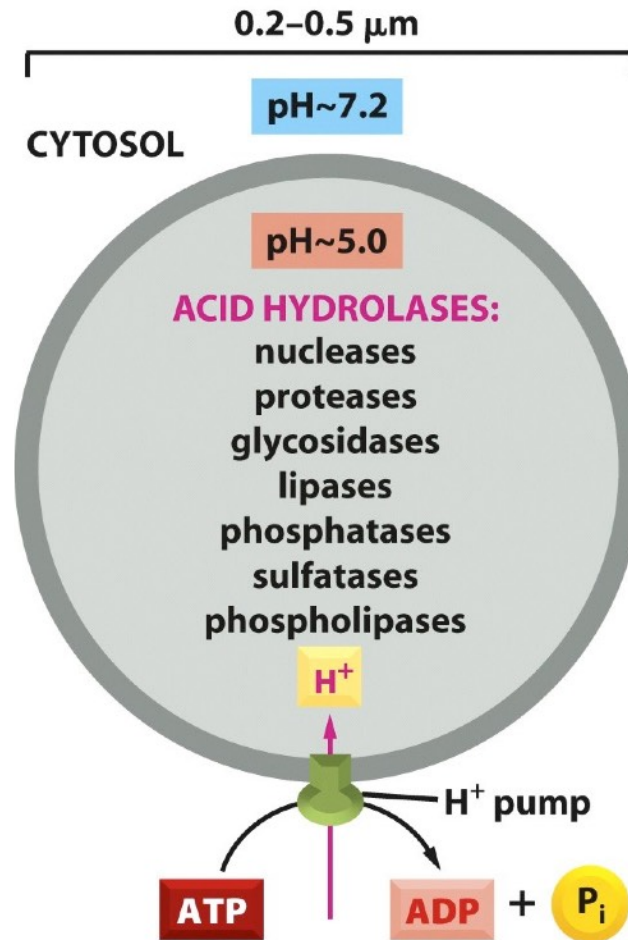


Sorting Proteins

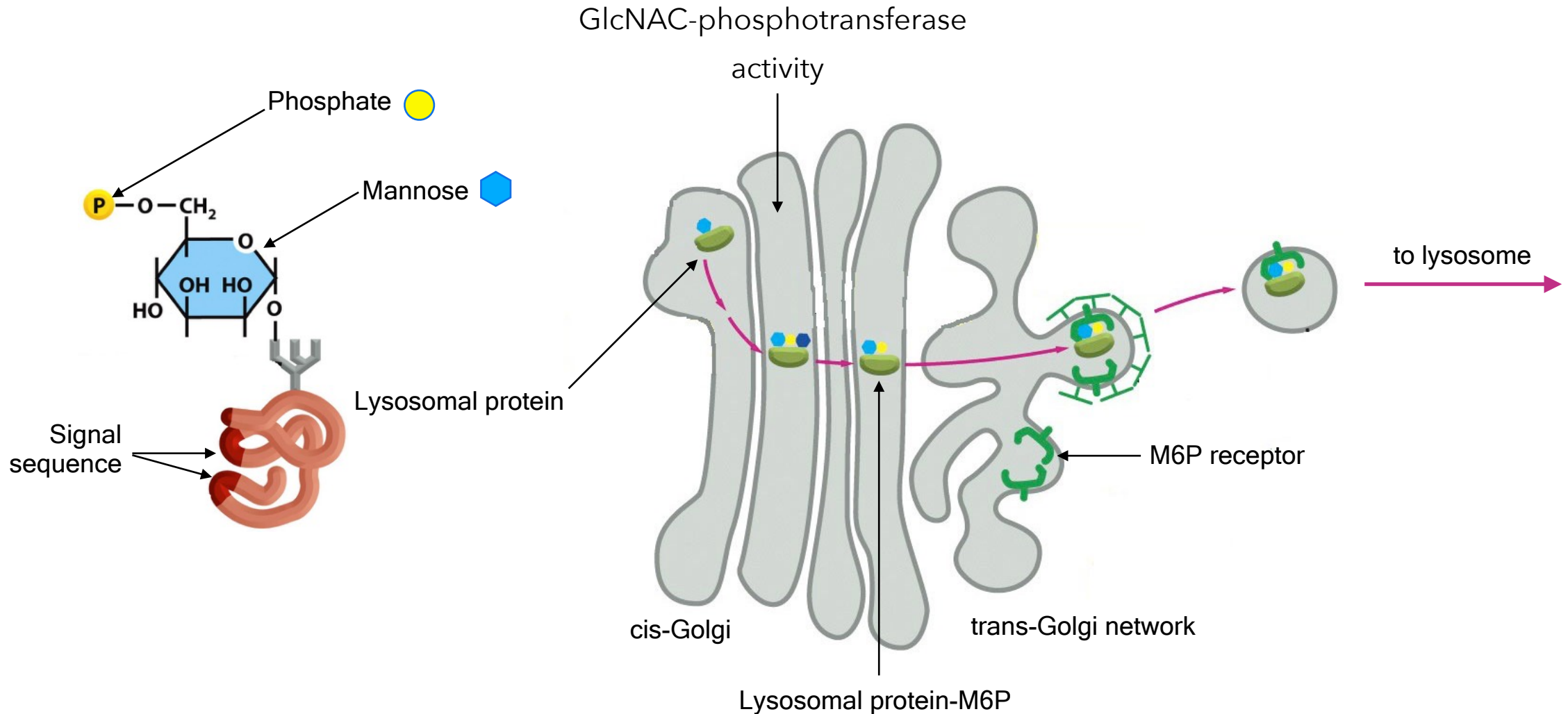
Proteins are sorted in trans-Golgi network to their final destinations.



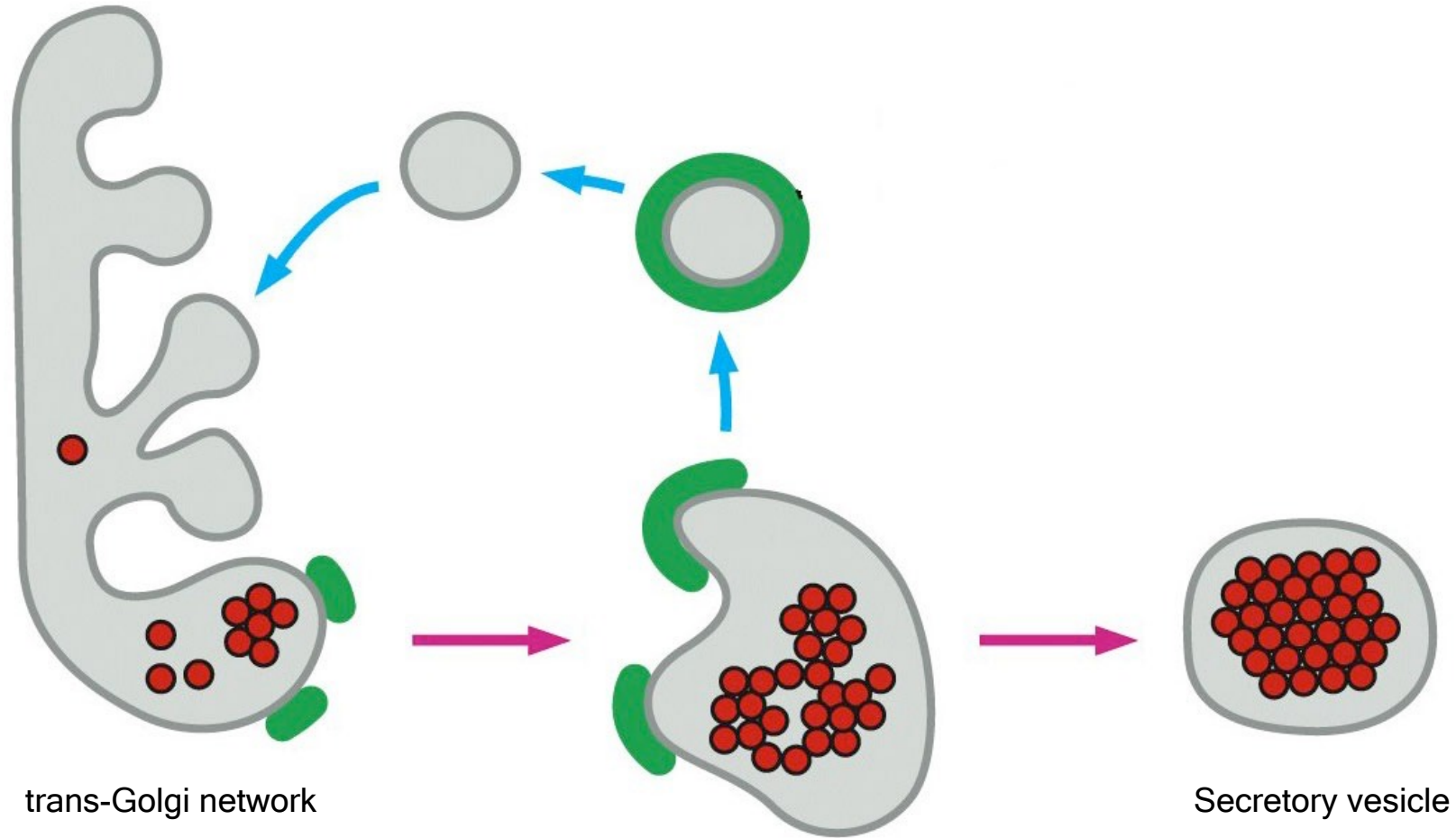
Lysosomes contain many digestive enzymes that are active at low pH.



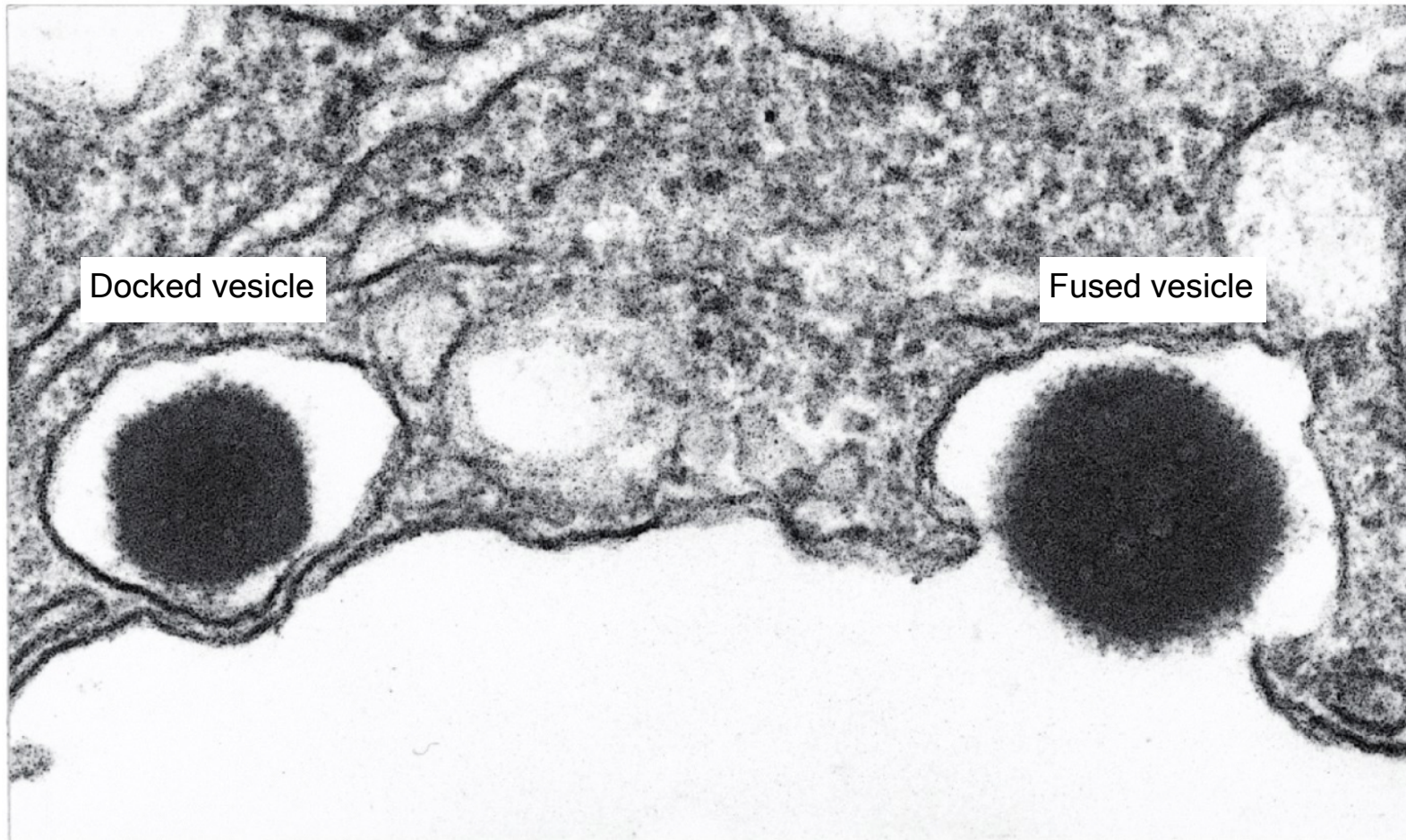
Mannose-6-phosphate targets proteins to lysosomes.



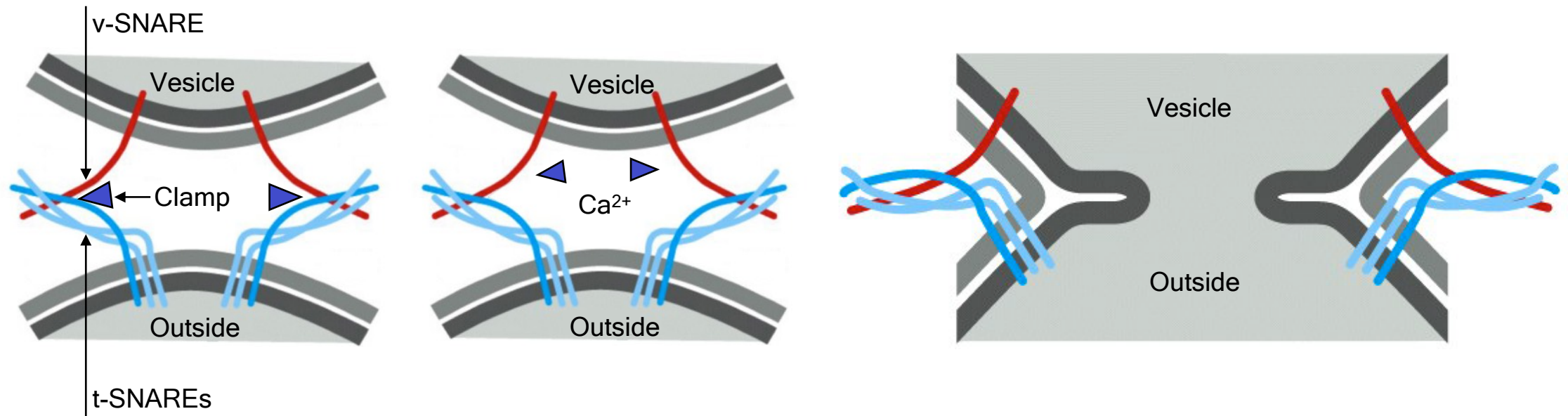
Secretory vesicles accumulate aggregated proteins in TGN and undergo maturation.



Some secretory vesicles dock at the cell membrane awaiting a signal to fuse.

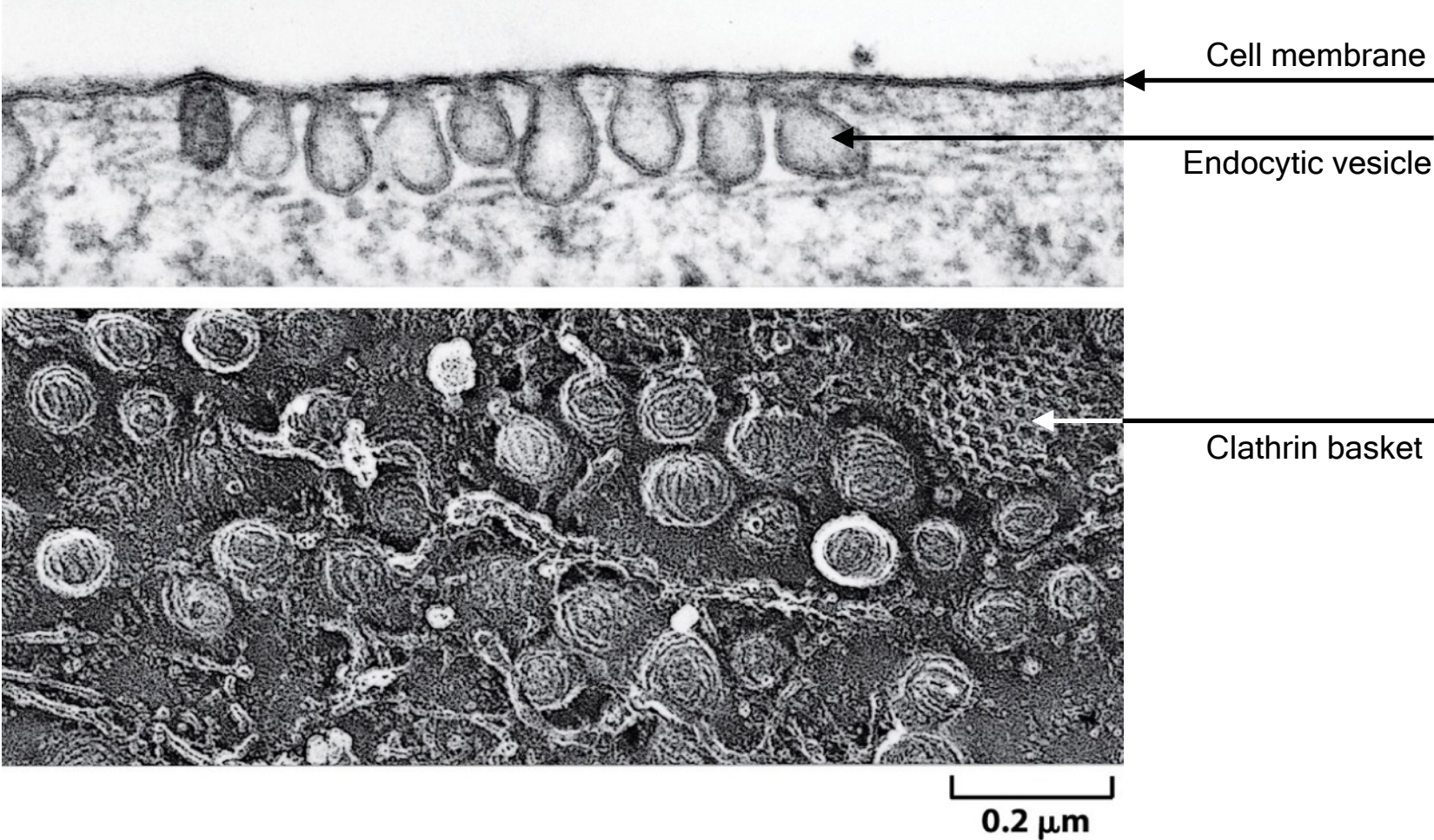


Calcium-sensitive clamps inhibit SNARE pairing to arrest fusion.

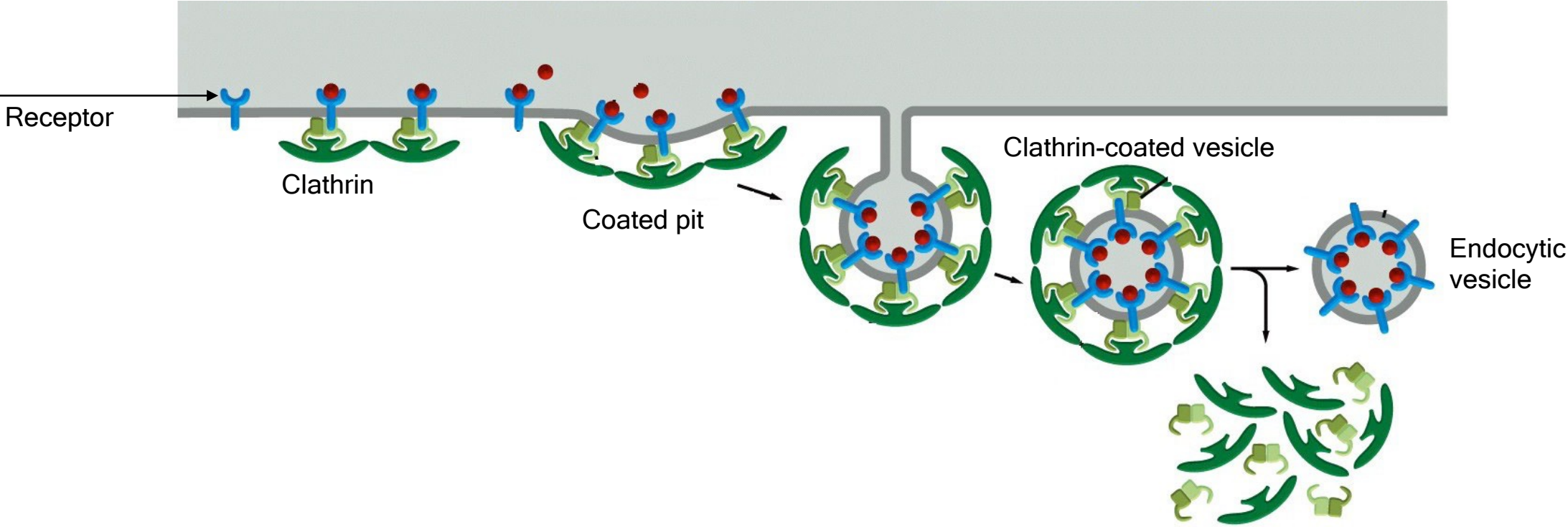


Endocytosis

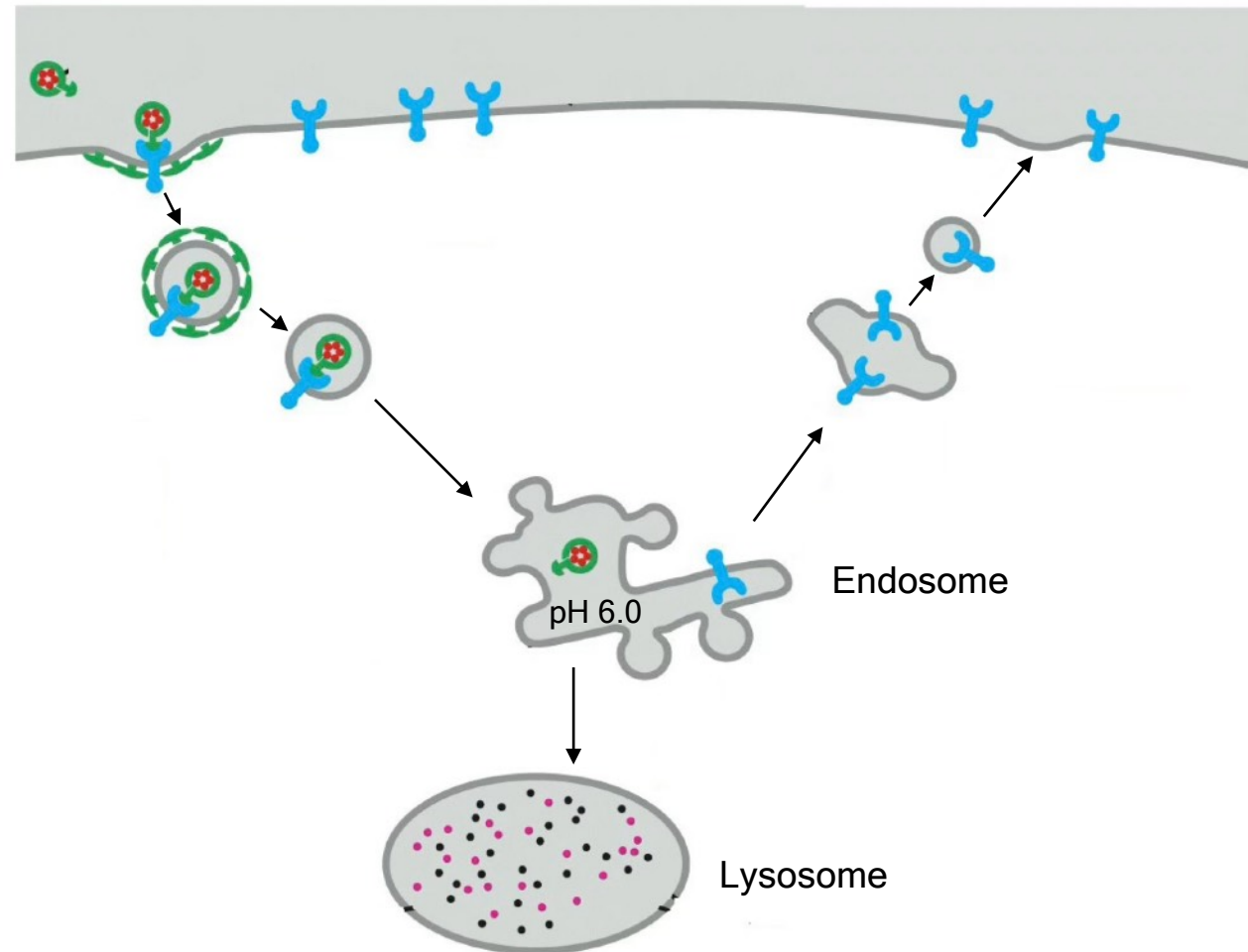
Pinocytosis ingests small amount of the cell membrane through formation of endocytic vesicles.



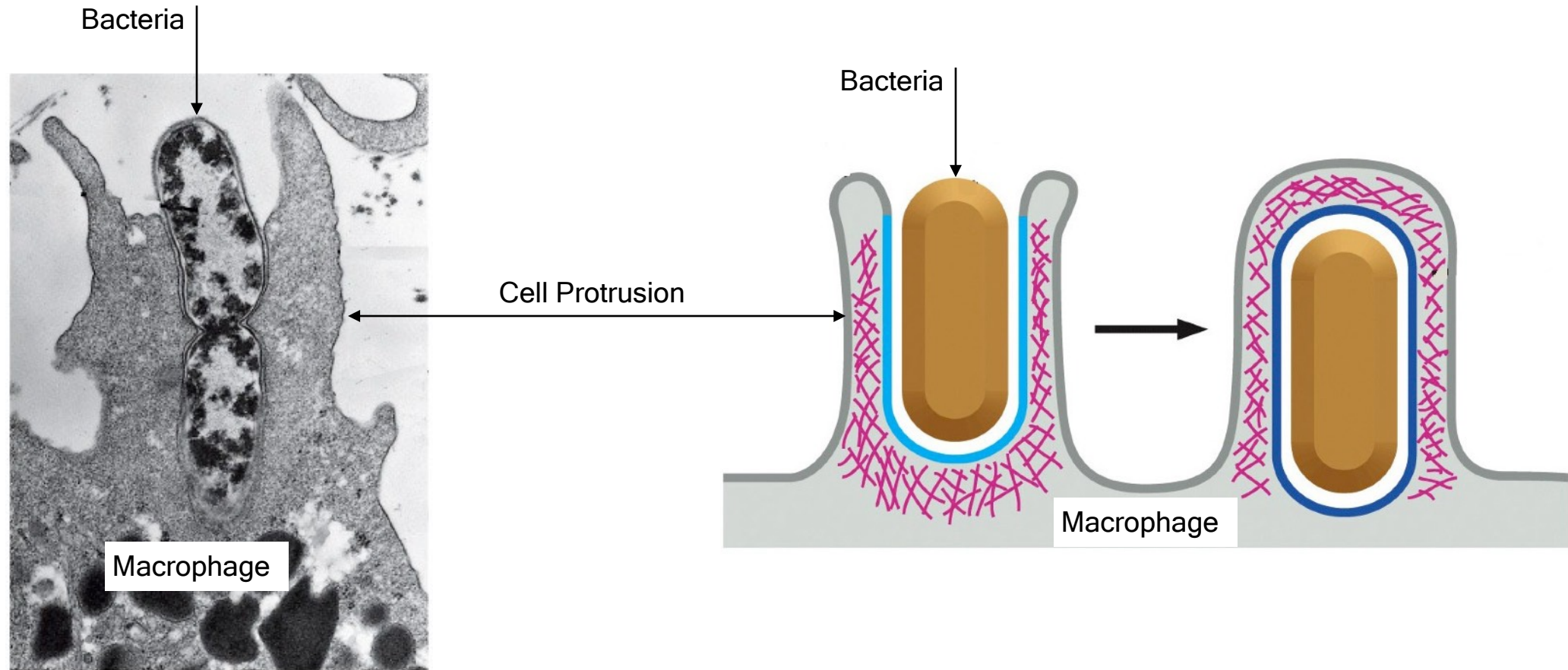
Receptor-mediated endocytosis takes up specific proteins from the cell membrane.



Recycling pathway returns receptors to cell membrane and delivers cargo to the lysosome.



Phagocytosis engulfs large particles and microorganisms.



Take home points...

- Signal sequences target proteins to organelles and cell membrane
- Vesicles move proteins and lipids between organelles in the secretory pathway.
- Proteins are sorted in the Golgi and delivered to cell membrane, lysosomes or storage granules.
- Glycosylation is the addition of sugars to proteins and occurs in the ER and Golgi.
- Endocytosis allows cells to take up external material and portions of the cell membrane for degradation or recycling.