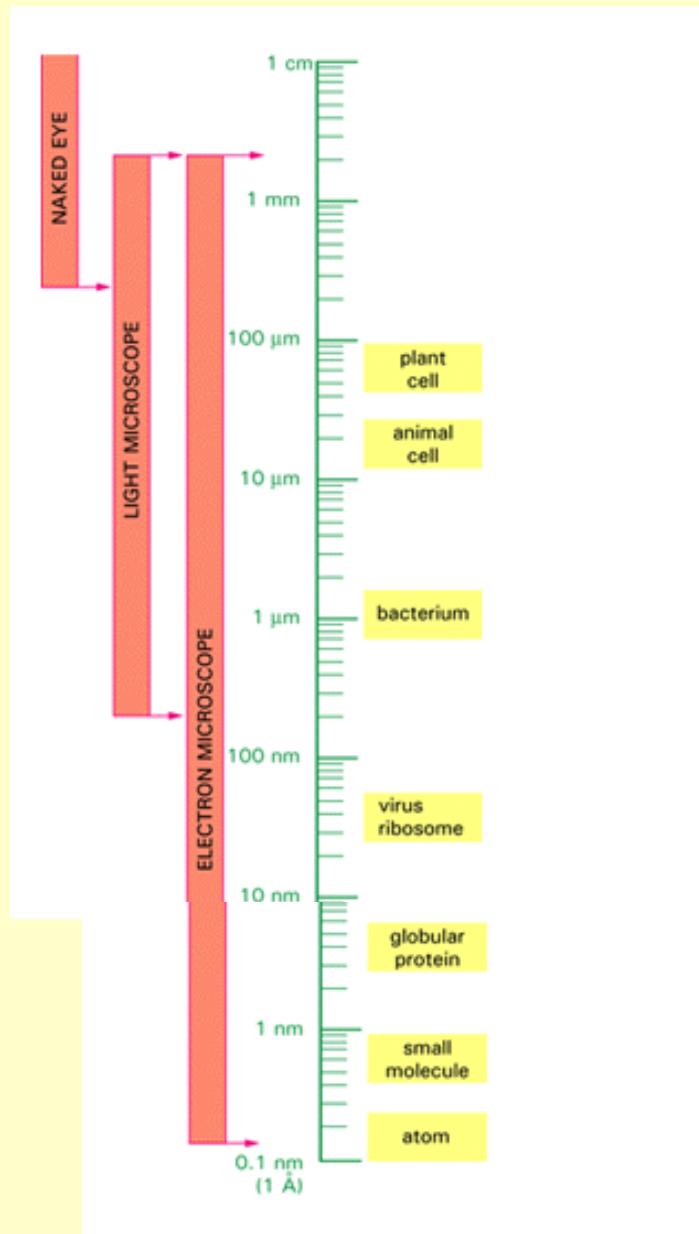


# **BIOLOGÍA CELULAR**



**Escala logarítmica del tamaño de las células y sus componentes indicando rango que puede ser detectado por ojo desnudo, microscopio de luz y electrónico.**

**Unidades de longitud empleadas:**

$\mu\text{m}$  ( $10^{-6}$  m), nm ( $10^{-9}$  m),

Å (Angstrom) ( $10^{-10}$  m)

**Microscopía Óptica**



**Microscopía de Luz**



**Microscopía Electrónica**

# Primer Microscopio de Luz (Campo claro)

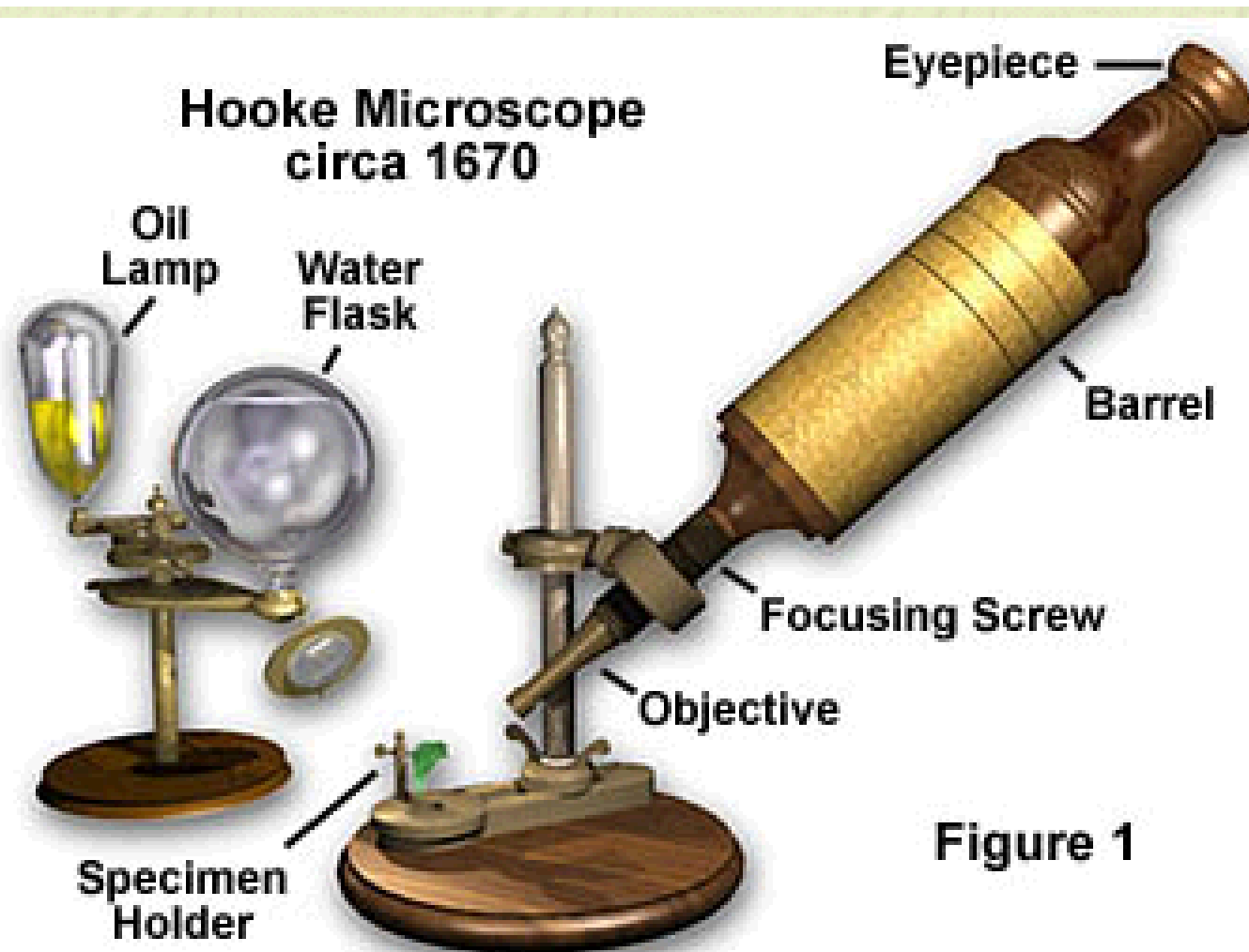


Figure 1

Sistema de aumento

Ocular

Sistema de soporte

Sistema de Iluminación

Bastidor

Portaobjetivo

Objetivos

Macrométrico

Diafragma

Platina

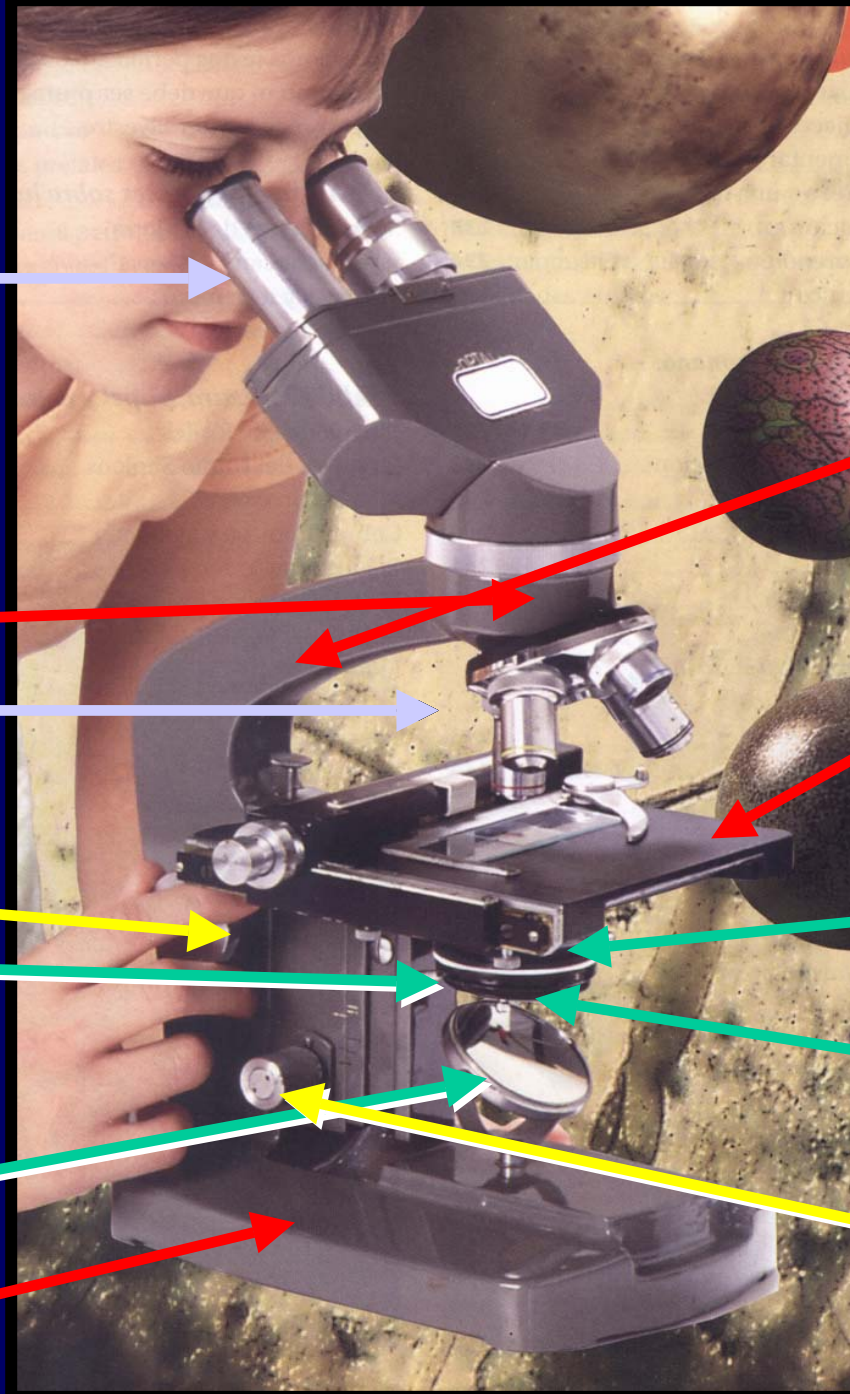
Condensador

Espejo

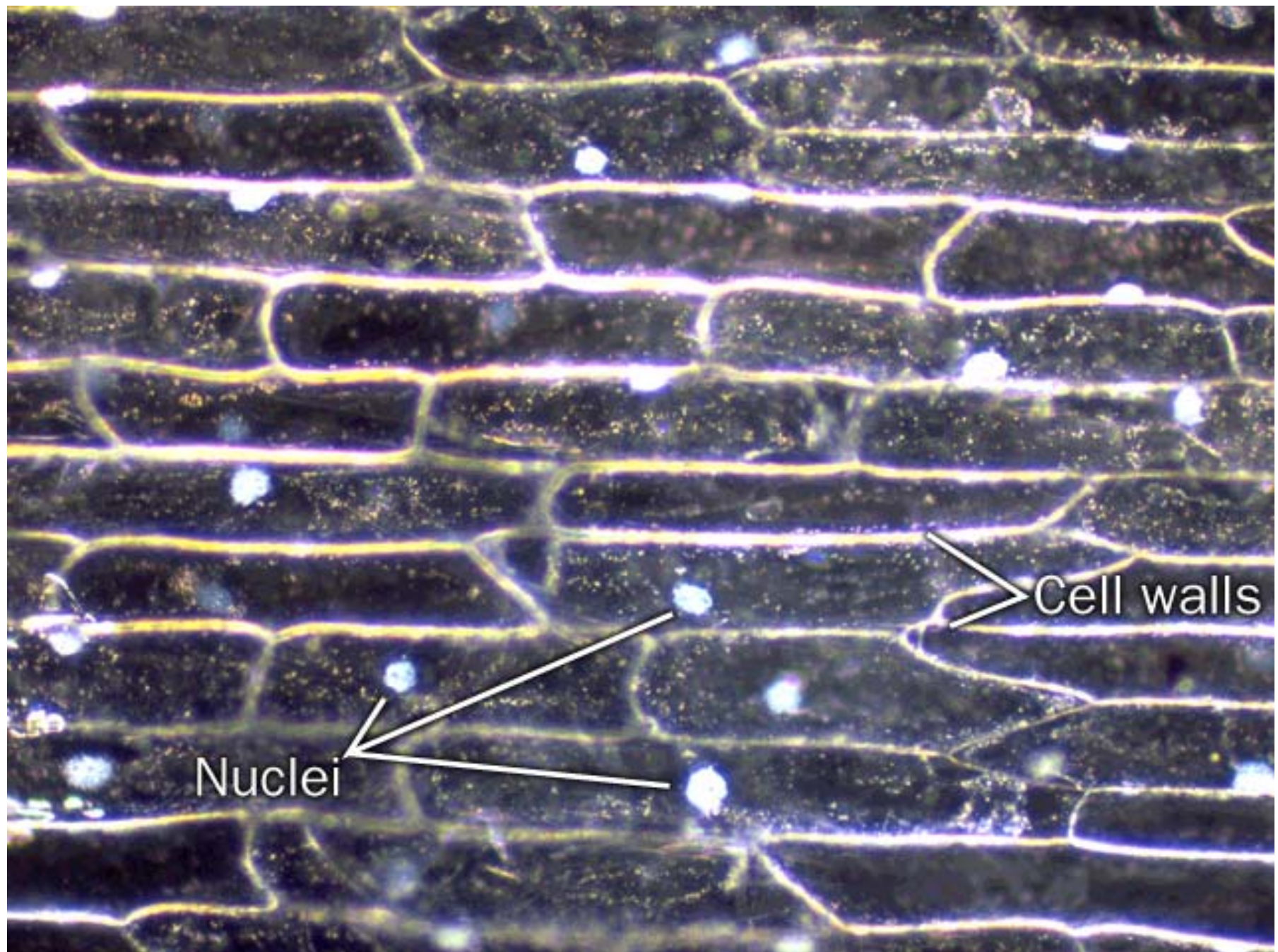
Filtros  
Sistema de Ajuste

Pie

Tornillo micrométrico







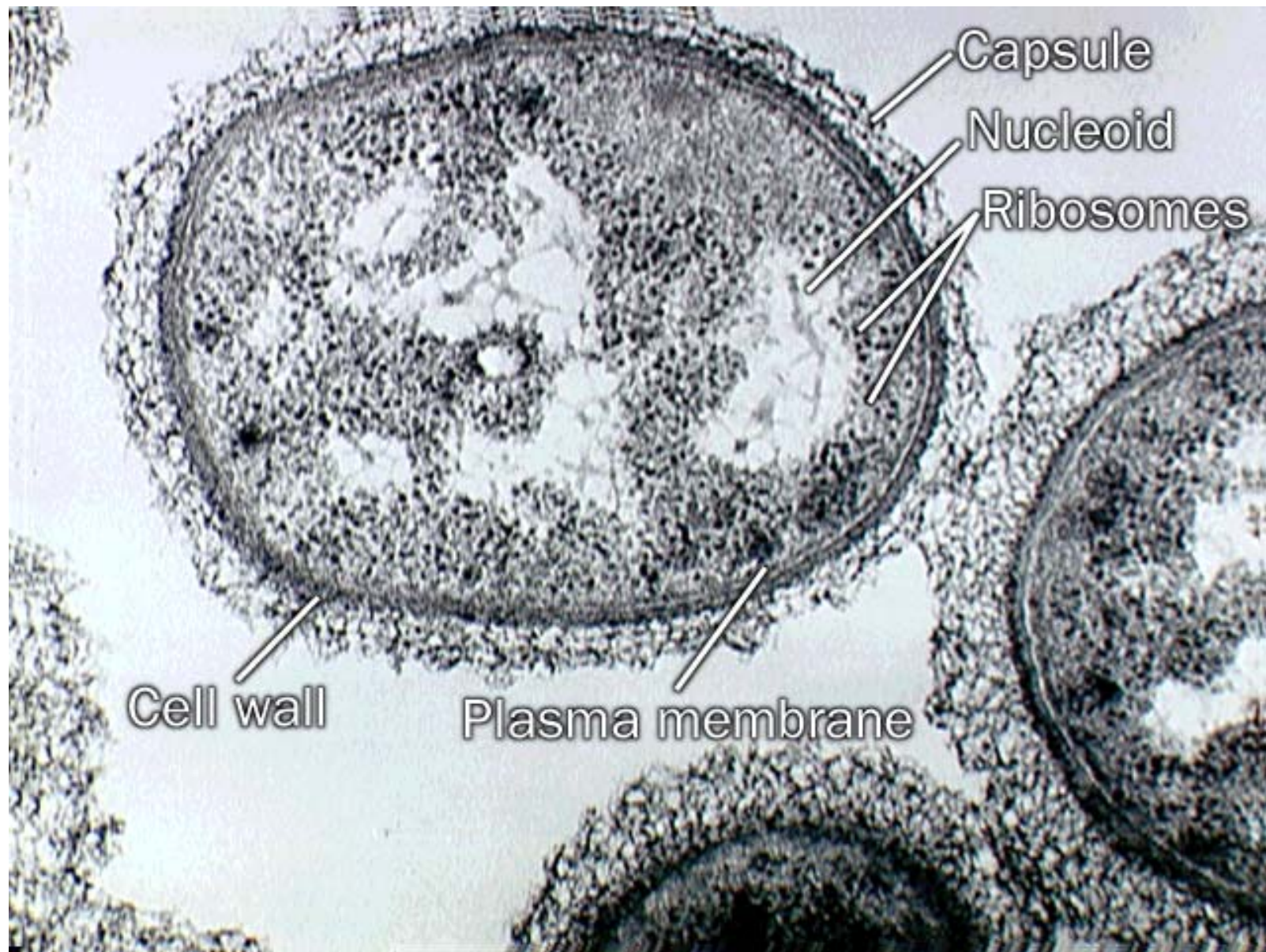




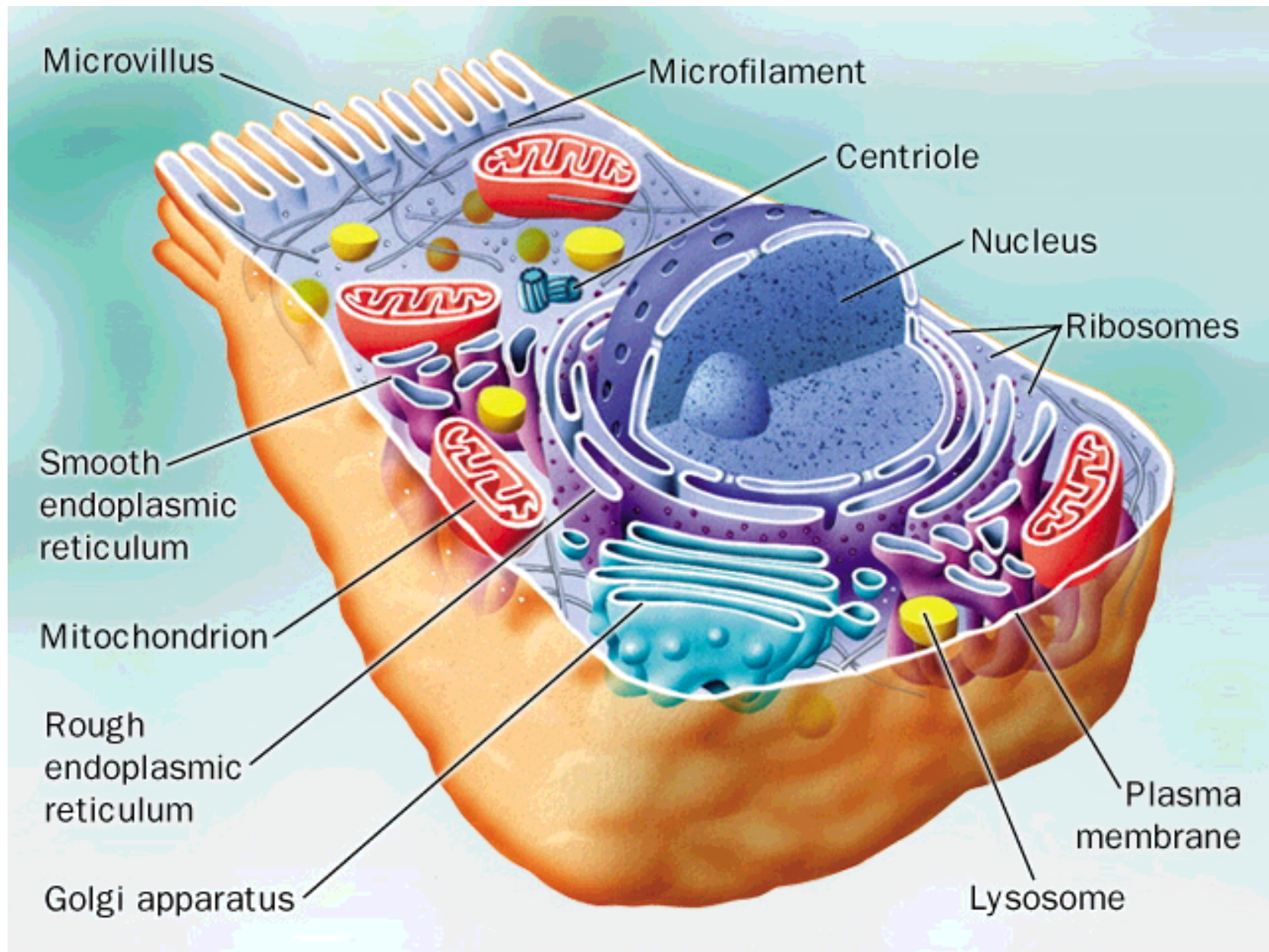


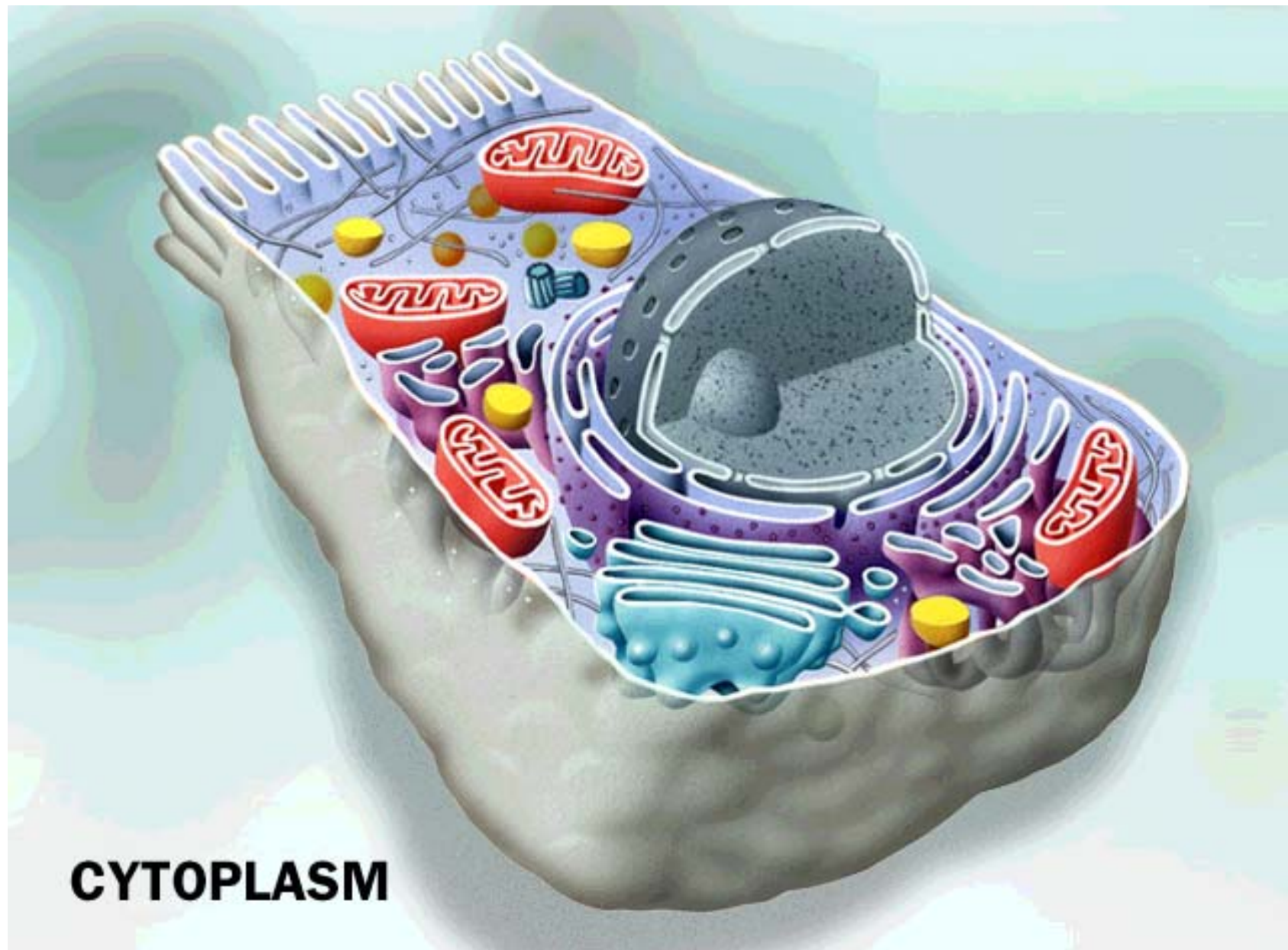
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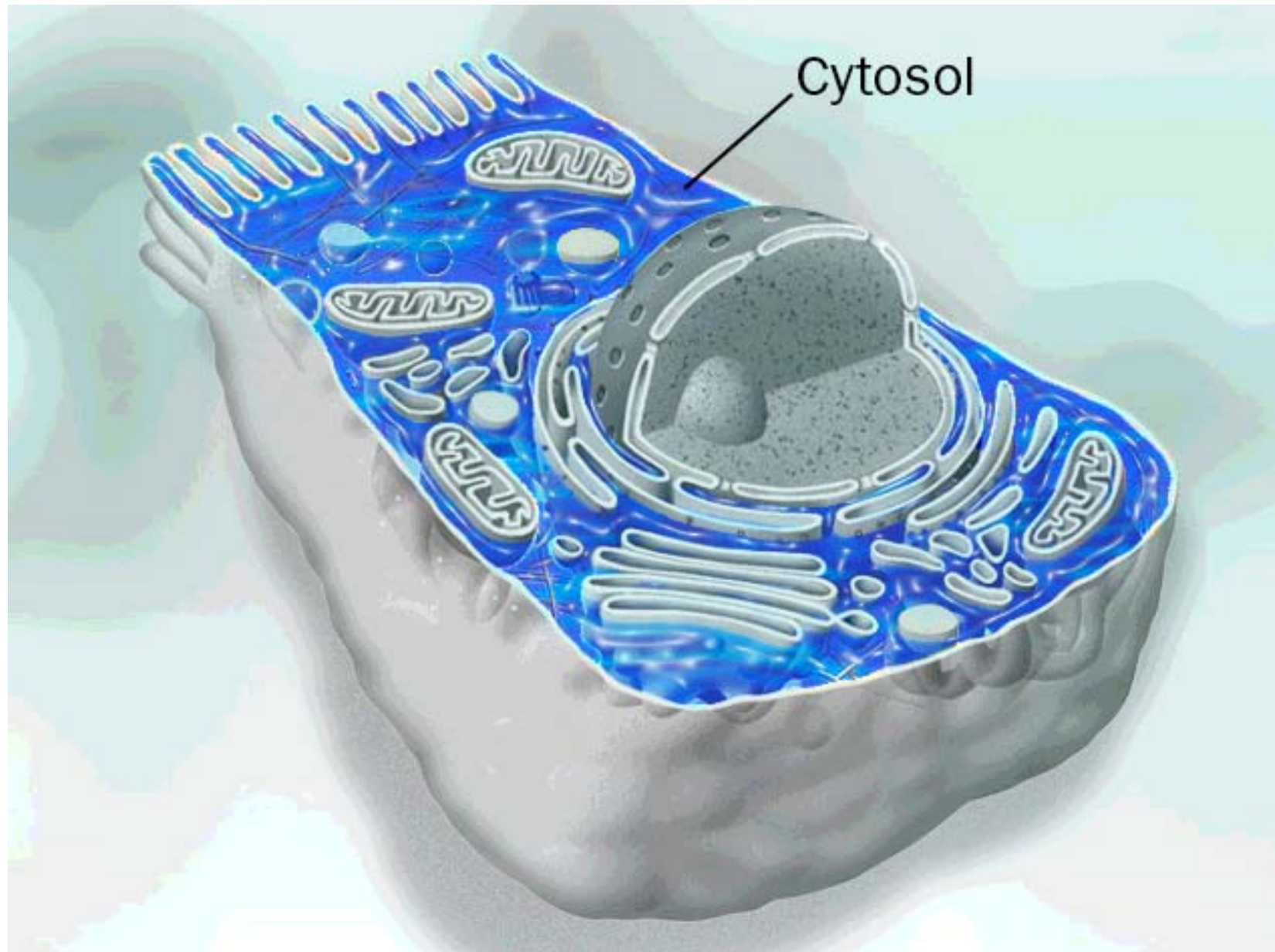




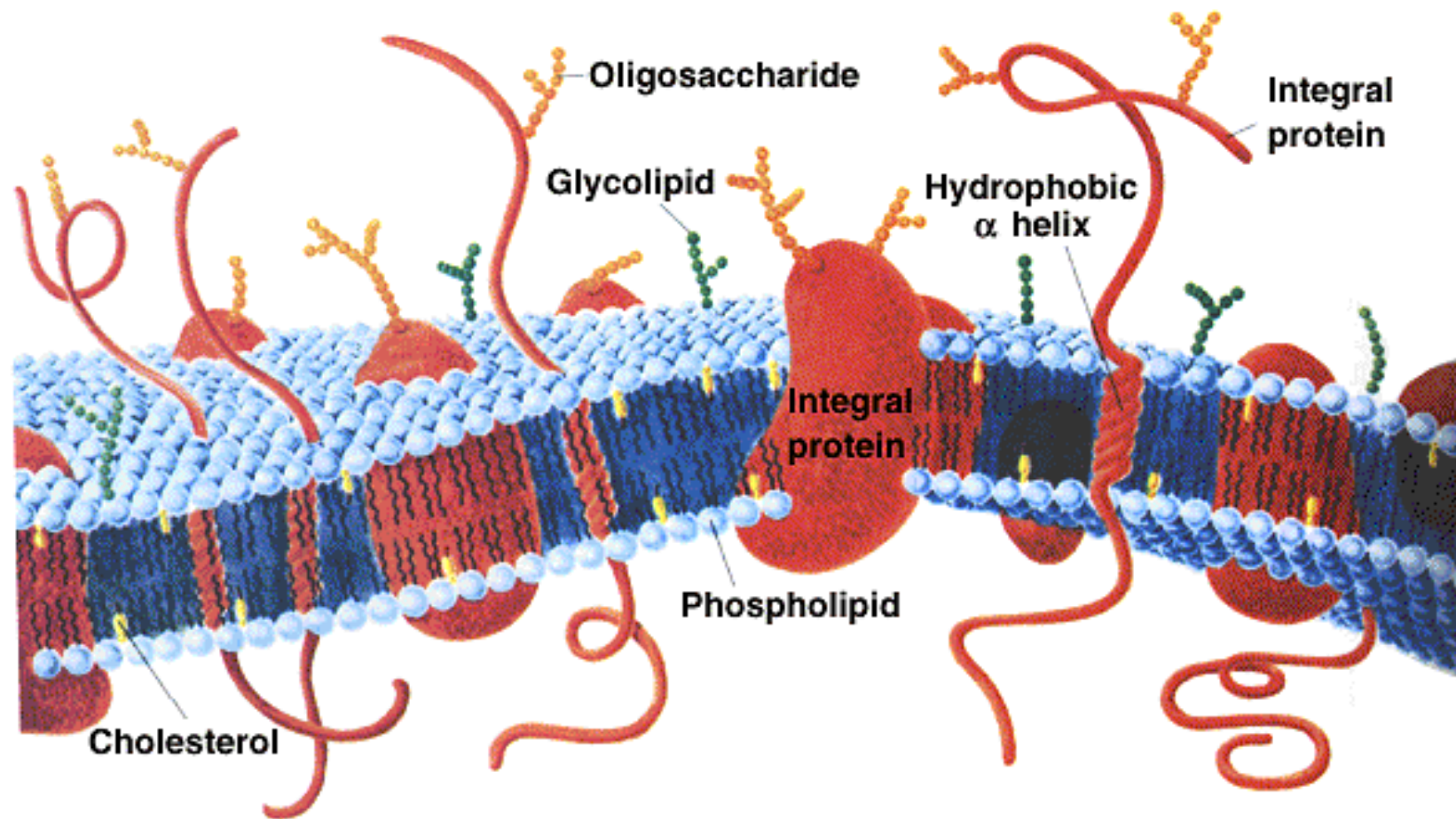


**CYTOPLASM**

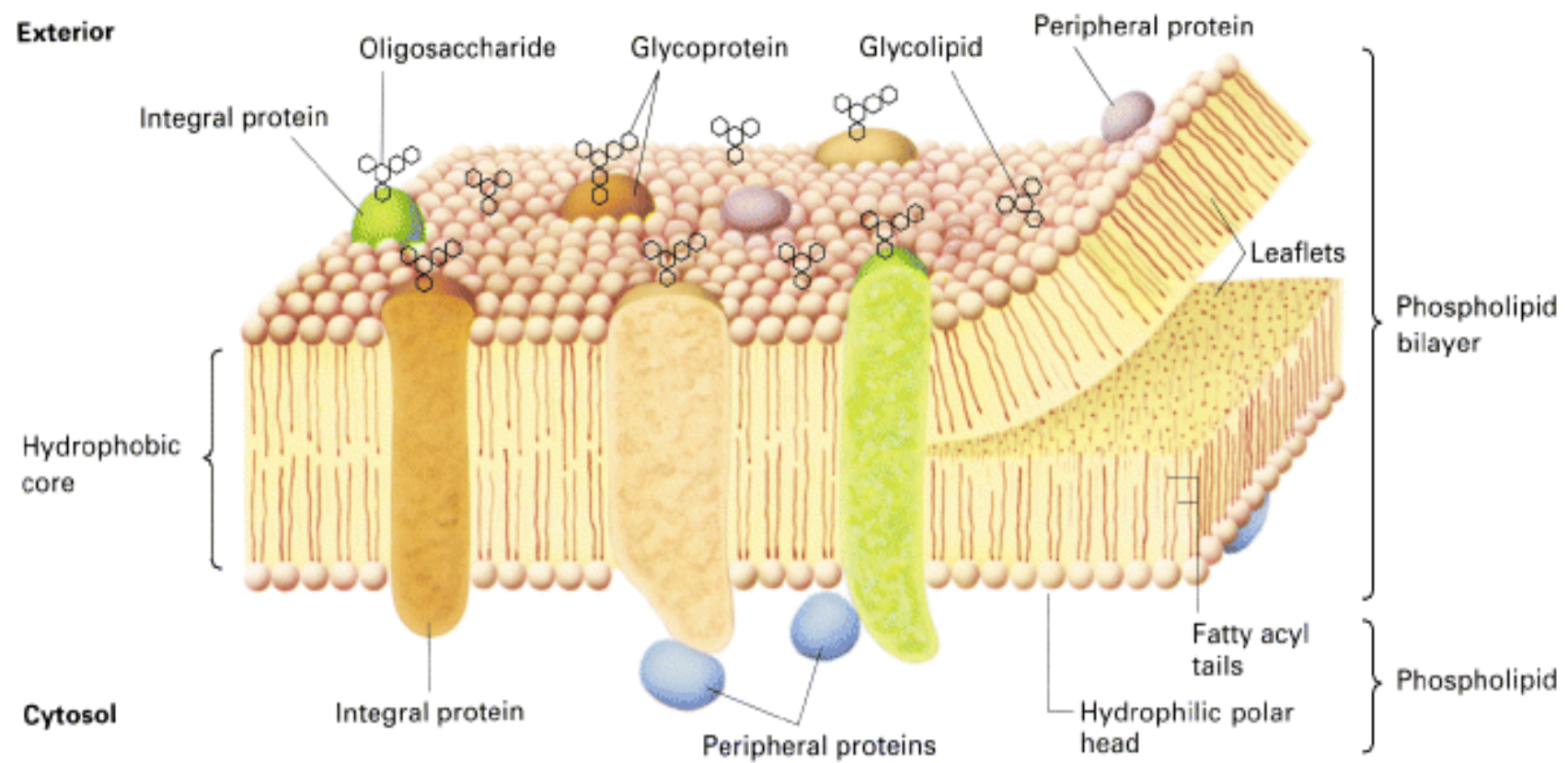


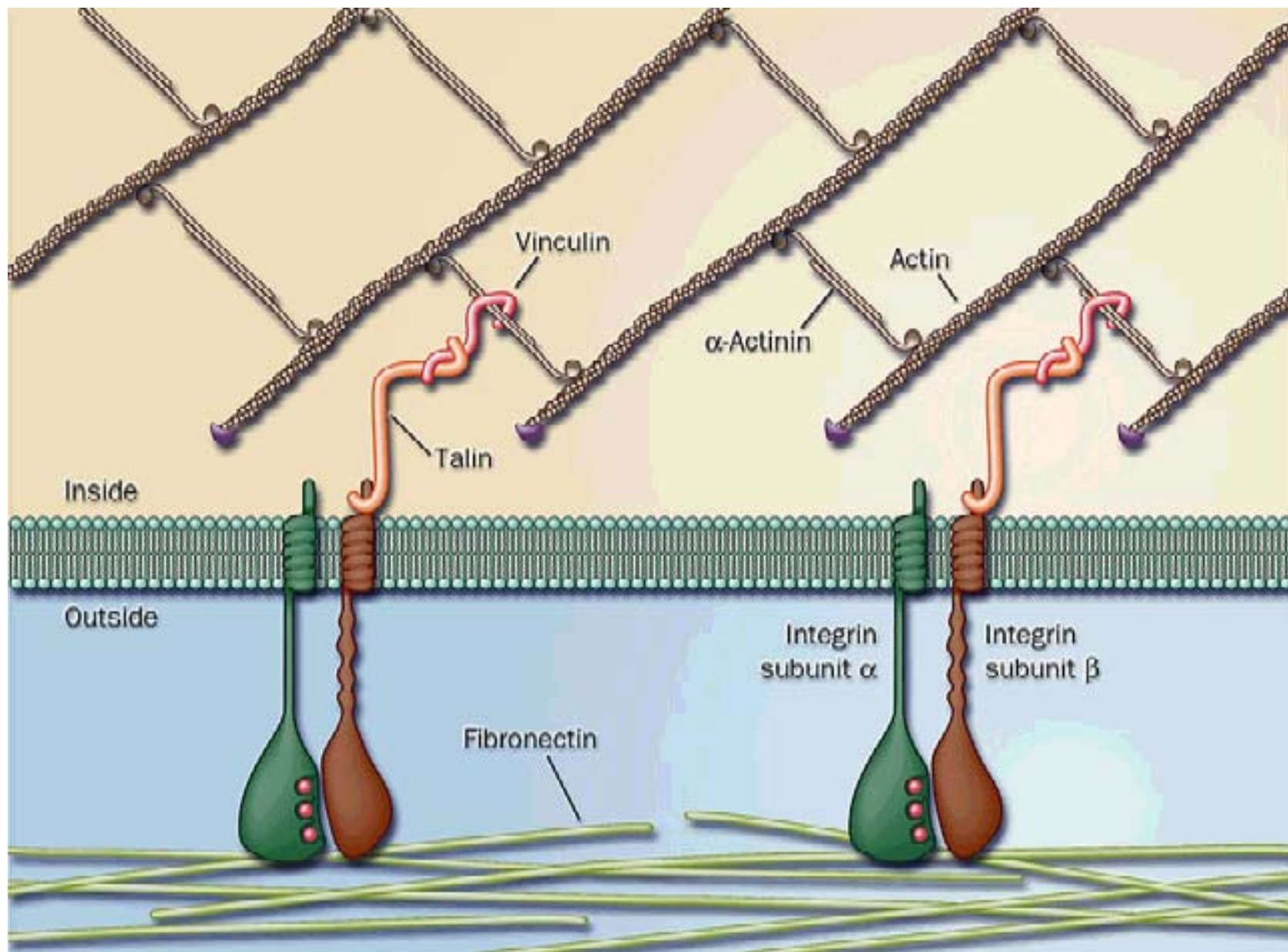




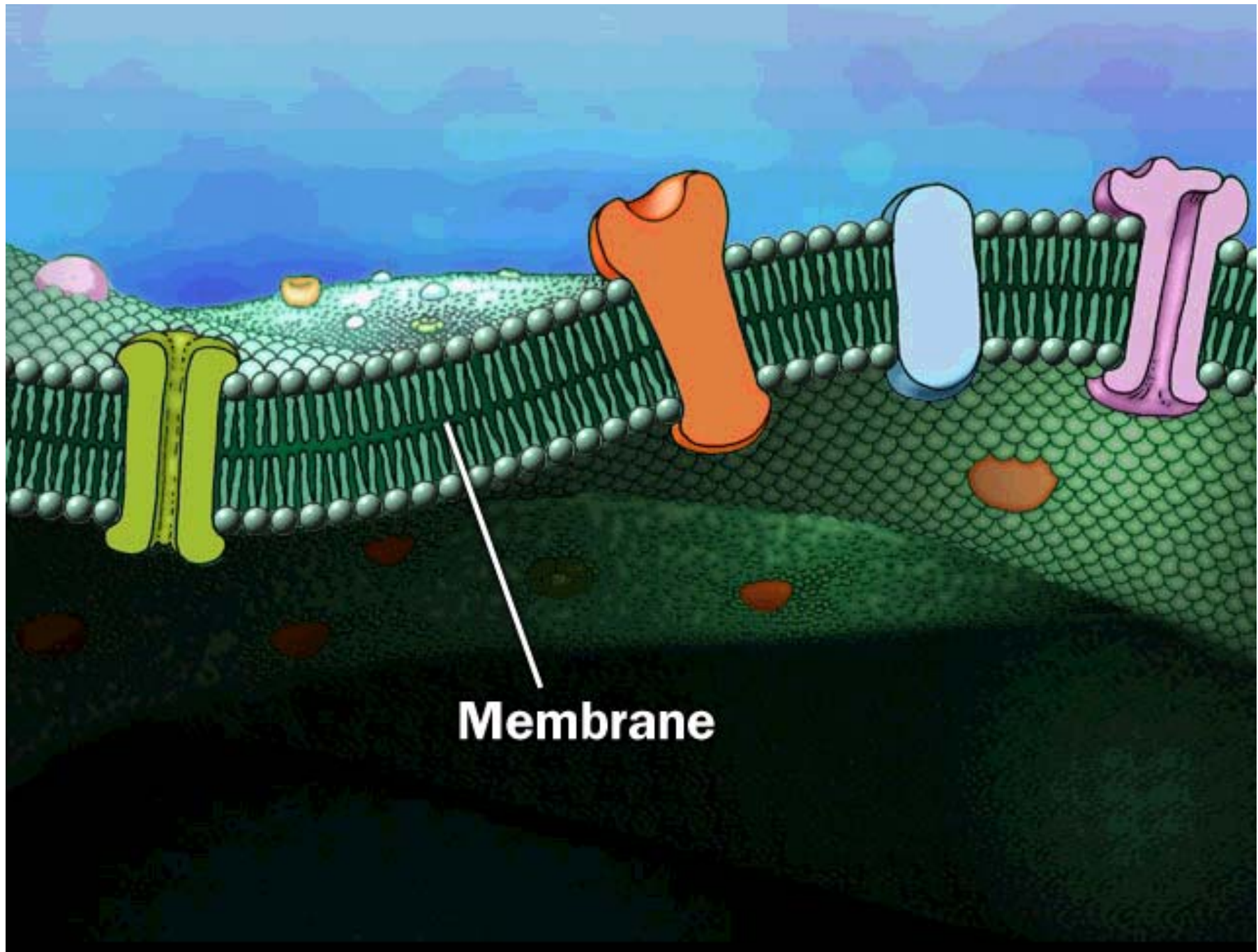


Modelo del mosaico fluído para la membrana biológica



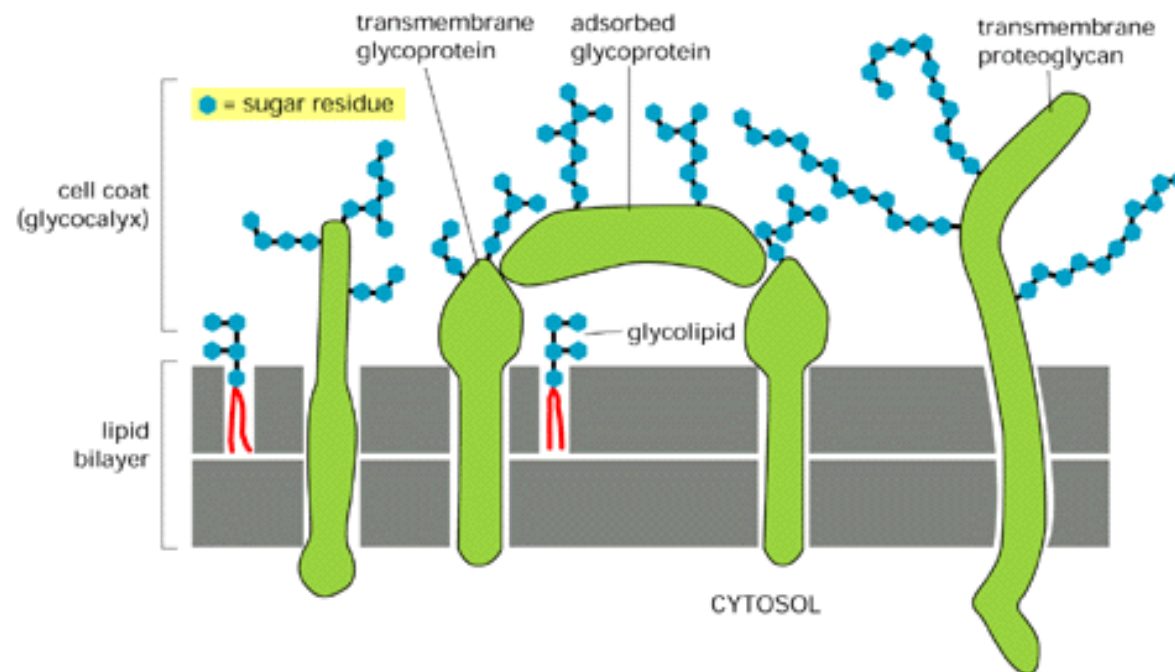




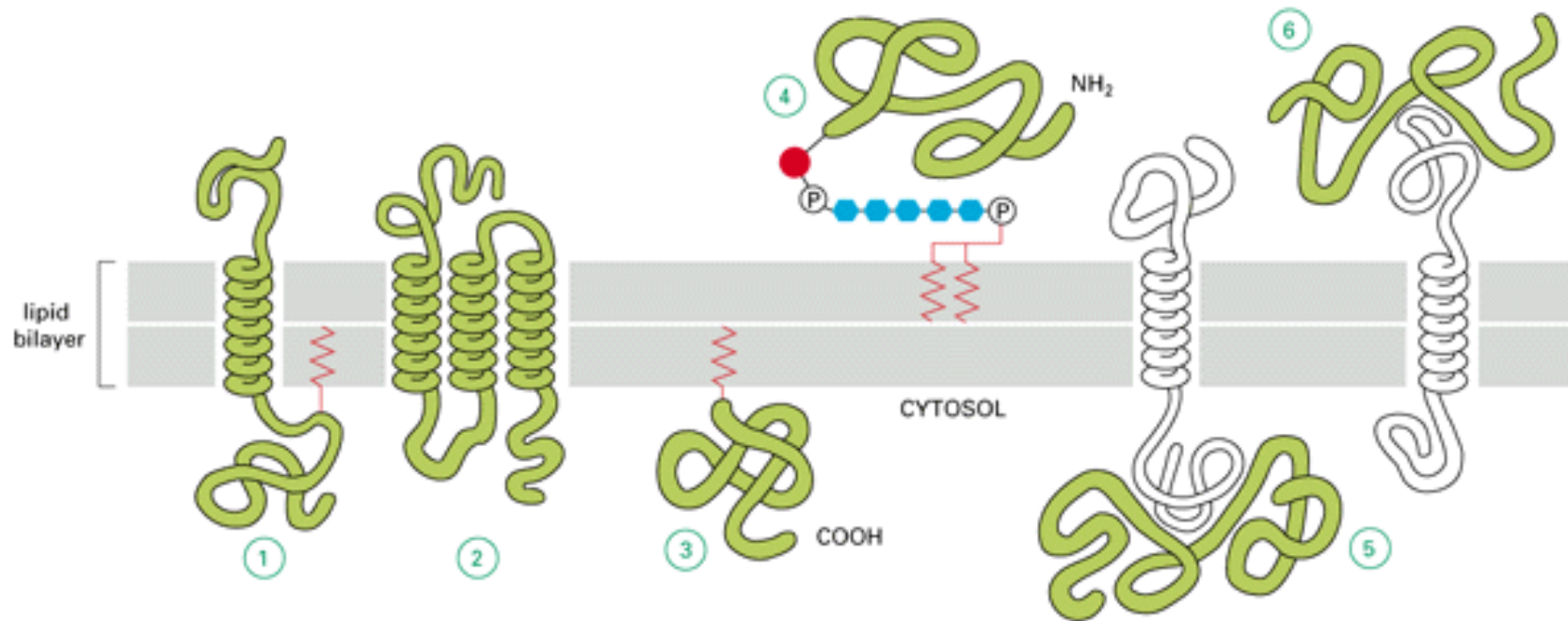


**Membrane**

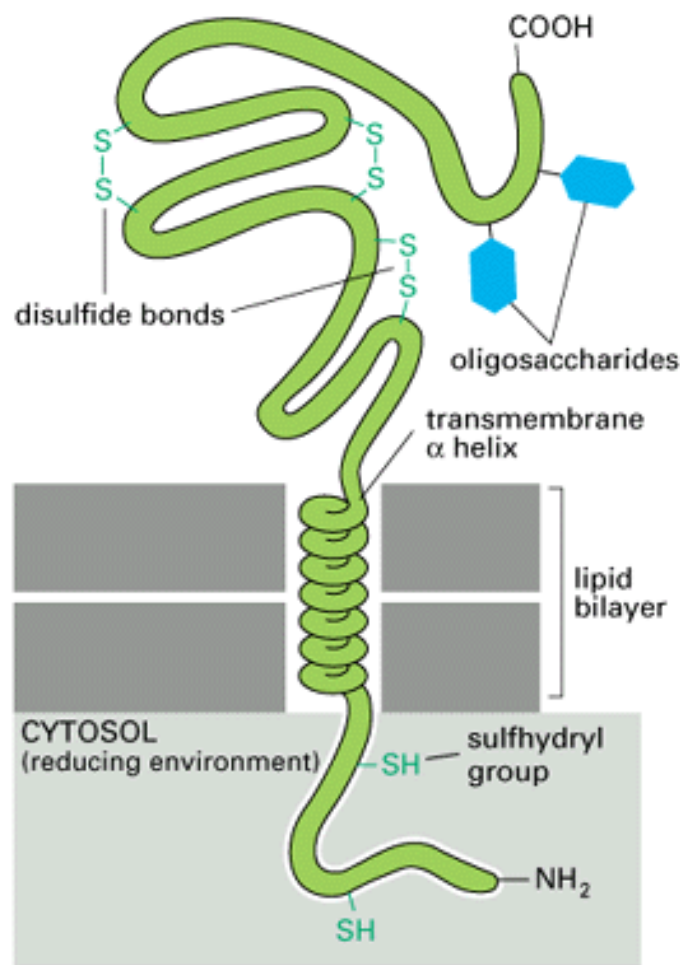




**Figure 10-41. Simplified diagram of the cell coat (glycocalyx).** The cell coat is made up of the oligosaccharide side chains of glycolipids and integral membrane glycoproteins and the polysaccharide chains on integral membrane proteoglycans. In addition, adsorbed glycoproteins and adsorbed proteoglycans (not shown) contribute to the glycocalyx in many cells. Note that all of the carbohydrate is on the noncytoplasmic surface of the membrane.



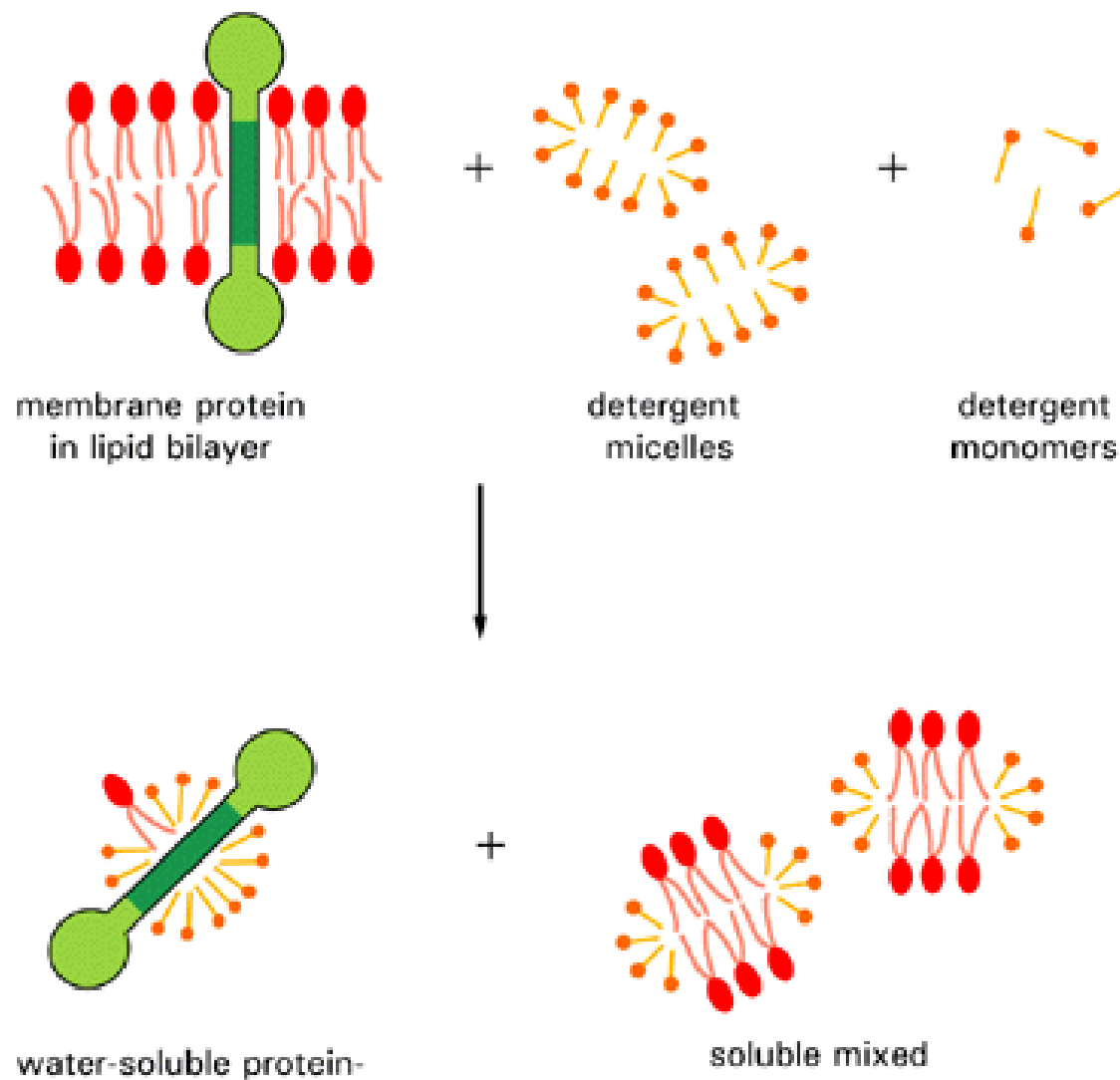
Diferentes vías de asociación de las proteínas con la bicapa lipídica



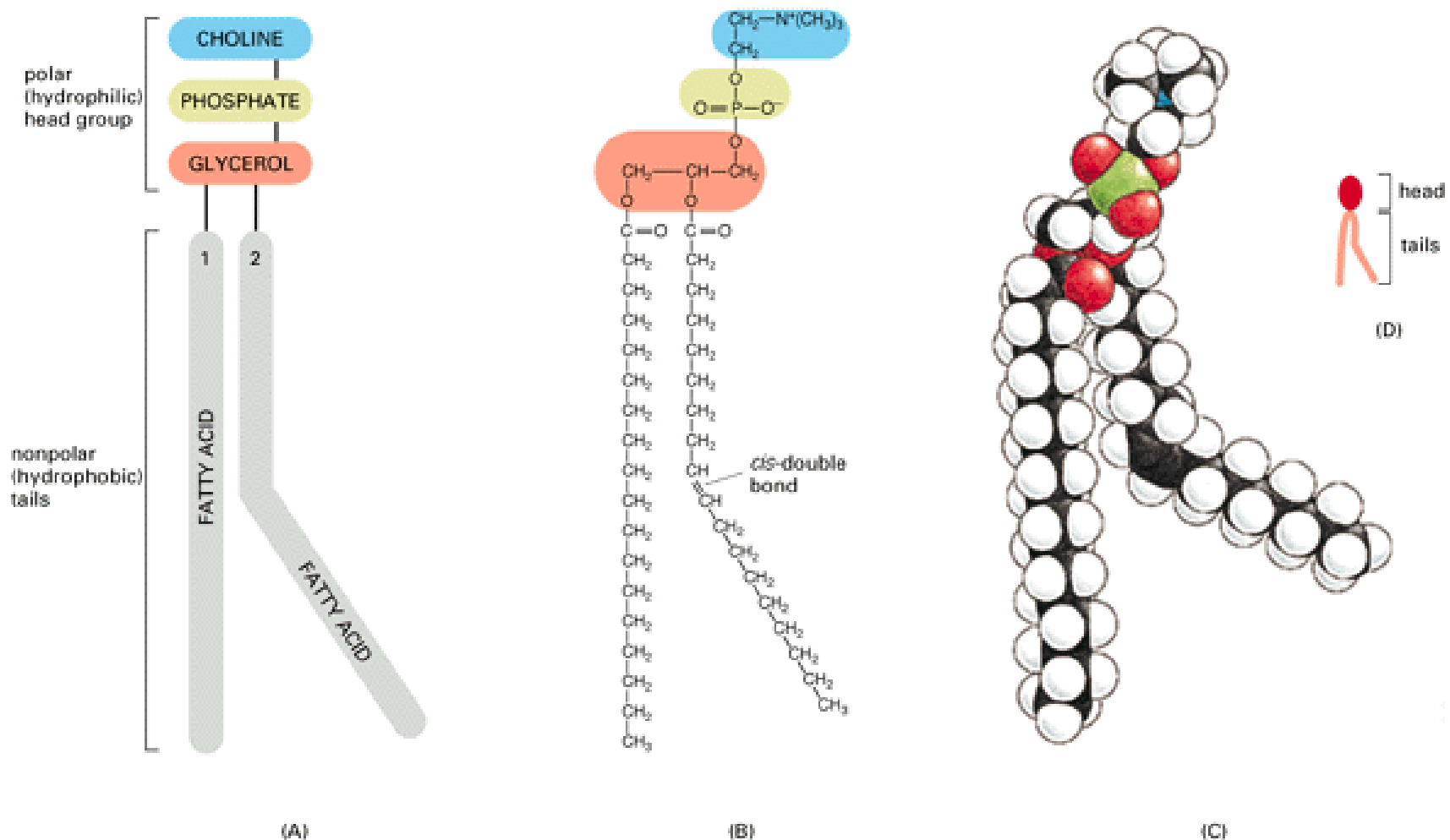
**Figure 10-17. A typical single-pass transmembrane protein.** Note that the polypeptide chain traverses the lipid bilayer as a right-handed  $\alpha$  helix and that the oligosaccharide chains and disulfide bonds are all on the noncytosolic surface of the membrane. Disulfide bonds do not form between the sulfhydryl groups in the cytoplasmic domain of the protein because the reducing environment in the cytosol maintains these groups in their reduced (-SH) form.



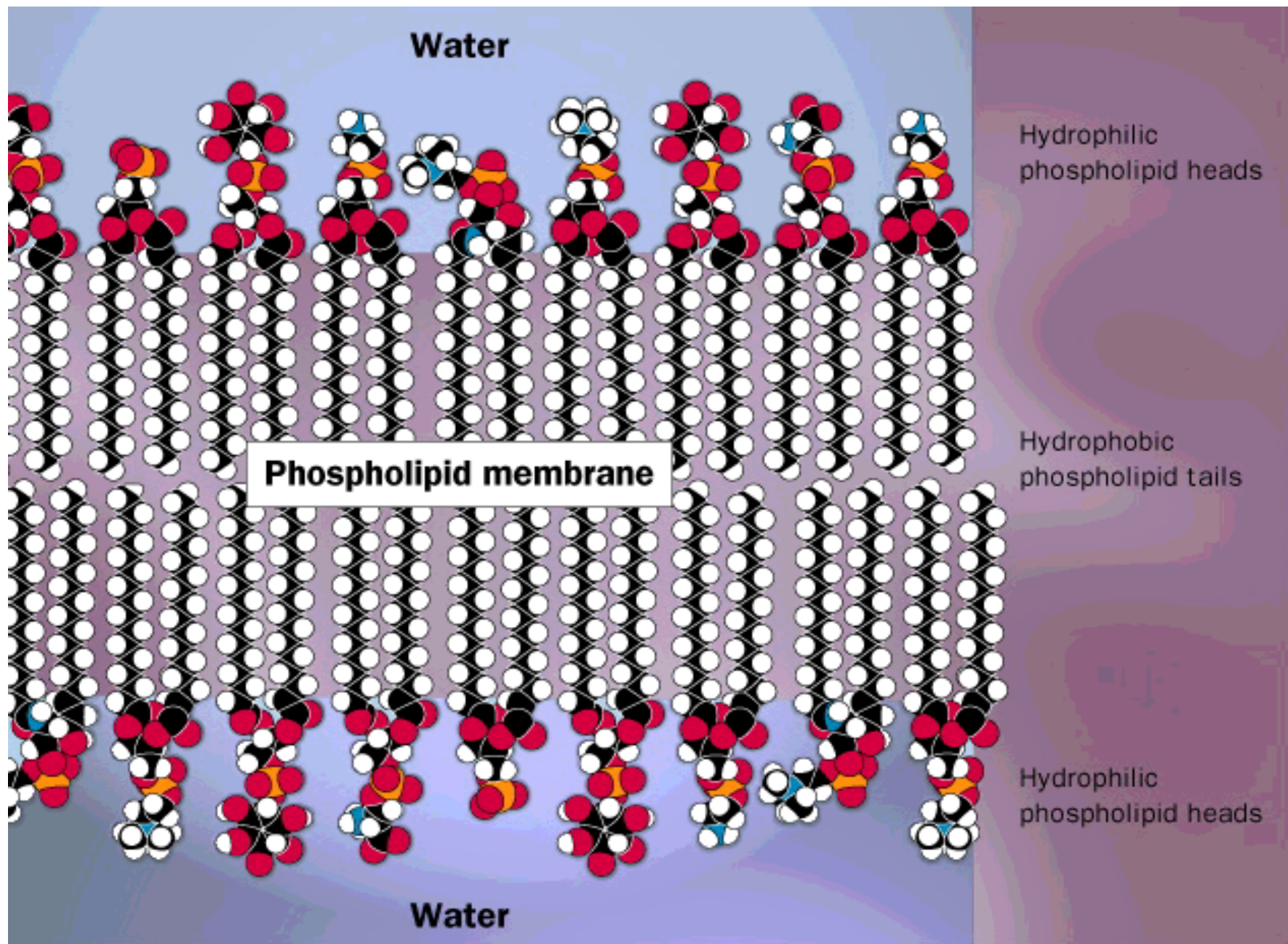




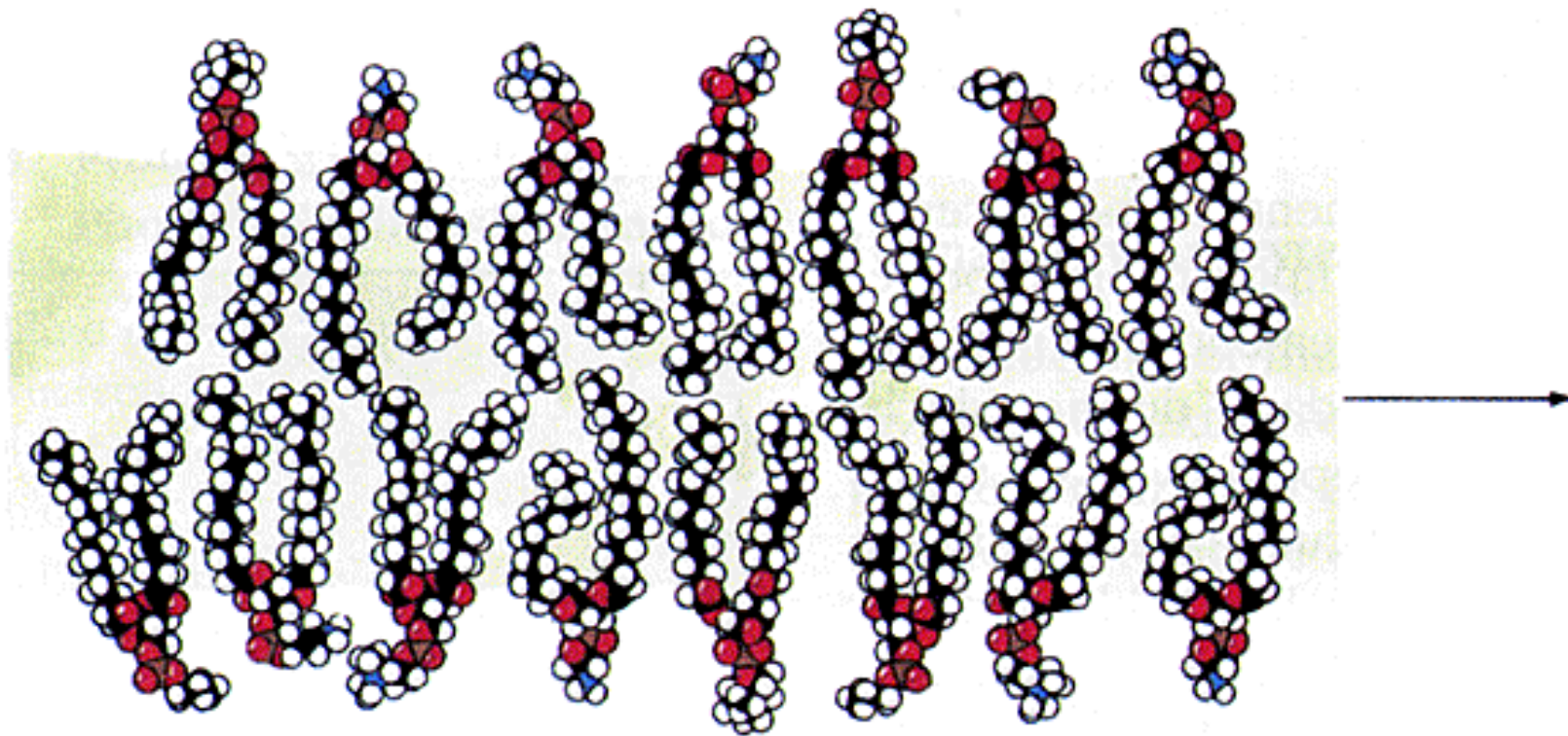
**Figure 10-19. Solubilizing membrane proteins with a mild detergent.** The detergent disrupts the lipid bilayer and brings the proteins into solution as protein-lipid-detergent complexes. The phospholipids in the membrane are also solubilized by the detergent.



**Figure 10-2. The parts of a phospholipid molecule.** Phosphatidylcholine, represented schematically (A), in formula (B), as a space-filling model (C), and as a symbol (D). The kink due to the *cis*-double bond is exaggerated in these drawings for emphasis.



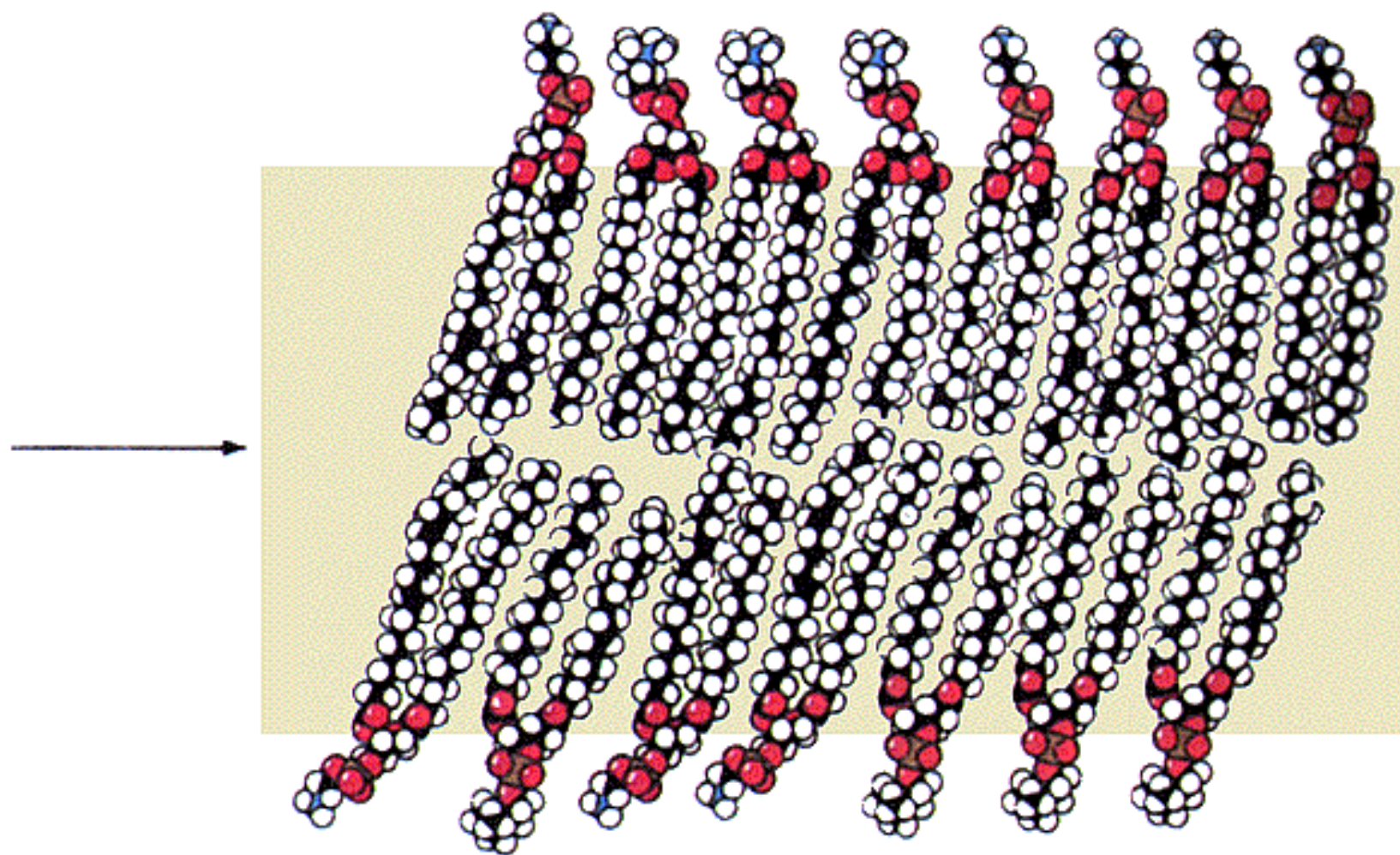
***a)* Above transition temperature**

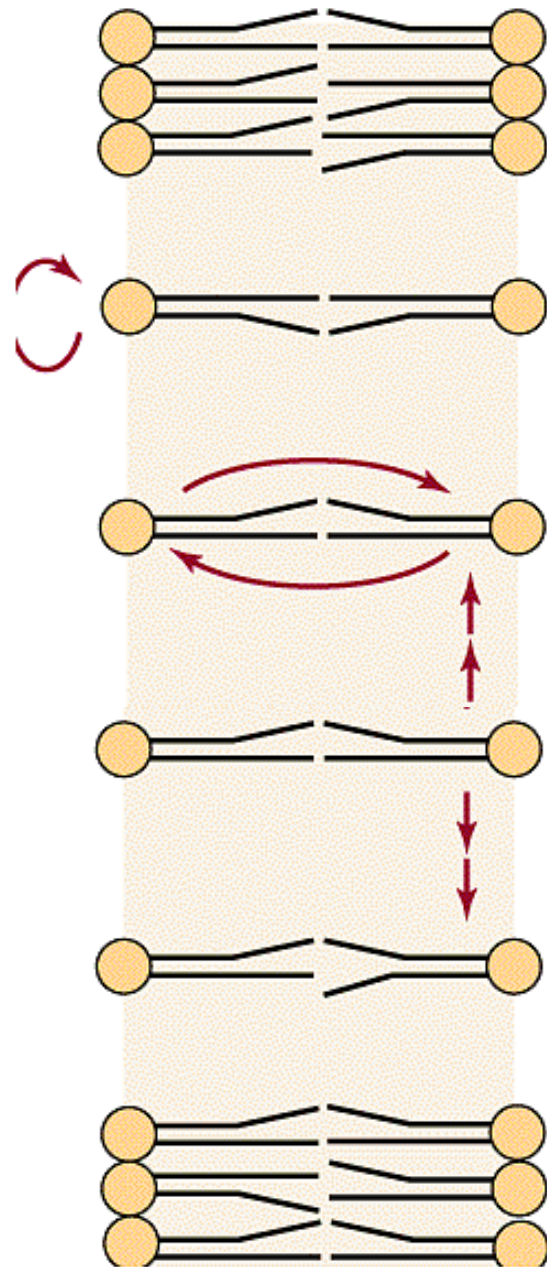


**Estructura de la bicapa lipídica, sobre y bajo la temperatura de transición.**



***b)* Below transition temperature**





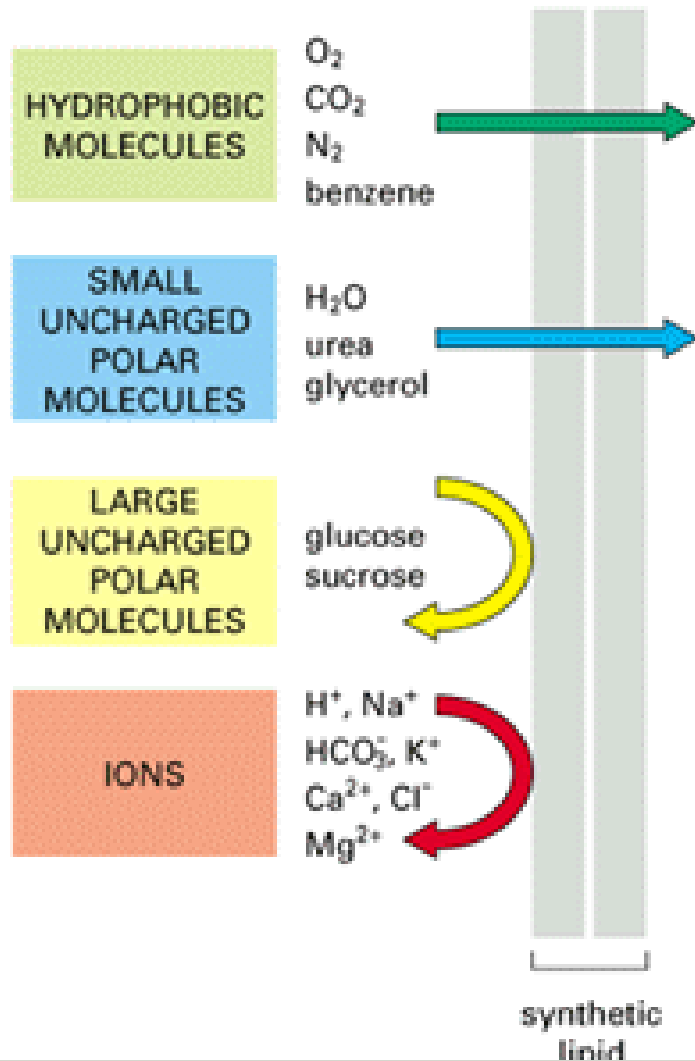
**Rapid rotational  
diffusion**

**Very slow  
transverse  
(flip-flop) exchange**

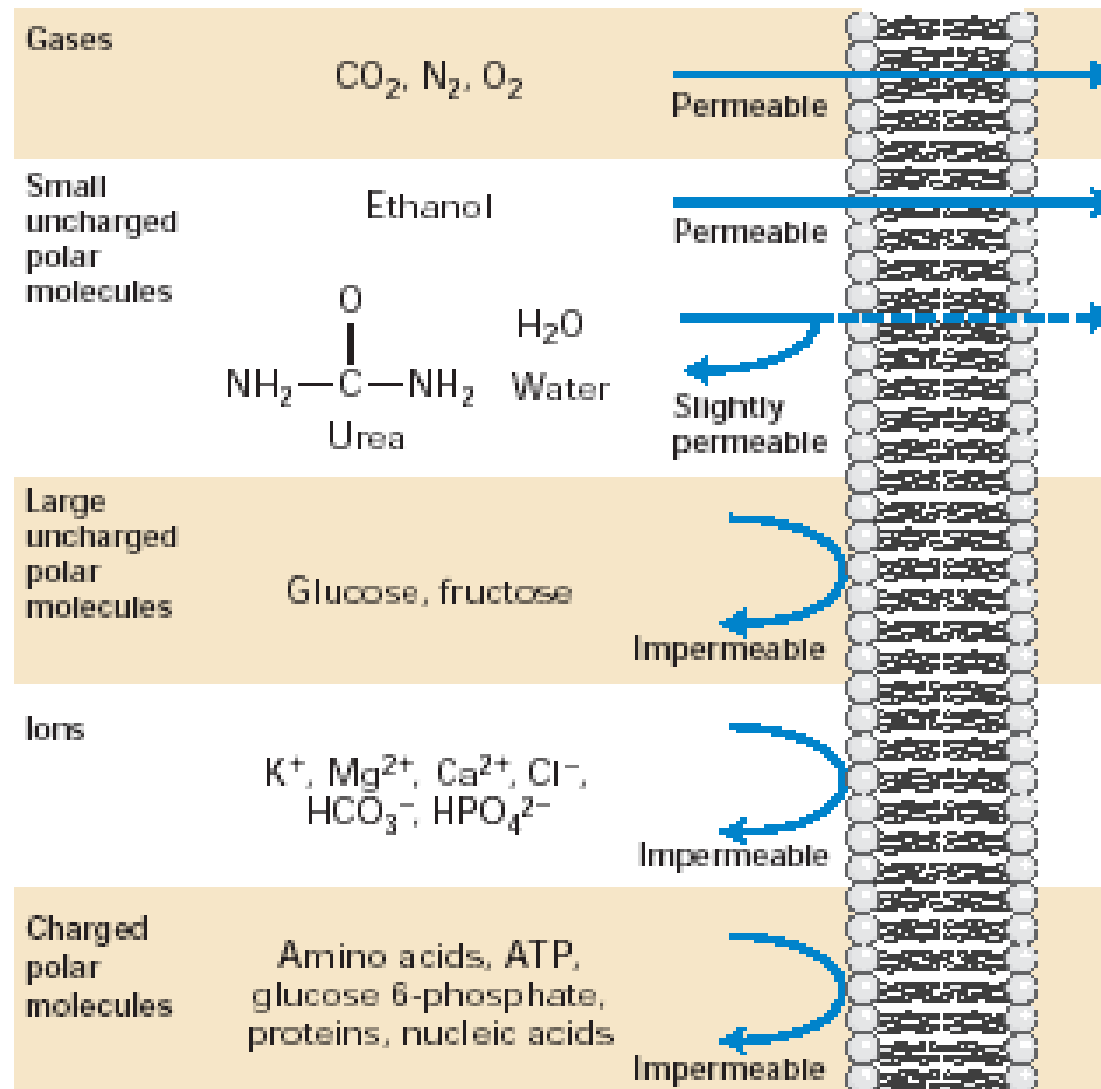
**Rapid lateral  
diffusion**

**Rapid flexing of  
hydrocarbon chains**

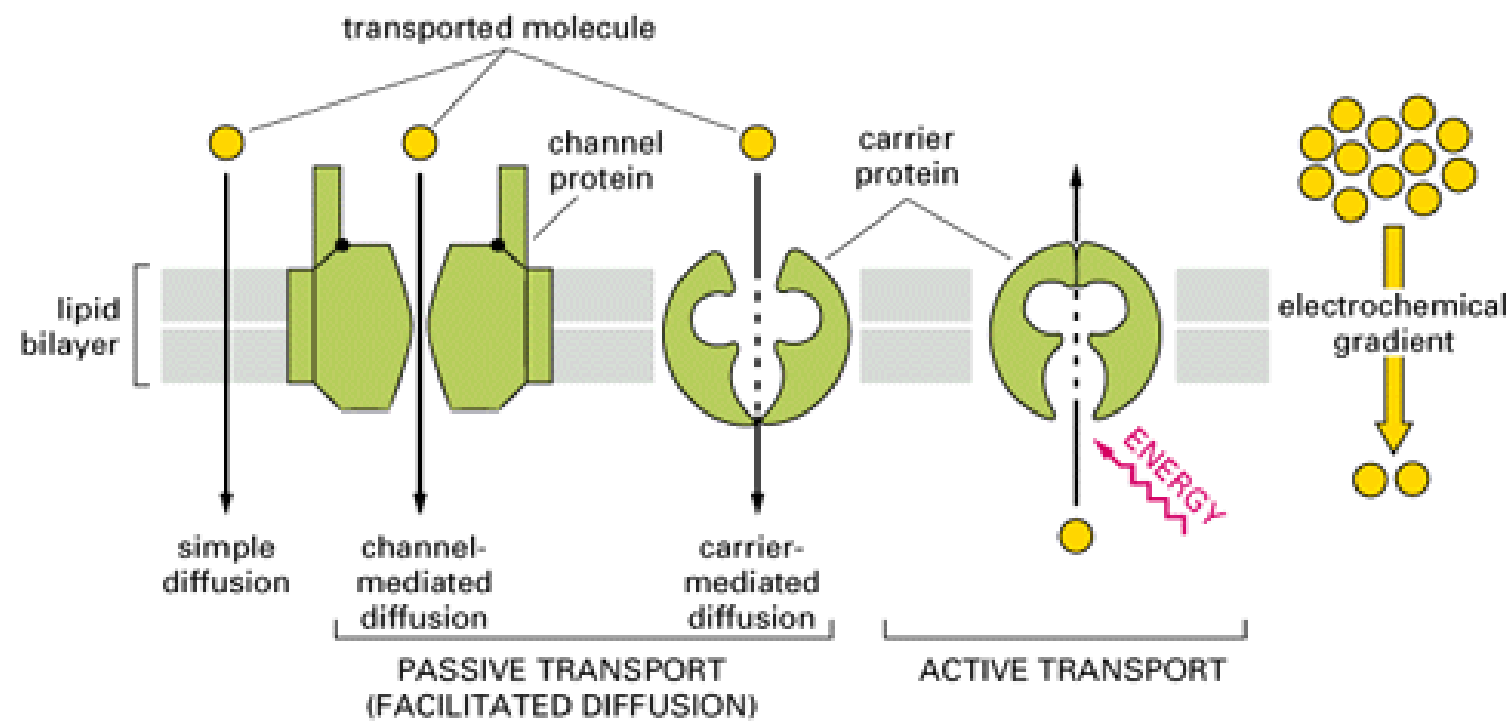
# PERMEABILIDAD DE LA MEMBRANA

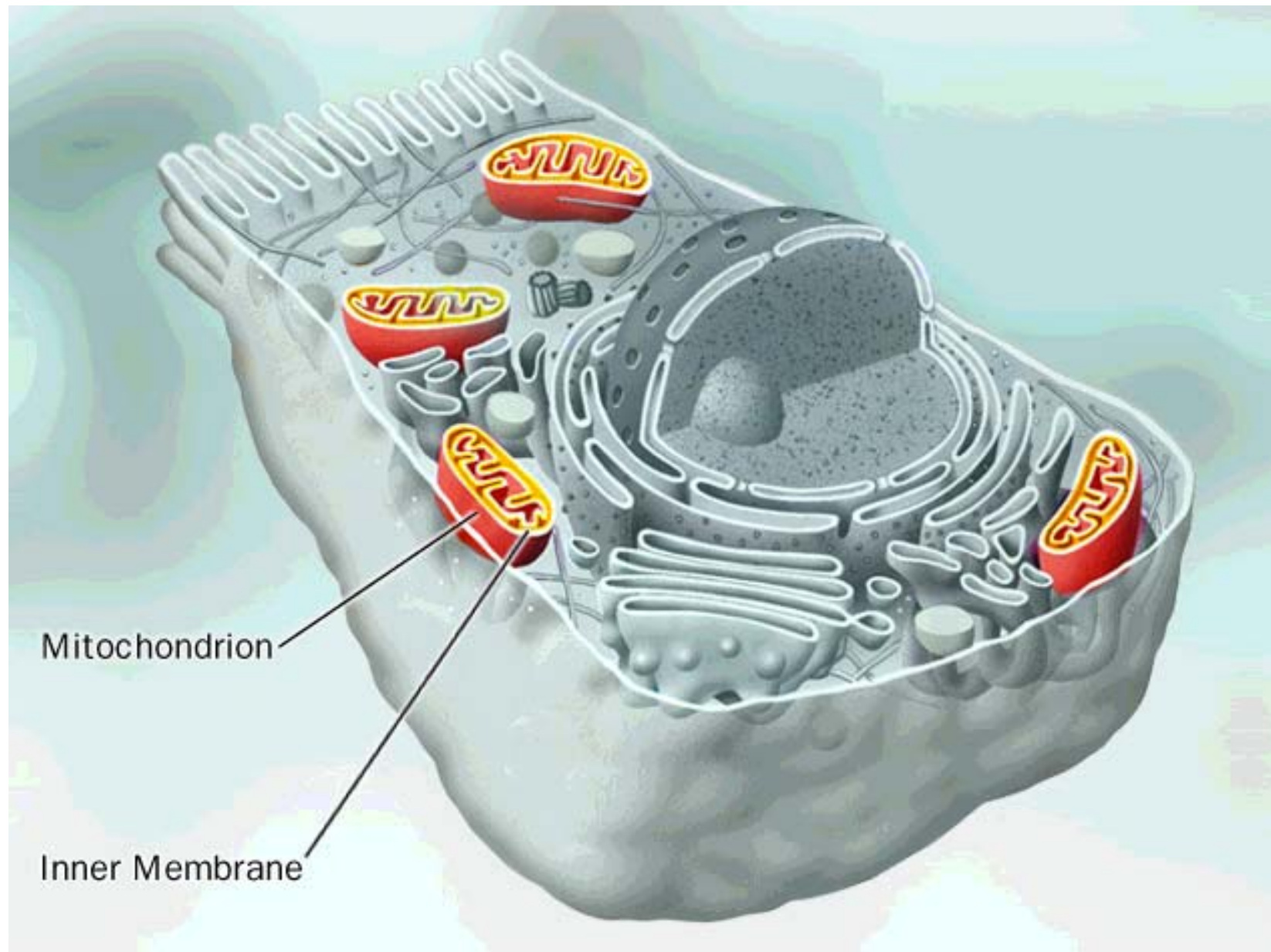




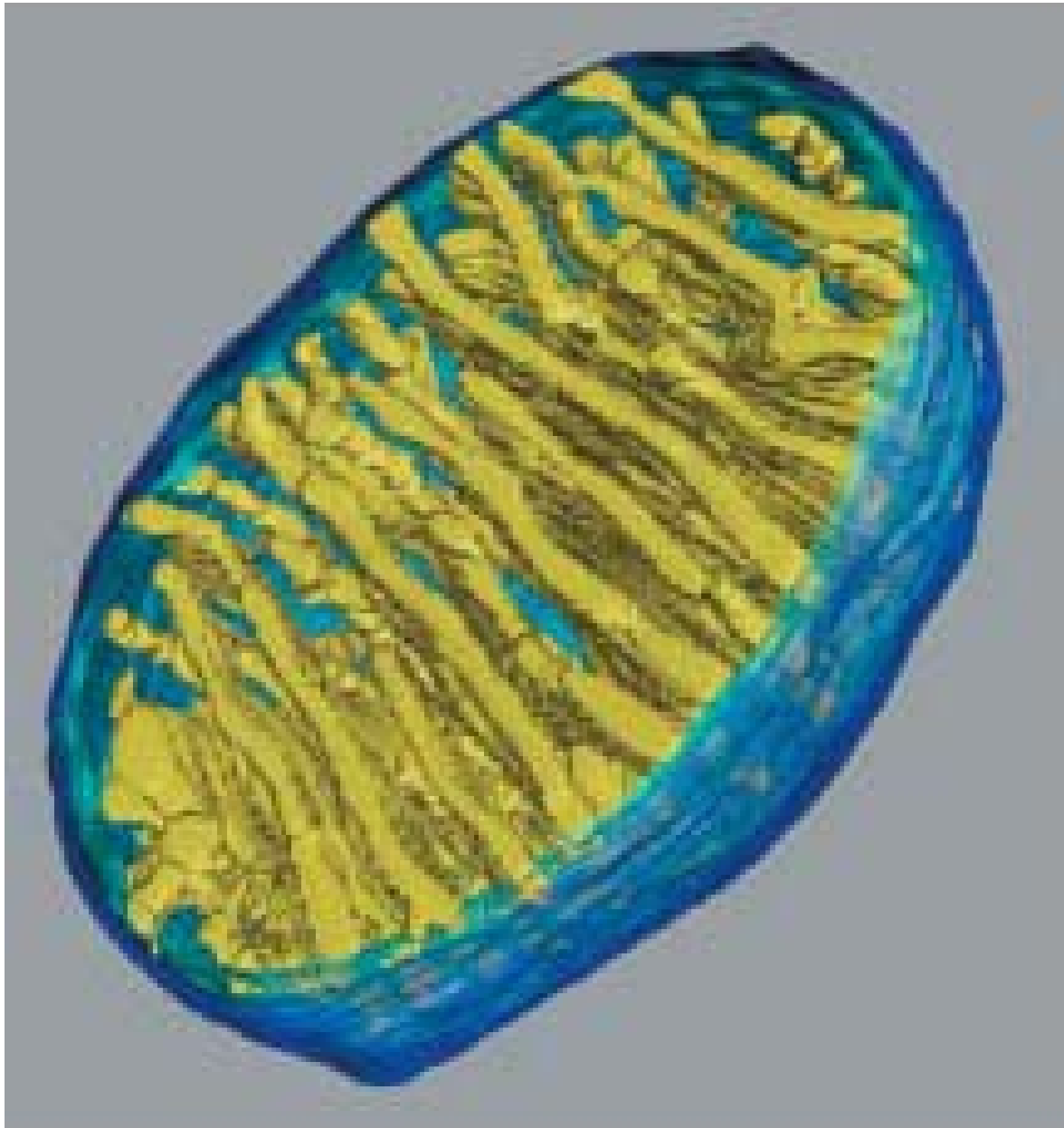


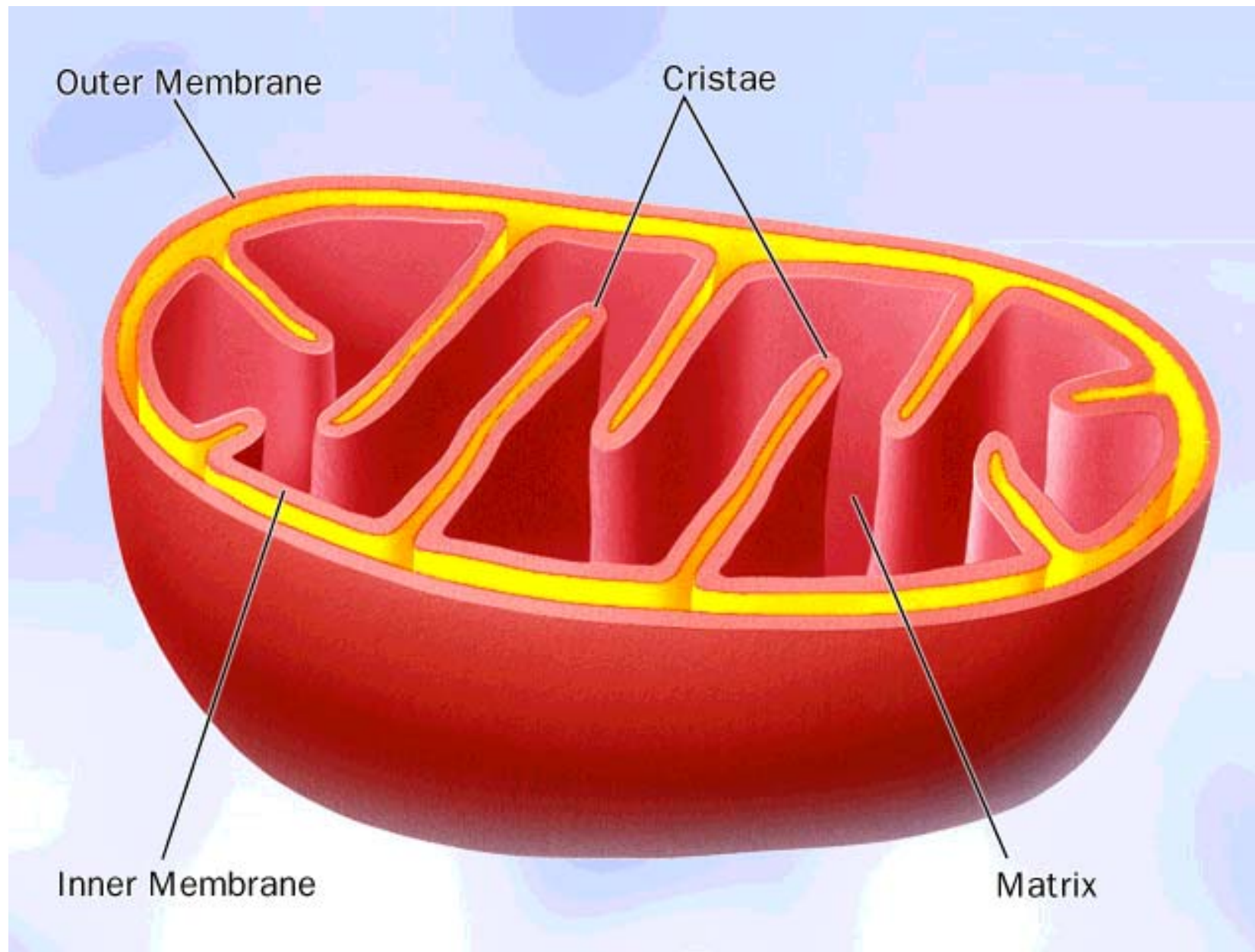
▲ **FIGURE 7-1** Relative permeability of a pure phospholipid bilayer to various molecules. A bilayer is permeable to small





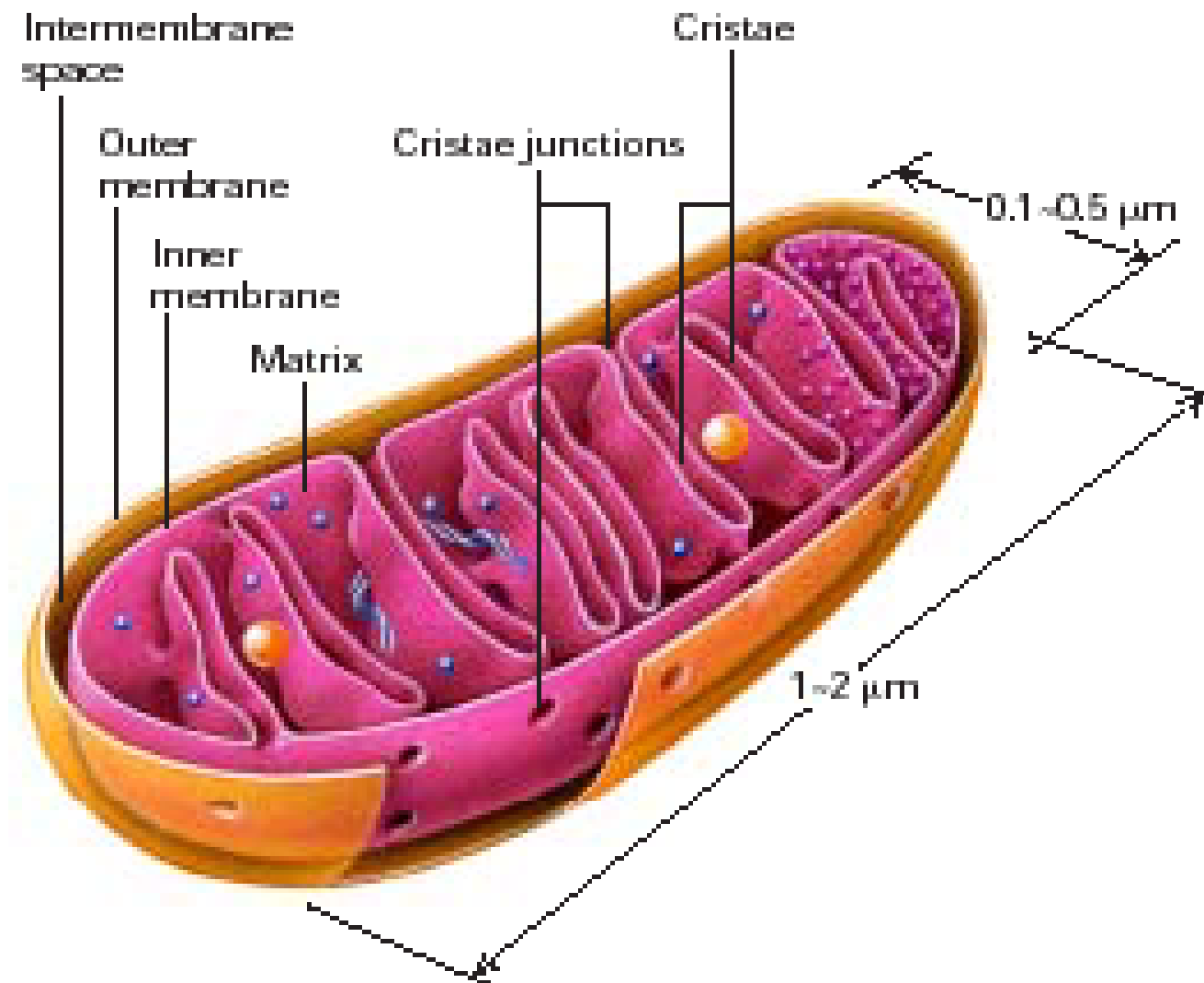




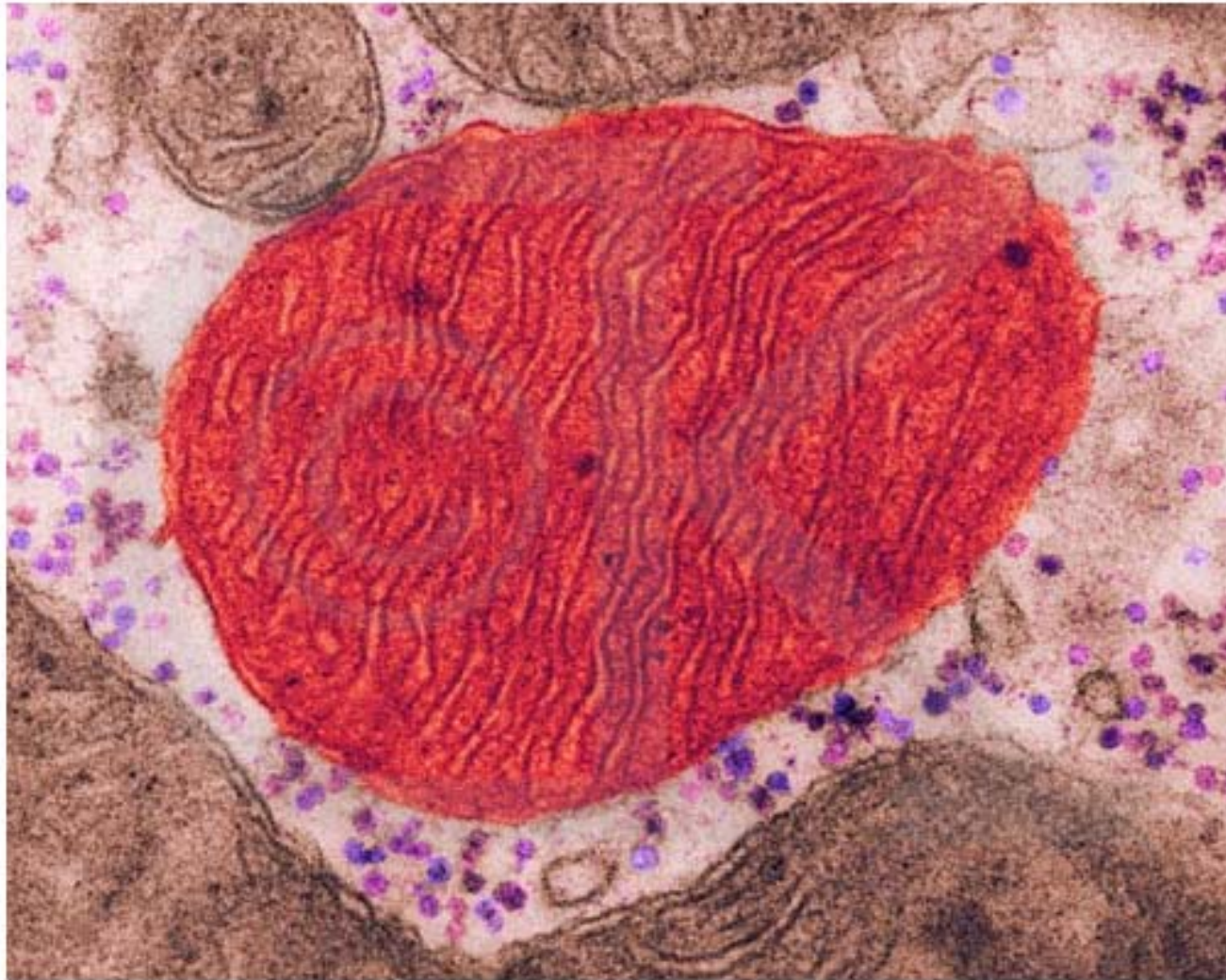


(a)

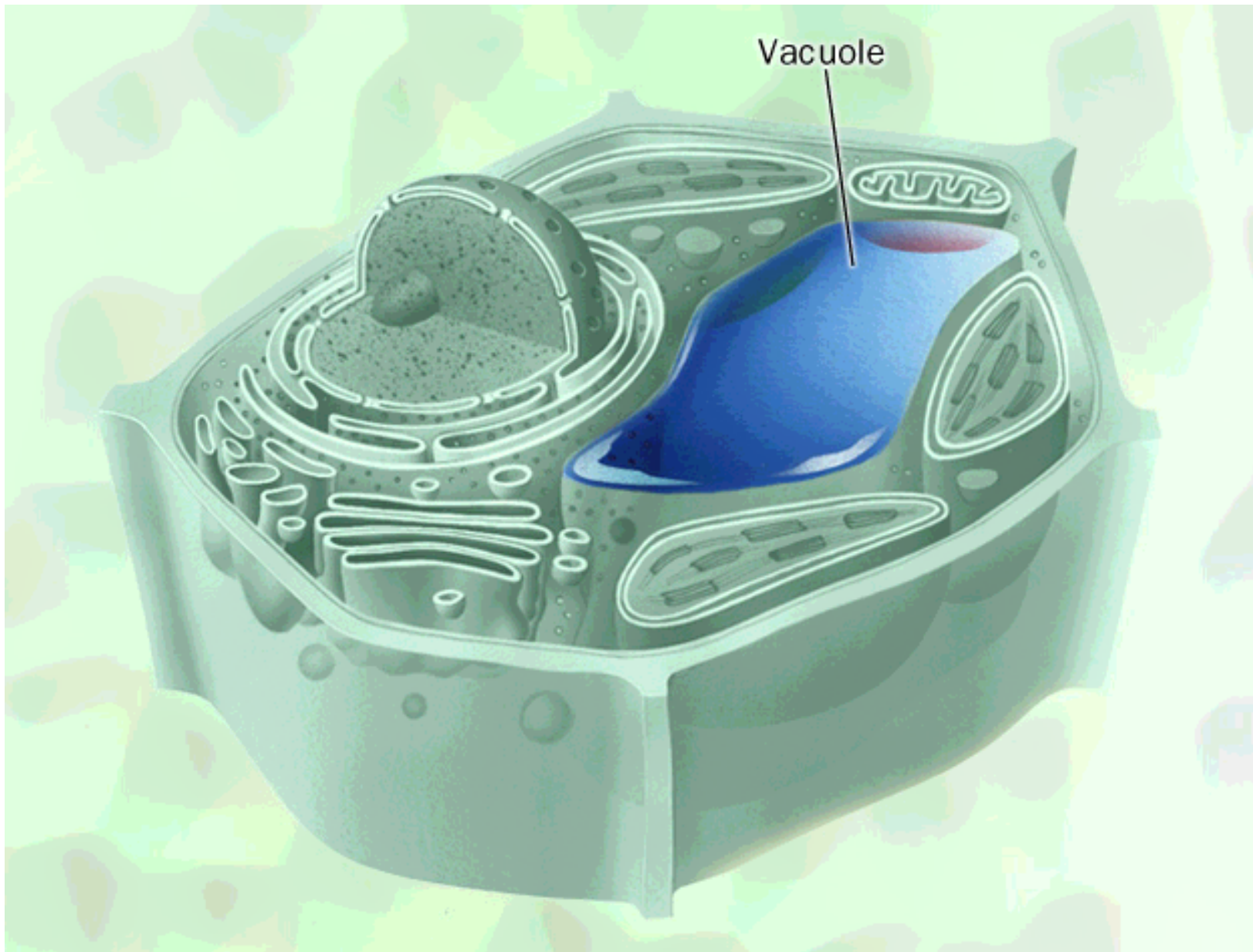
(b)



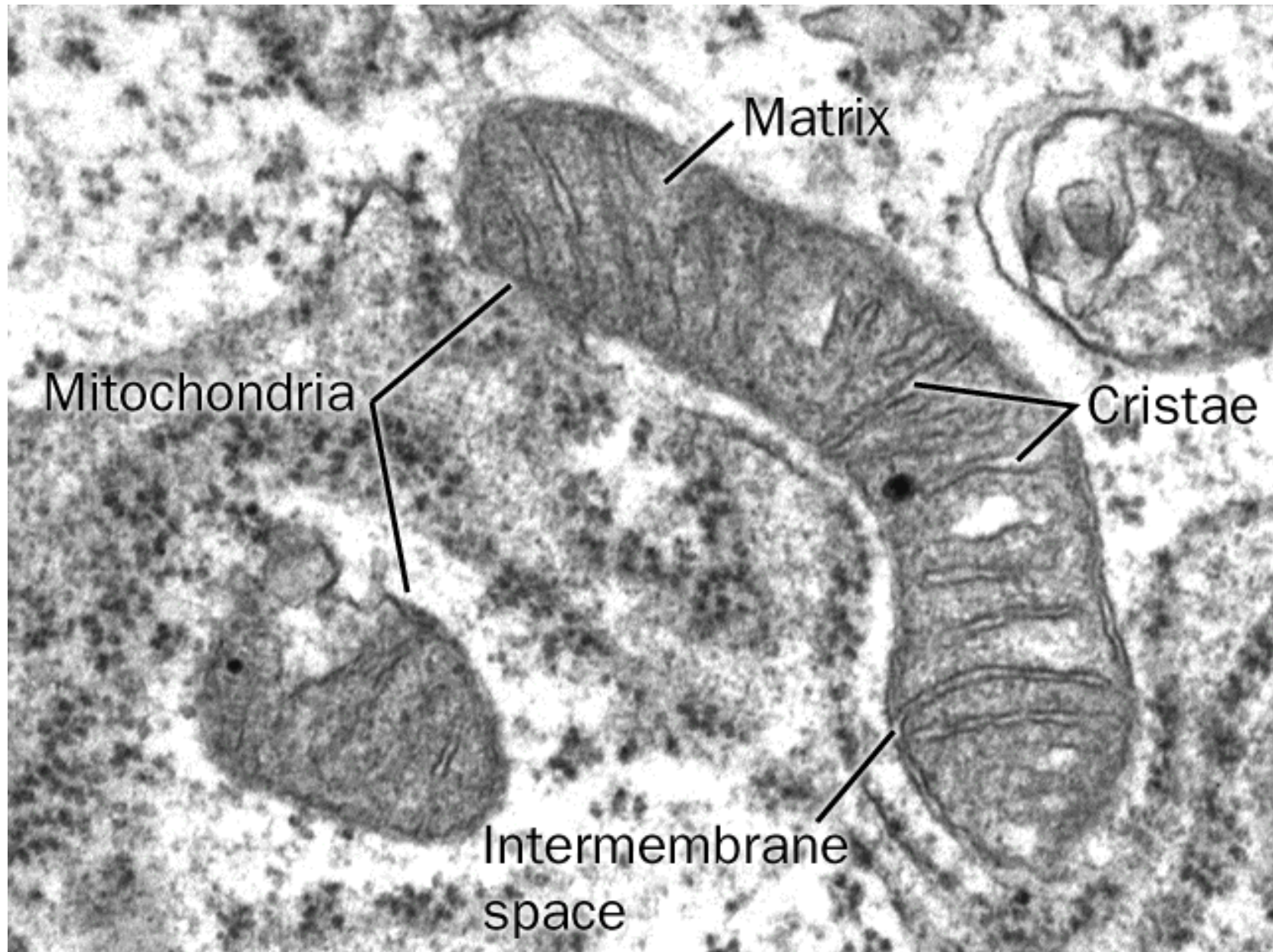




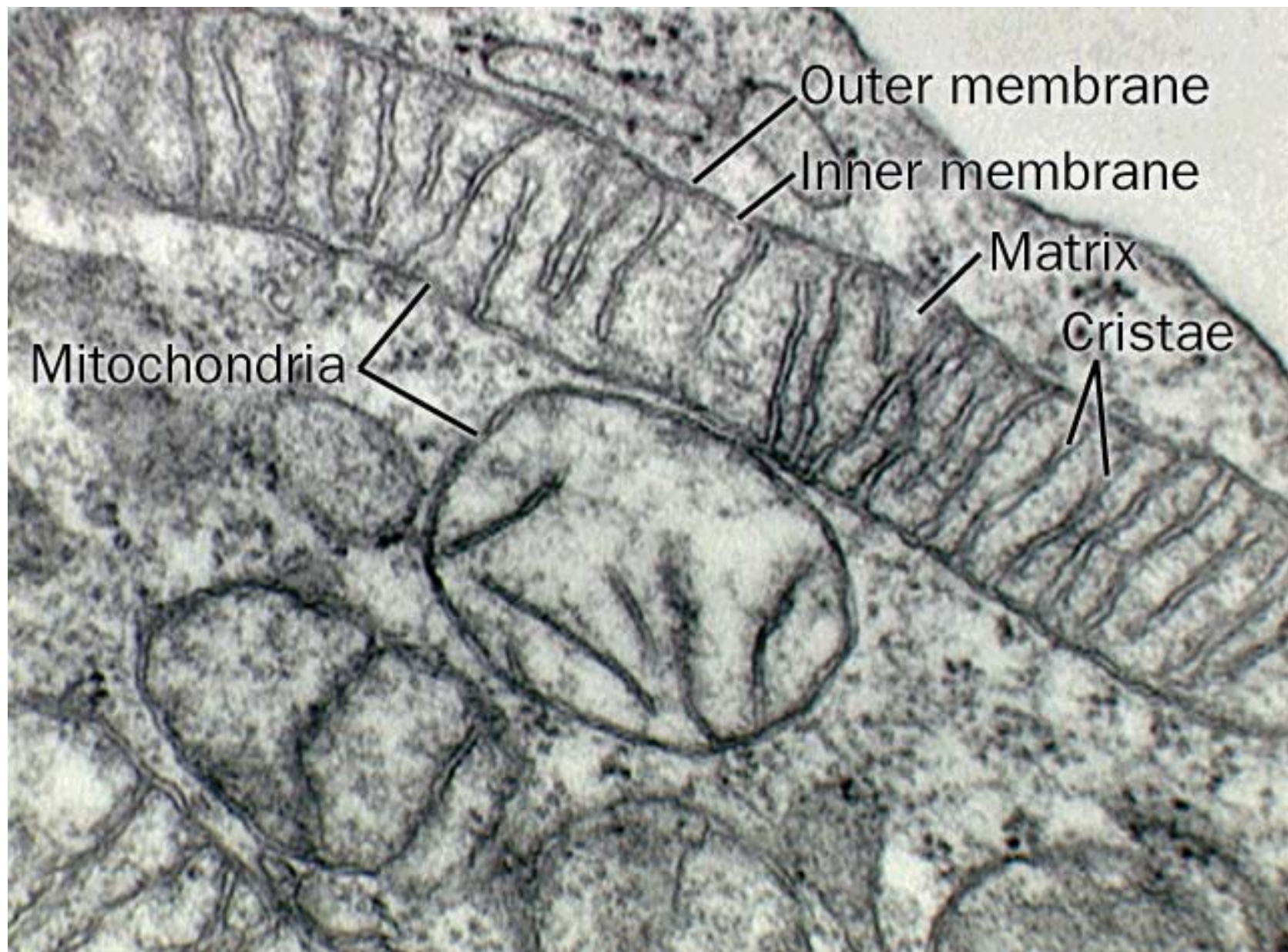
**Muscle Cell Mitochondrion (TEM x190,920).** This image is copyright Dennis Kunkel at [www.DennisKunkel.com](http://www.DennisKunkel.com), used with permission.





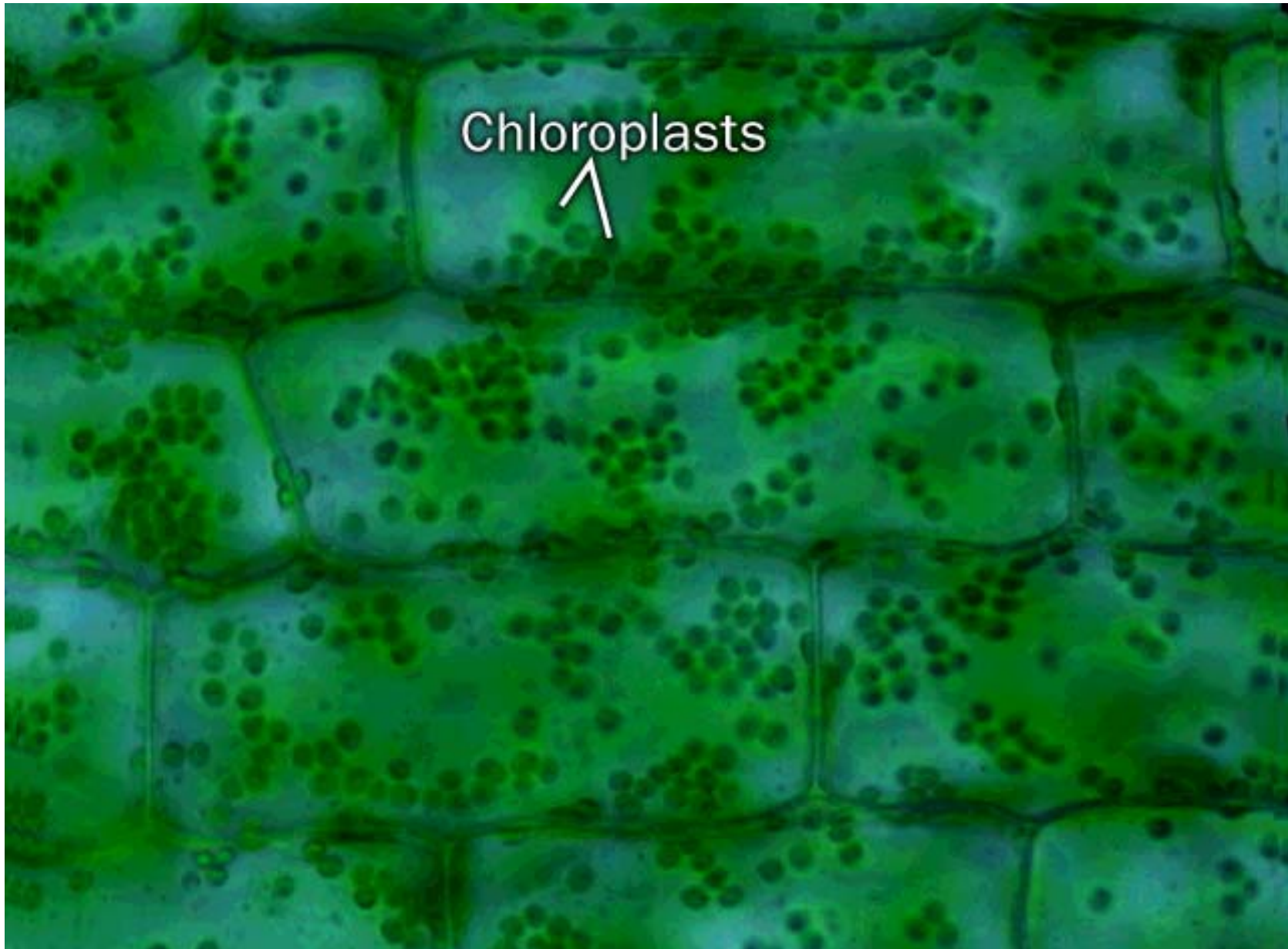






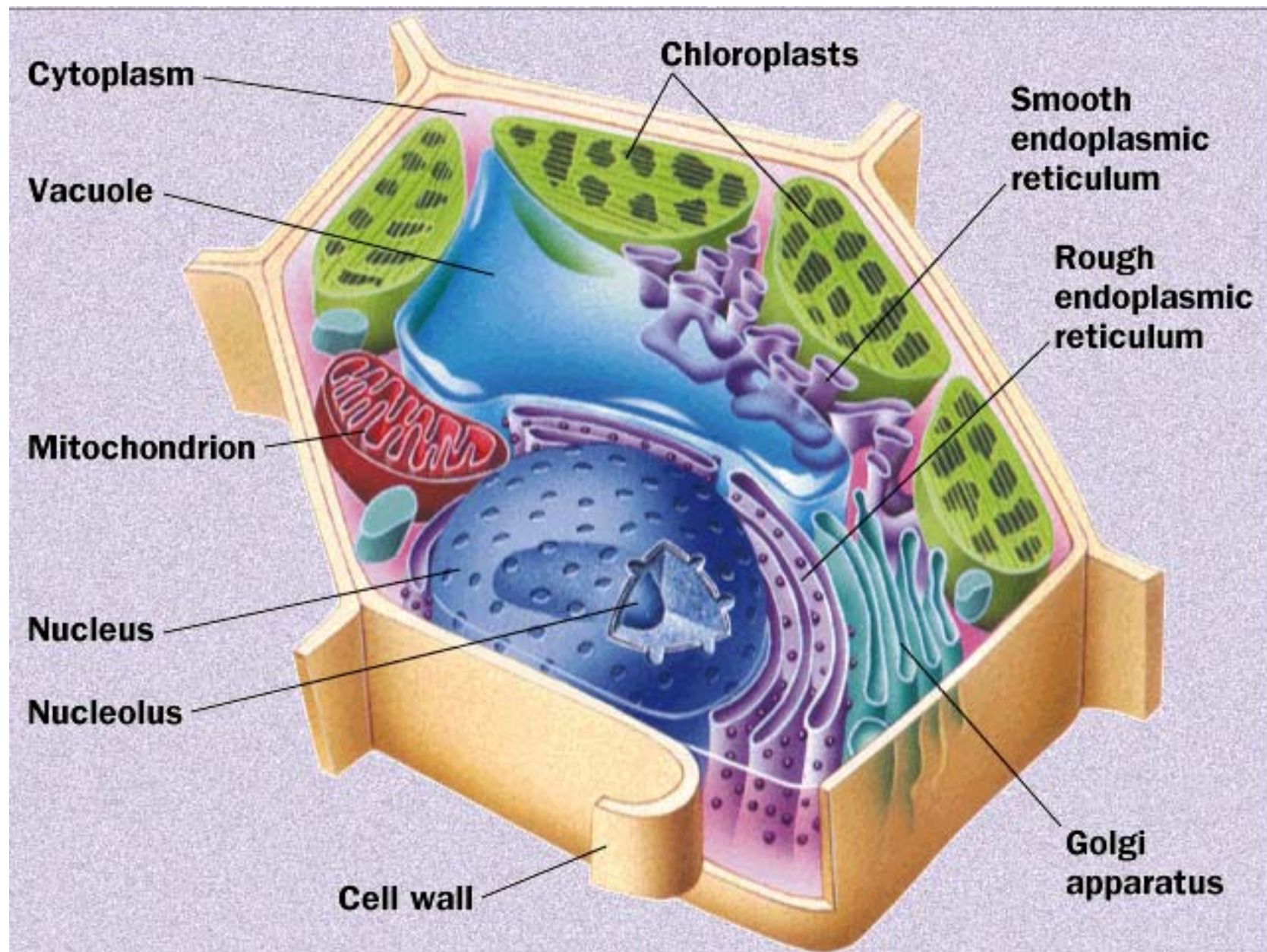




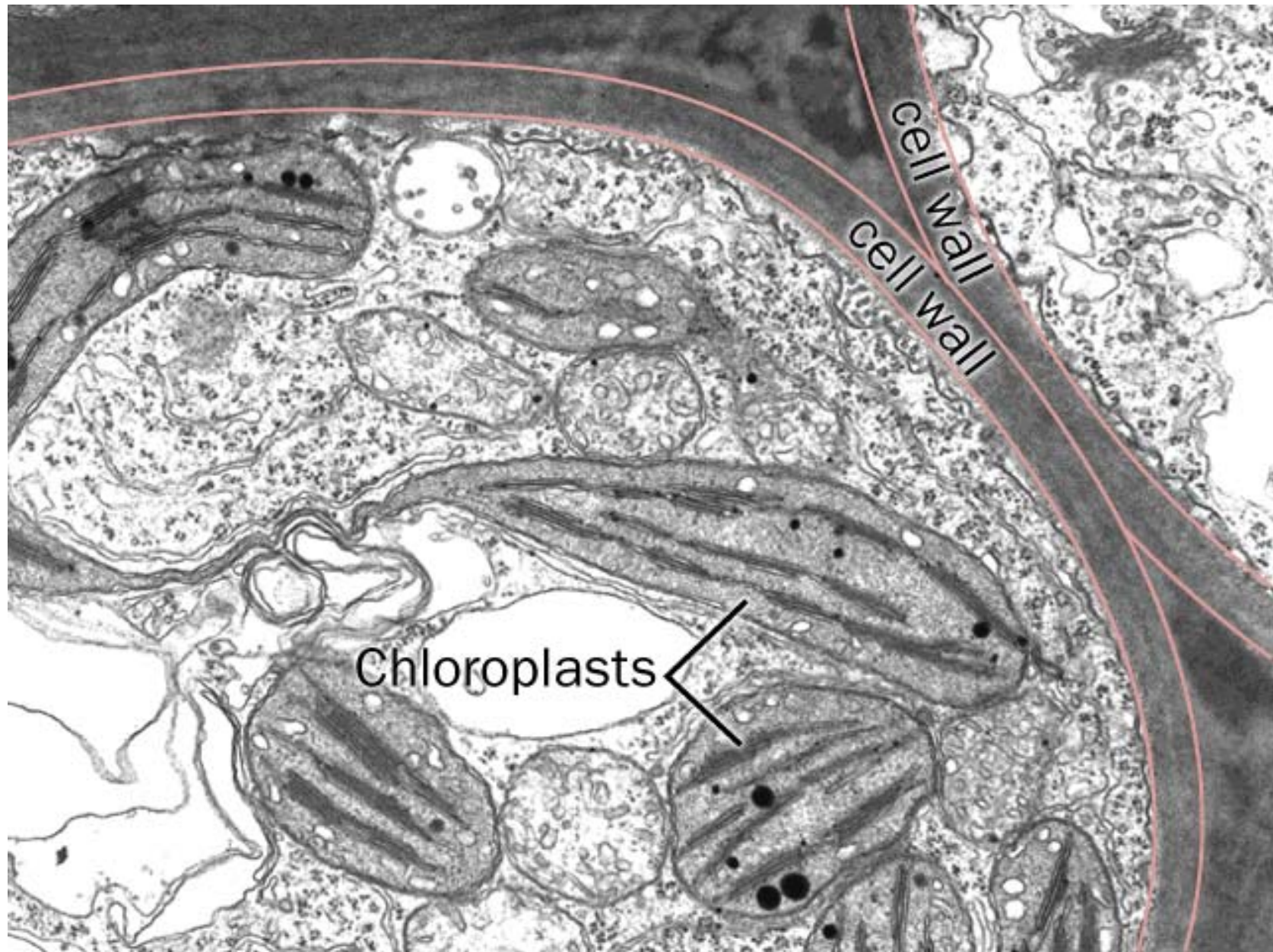


Chloroplasts

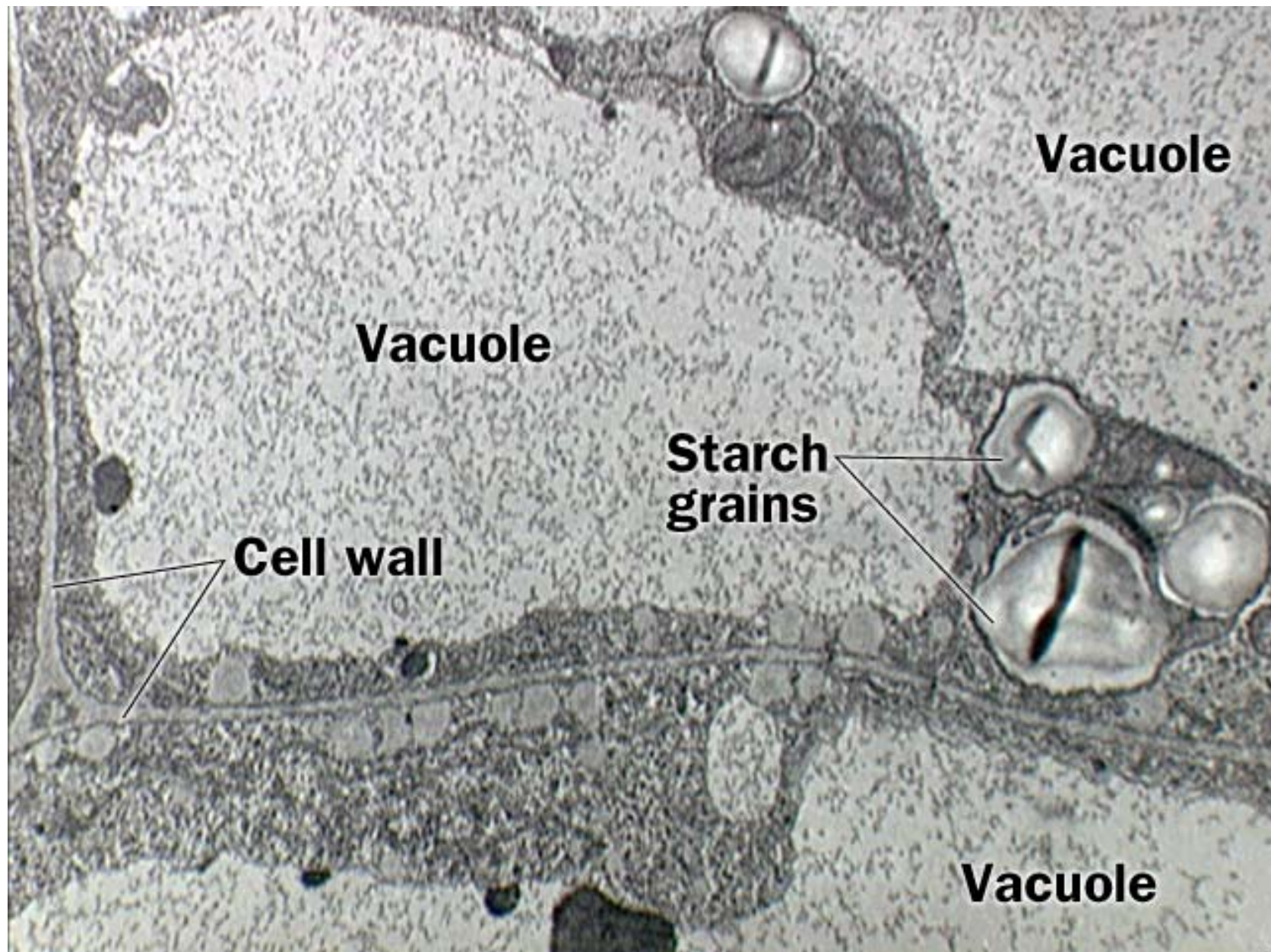


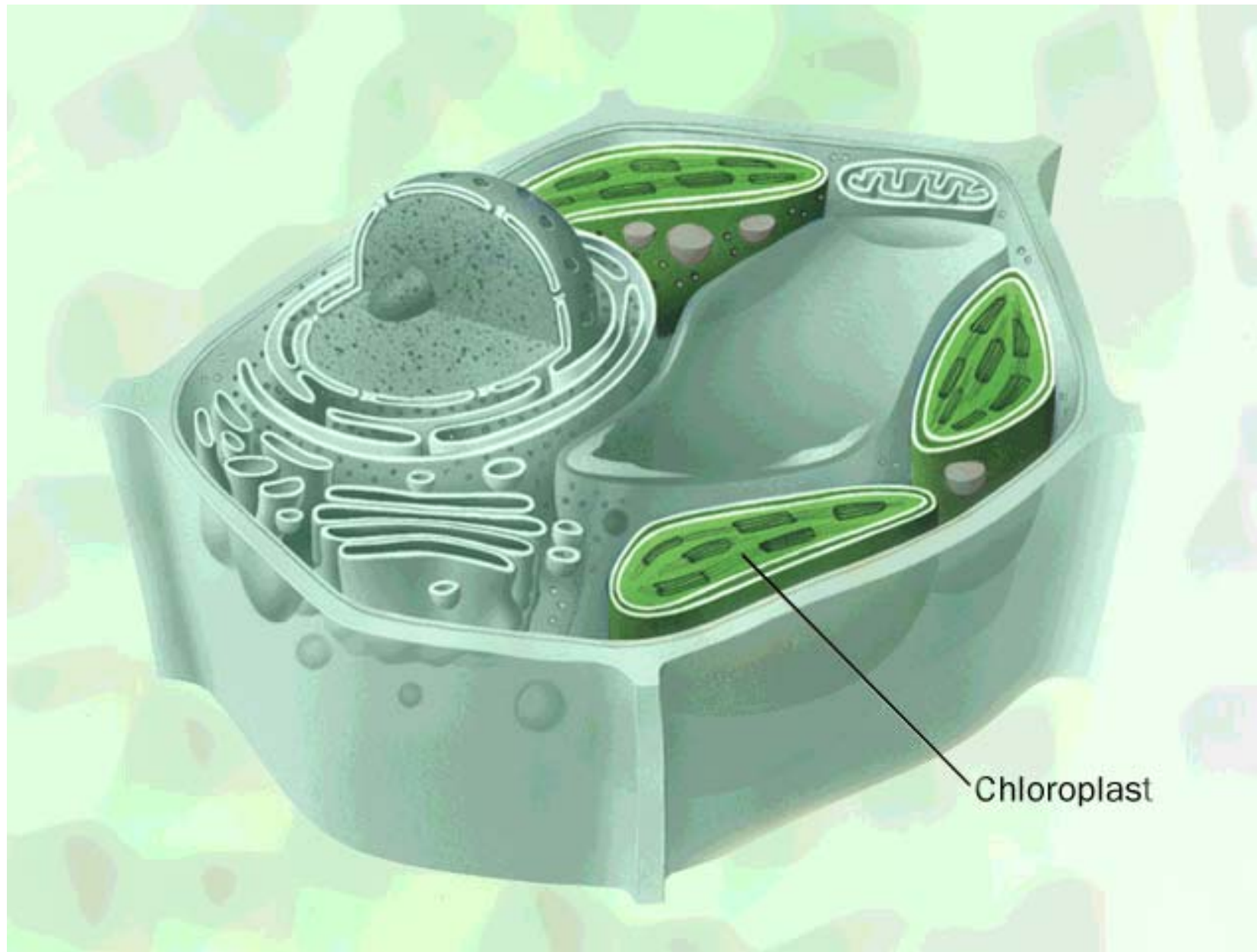




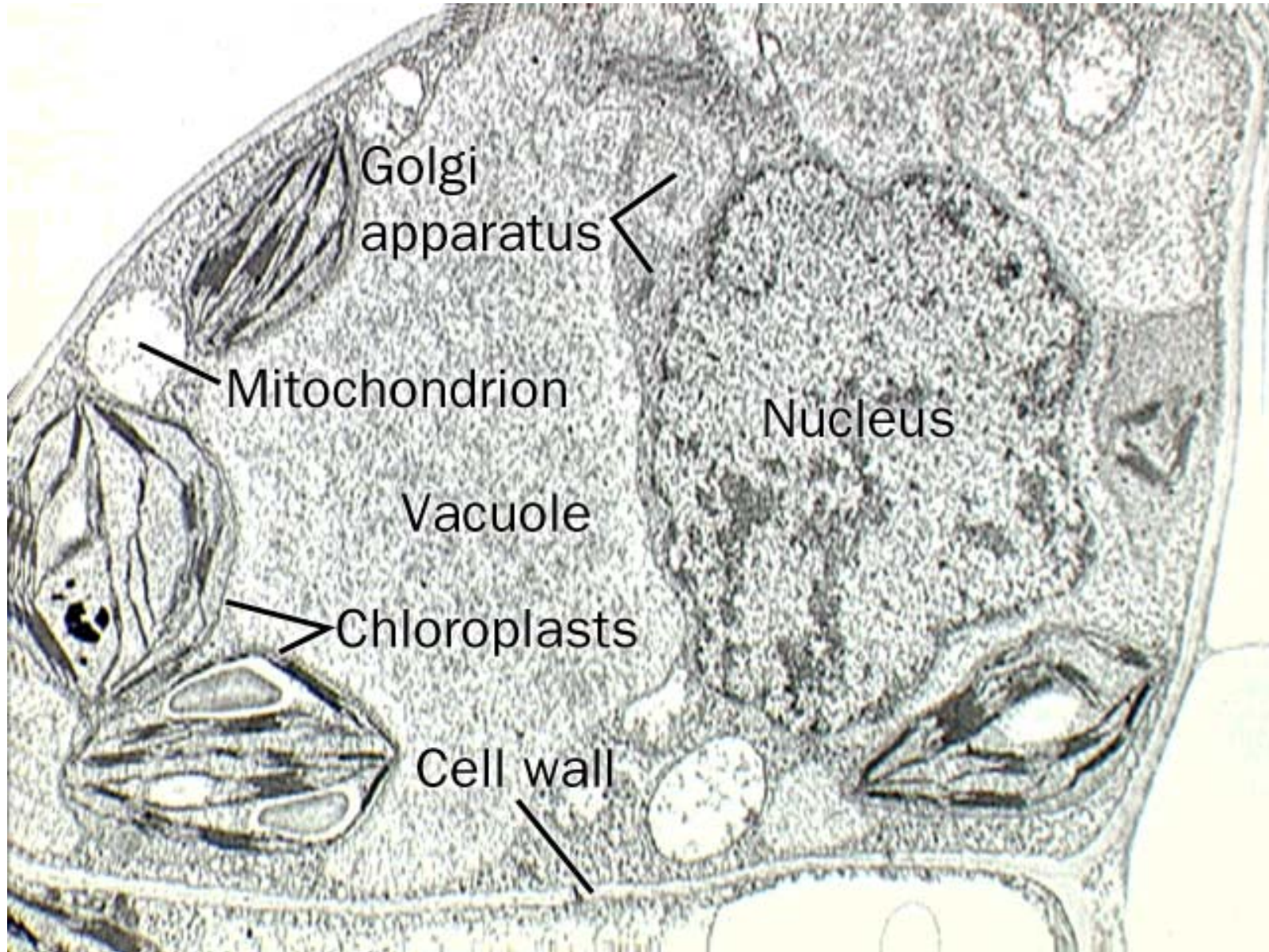




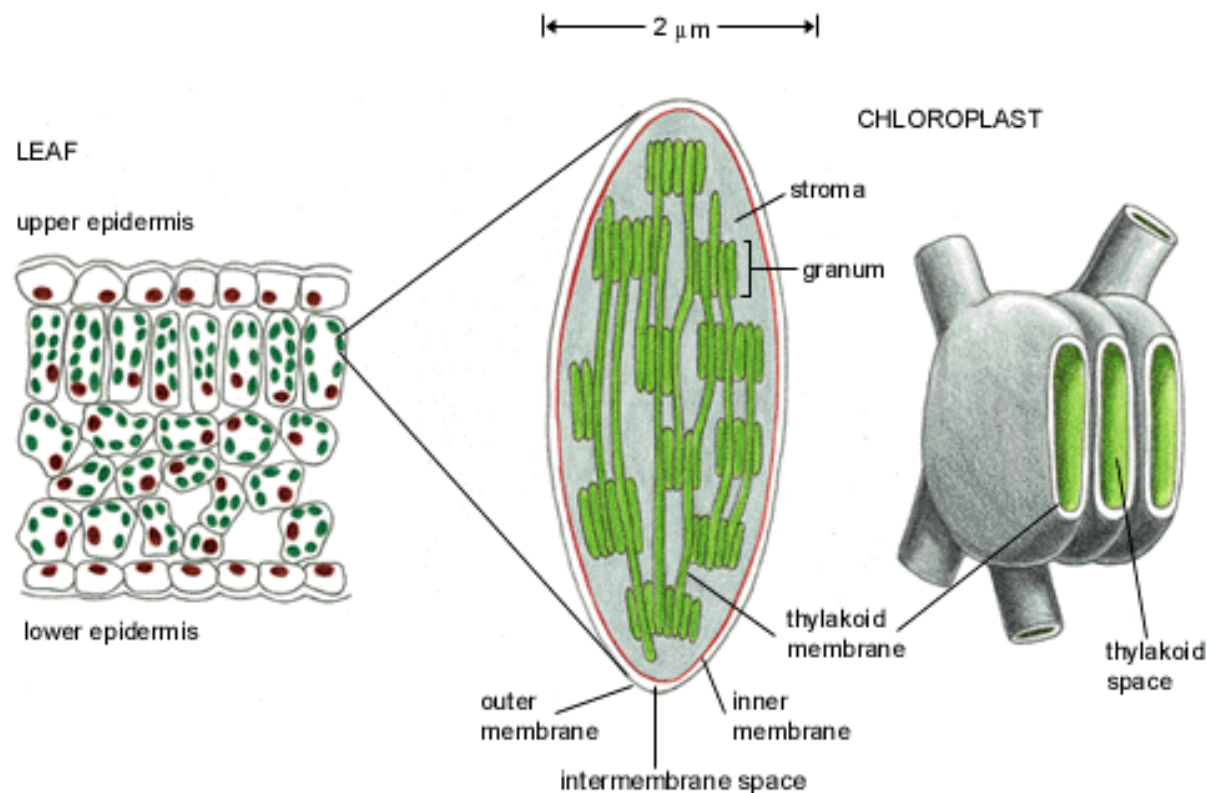




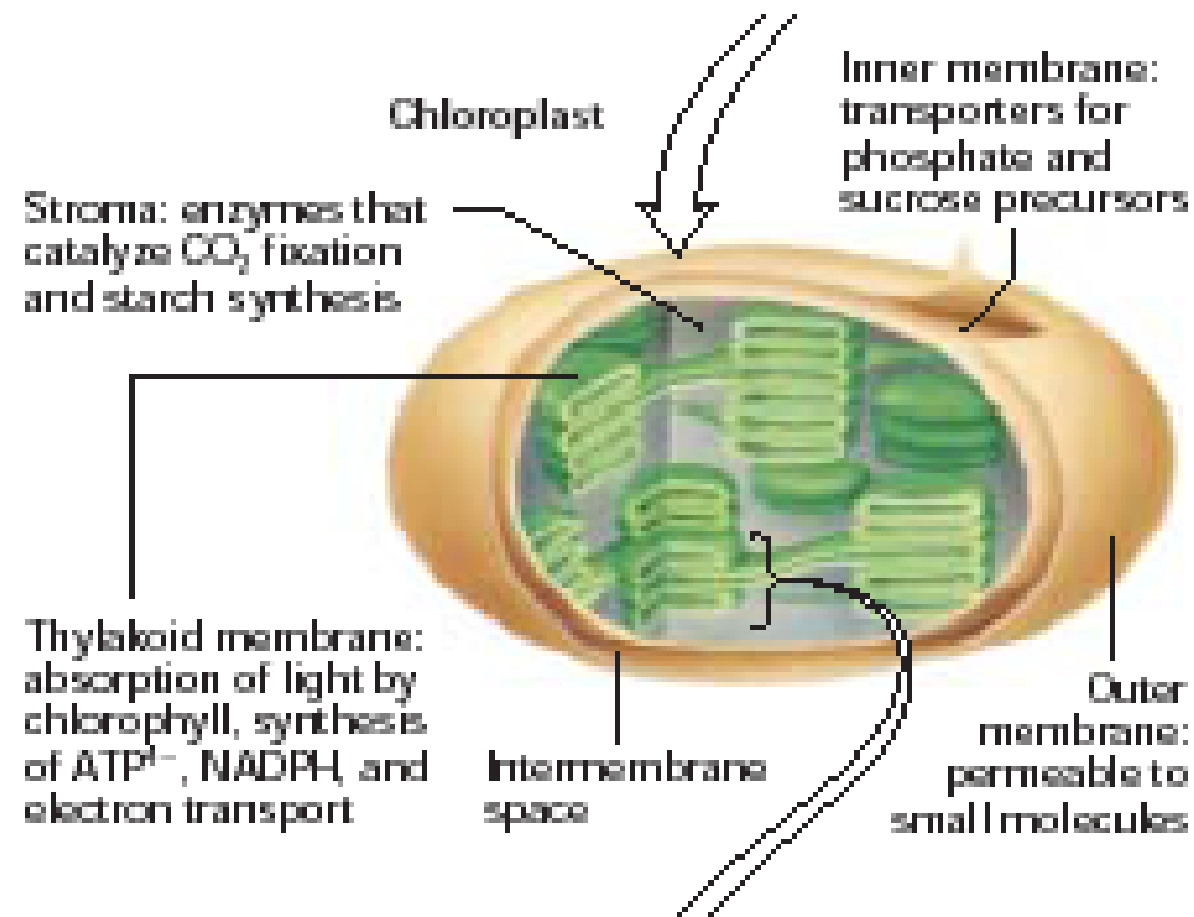


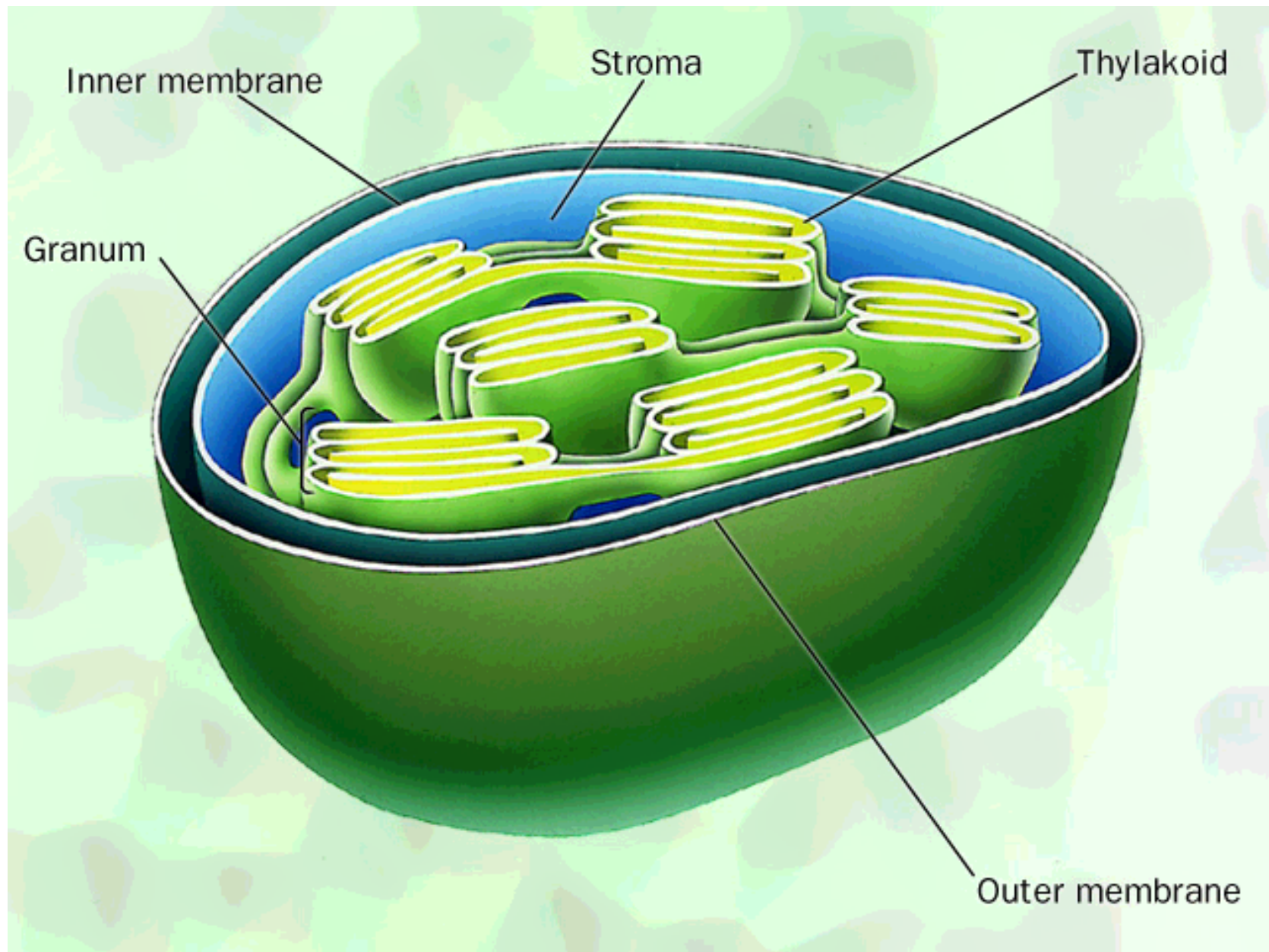


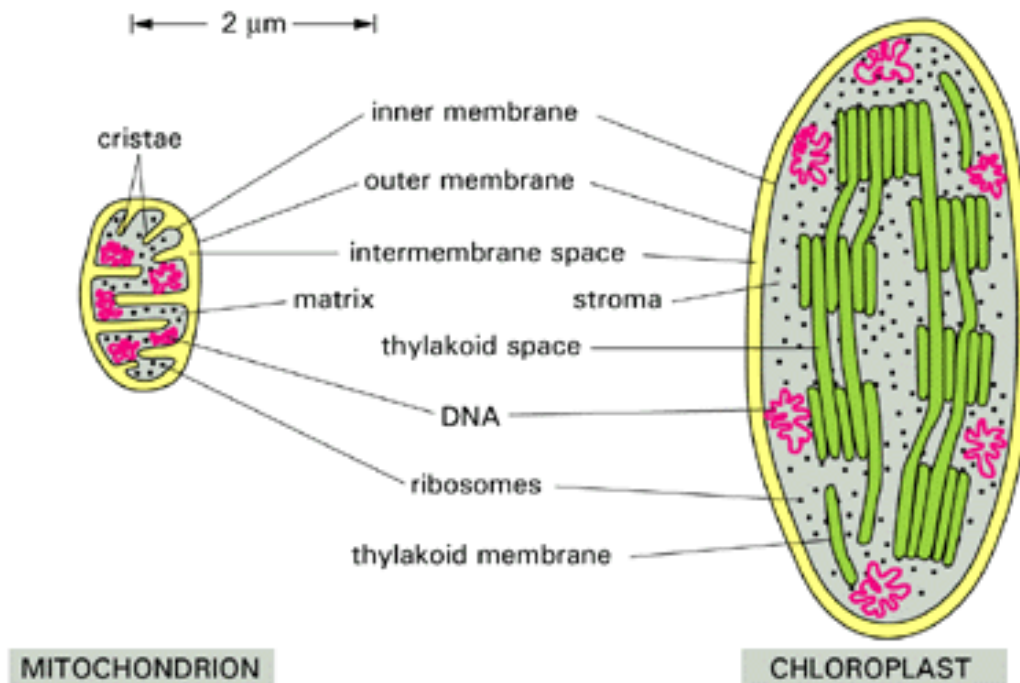




**Figure 14-39. The chloroplast.** This photosynthetic organelle contains three distinct membranes (the outer membrane, the inner membrane, and the thylakoid membrane) that define three separate internal compartments (the intermembrane space, the stroma, and the thylakoid space). The thylakoid membrane contains all of the energy-generating systems of the chloroplast. In electron micrographs this membrane appears to be broken up into separate units that enclose individual flattened vesicles (see [Figure 14-40](#)), but these are probably joined into a single, highly folded membrane in each chloroplast. As indicated, the individual thylakoids are interconnected, and they tend to stack to form aggregates called grana.

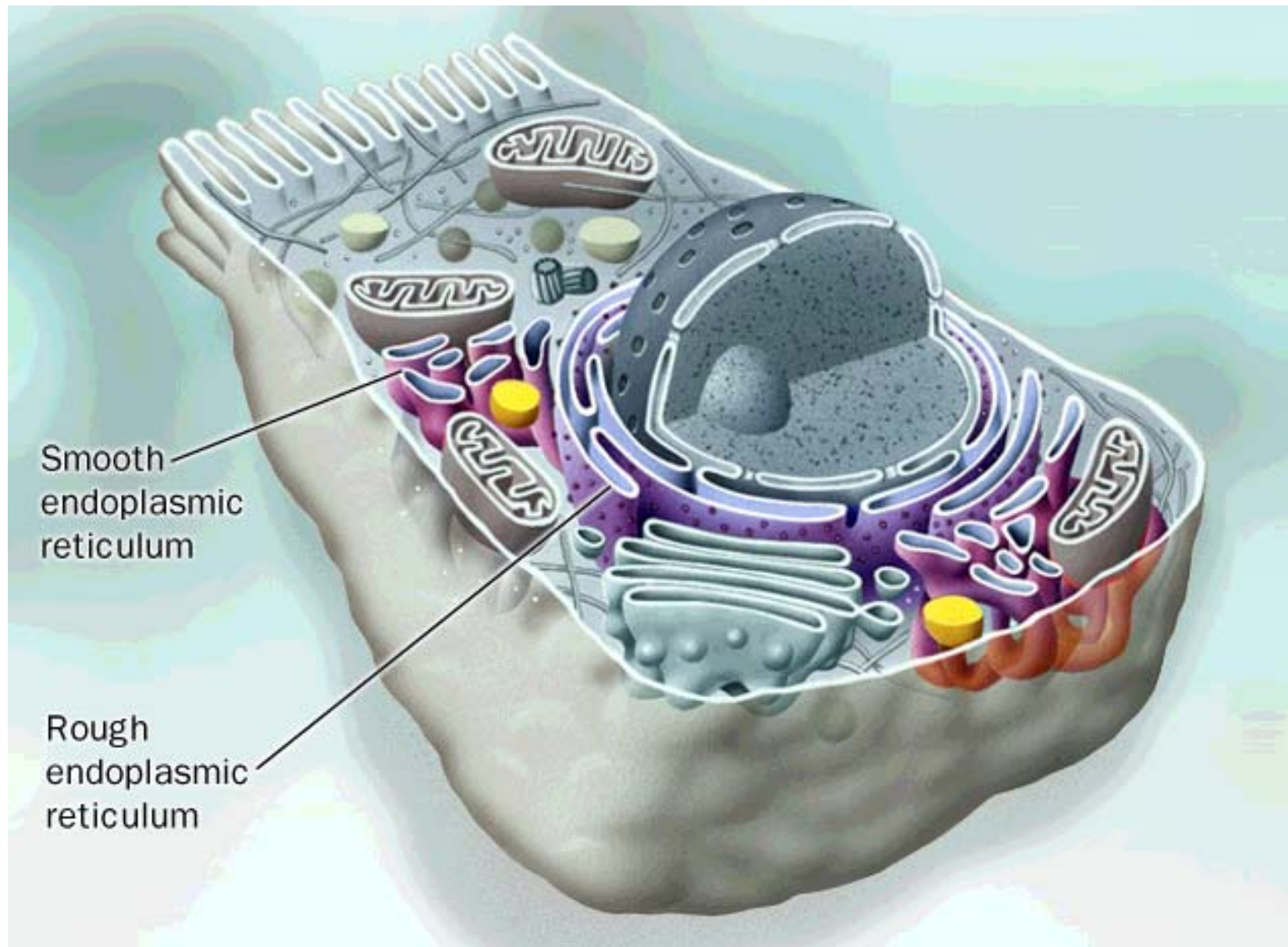


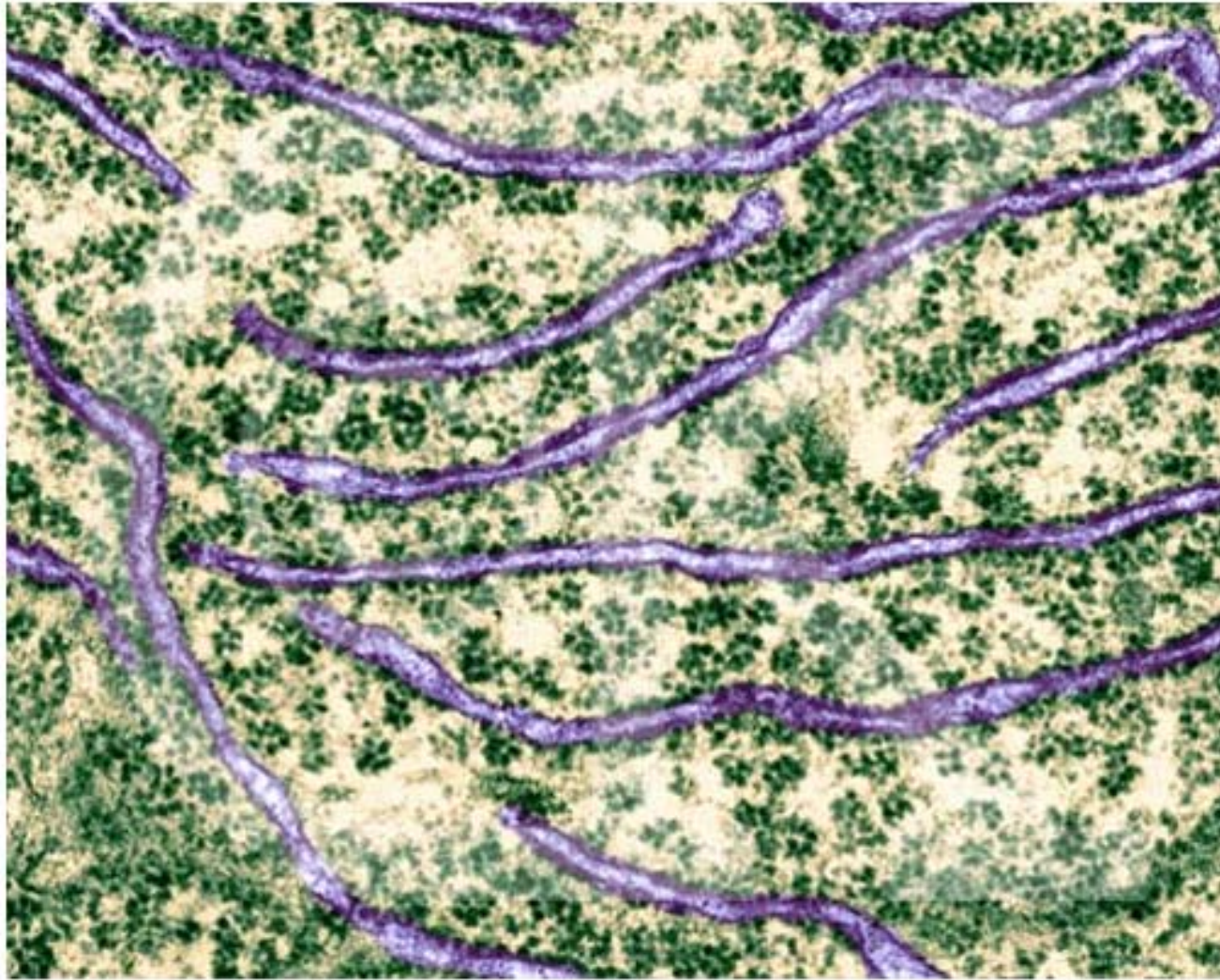




**Figure 14-41. Comparison of a mitochondrion and a chloroplast.** The chloroplast is generally much larger and contains a thylakoid membrane and thylakoid space. The mitochondrial inner membrane is folded into cristae.

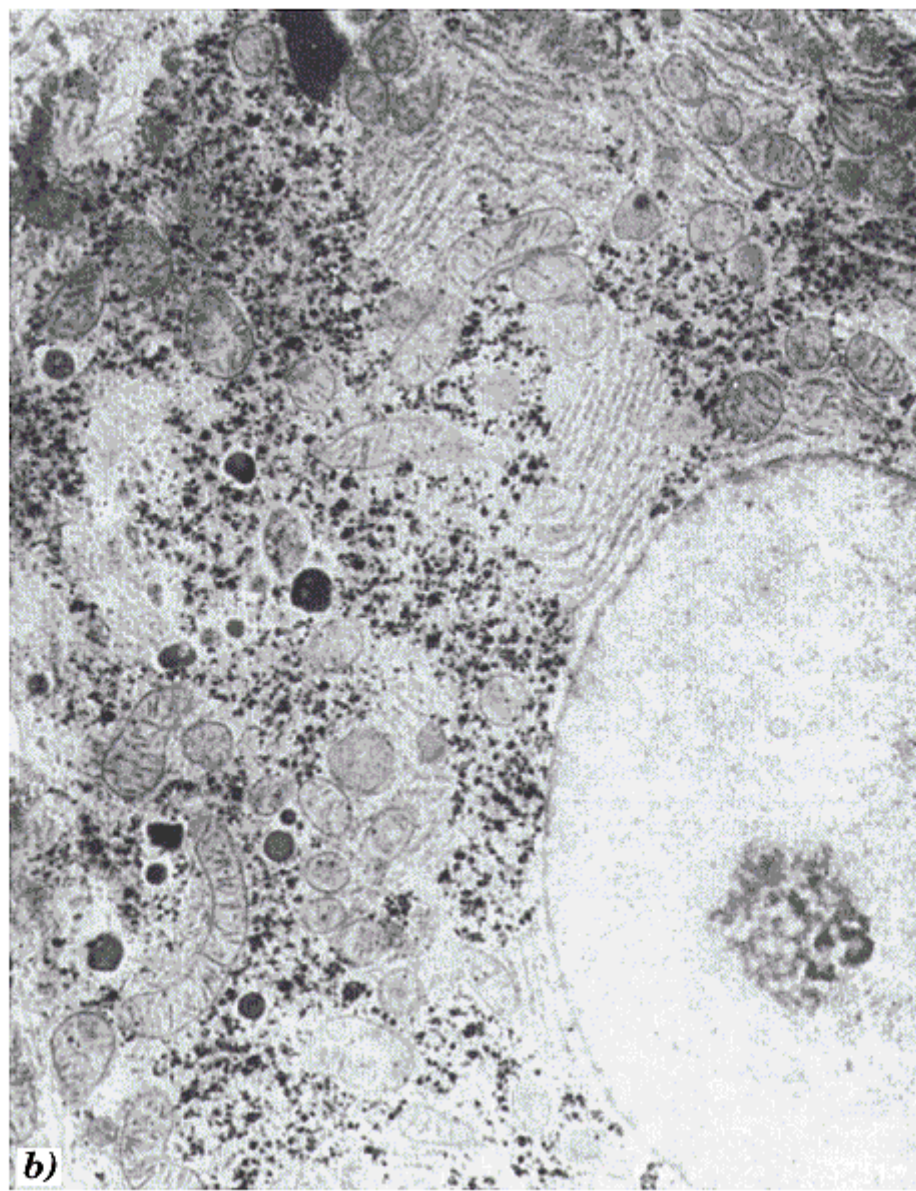






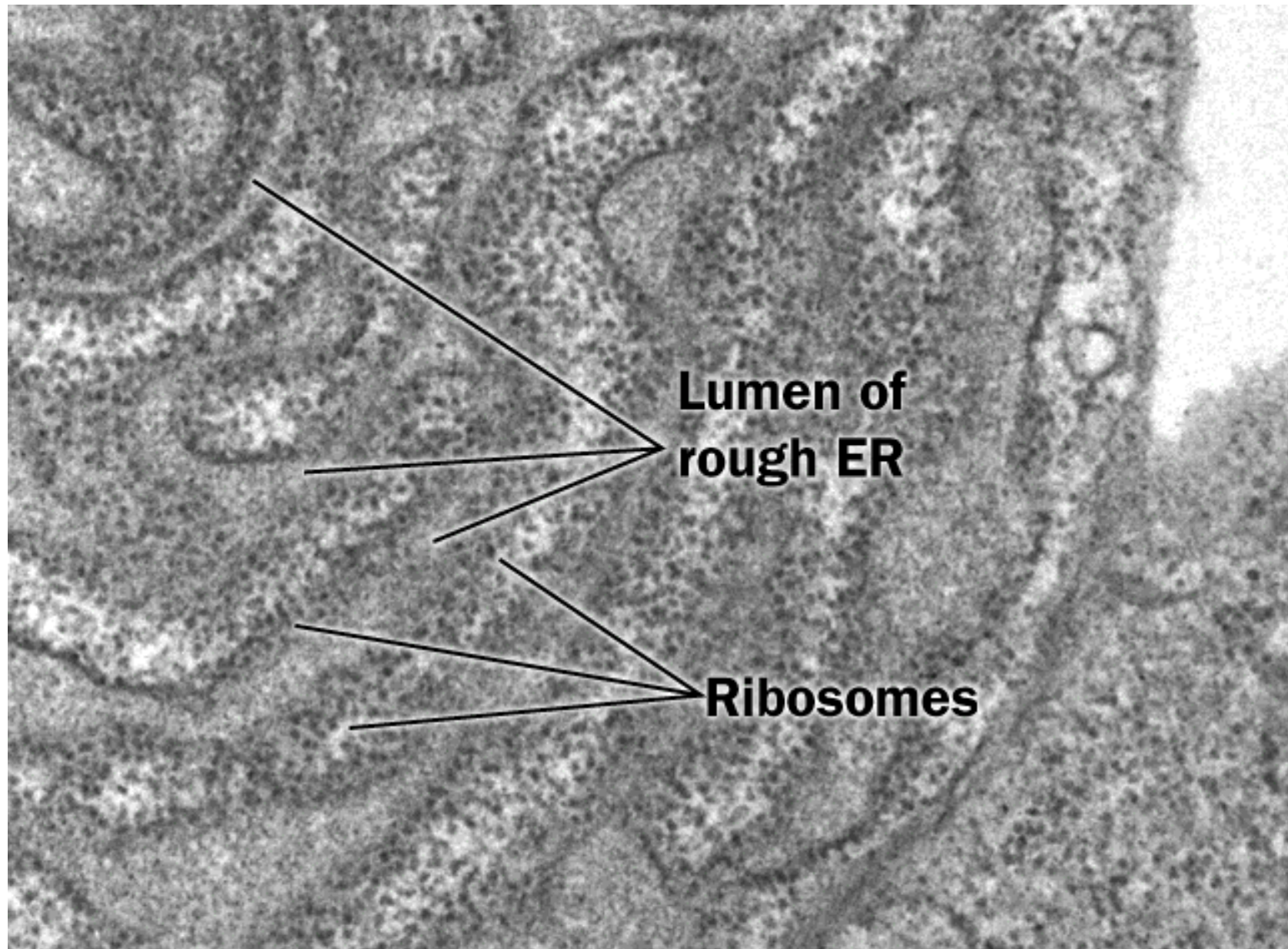
**Rough Endoplasmic Reticulum with Ribosomes** (TEM x61,560). This image is copyright Dennis Kunkel at [www.DennisKunkel.com](http://www.DennisKunkel.com), used with permission.



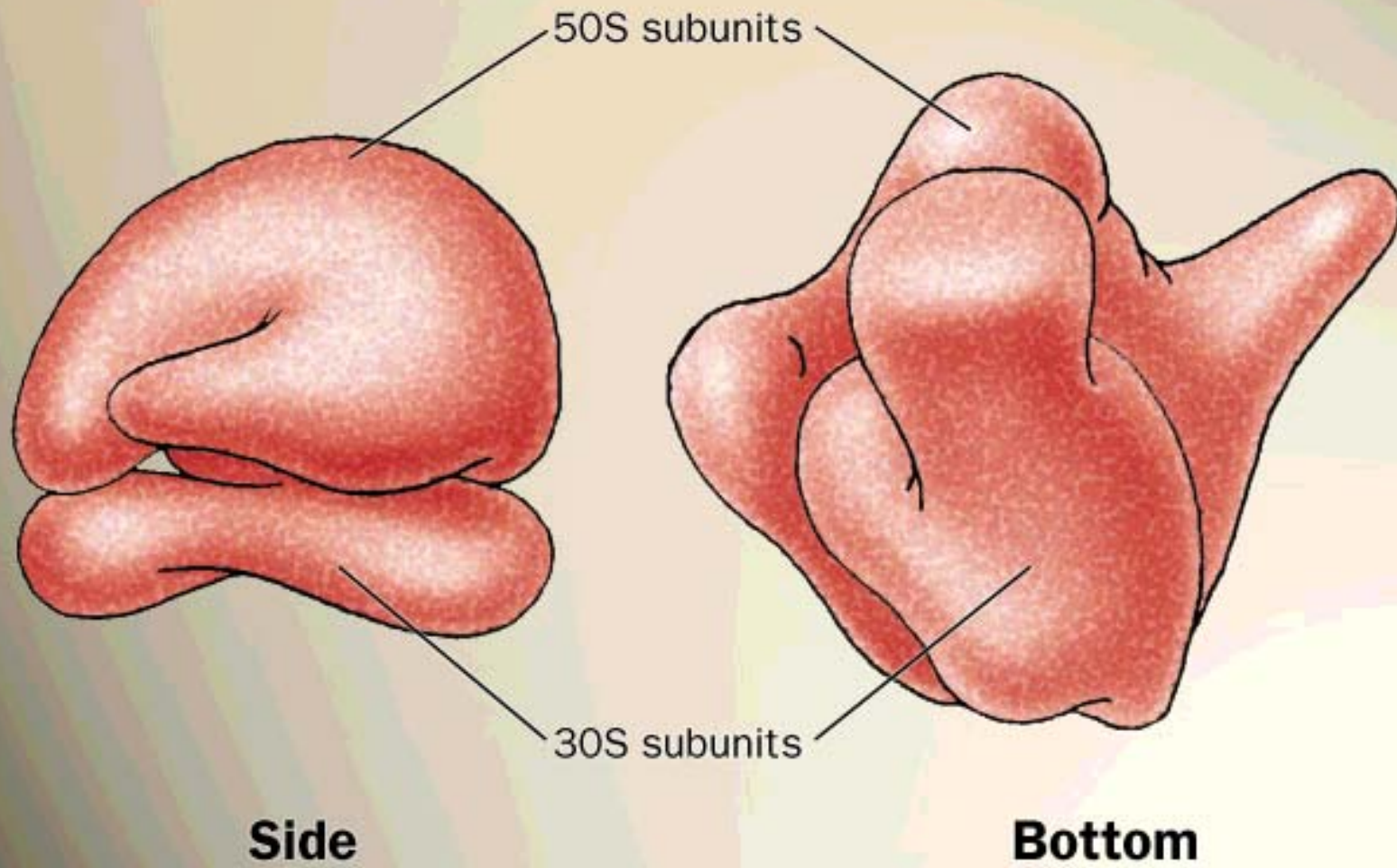


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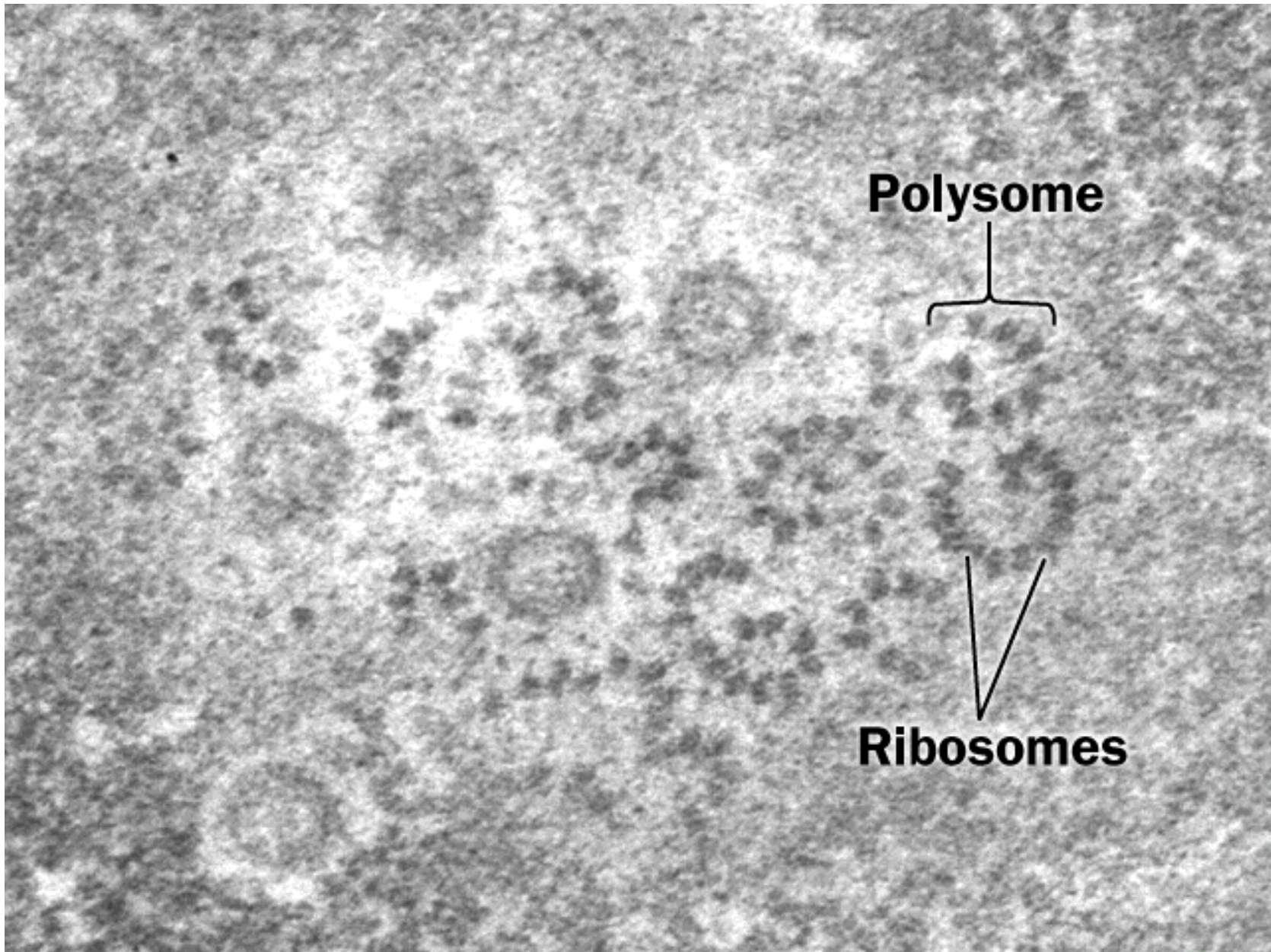


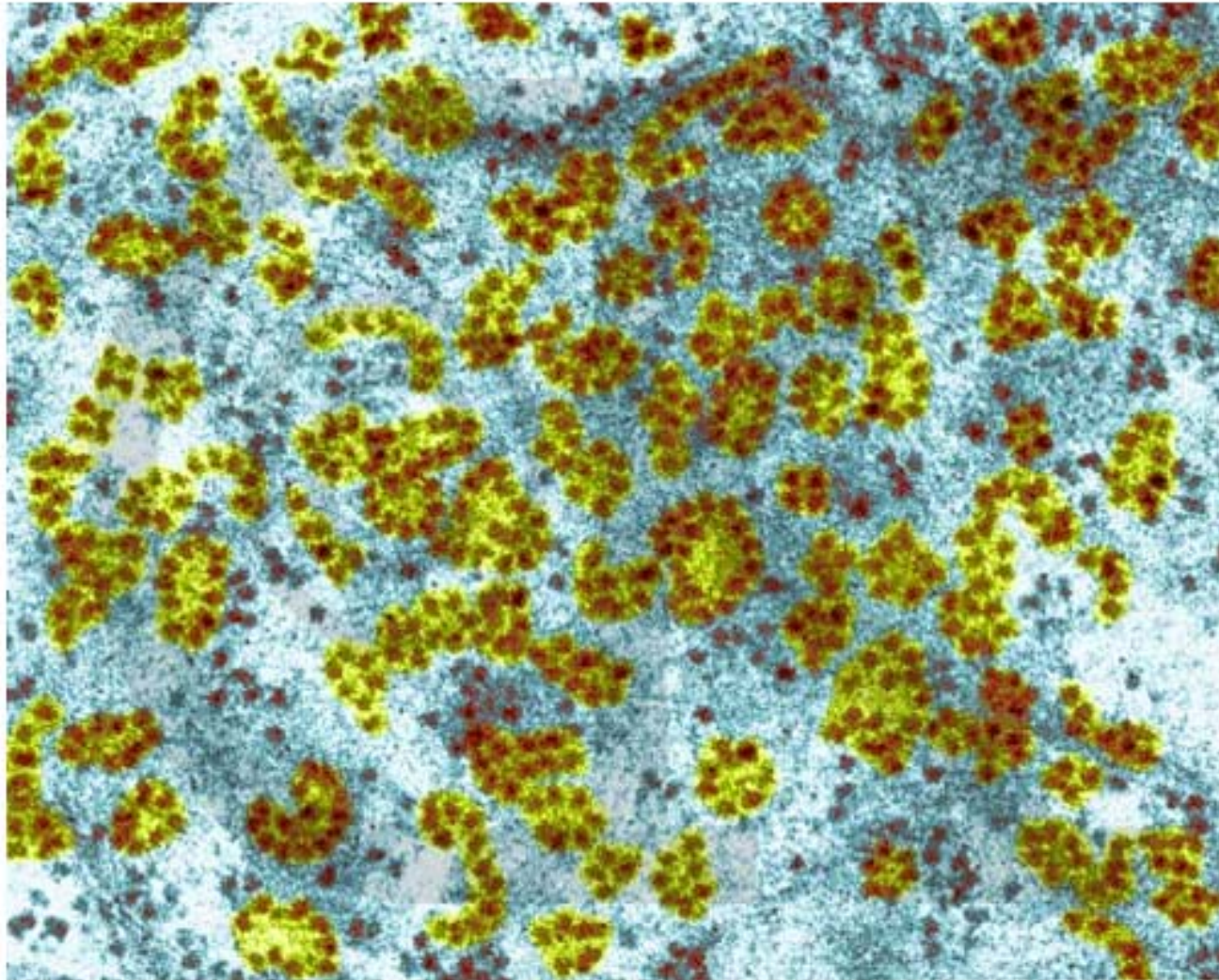


# RIBOSOME



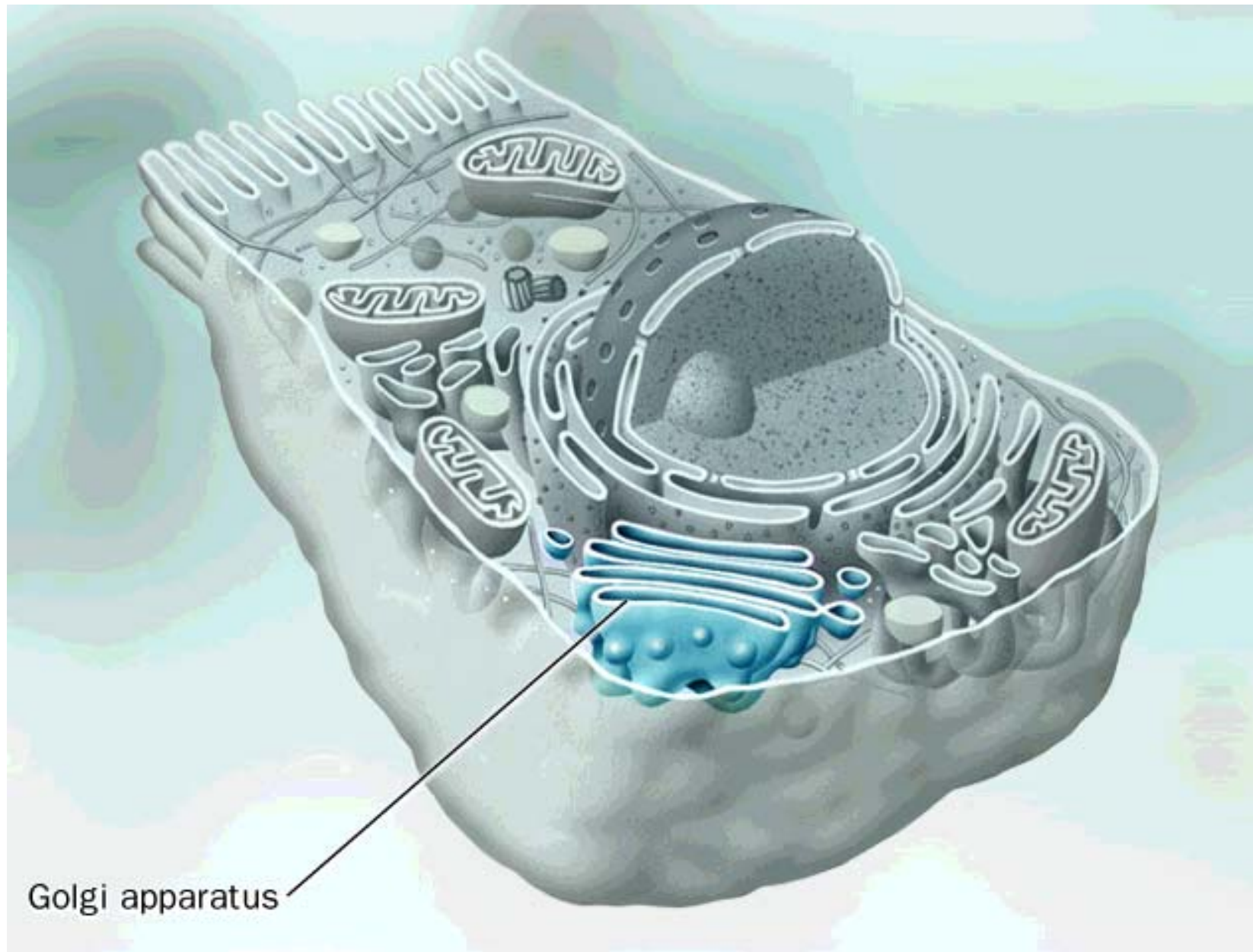


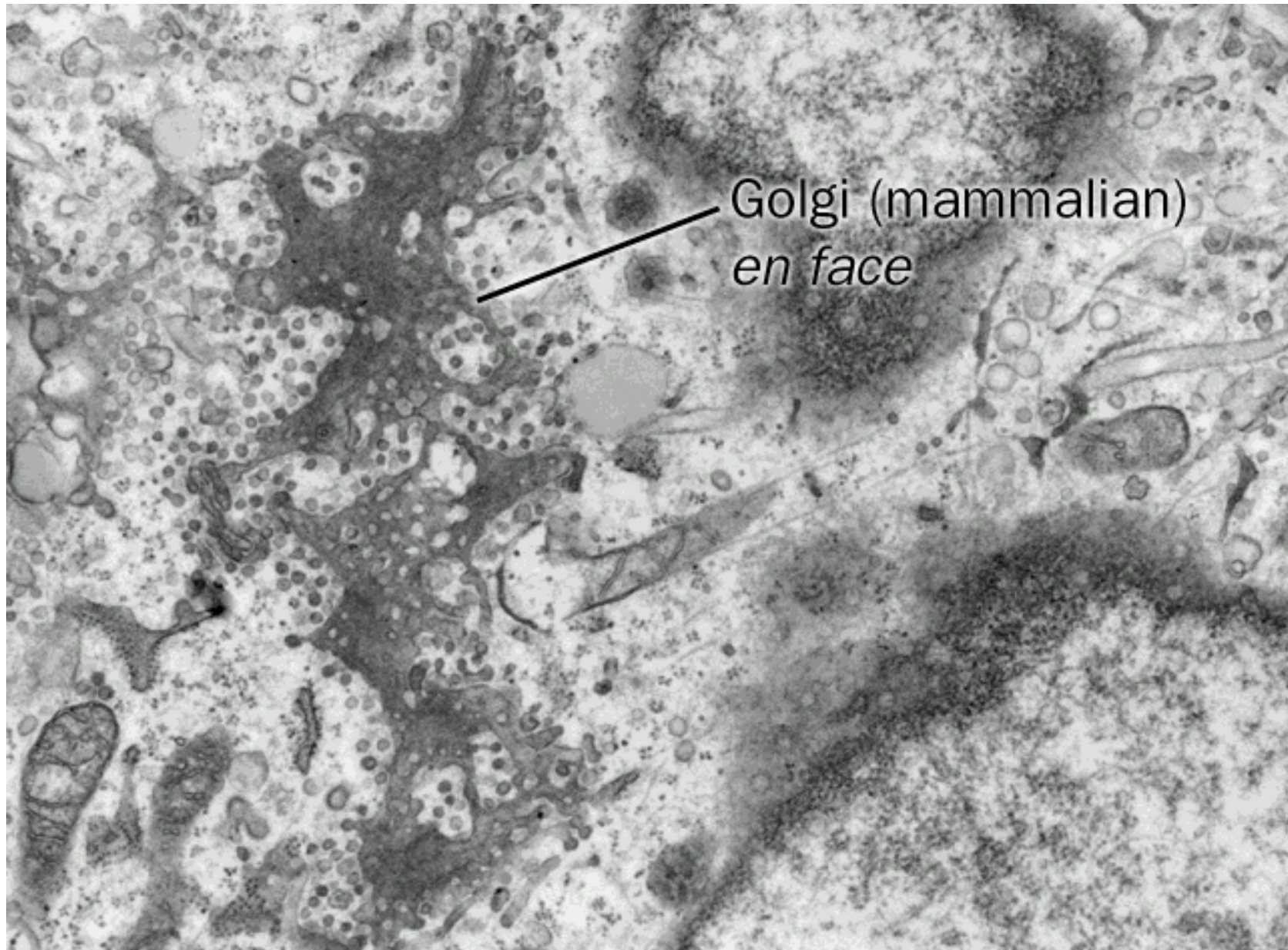




**Ribosomes and Polyribosomes - liver cell (TEM x173,400).** This image is copyright Dennis Kunkel at [www.DennisKunkel.com](http://www.DennisKunkel.com), used with permission.







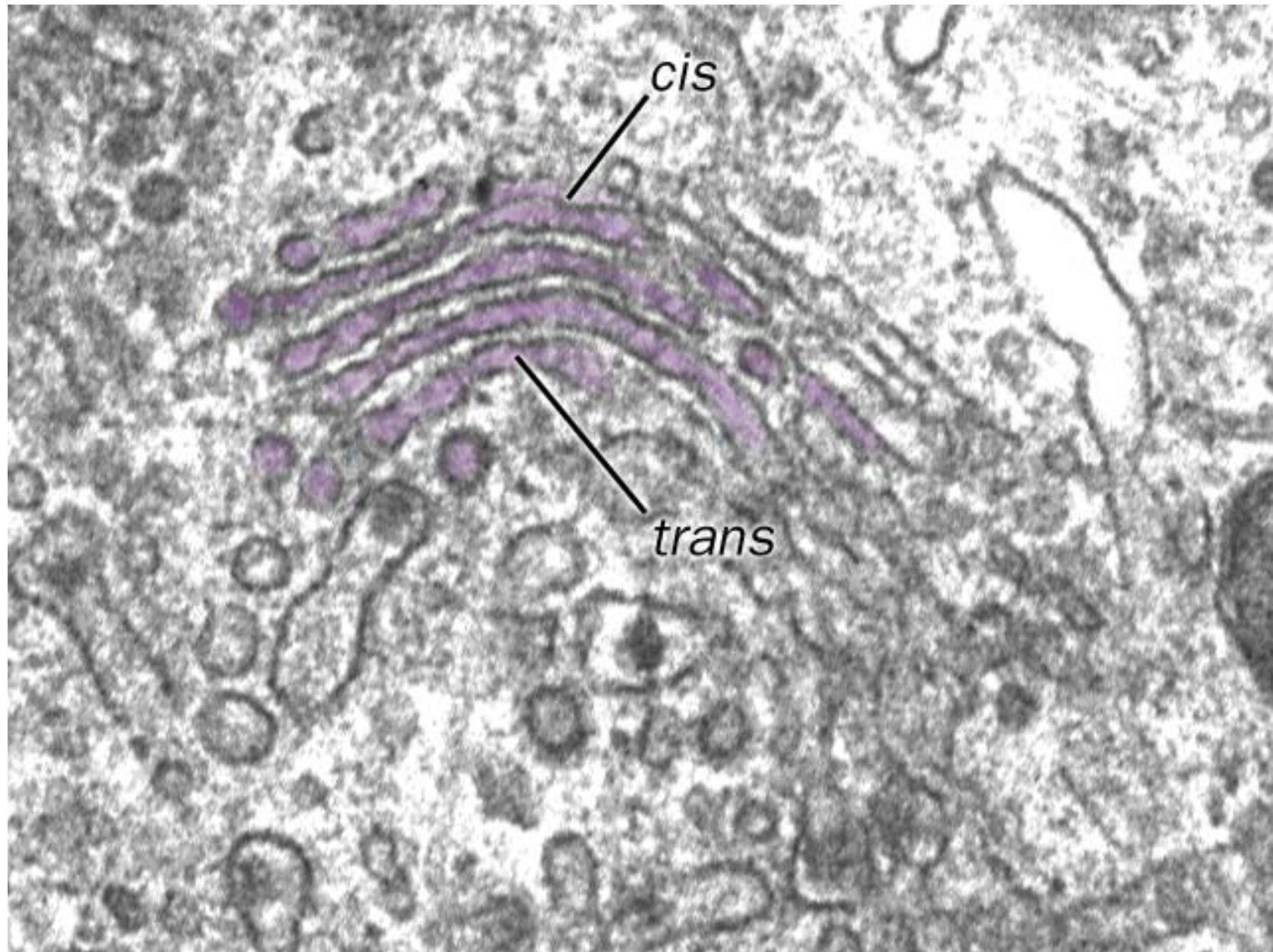
Golgi (mammalian)  
*en face*





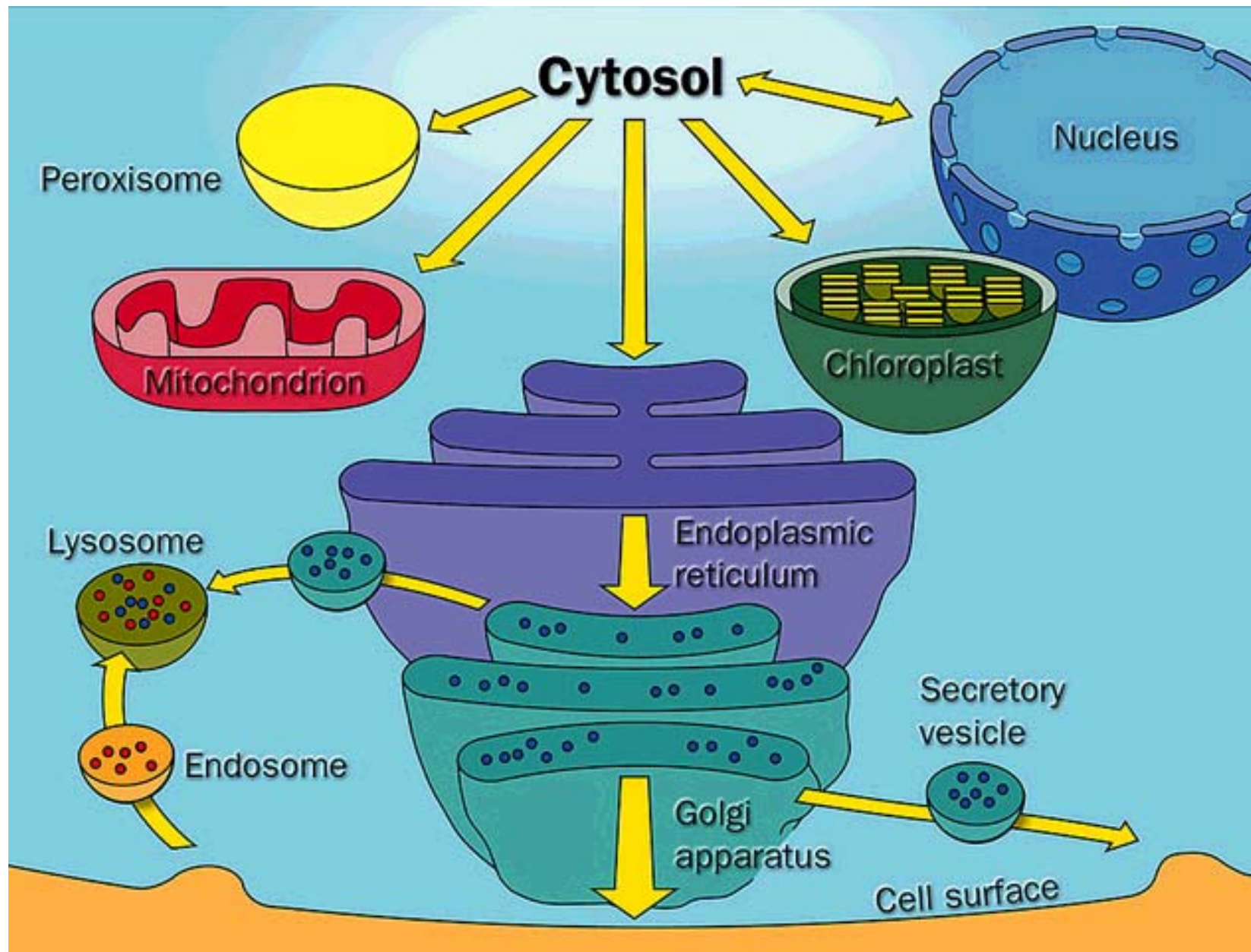
Golgi Apparatus in a plant parenchyma cell from *Sauromatum guttatum* (TEM x145,700). Note the numerous vesicles near the Golgi. This image is copyright Dennis Kunkel at [www.DennisKunkel.com](http://www.DennisKunkel.com), used with permission.



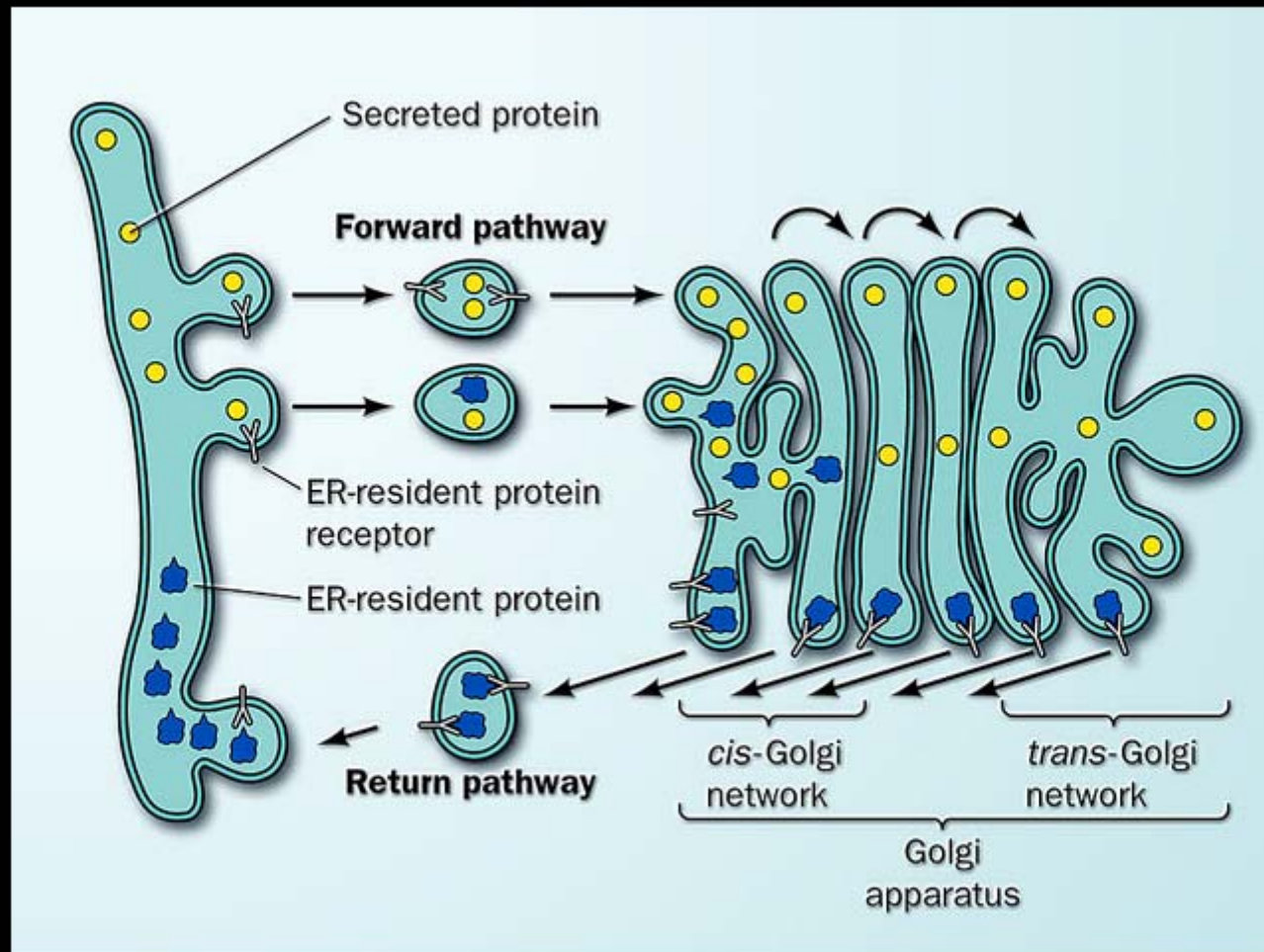


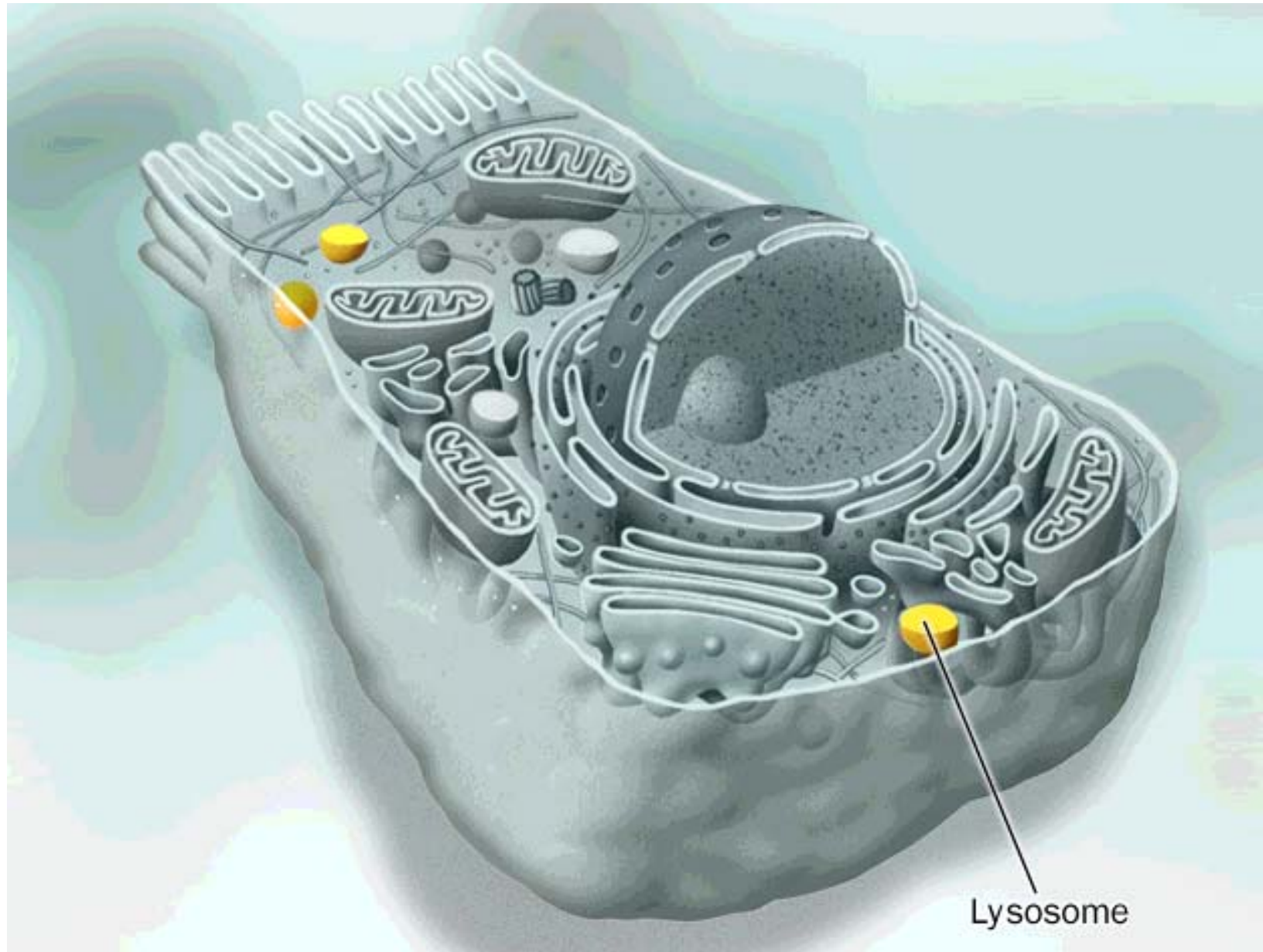








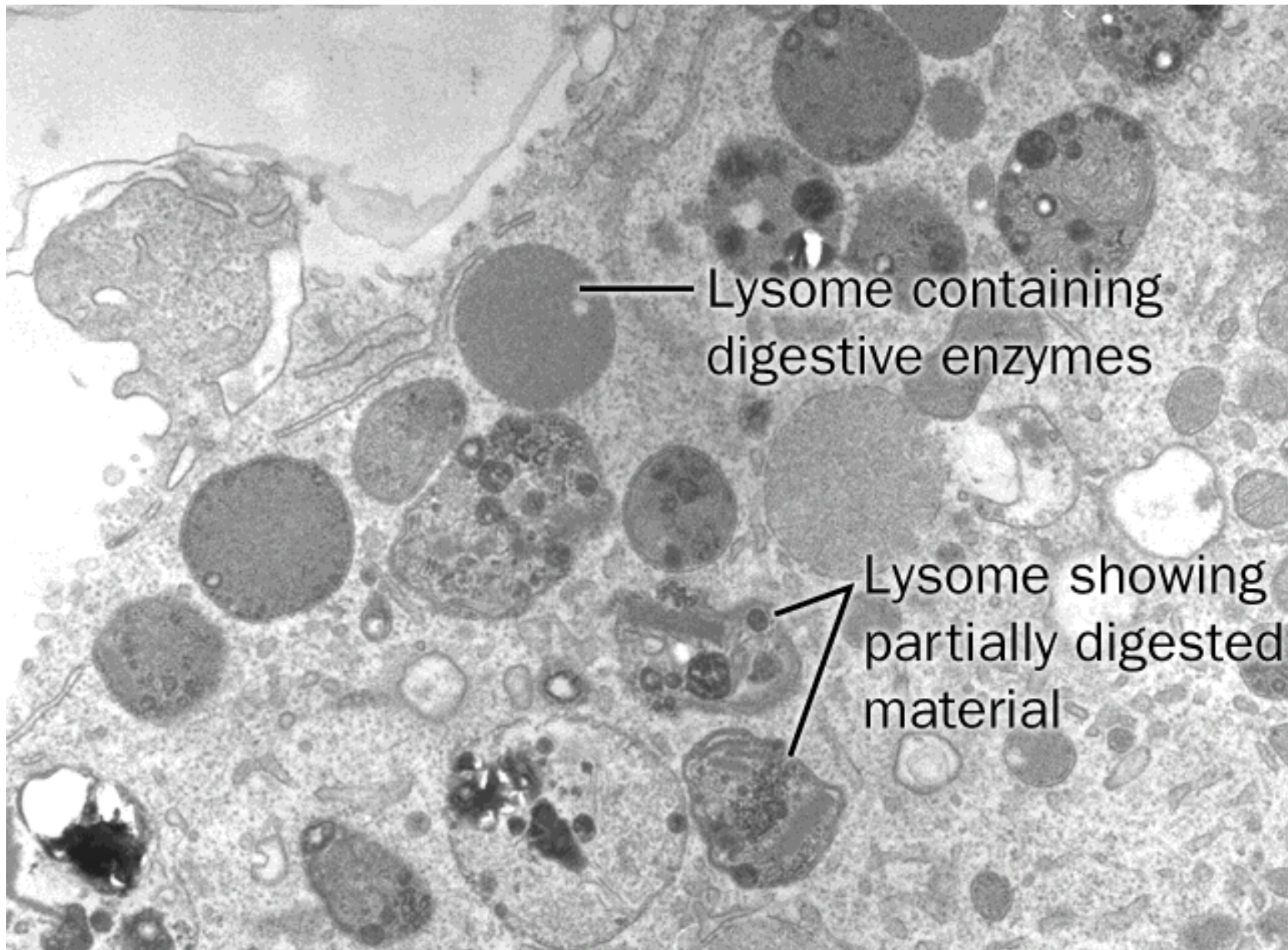






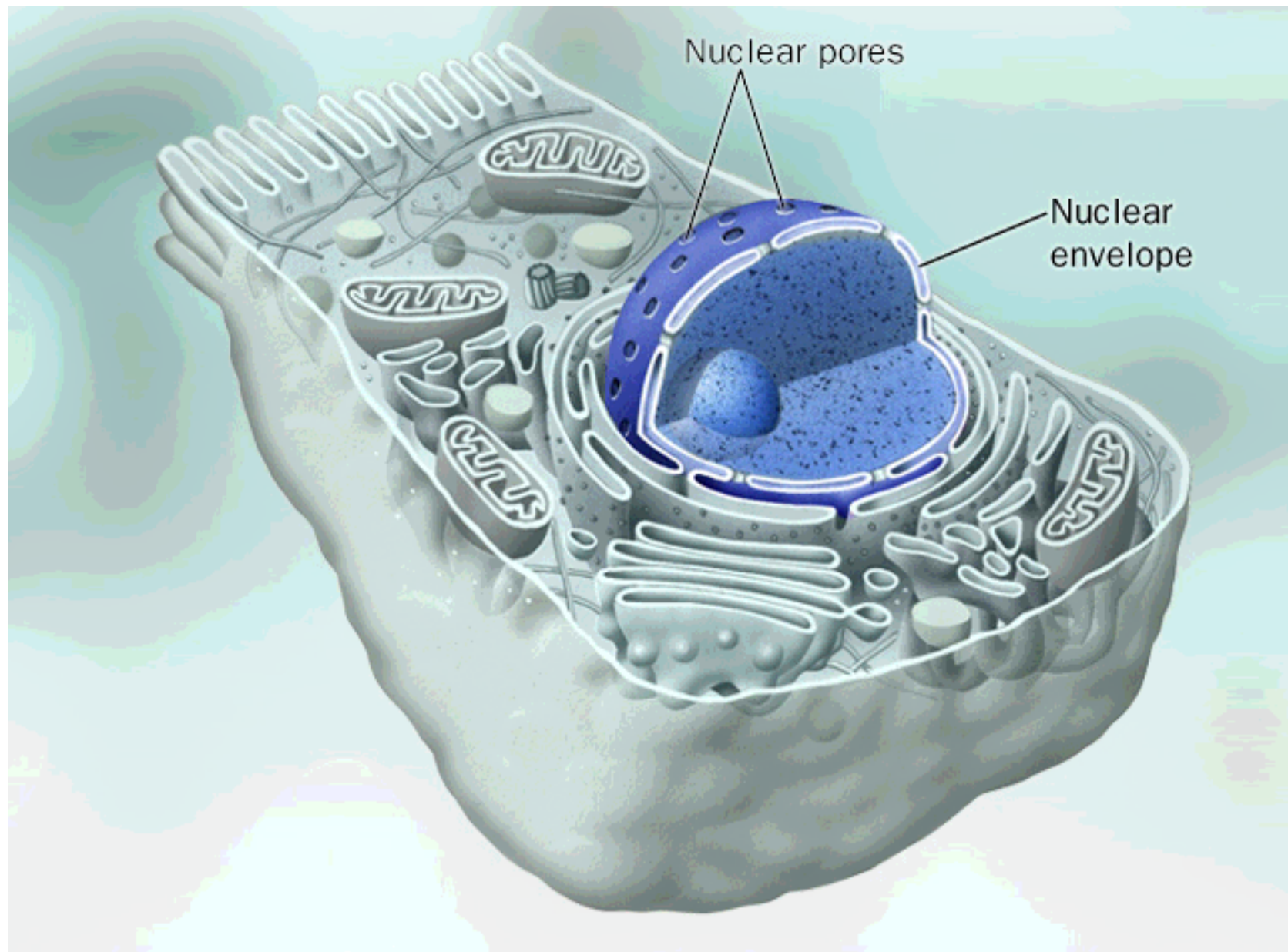




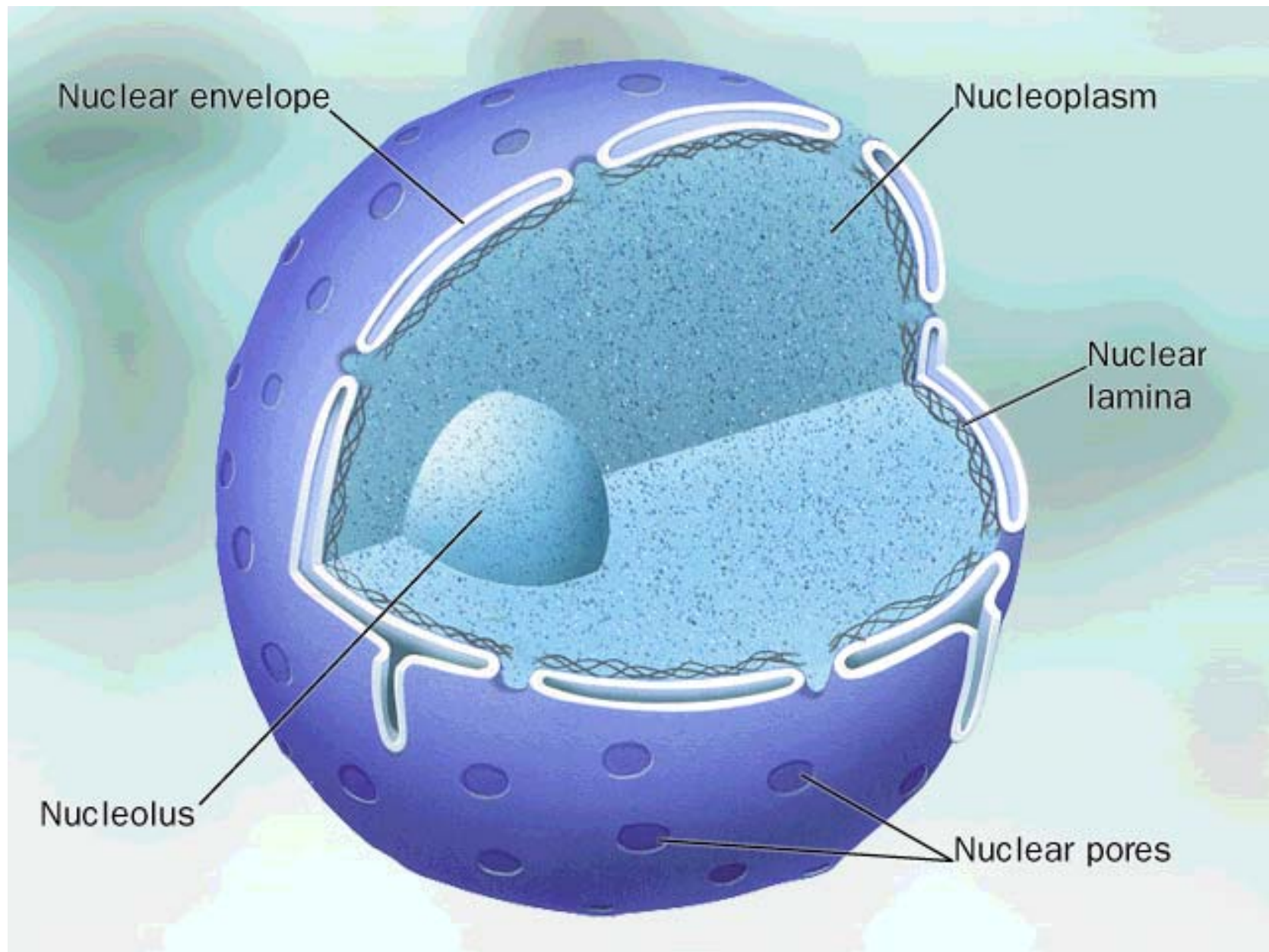


— Lysome containing  
digestive enzymes

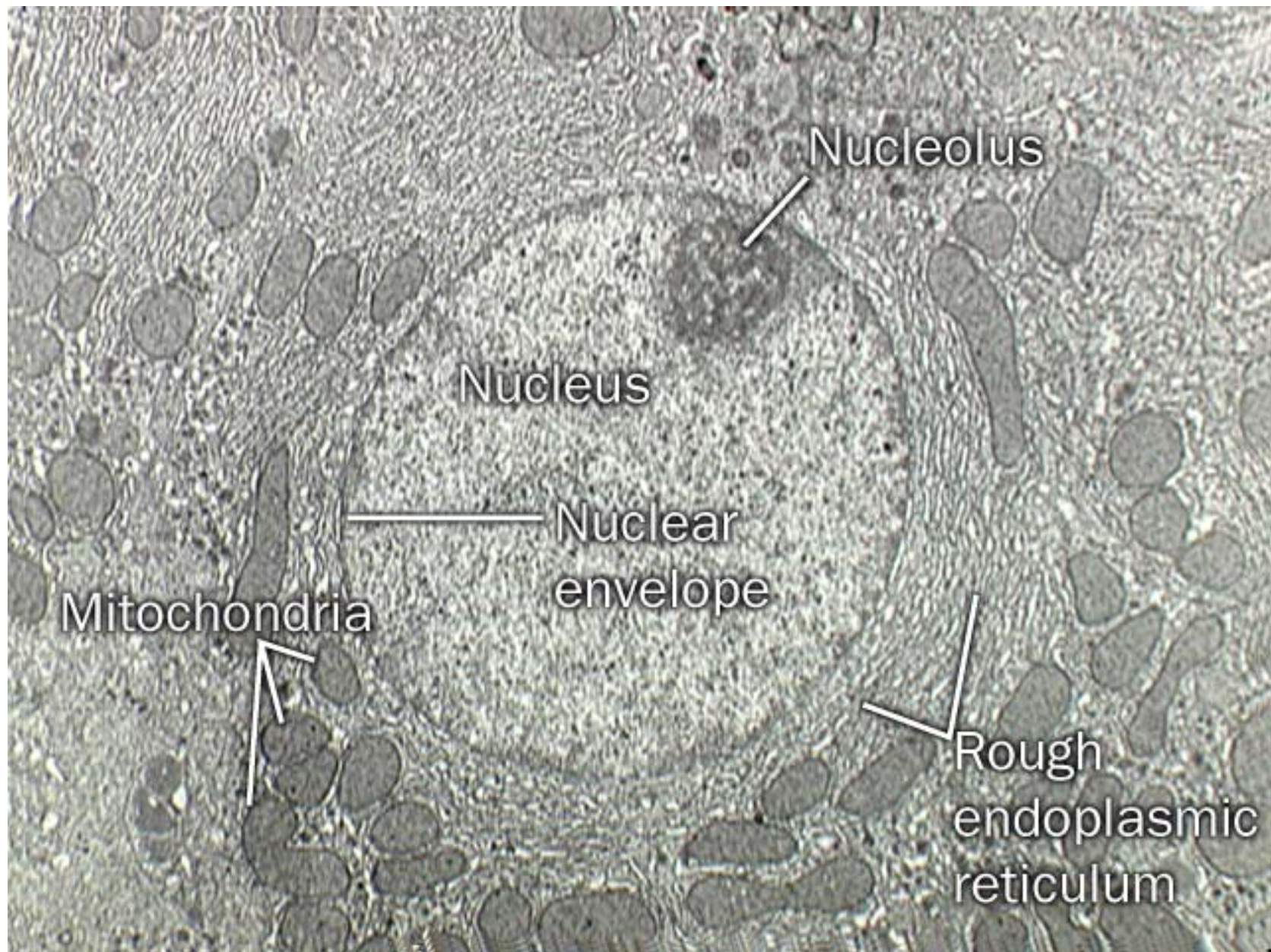
⌈ Lysome showing  
partially digested  
material



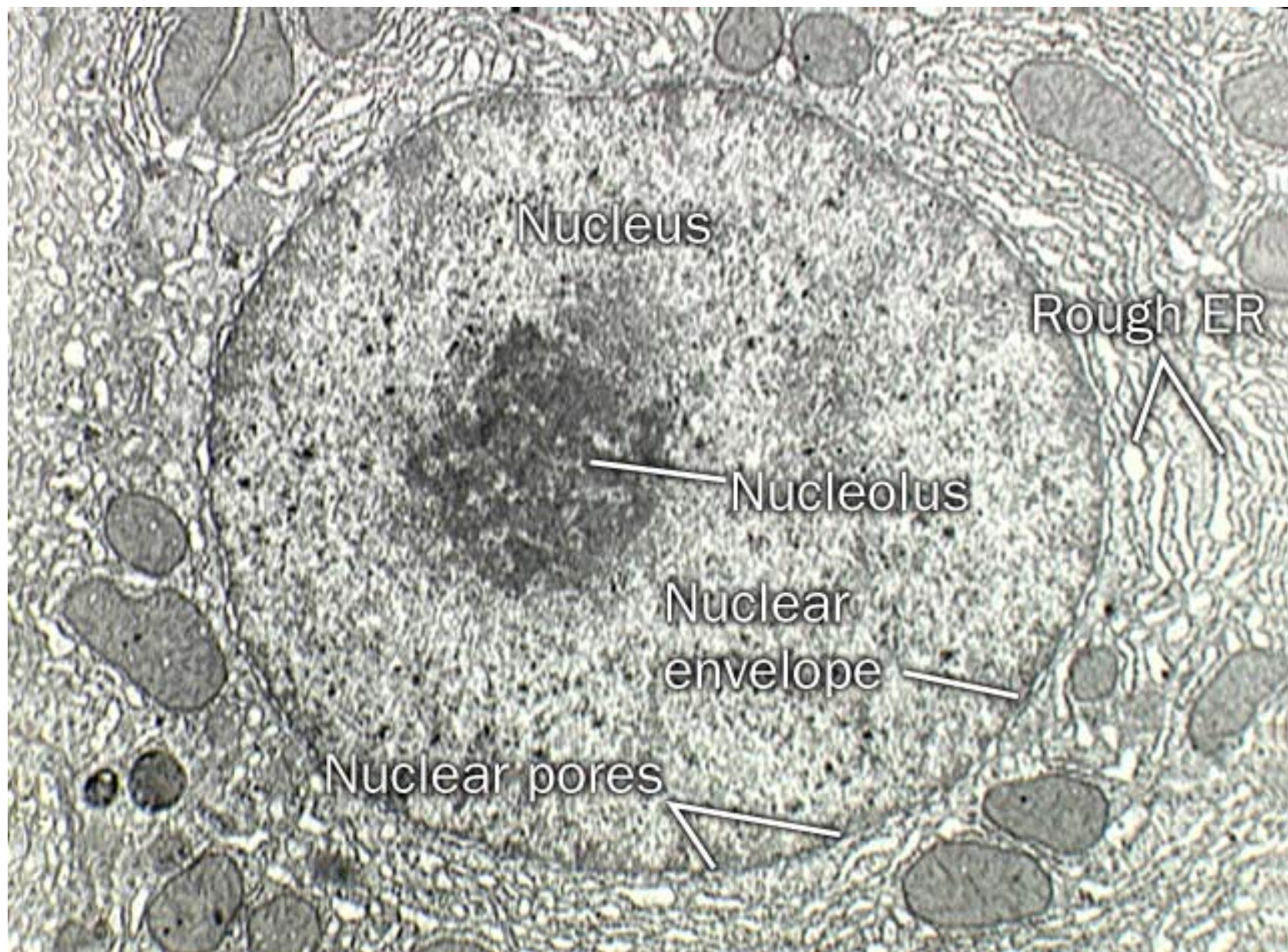




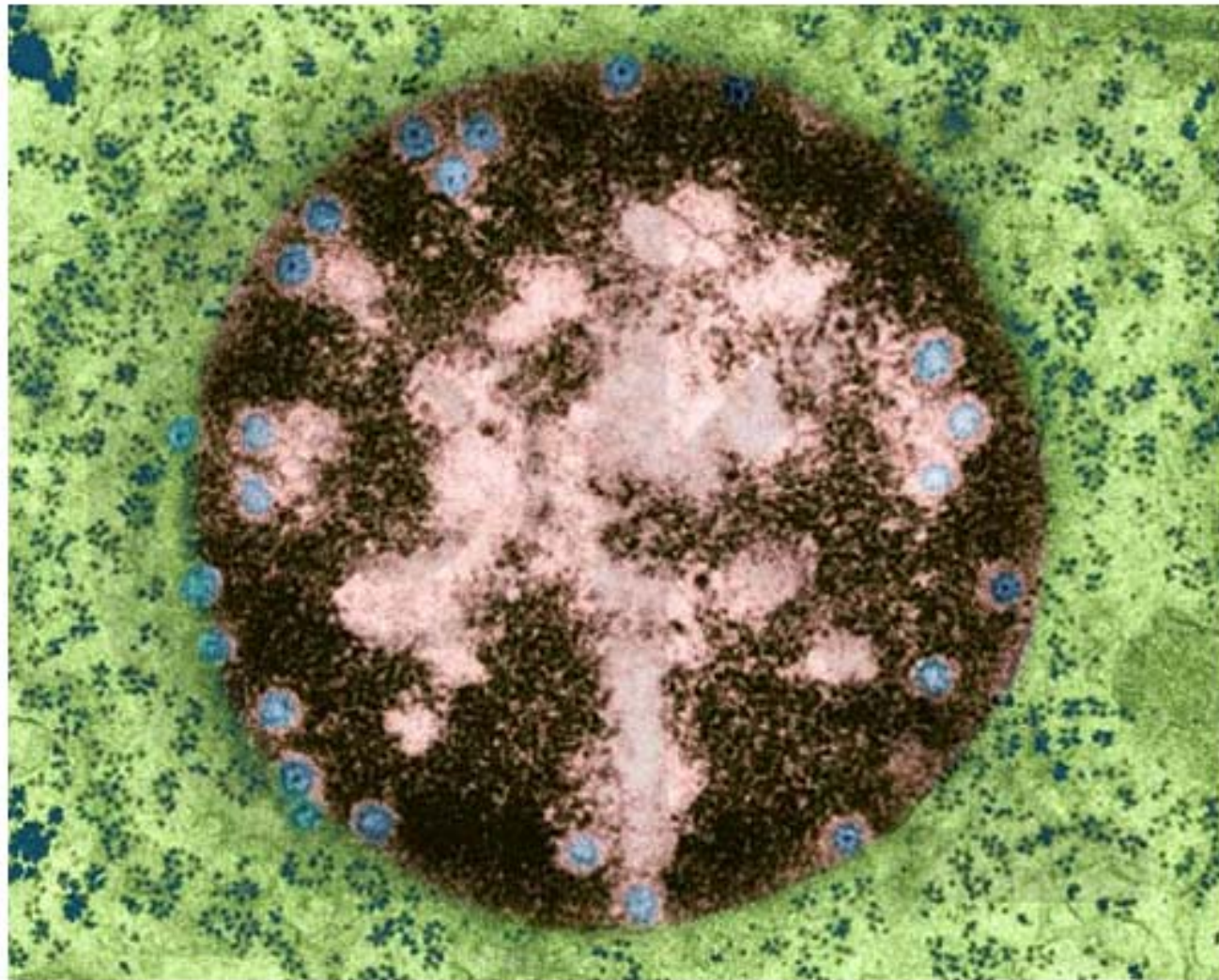






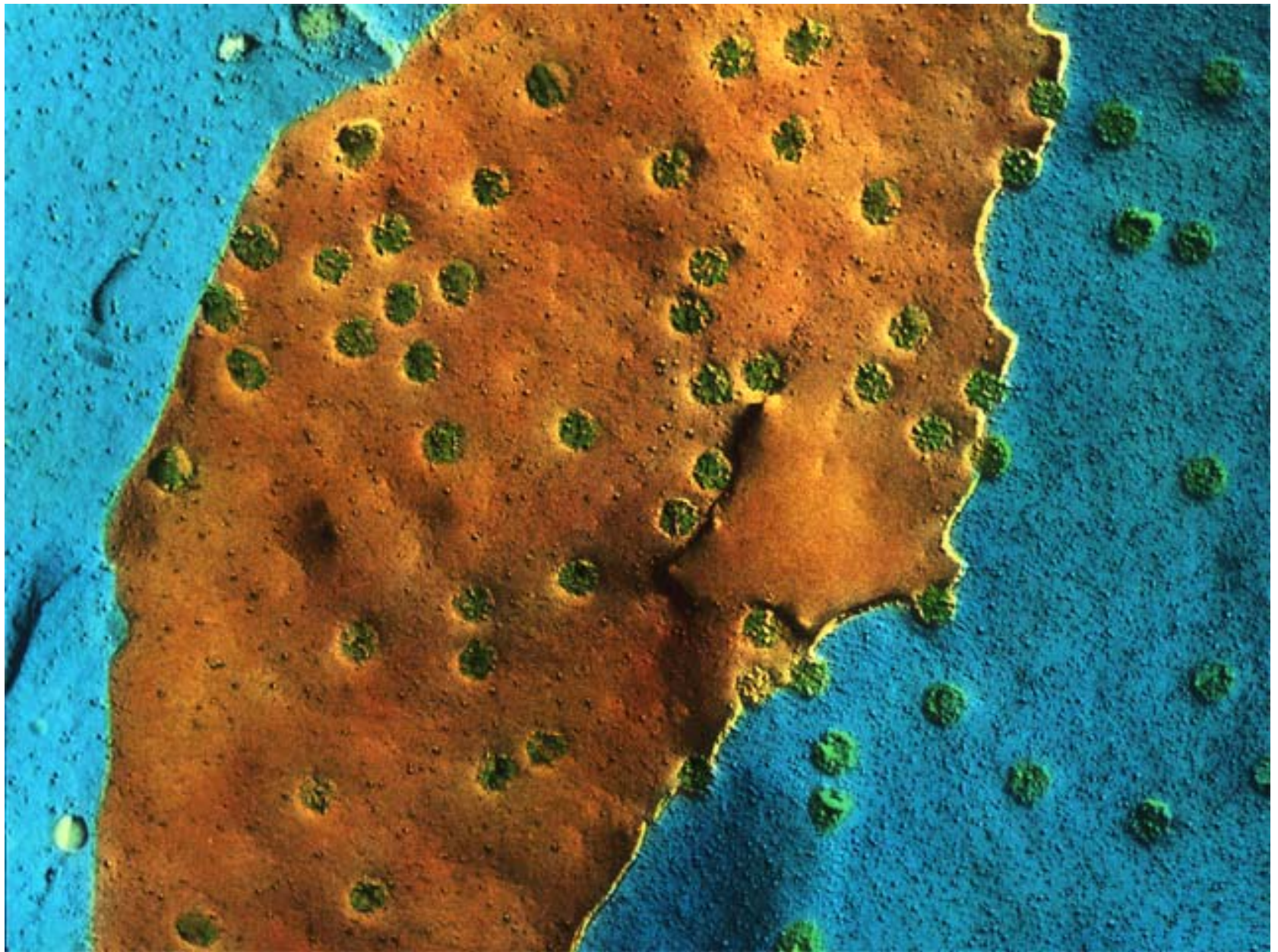






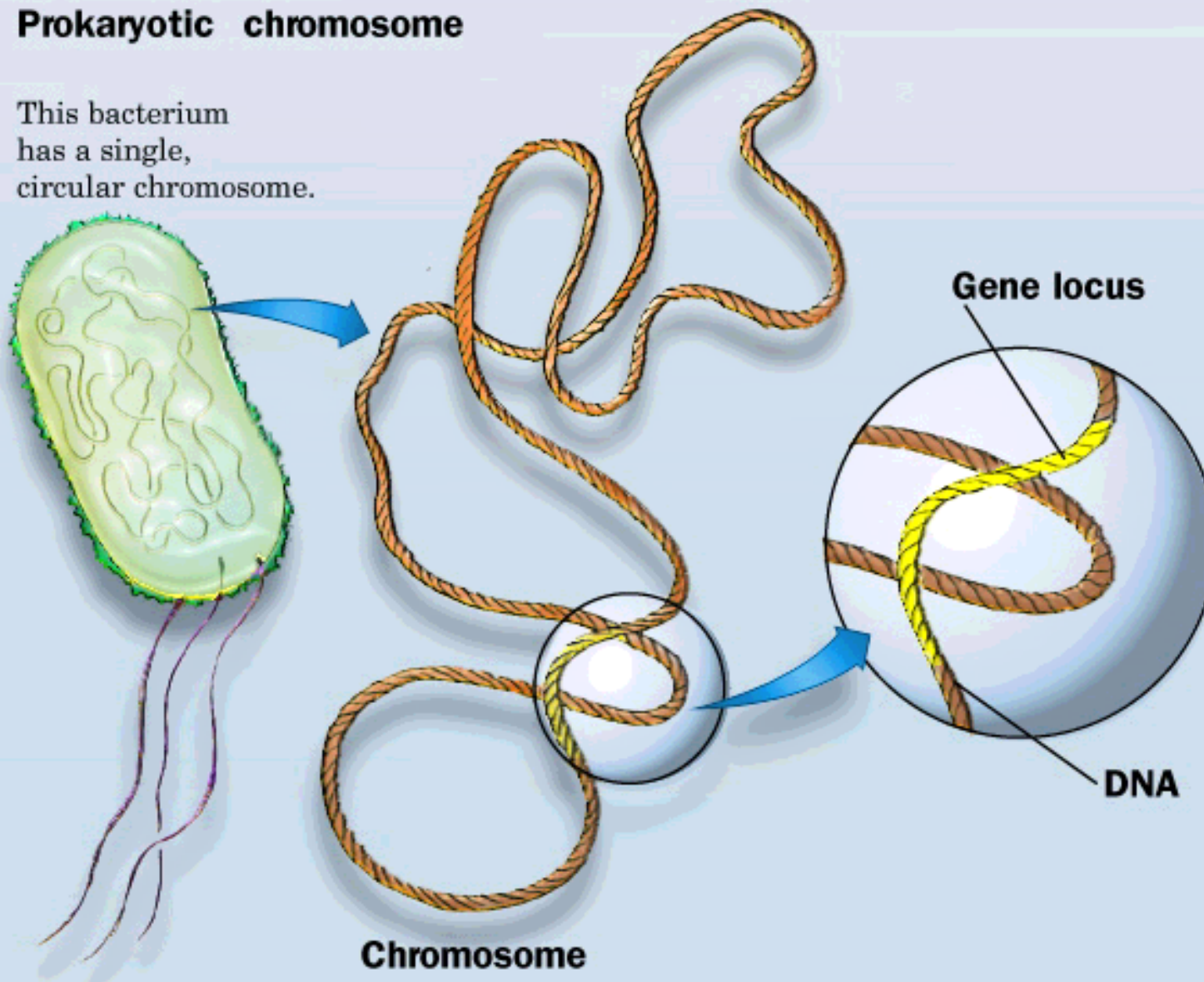
**Nucleus with Nuclear Pores (TEM x73,200).** The **cytoplasm** also contains numerous ribosomes. This image is copyright Dennis Kunkel at [www.DennisKunkel.com](http://www.DennisKunkel.com), used with permission.





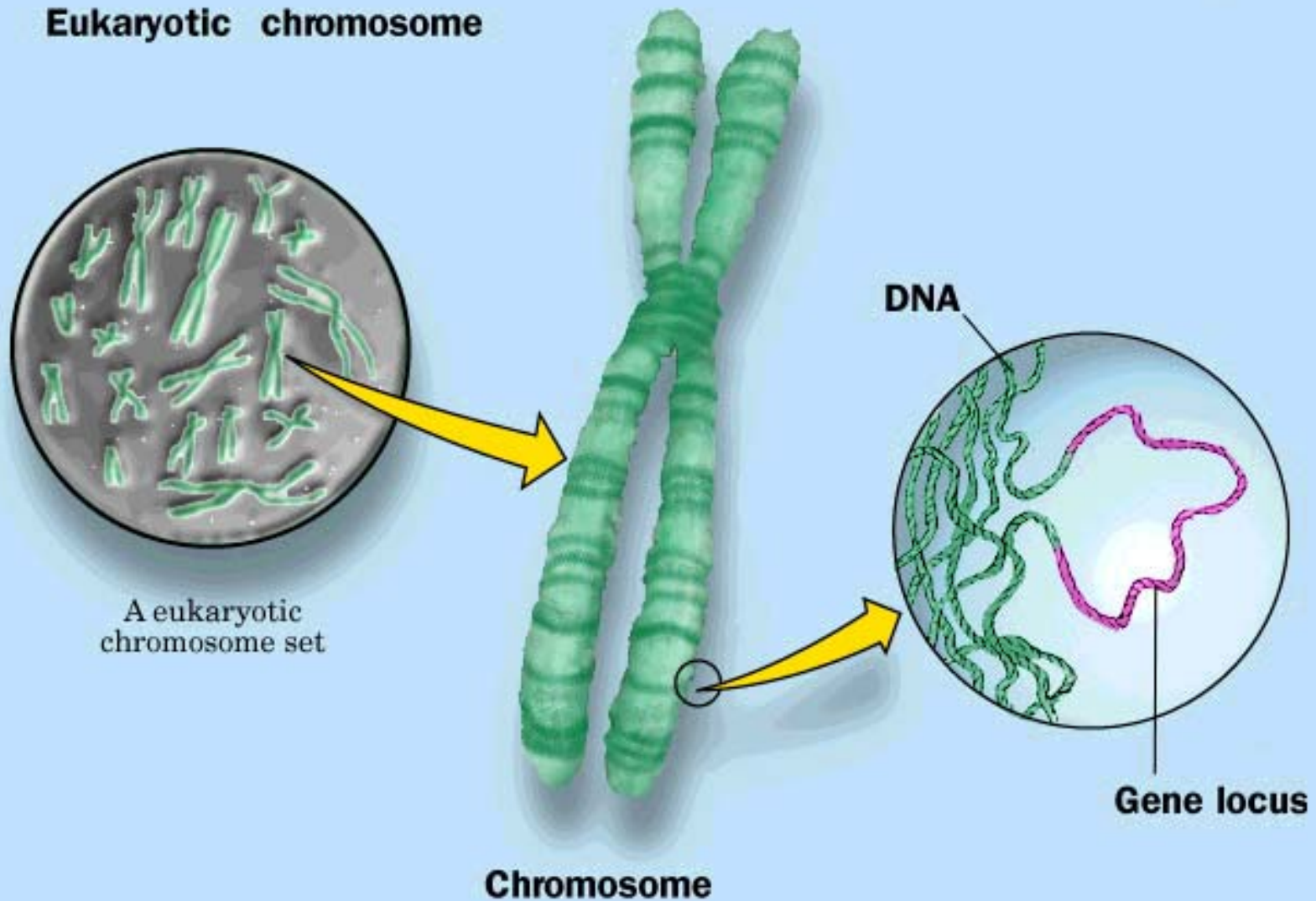
## Prokaryotic chromosome

This bacterium has a single, circular chromosome.

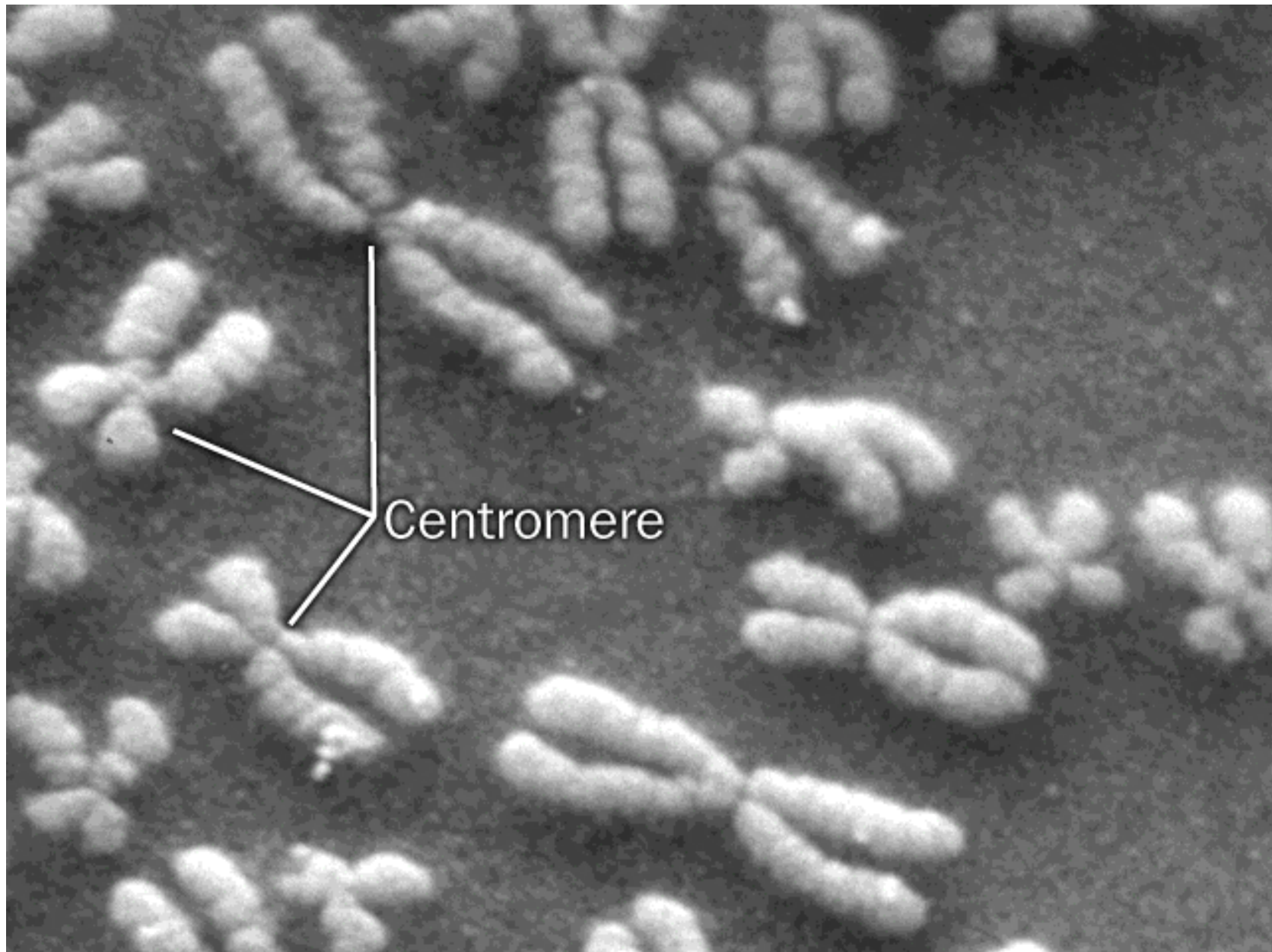


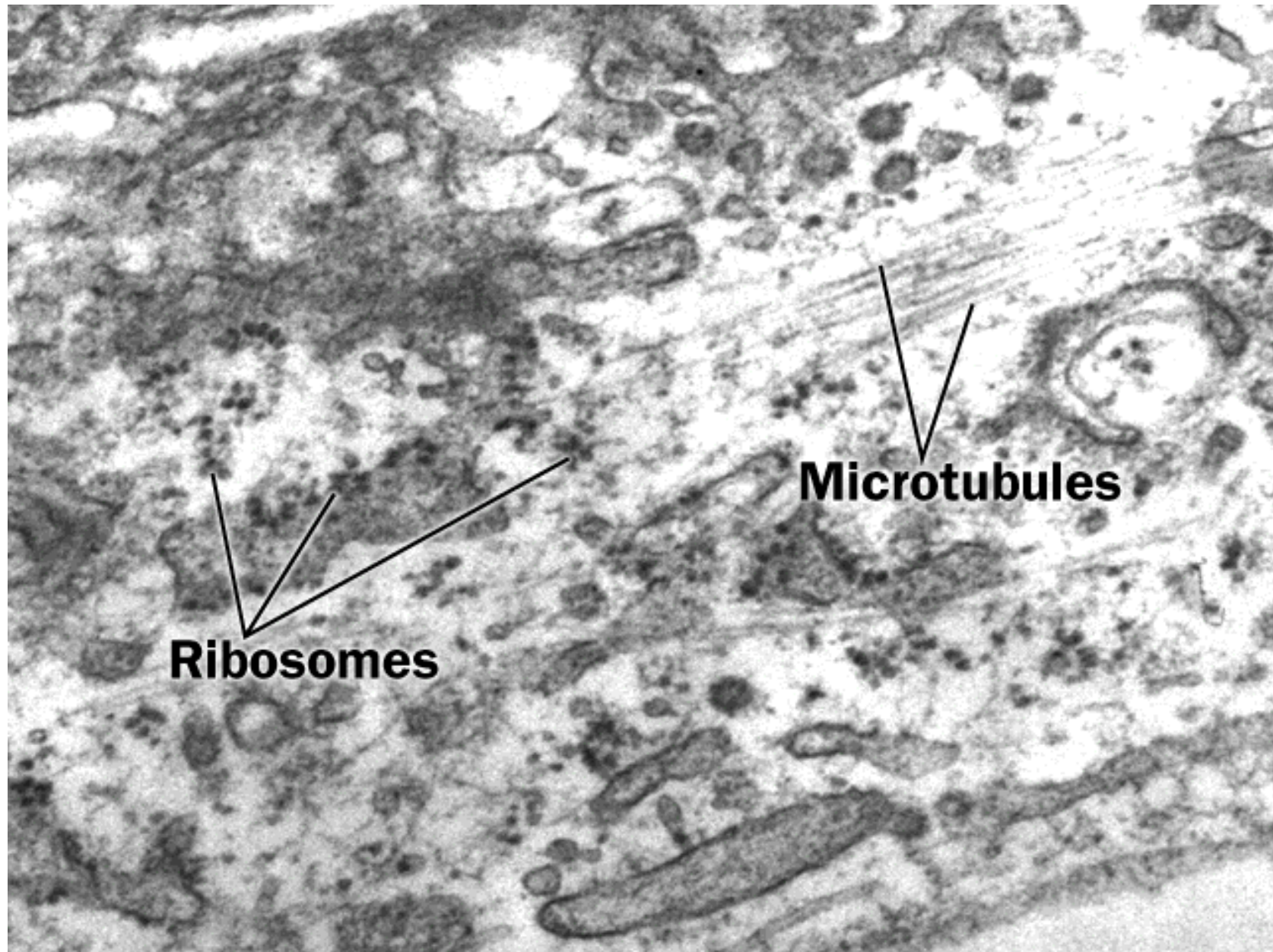


## Eukaryotic chromosome

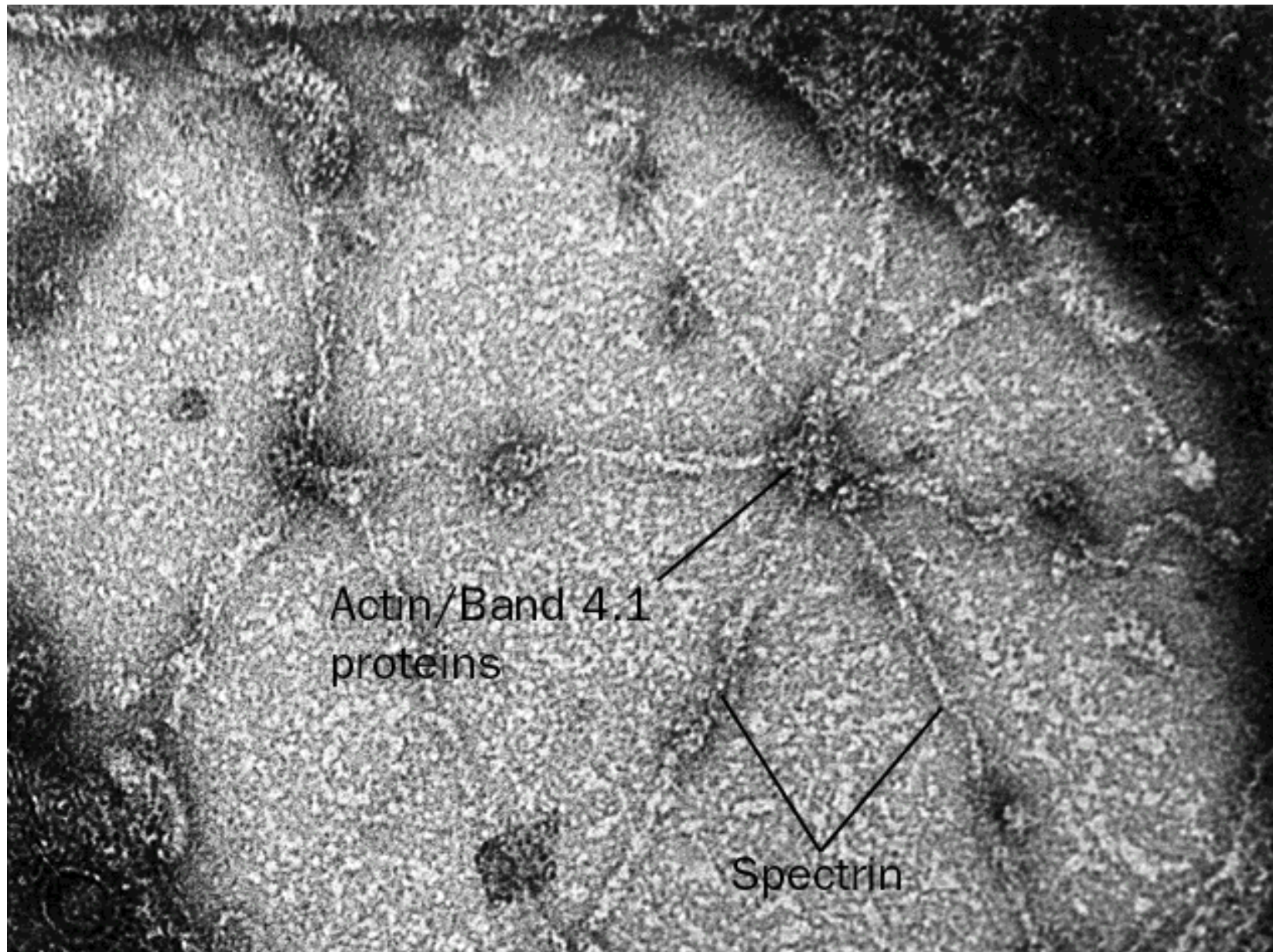




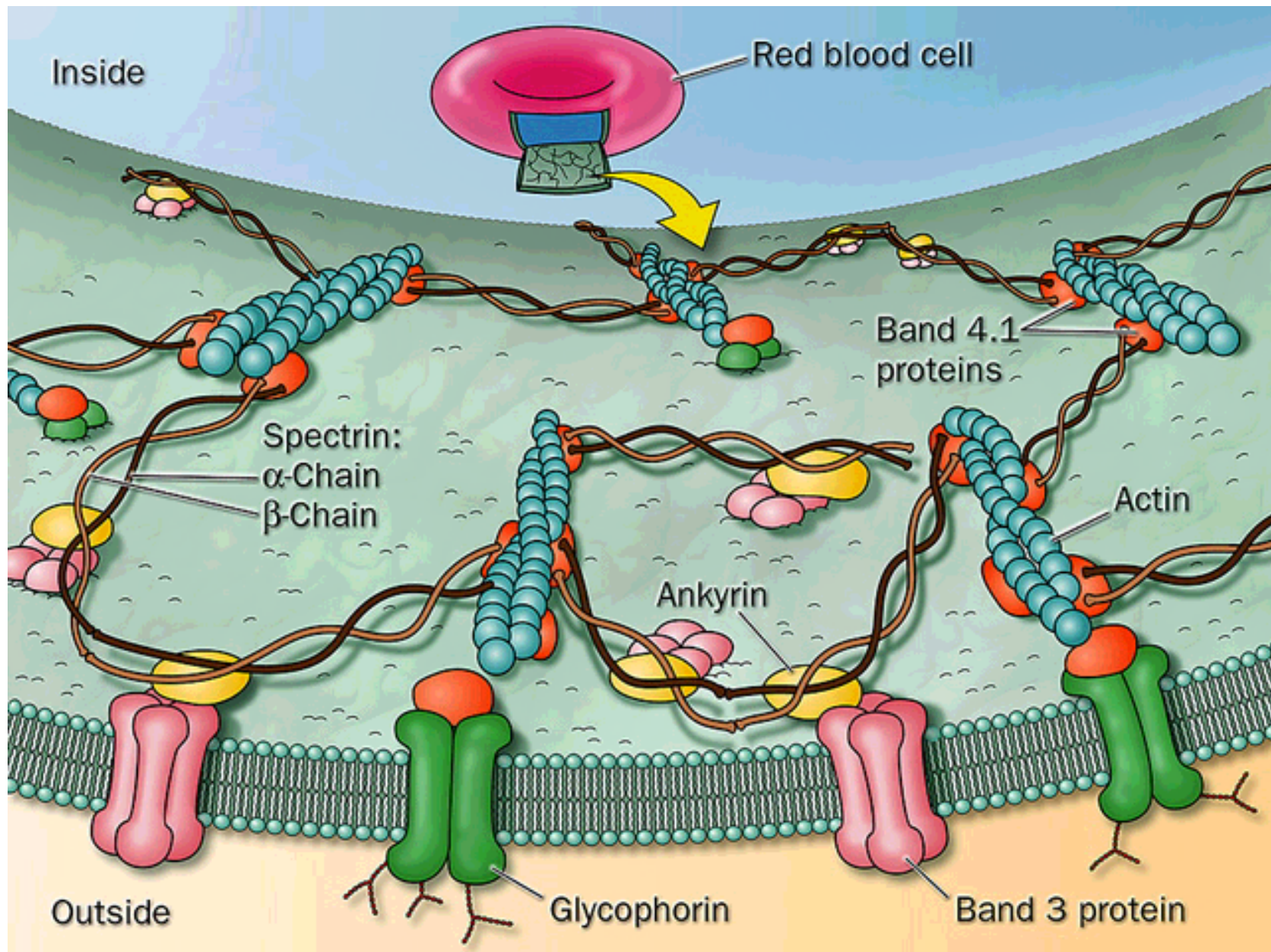


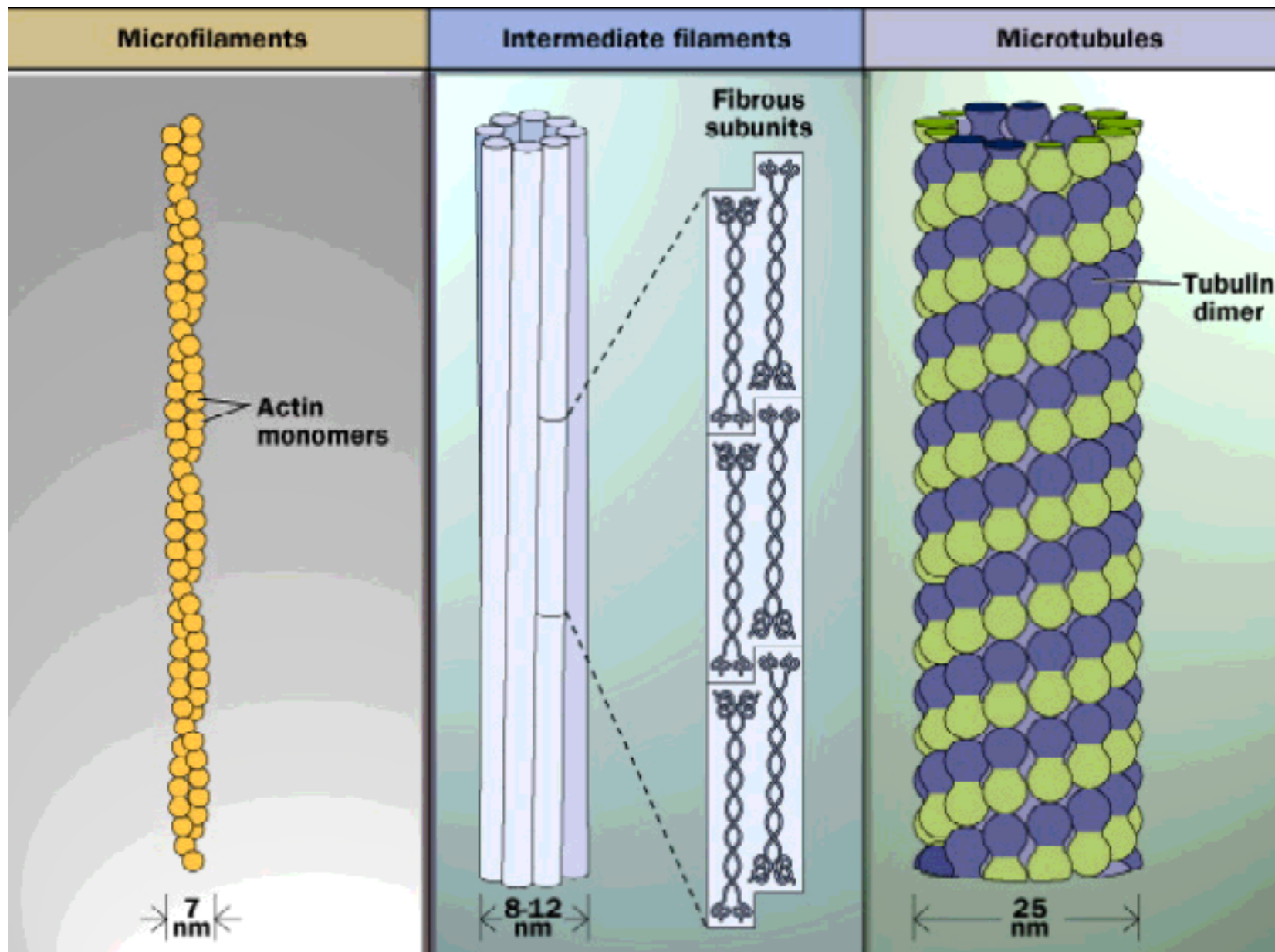




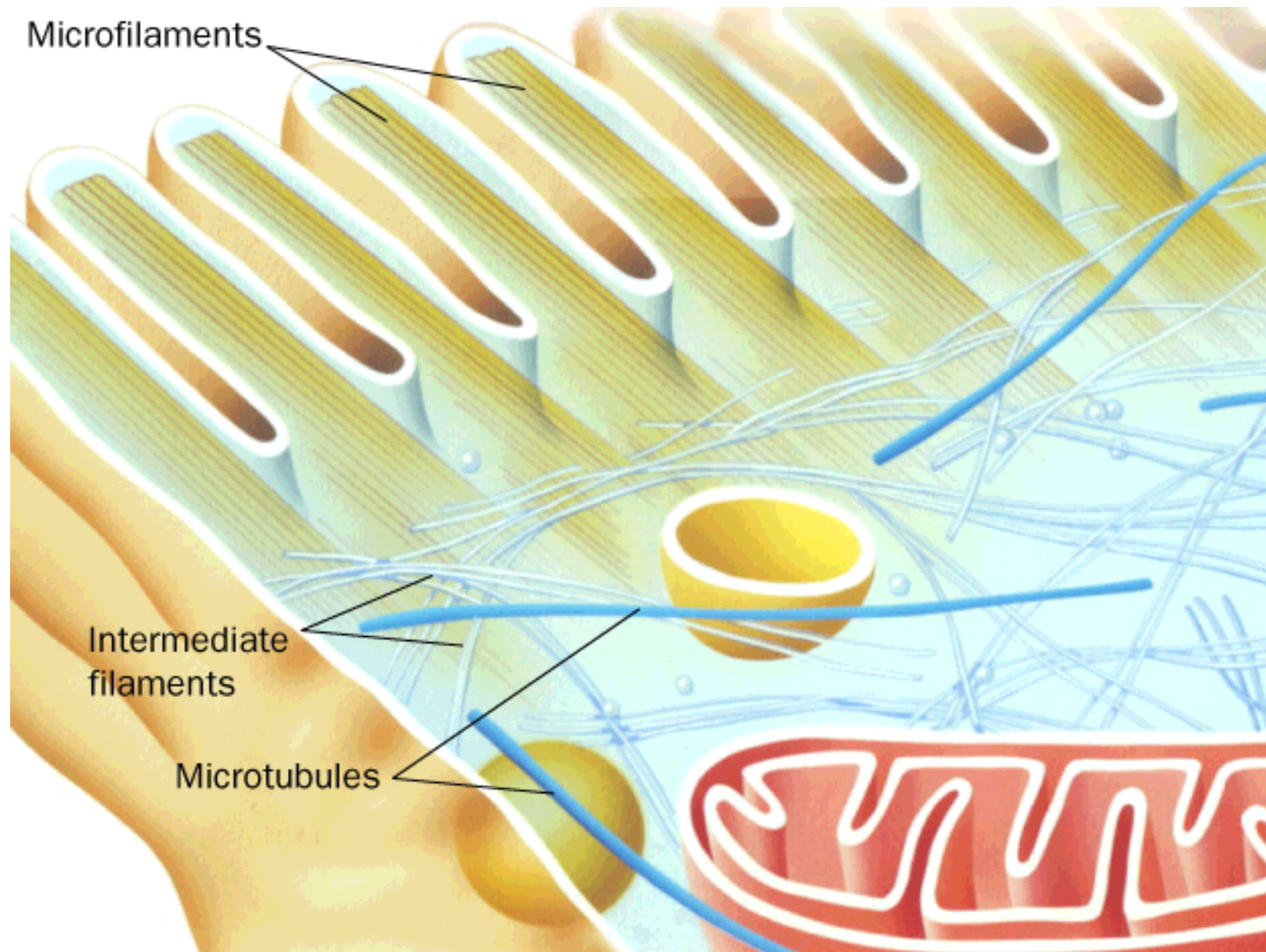








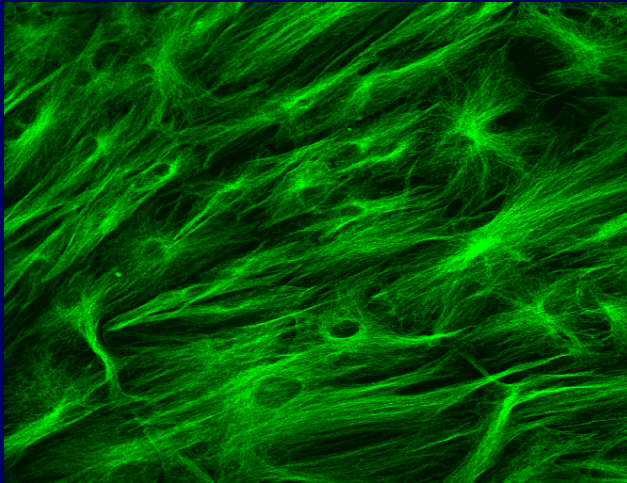




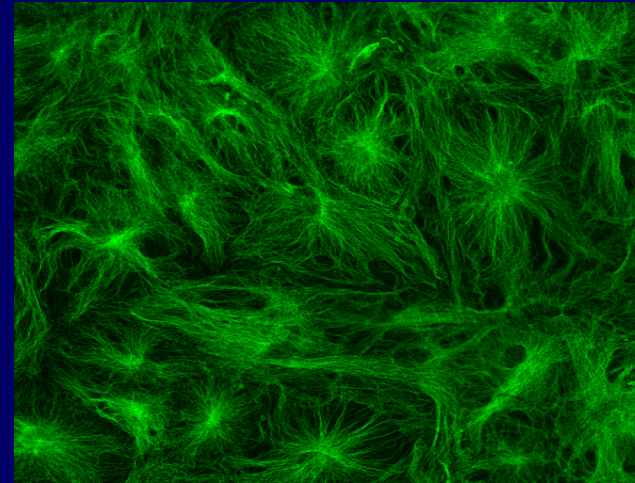


# Microscopio confocal de fluorescencia

## Organización de Tubulina



**Basal**



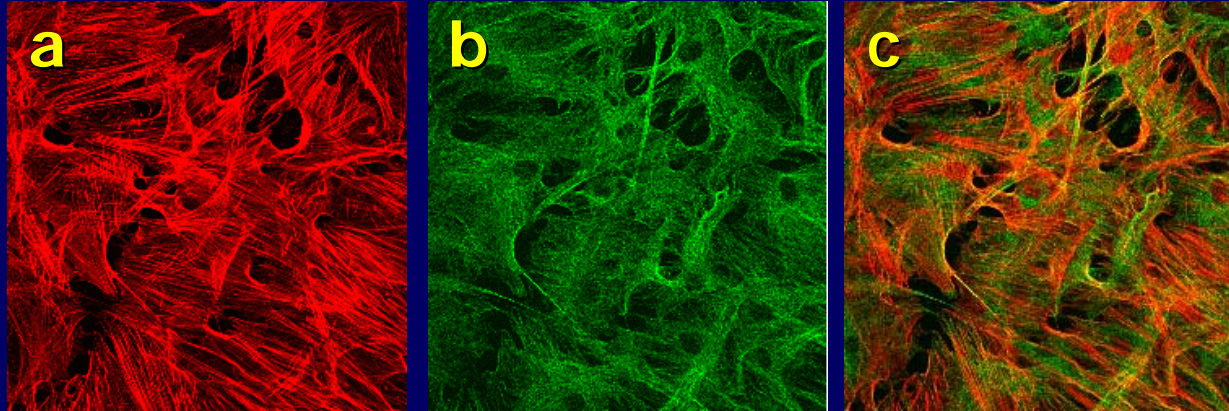
**Diferenciación  
Osteogénica**

Tinción para tubulina en células troncales mesenquimáticas humanas en condiciones basales y de diferenciación osteogénica.

Para la tinción se utilizó un anticuerpo monoclonal anti tubulina y un segundo anticuerpo conjugado con fluoresceína.

## Doble tinción: Actina y tubulina.

Osteogénesis  
24h



La tubulina se evidencia con un anticuerpo monoclonal anti tubulina y segundo anticuerpo conjugado con fluoresceína (verde).

La actina se marca con faloidina (rojo).

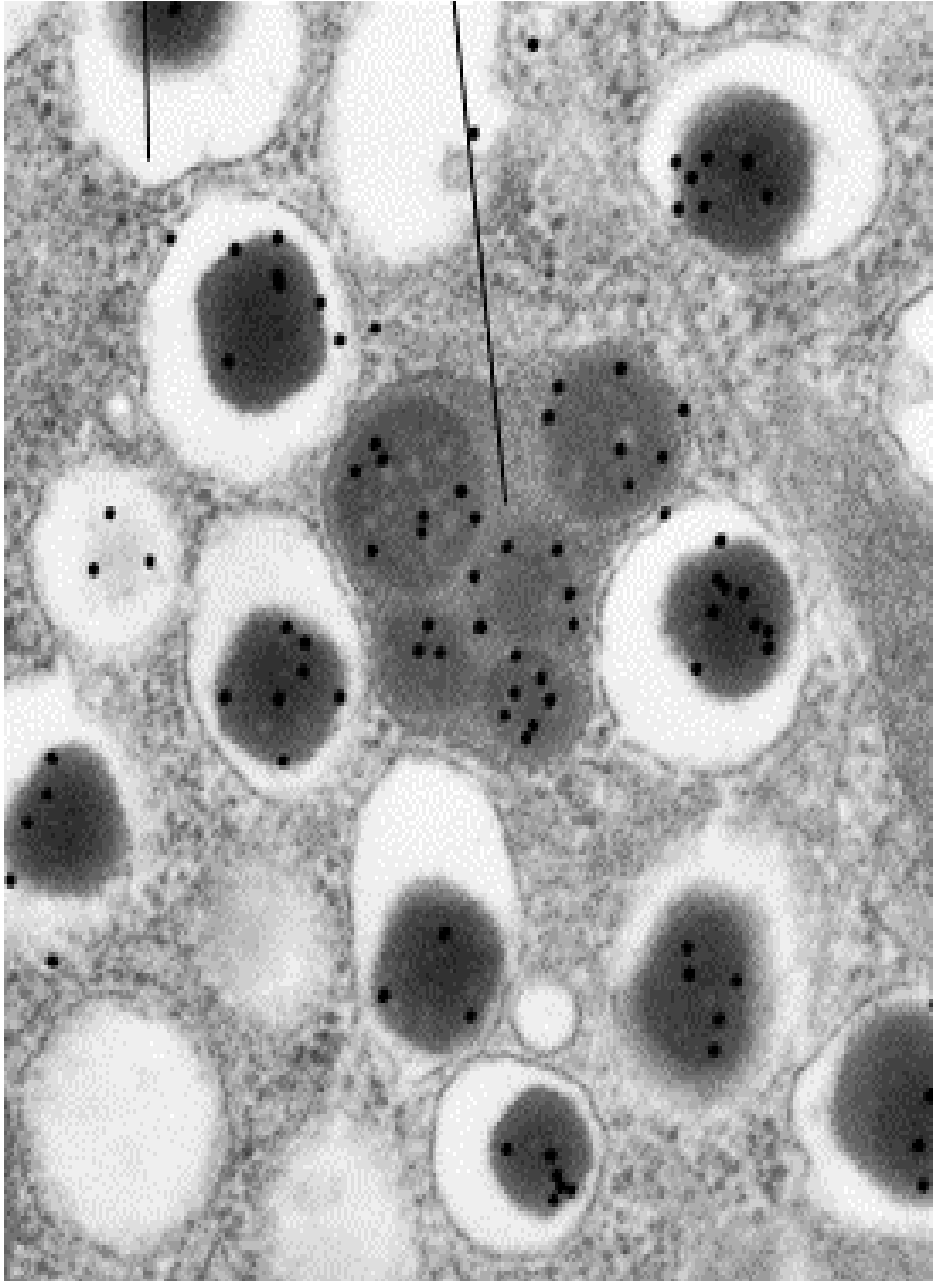
a,b,c. Diferenciación osteogénica



# **Microscopía Electrónica**

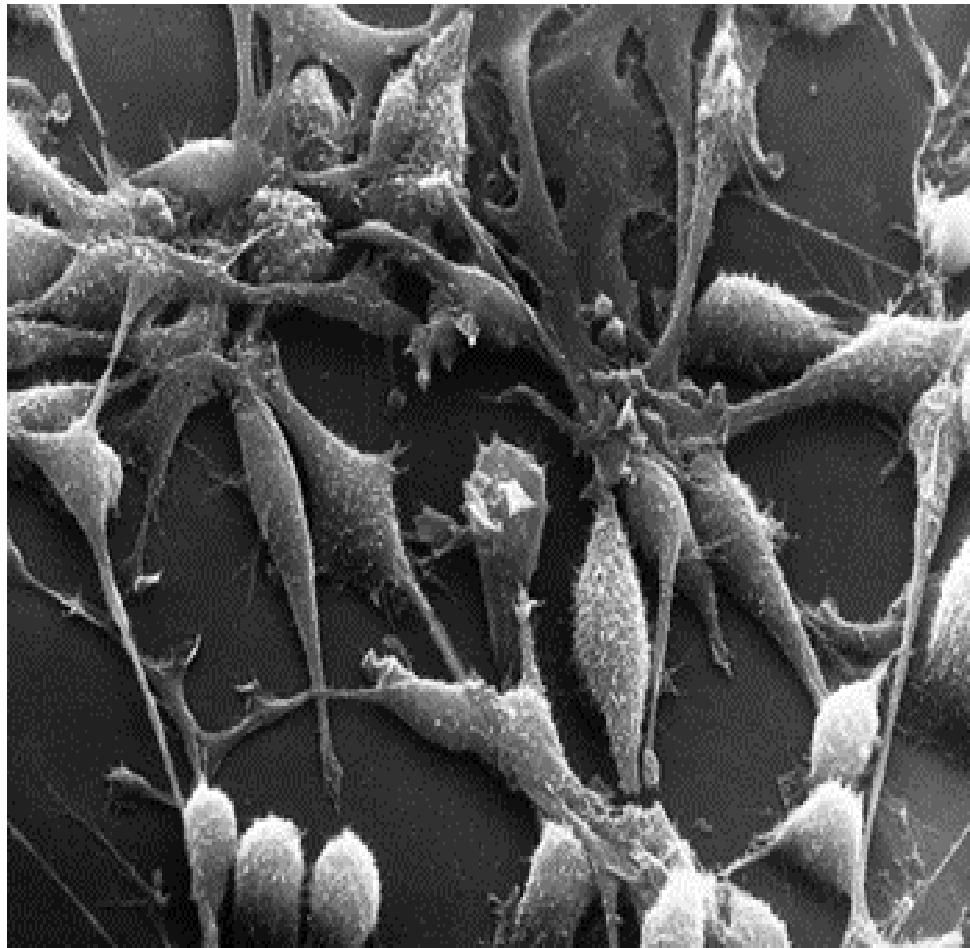
**1. Transmisión**

**2. Barrido**



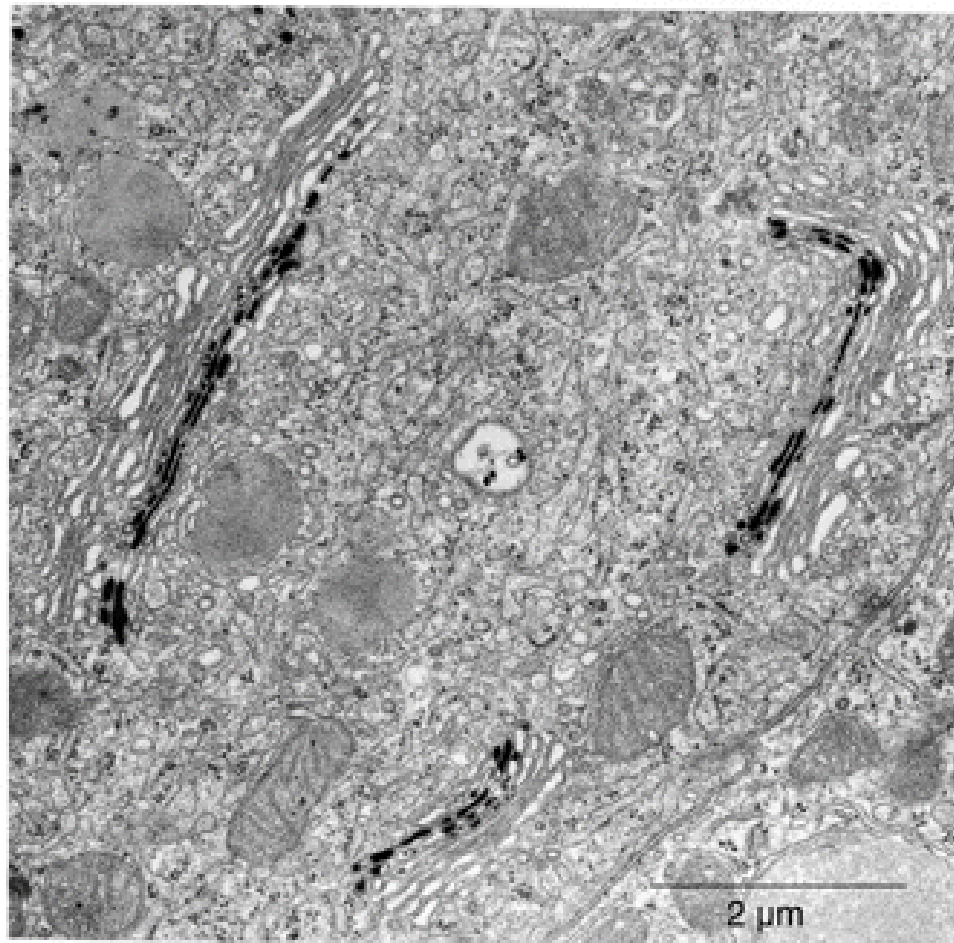
**ME con inmuno-oro:**  
Célula  $\beta$  del páncreas.  
Insulina se marcó con Ac anti-I unidas a esferas de oro coloidal. La I está almacenada en vesículas secretoras como material denso. Algunos están siendo degradados en los Lisosomas.





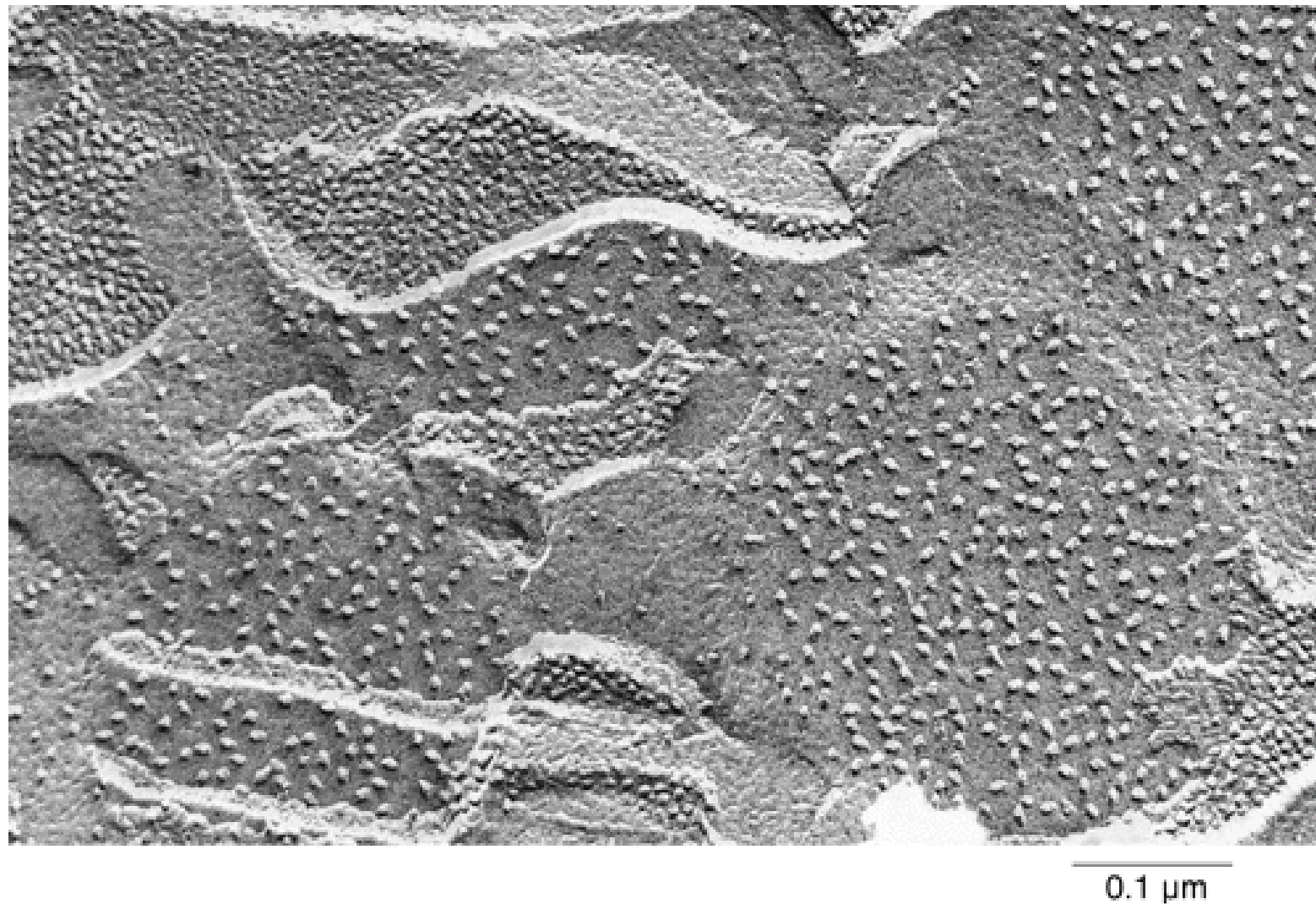
10  $\mu\text{m}$

**Figure 4-32. Cells in culture.** Scanning electron micrograph of rat fibroblasts growing on the plastic surface of a tissue-culture dish. (Courtesy of Guenter Albrecht-Buehler.)



**Figure 4-21.** Electron micrograph of a cell showing the location of a particular enzyme (nucleotide diphosphatase) in the Golgi apparatus. A thin section of the cell was incubated with a substrate that formed an electron-dense precipitate upon reaction with the enzyme. (Courtesy of Daniel S. Friend.)





**Figure 4-26.** Freeze-fracture electron micrograph of the thylakoid membranes from the chloroplast of a plant cell. These membranes, which carry out photosynthesis, are stacked up in multiple layers (see [Figure 14-39](#)). The plane of the fracture has moved from layer to layer, passing through the middle of each lipid bilayer and exposing transmembrane proteins that have sufficient bulk in the interior of the bilayer

