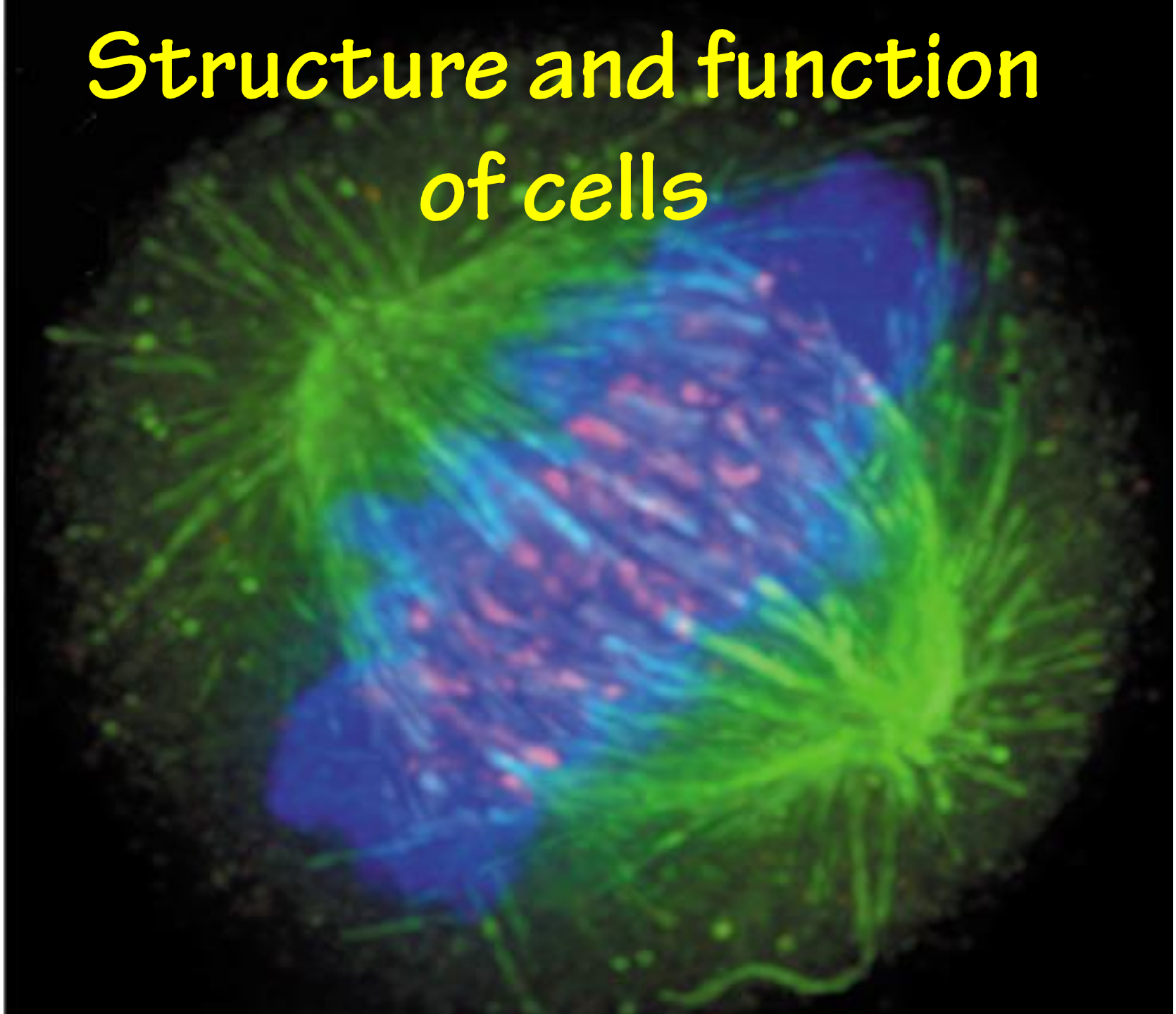
Structure and function of cells

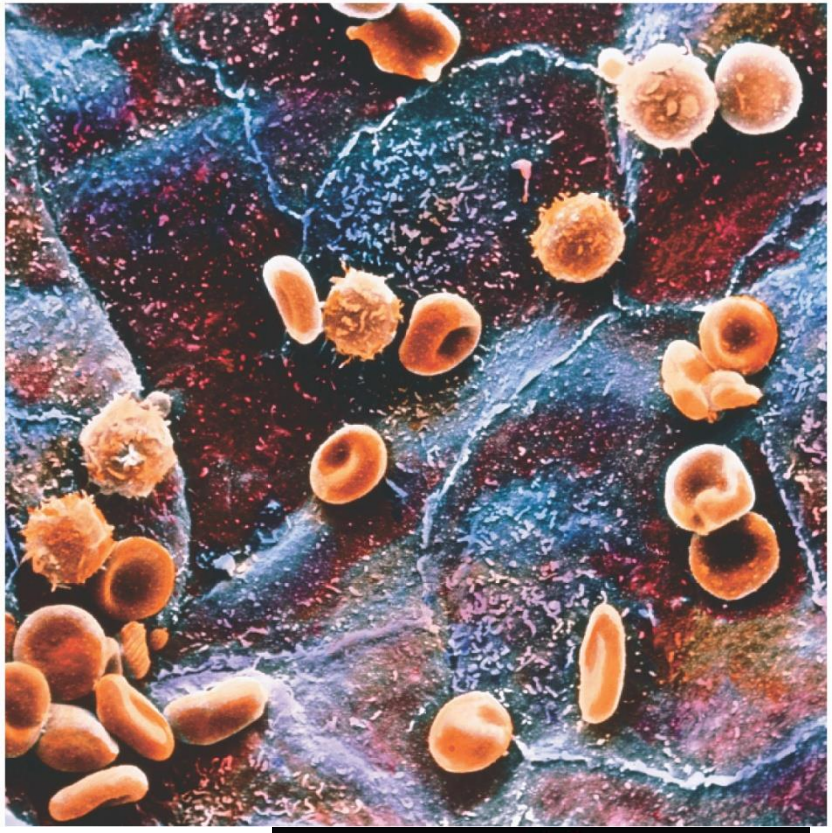


Cells are Us

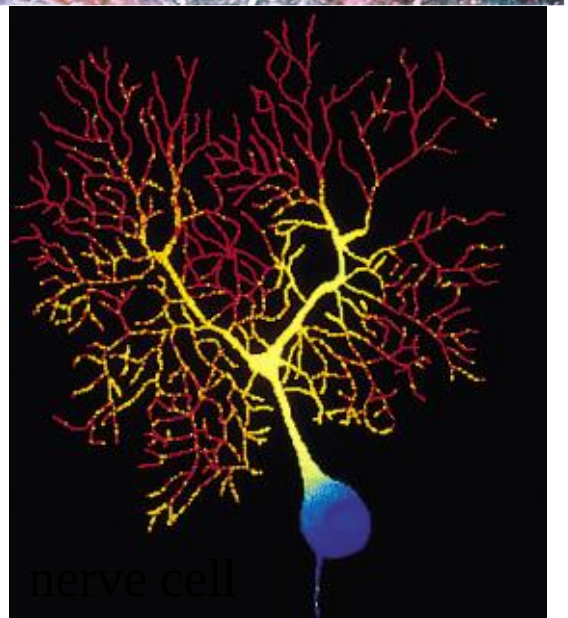
A person contains about 100 trillion cells. That's 100,000,000,000,000 or 1×10^{14} cells.

There are about 200 different cell types in mammals (one of us).

Cells are tiny, measuring on average about 0.002 cm (20 um) across. That's about 500 cells, "shoulder-to-shoulder" per centimetre.

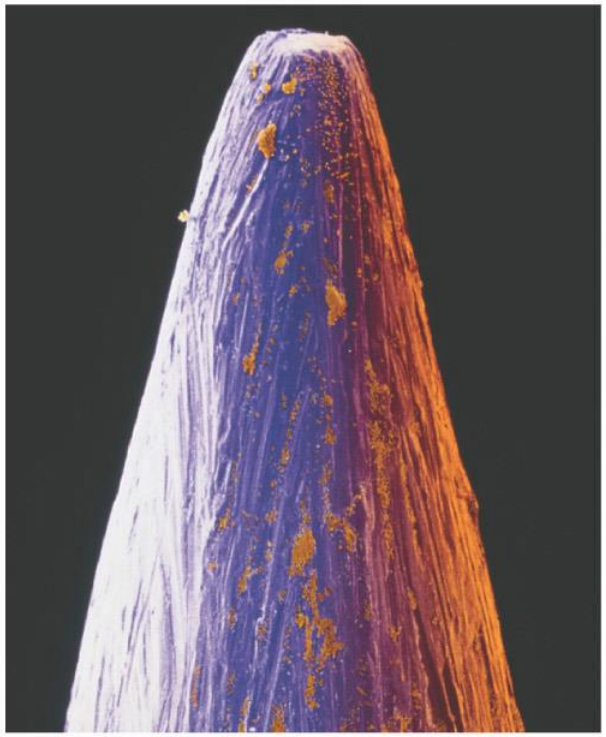


Red and white blood cells above vessel-forming cells.

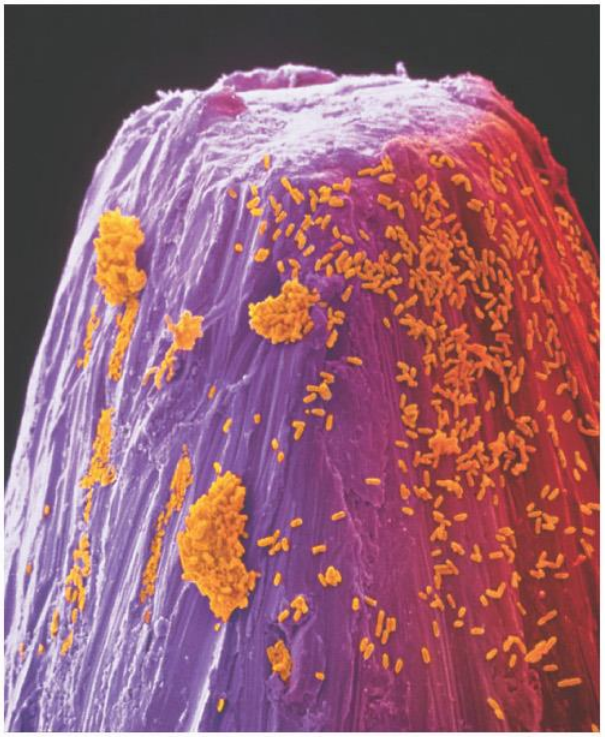


A Sense of Scale and Abundance – Bacteria on the Head of a Pin

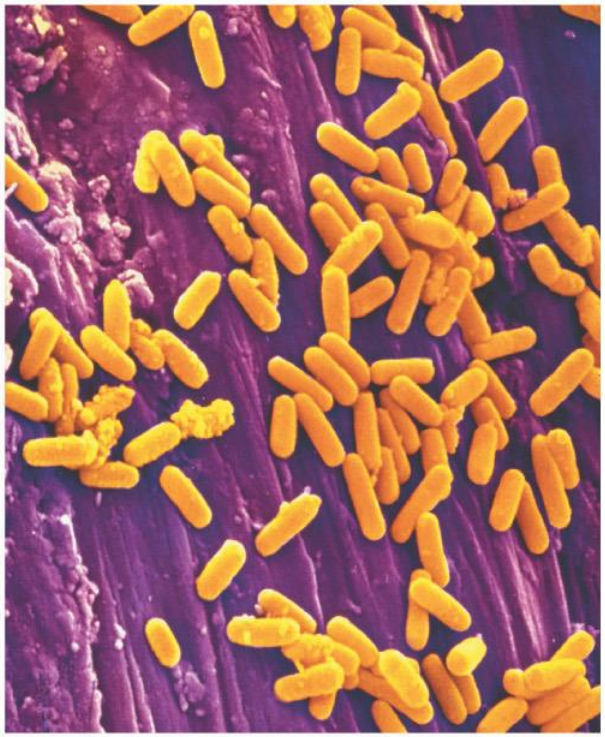
(a) Bacteria on a pin, magnified x 85



(b) Magnified x 425



(c) Magnified x 2100



The Cell Theory

The cell theory (proposed independently in 1838 and 1839) is a cornerstone of biology.

All organisms are composed of one or more cells.

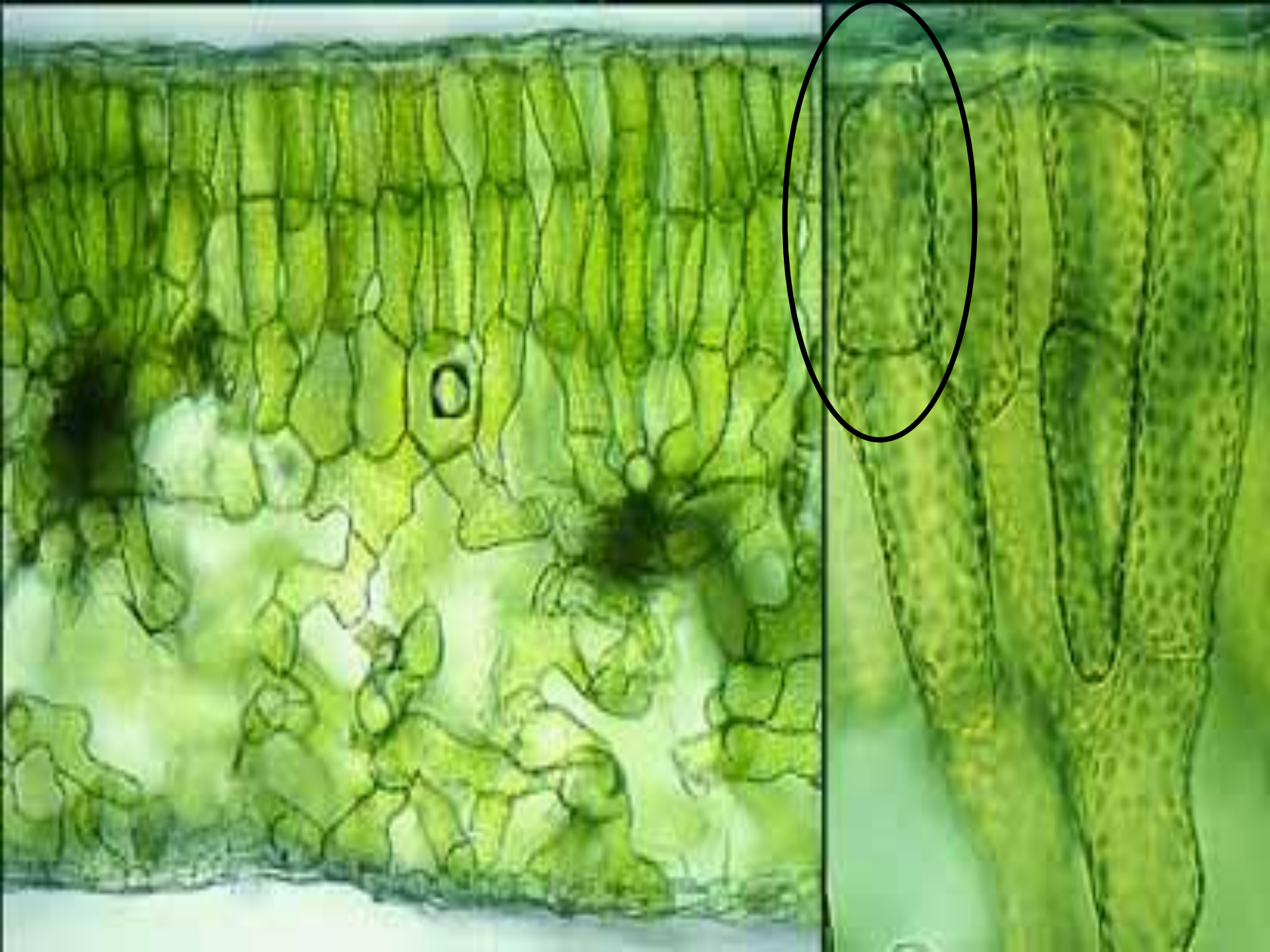
Cells are the smallest living things.

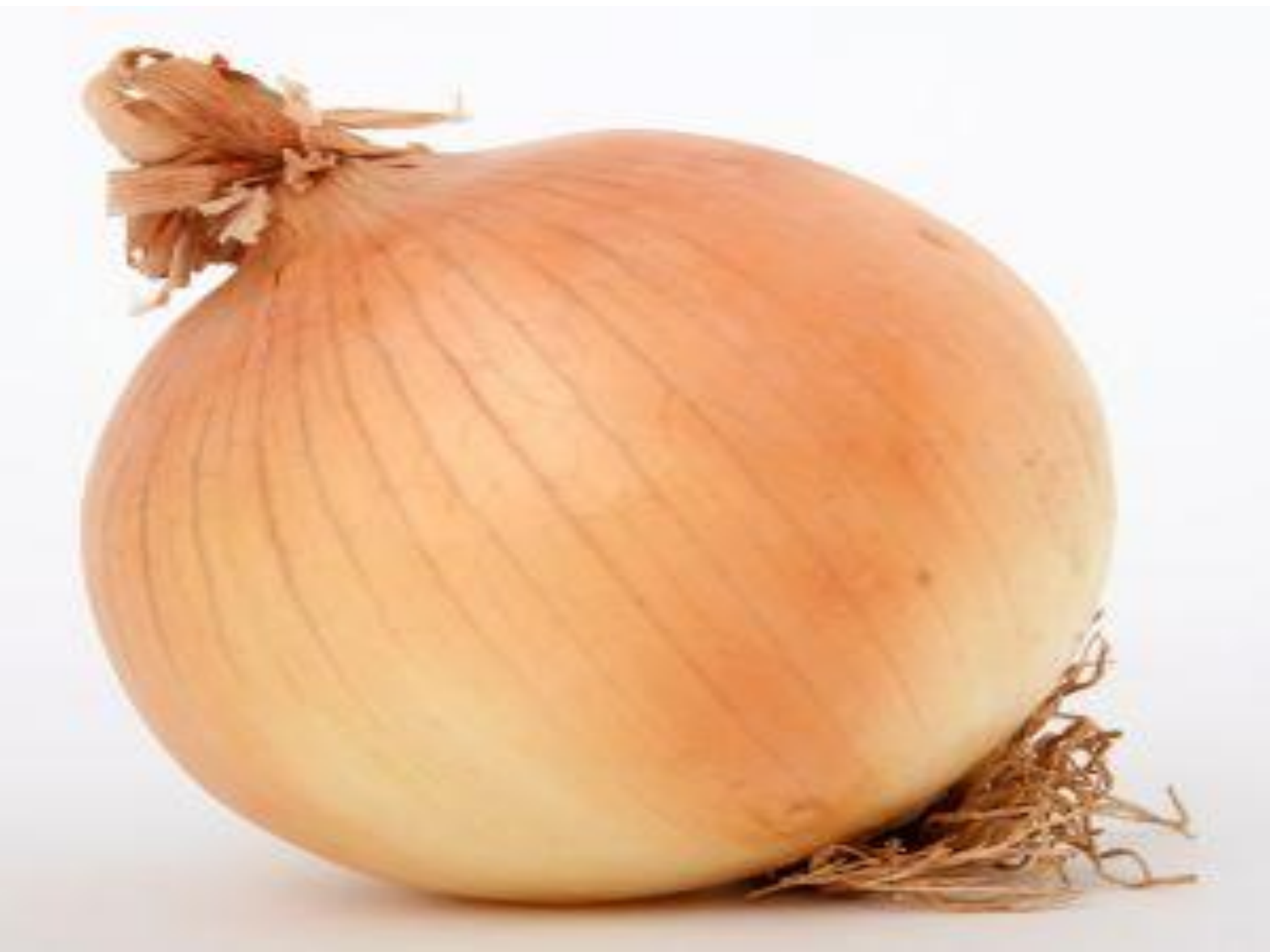
Cells arise only by division of previously existing cells.

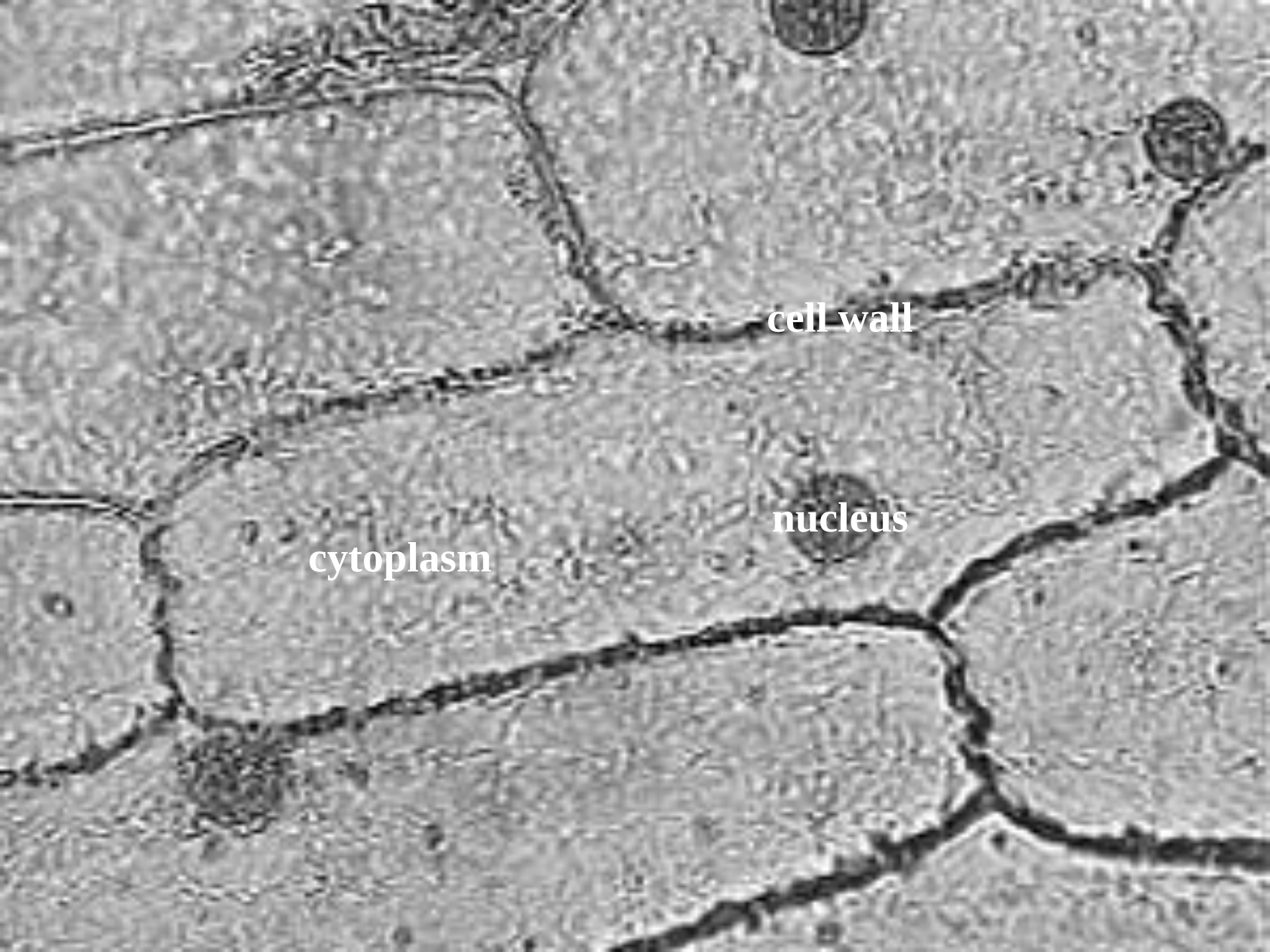
All organisms living today are descendents of an ancestral cell.

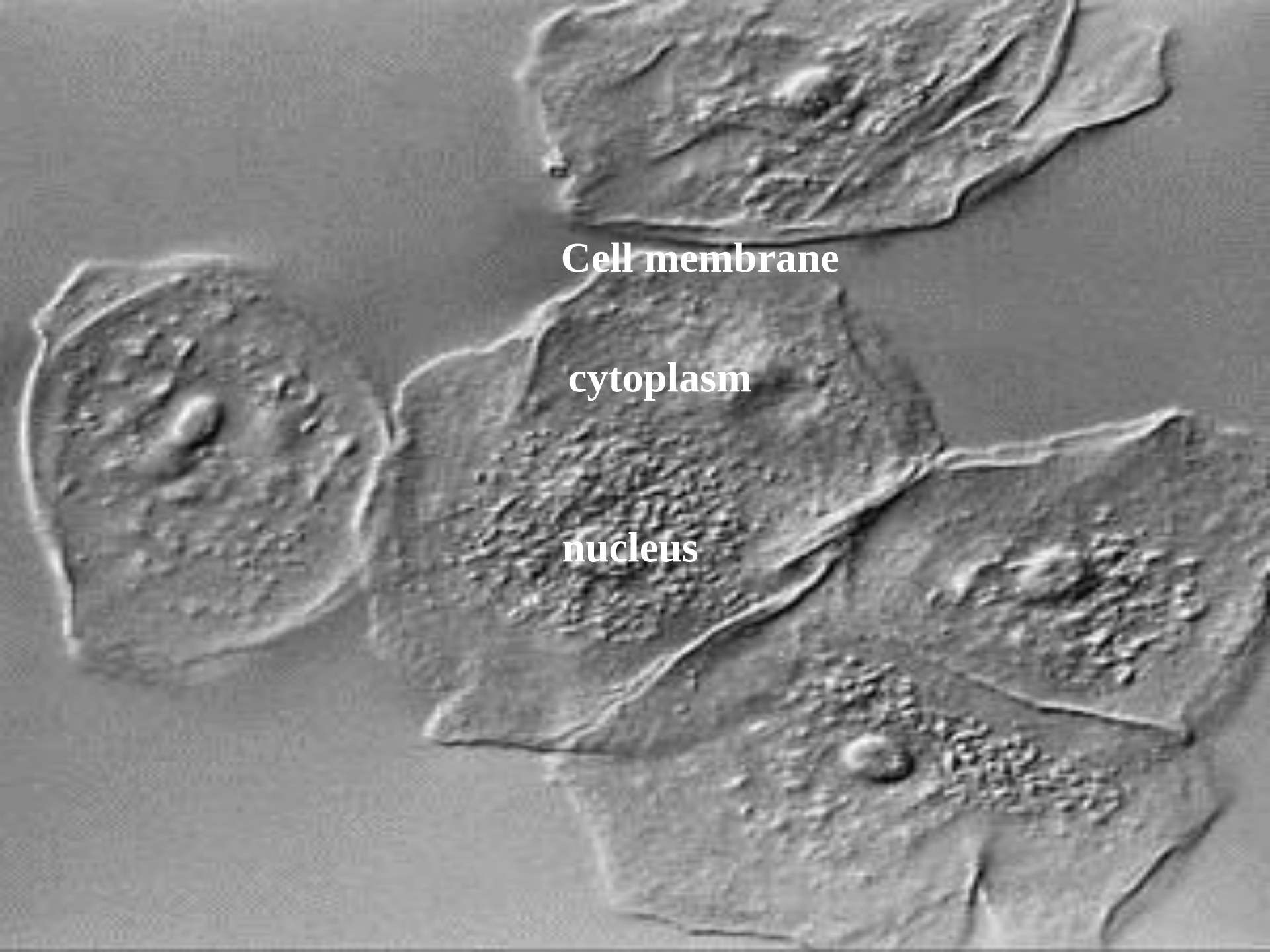
Schleiden

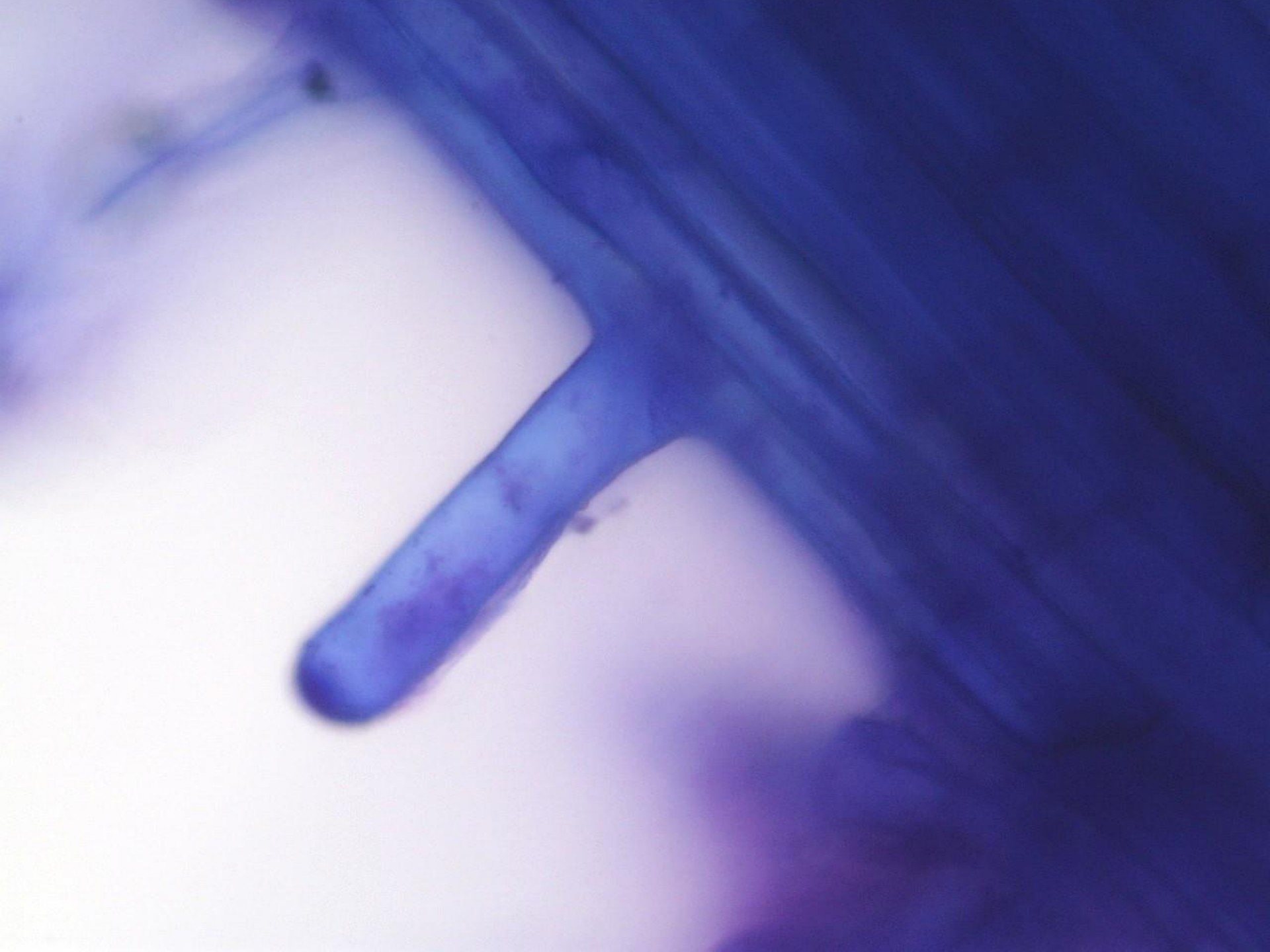
Schwann

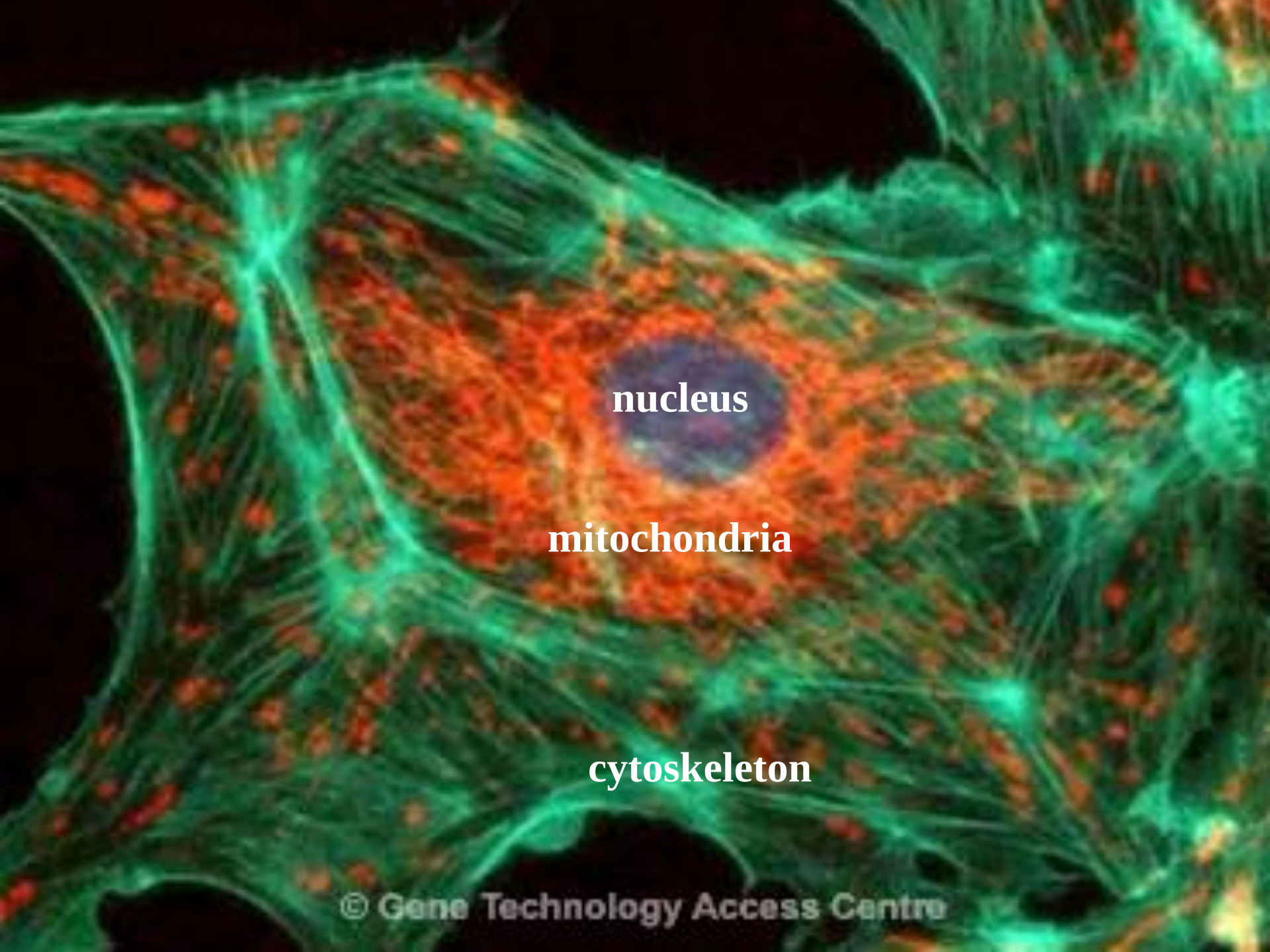


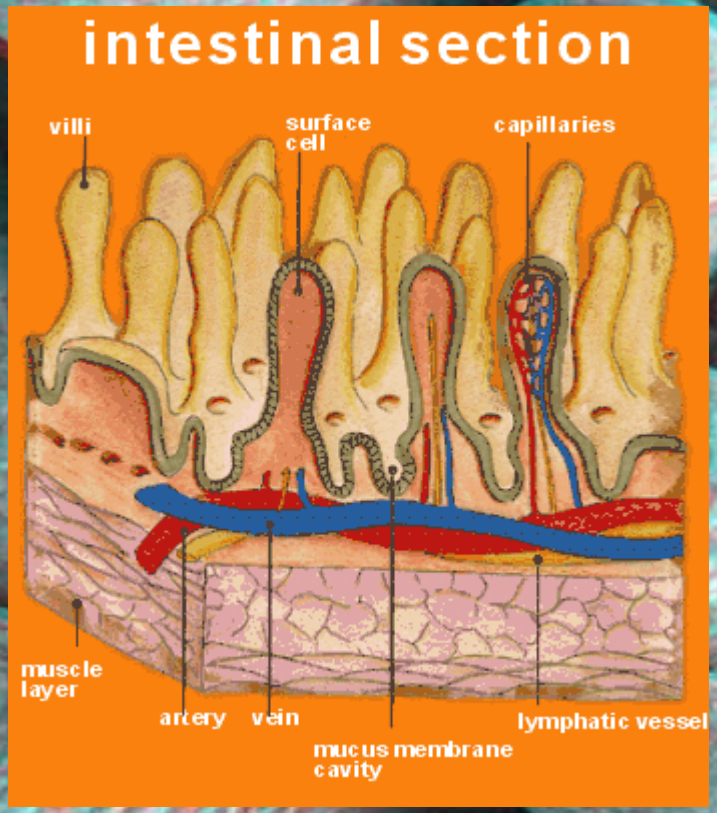


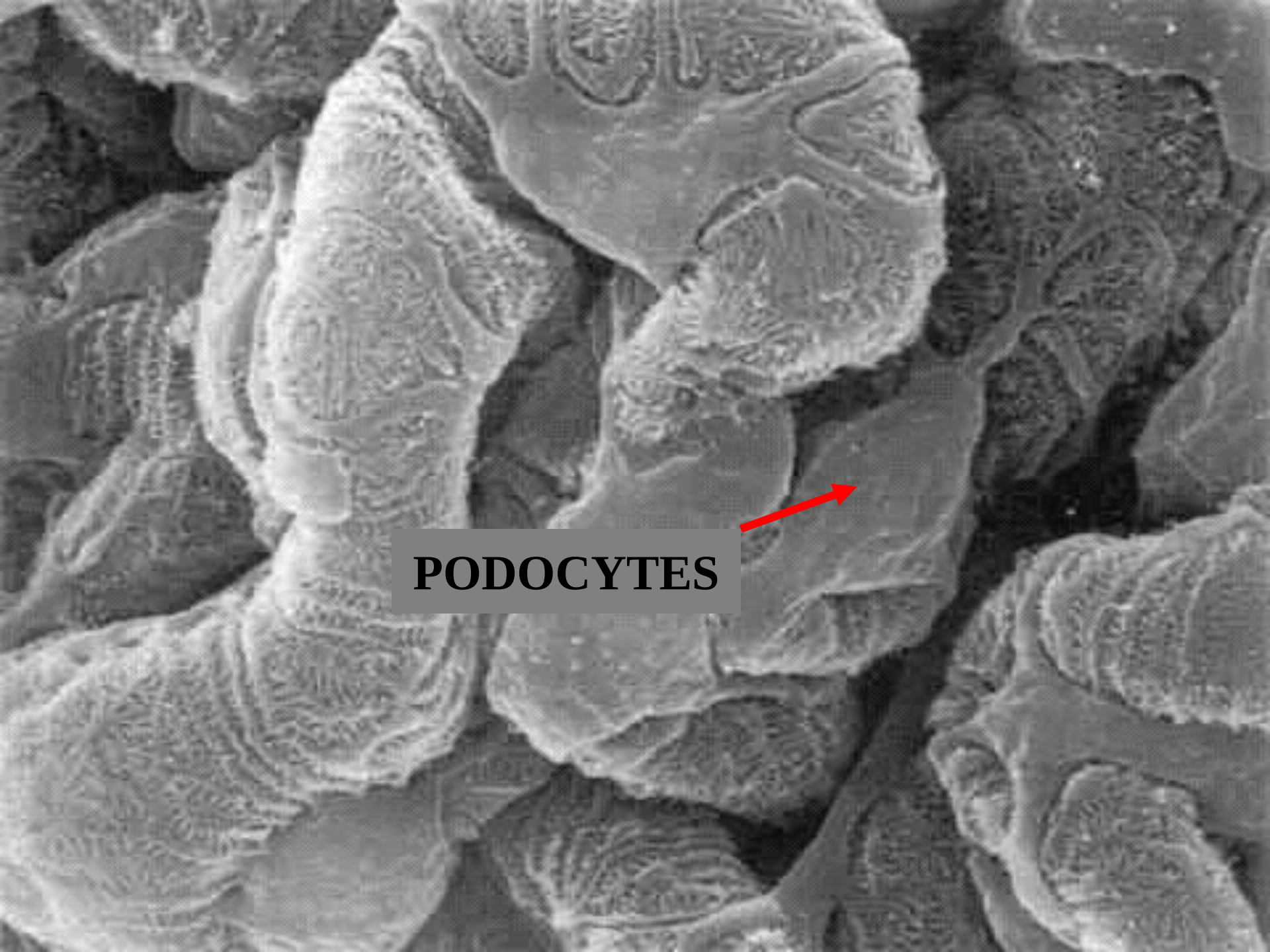

cell wall
nucleus
cytoplasm

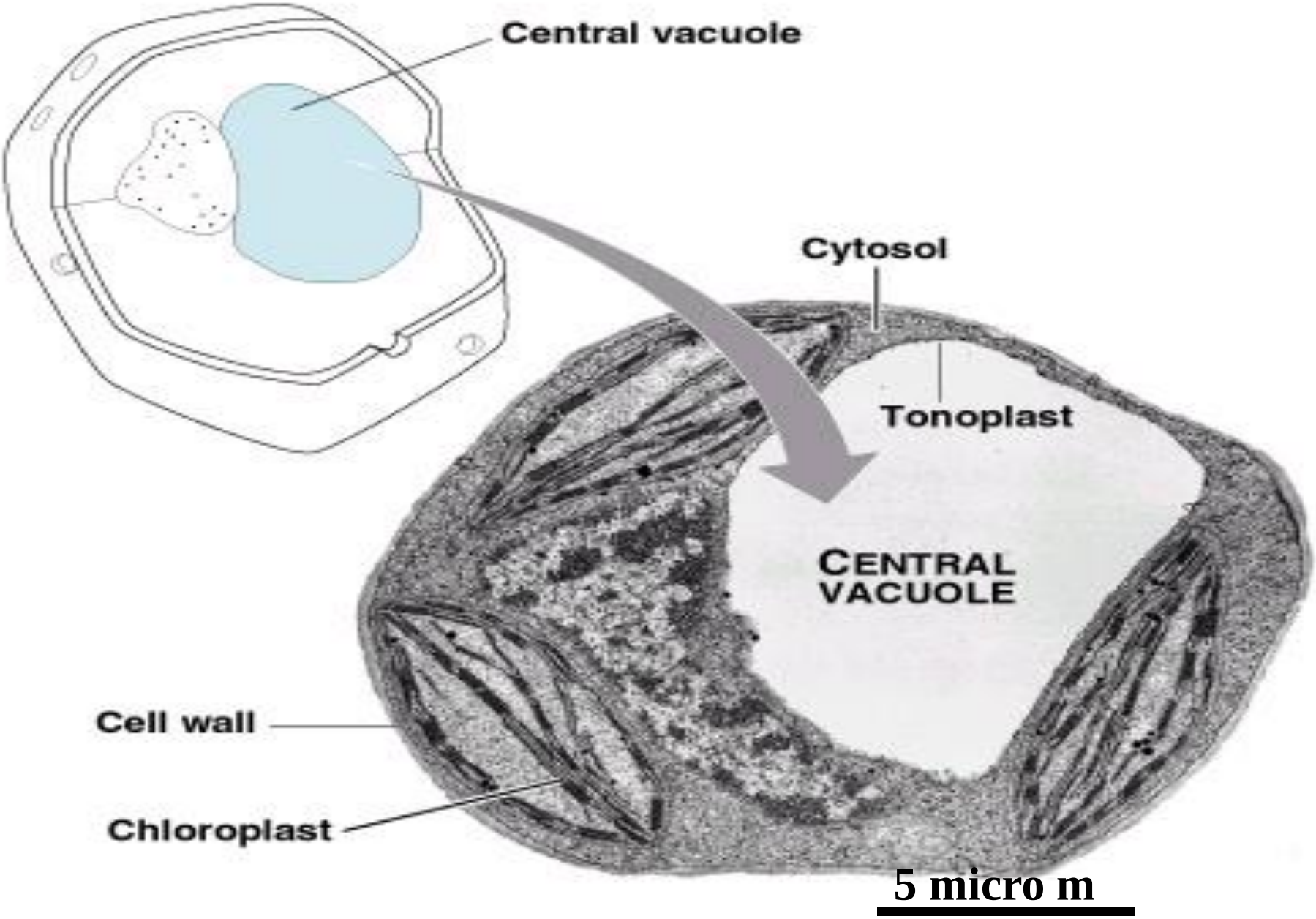

Cell membrane
cytoplasm
nucleus

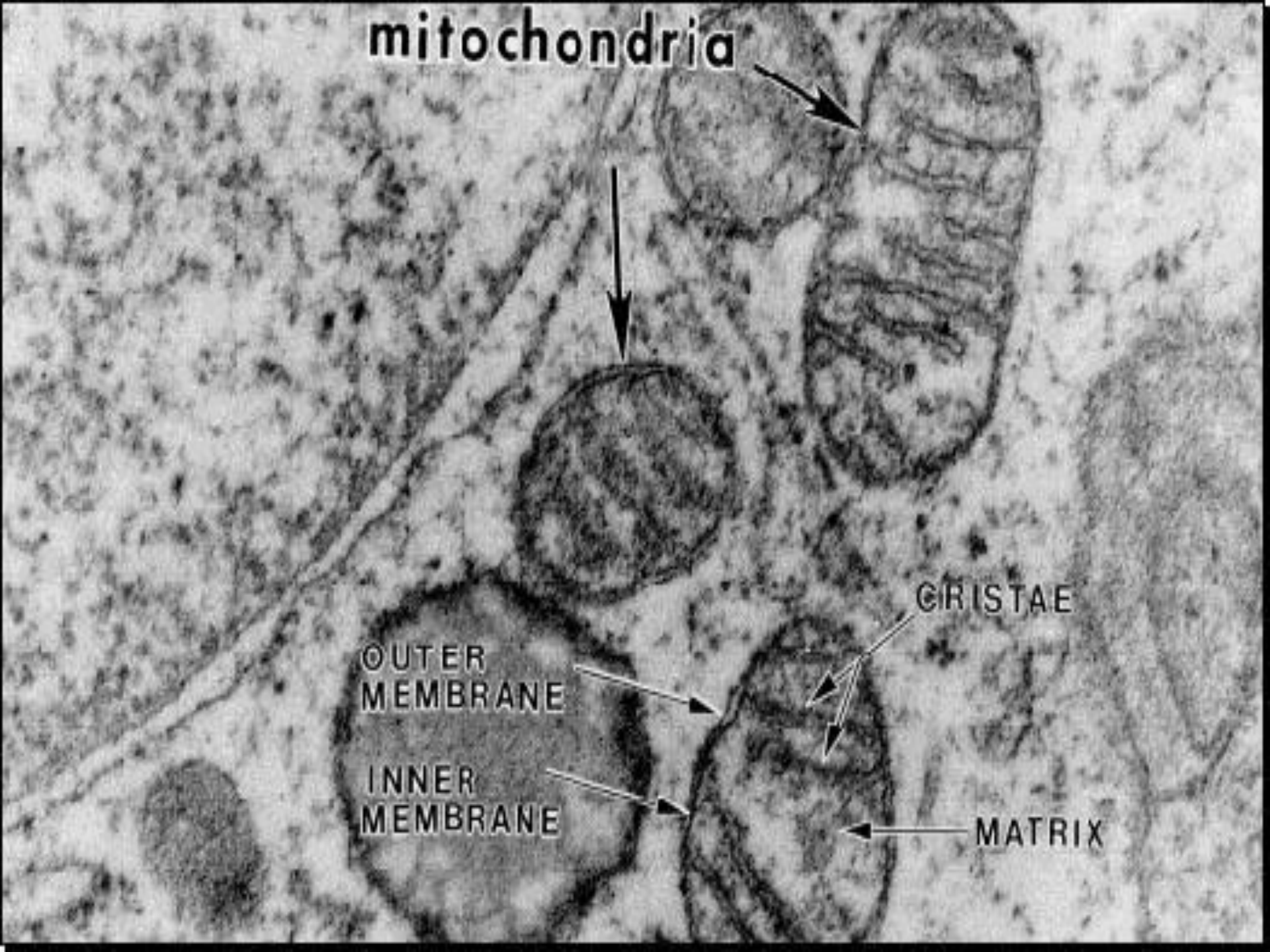


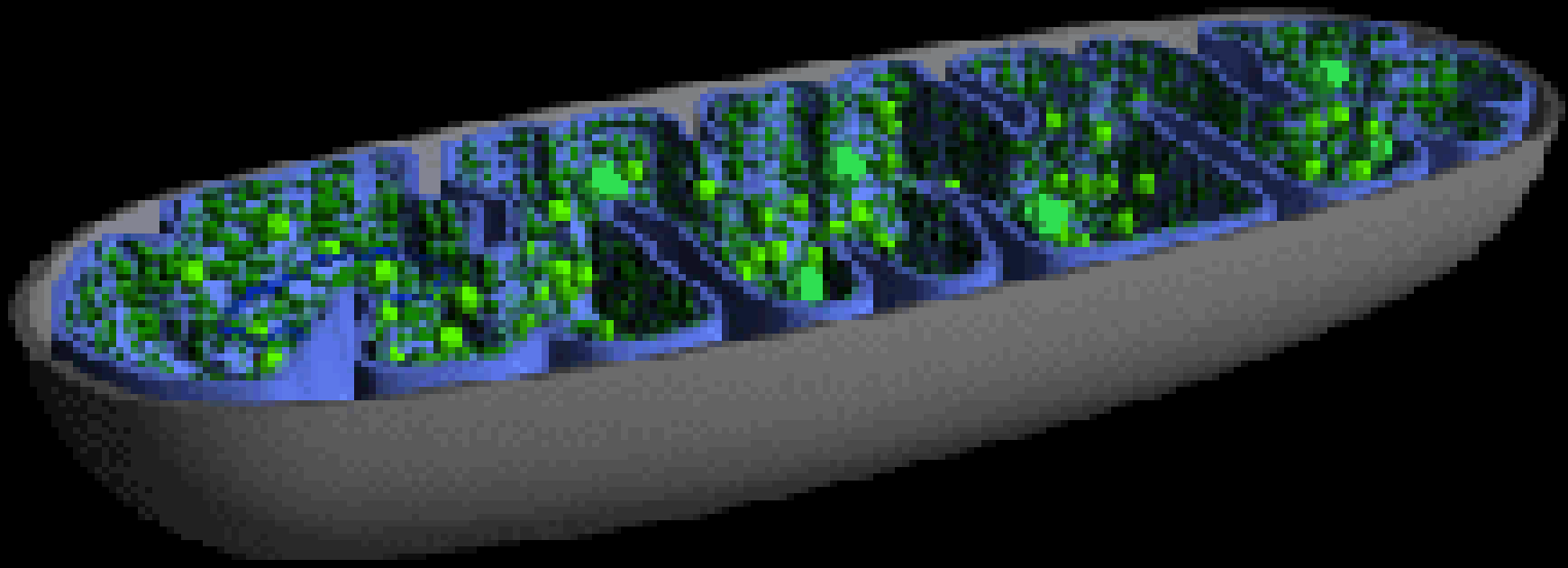

nucleus
mitochondria
cytoskeleton
© Gene Technology Access Centre


intestinal section
villi
surface cell
capillaries
muscle layer
artery
vein
mucus membrane
cavity
lymphatic vessel

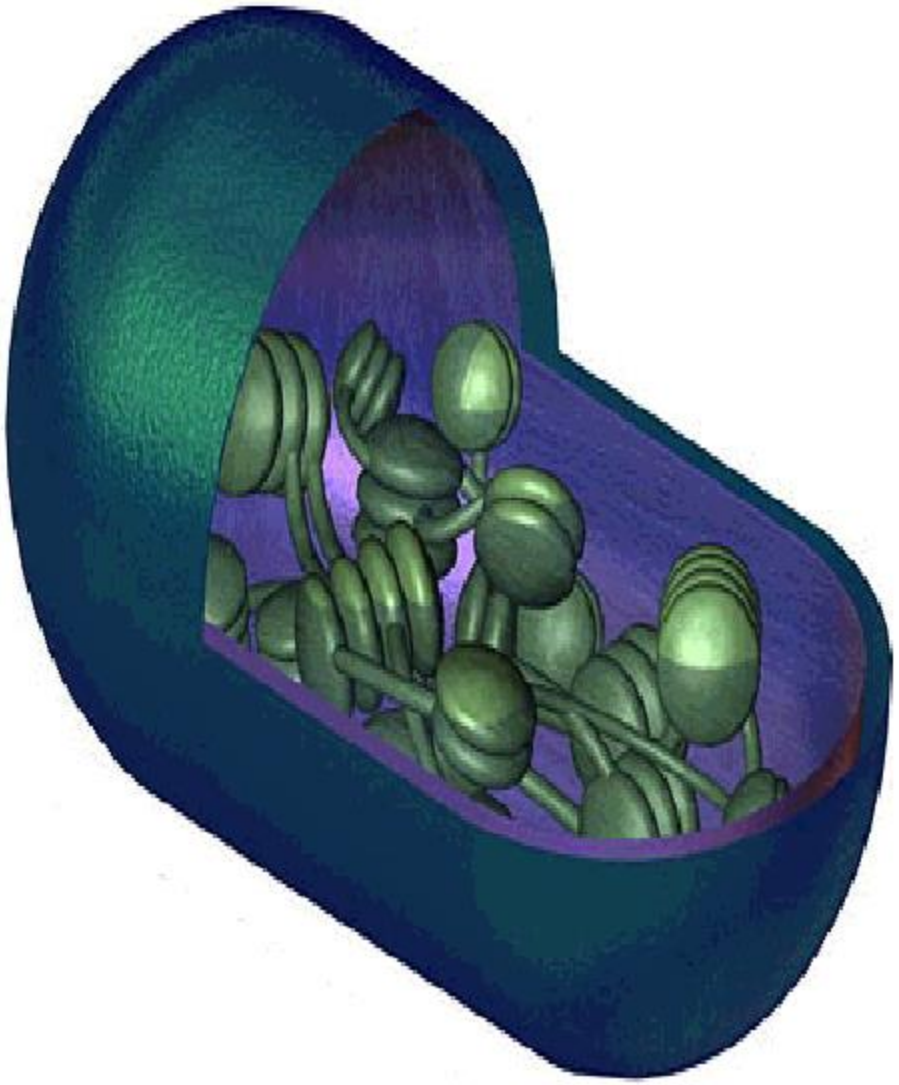

PODOCYTES


Central vacuole
Cytosol
Tonoplast
CENTRAL VACUOLE
Cell wall
Chloroplast
5 micro m

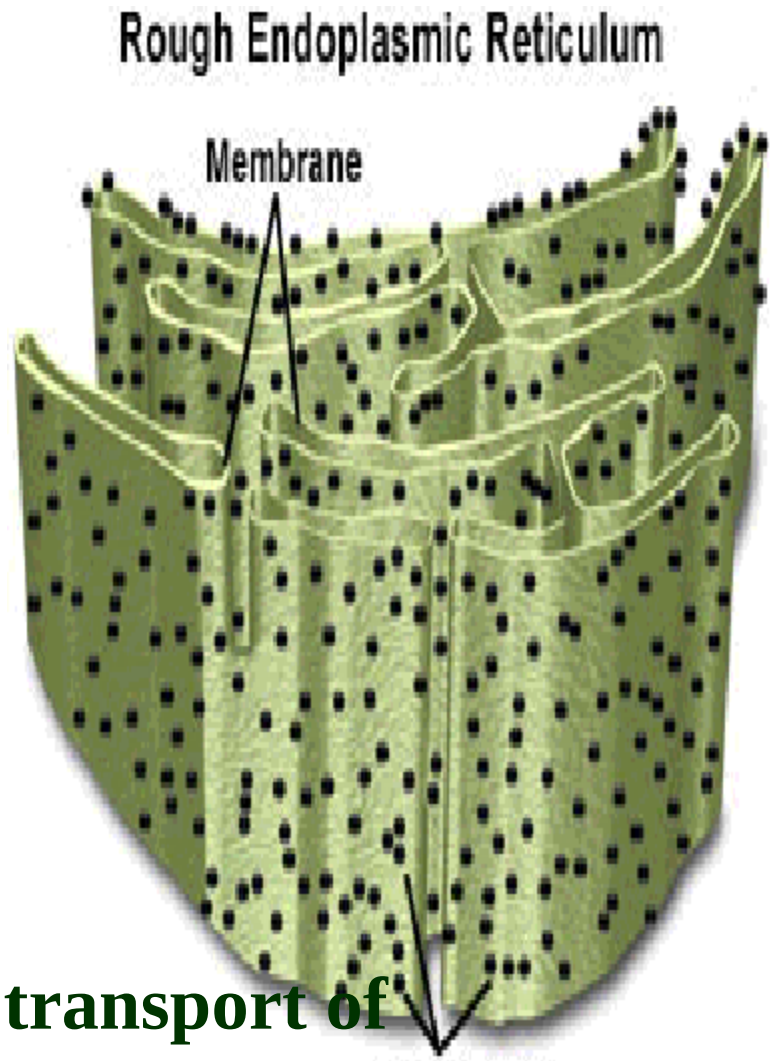

mitochondria
CRISTAE
OUTER MEMBRANE
INNER MEMBRANE
MATRIX



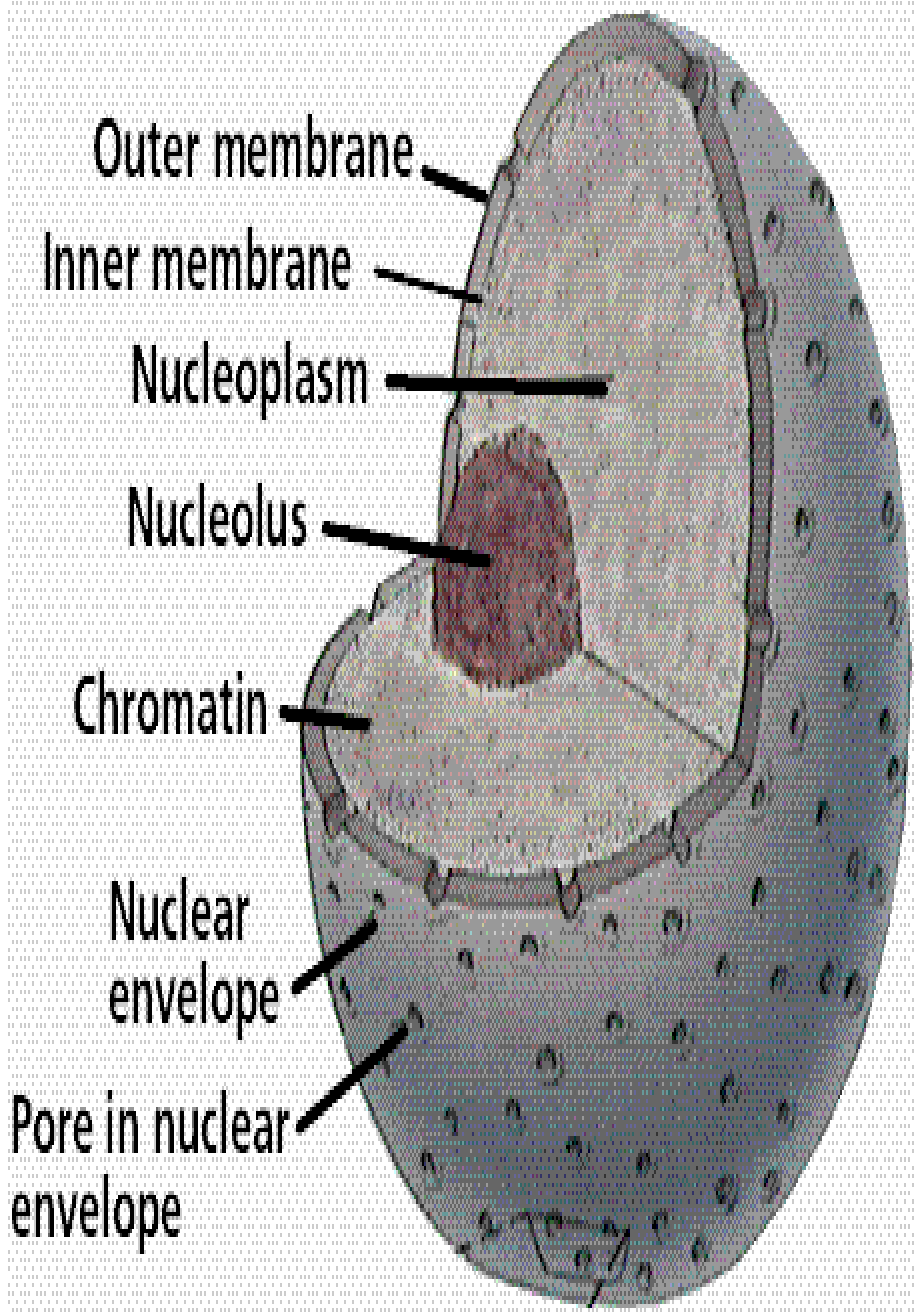
Aerobic respiration

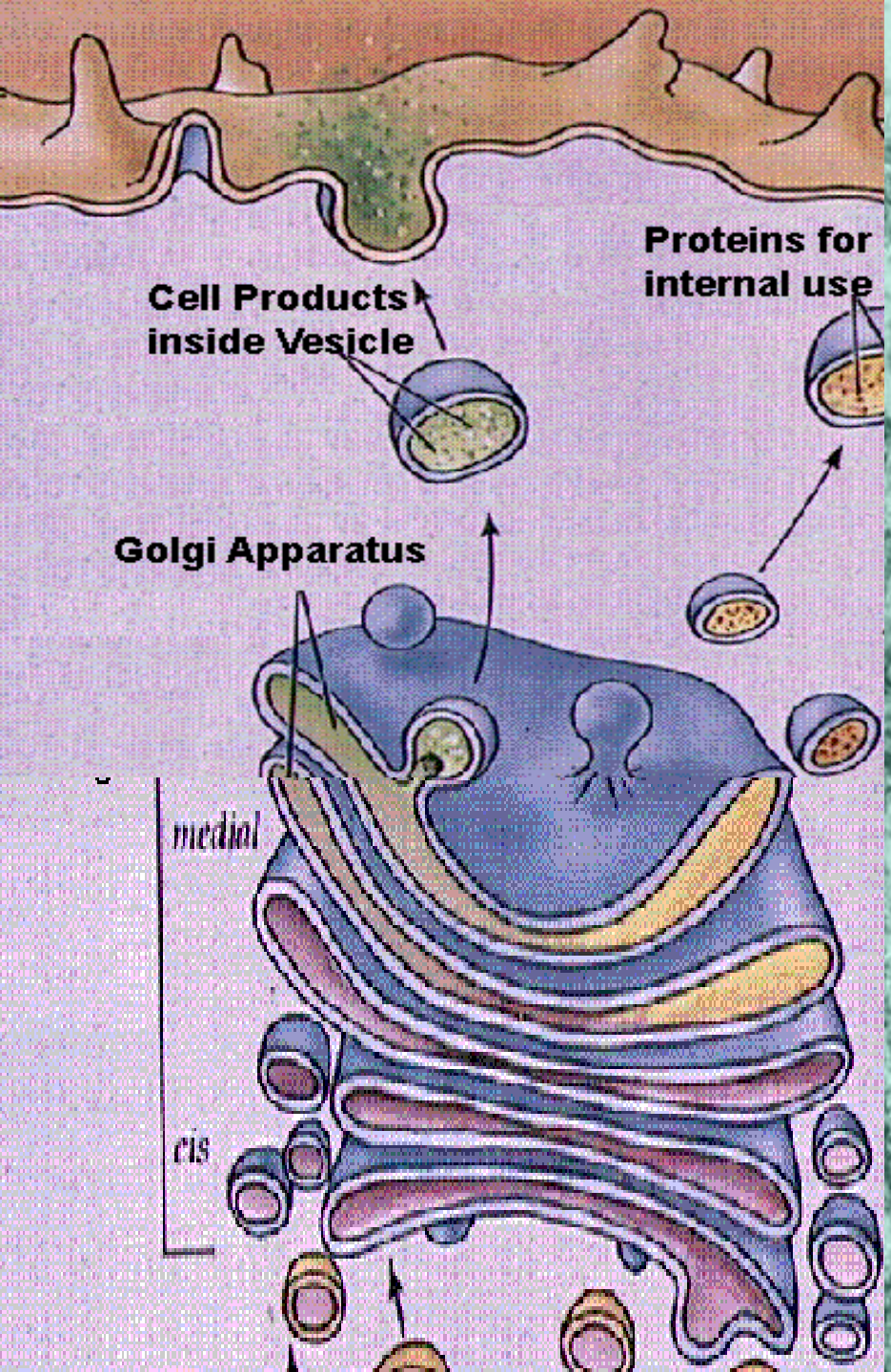


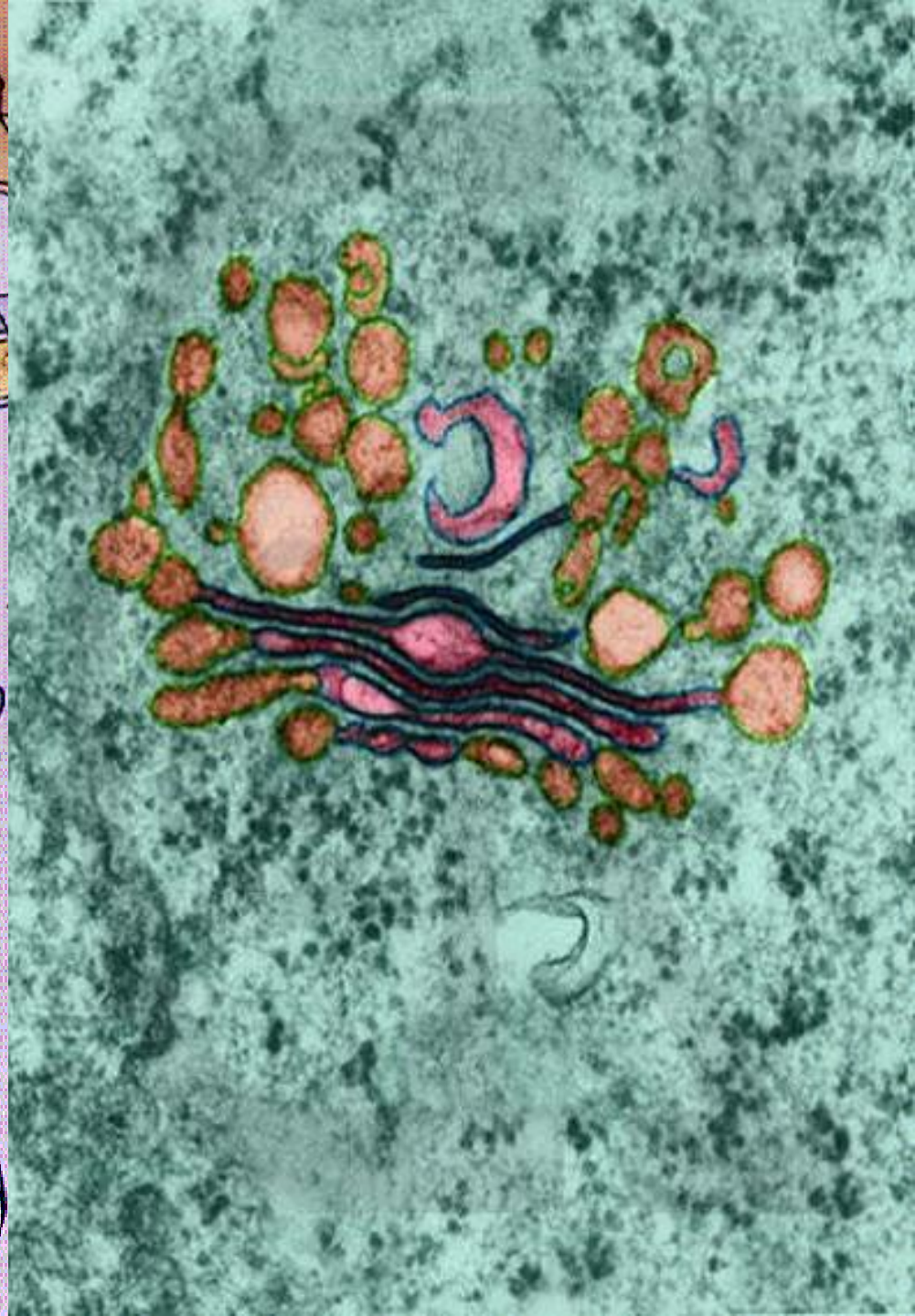
Photosynthesis

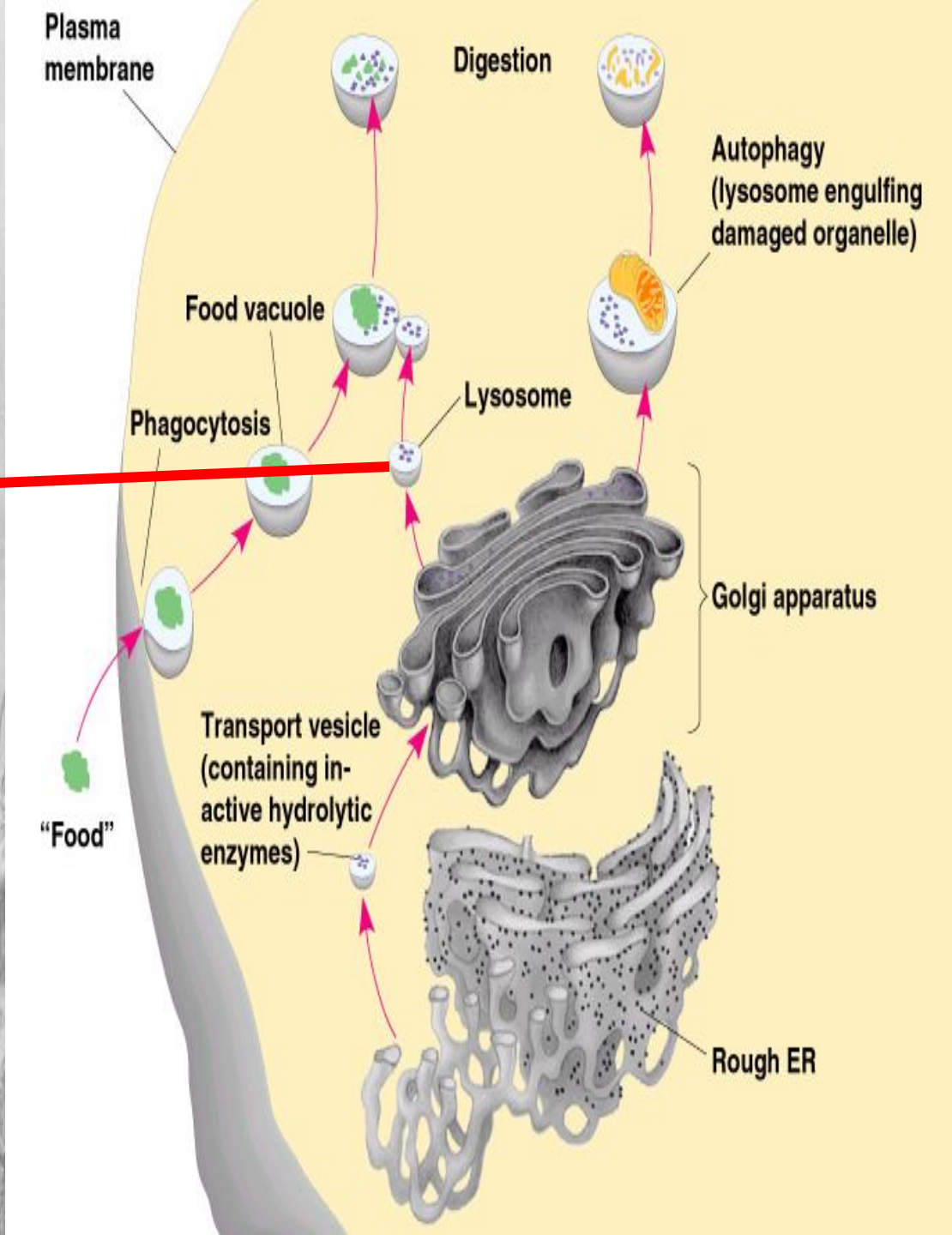


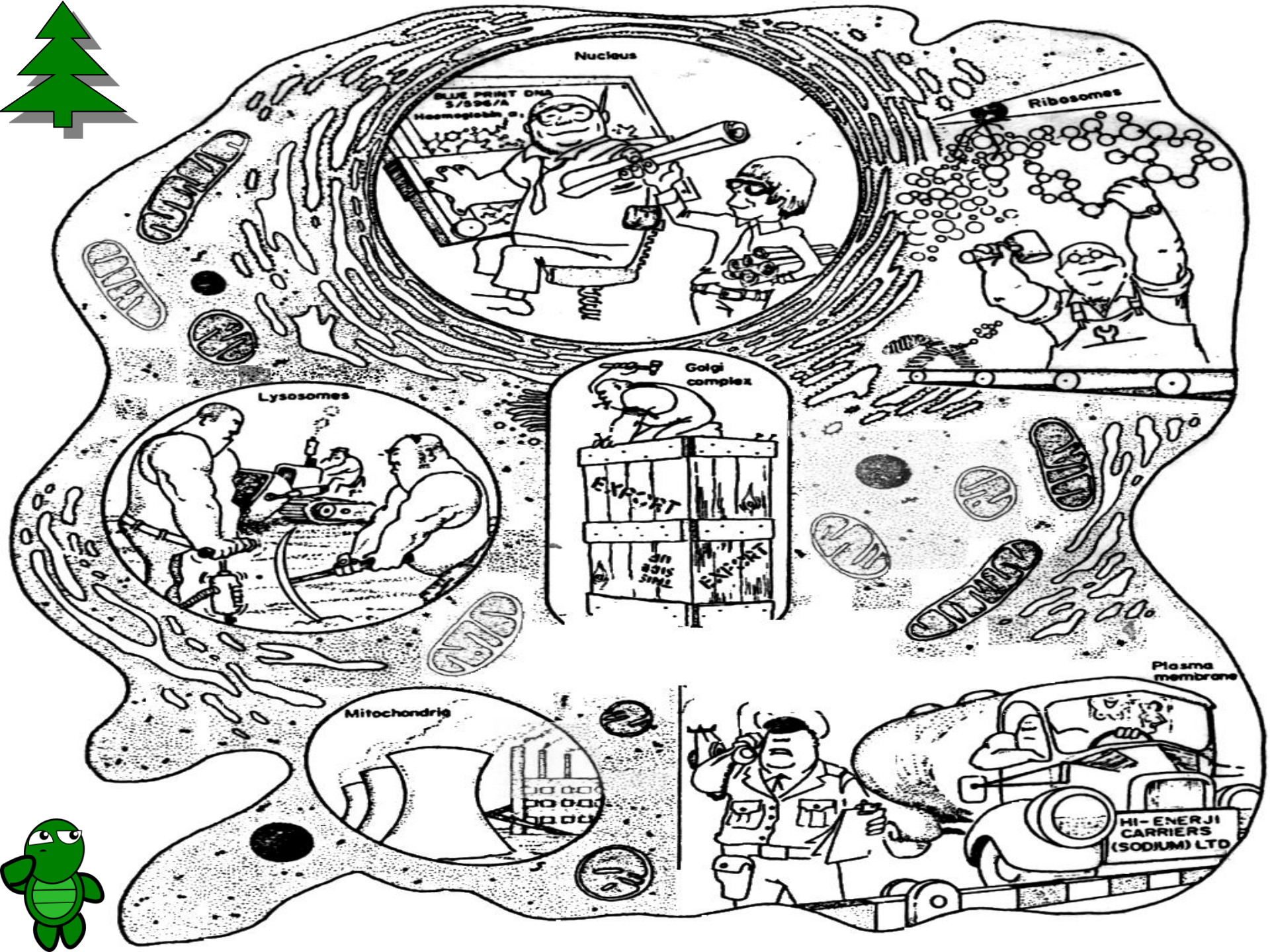
Synthesis and transport of protein(RER) and other macromolecules (SER)

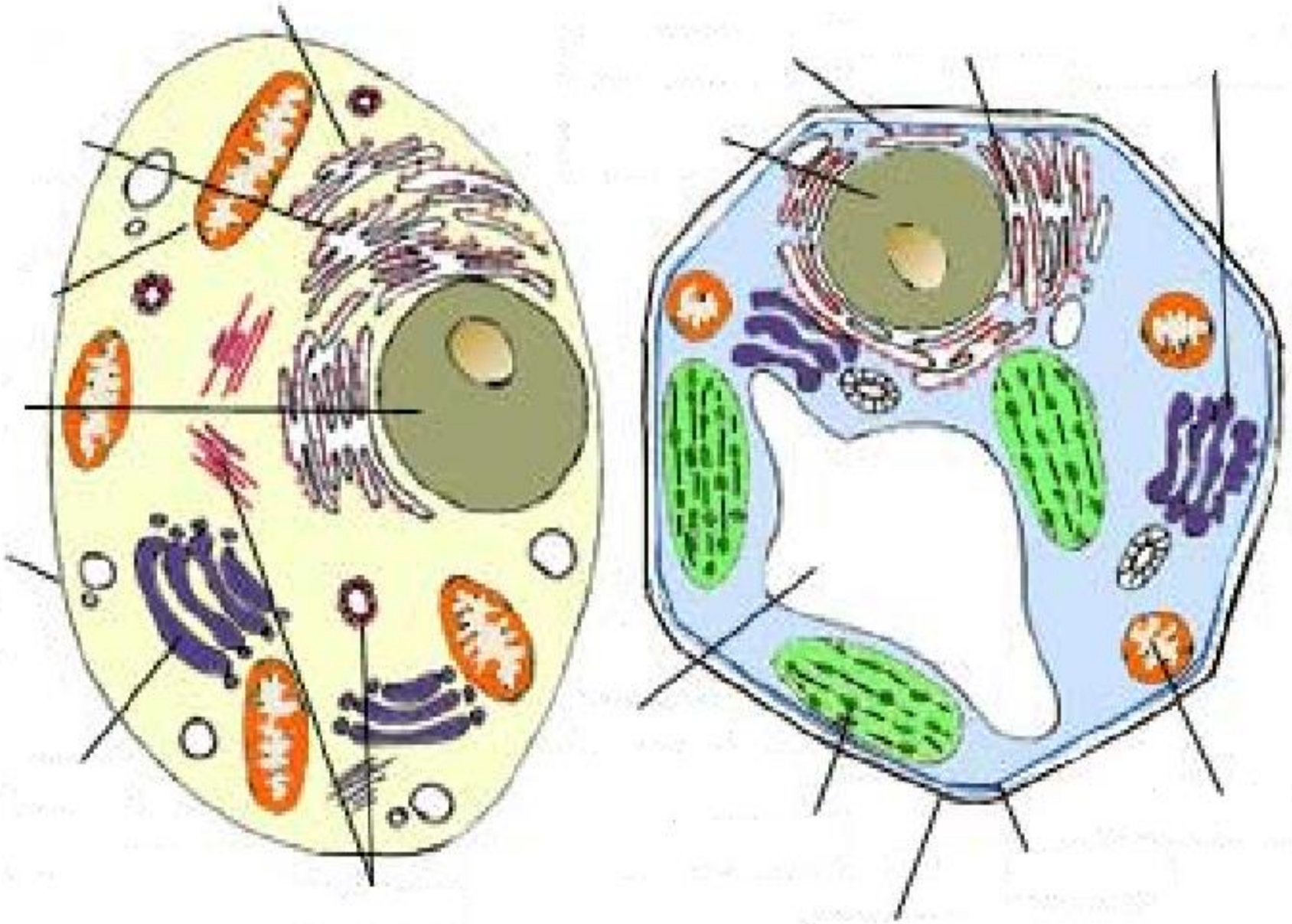

Outer membrane
Inner membrane
Nucleoplasm
Nucleolus
Chromatin
Nuclear envelope
Pore in nuclear envelope

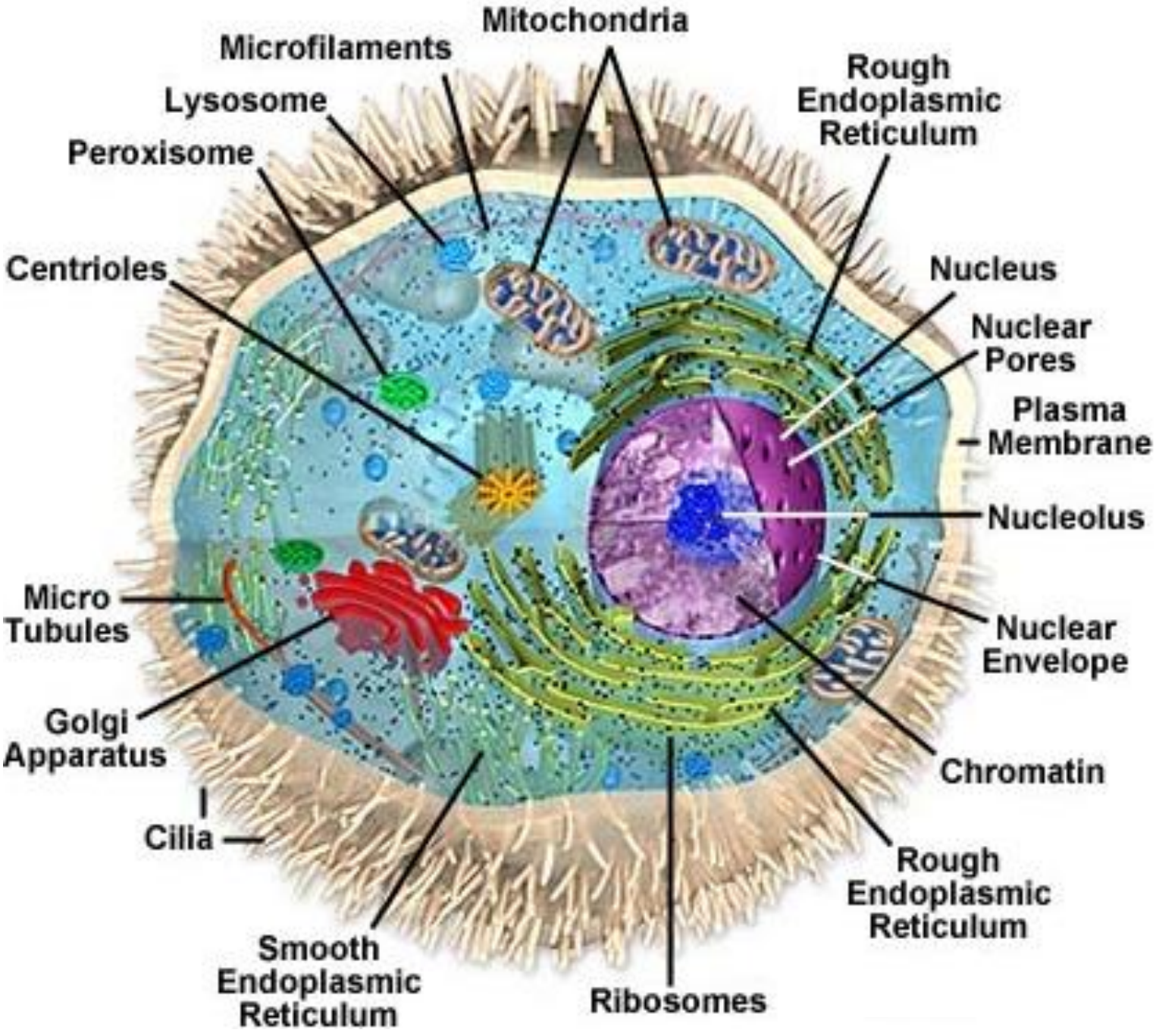

Proteins for
internal use
Cell Products
inside Vesicle
Golgi Apparatus
medial
cis



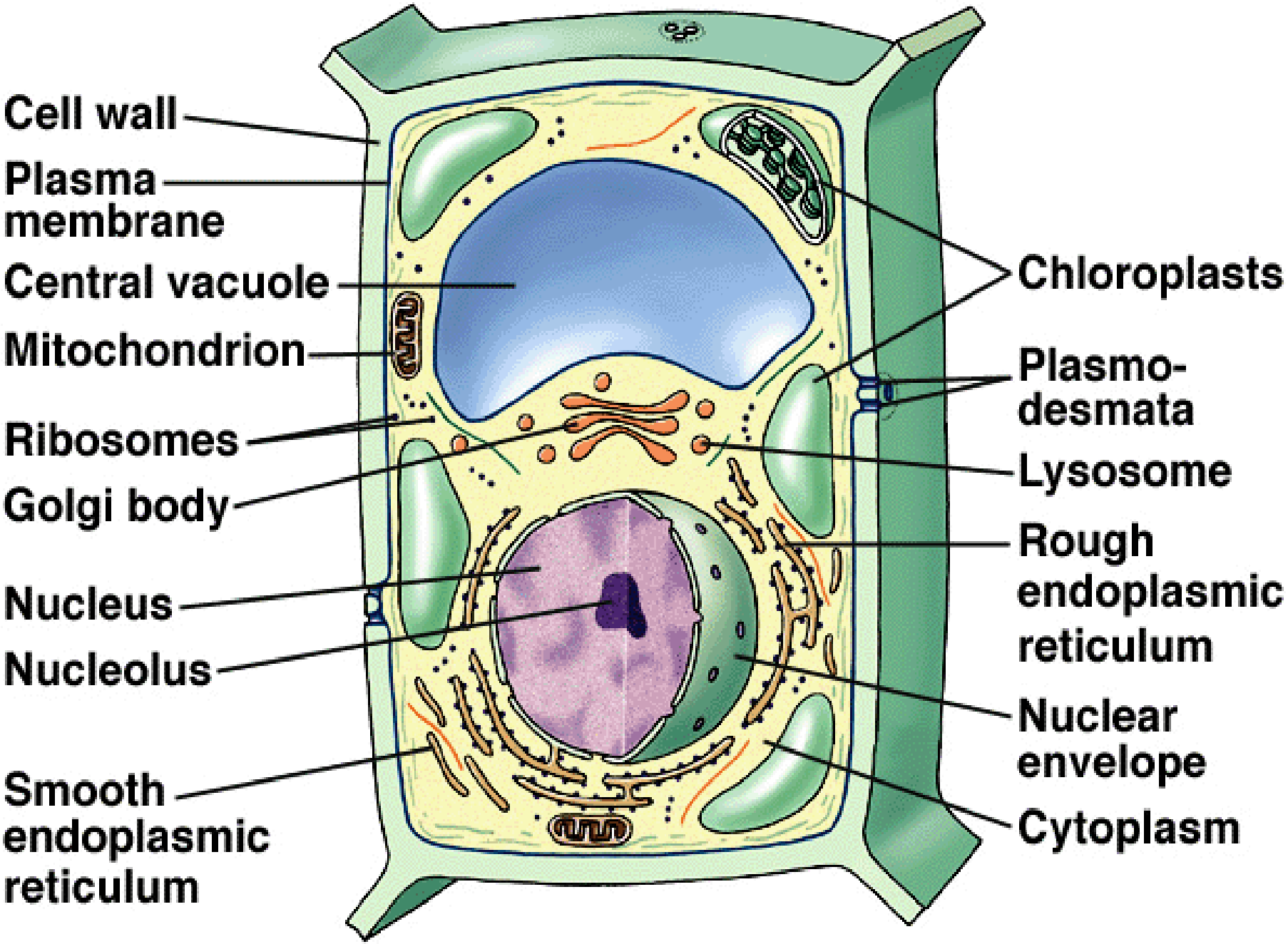

Plasma membrane
Digestion
Autophagy (lysosome engulfing damaged organelle)
Food vacuole
Lysosome
Phagocytosis
Golgi apparatus
Transport vesicle (containing in-active hydrolytic enzymes)
"Food"
Rough ER


Nucleus
BLUE PRINT DNA
Ribosomes
Golgi complex
EXPORT
THIS SIDE UP
Lysosomes
Mitochondria
Plasma membrane
HI-ENERJI CARRIERS (SODIUM) LTD

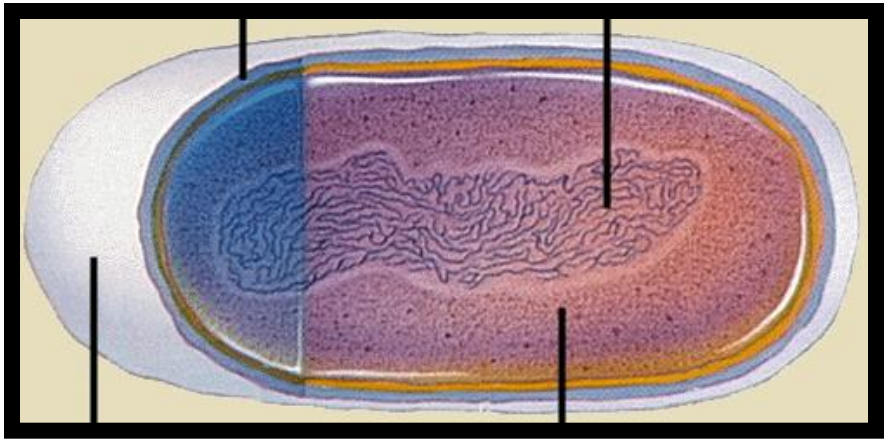



Mitochondria
Microfilaments
Lysosome
Peroxisome
Rough Endoplasmic Reticulum
Centrioles
Nucleus
Nuclear Pores
Plasma Membrane
Nucleolus
Micro Tubules
Nuclear Envelope
Golgi Apparatus
Chromatin
Cilia
Rough Endoplasmic Reticulum
Smooth Endoplasmic Reticulum
Ribosomes

An Idealized Plant Cell



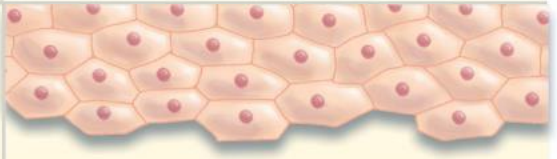
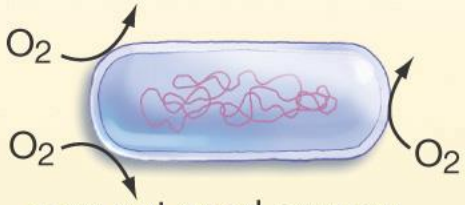
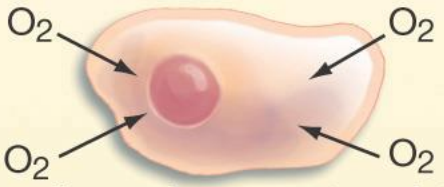
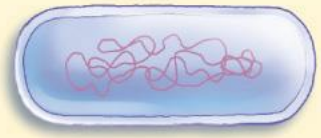
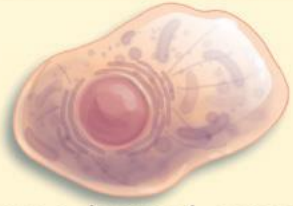
Two Fundamentally Different Types of Cells



A prokaryotic cell

A eukaryotic cell

Comparing Prokaryotic and Eukaryotic Cells

	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