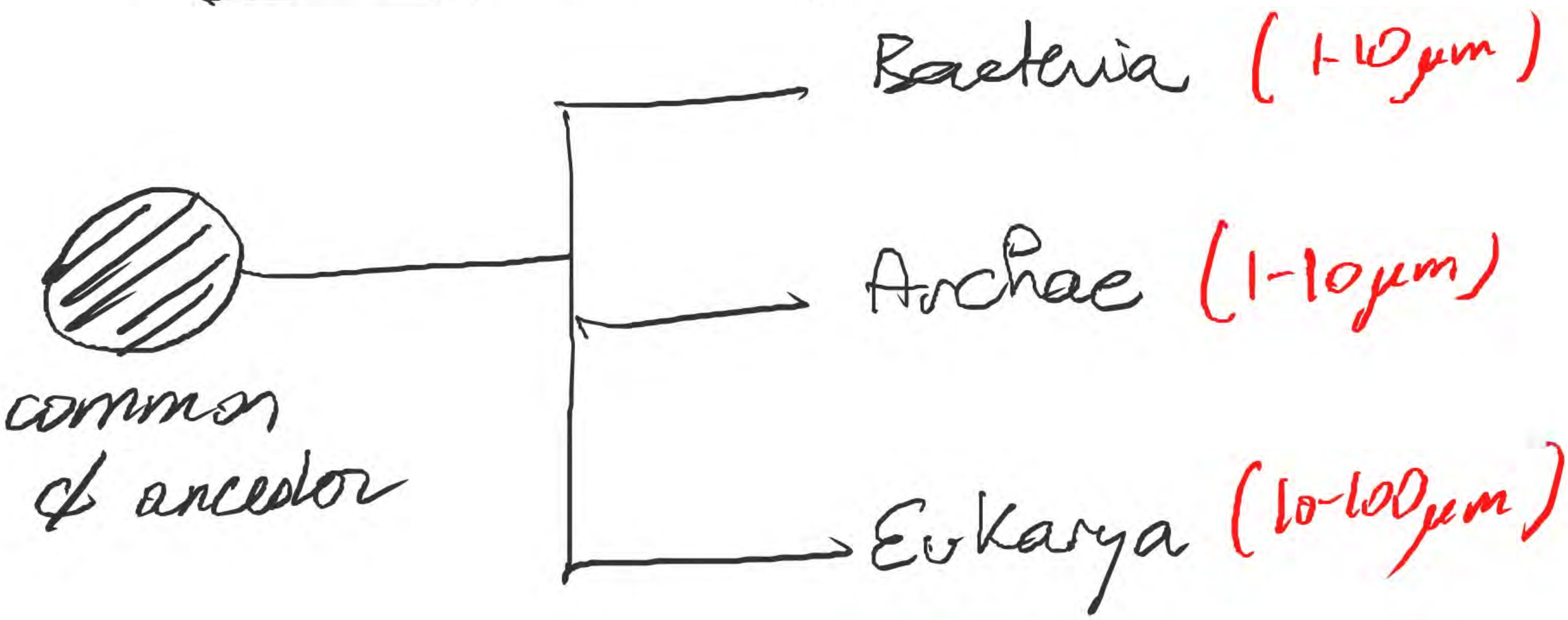
chap 3: CELLS

= tiny unit of life → our body.

common to human, plant, mushrooms...

but ≠ if you compare them closely.

3 domains of life:



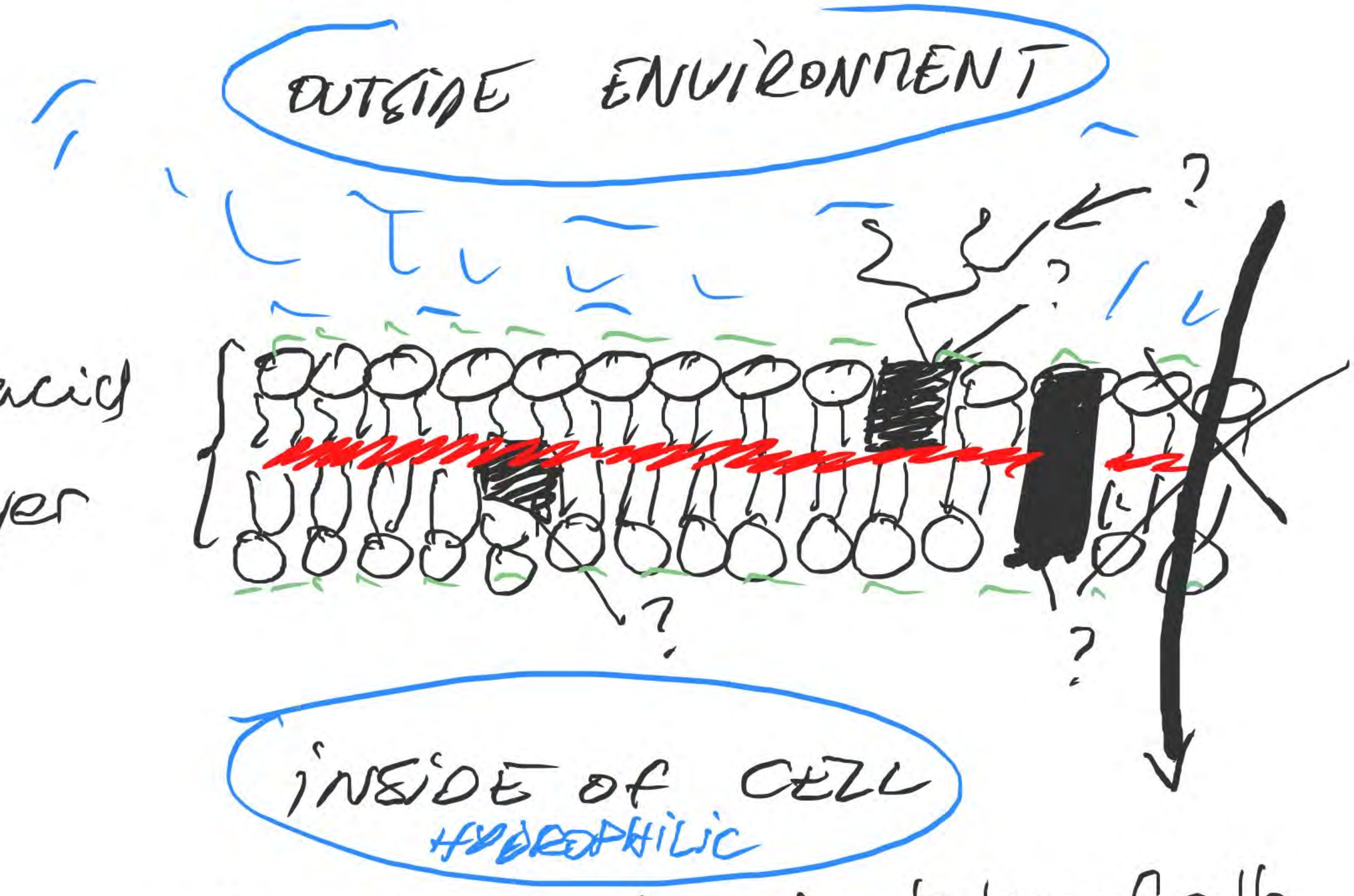
Ex: human cell:  : fatty acids

AMPHIPHILIC MOLECULE = hydrophilic side (acid function) + long chain (alkyle chain) hydrophobic

	Cell Type	Nucleus	Membrane-Bounded Organelles	Membrane Chemistry	Typical Cell Size
Domain Bacteria	Prokaryotic	Absent	Absent	Fatty acids	1–10 µm
Domain Archaea	Prokaryotic	Absent	Absent	Nonfatty acid lipids	1–10 µm
Domain Eukarya	Eukaryotic	Present	Present	Fatty acids	10–100 µm

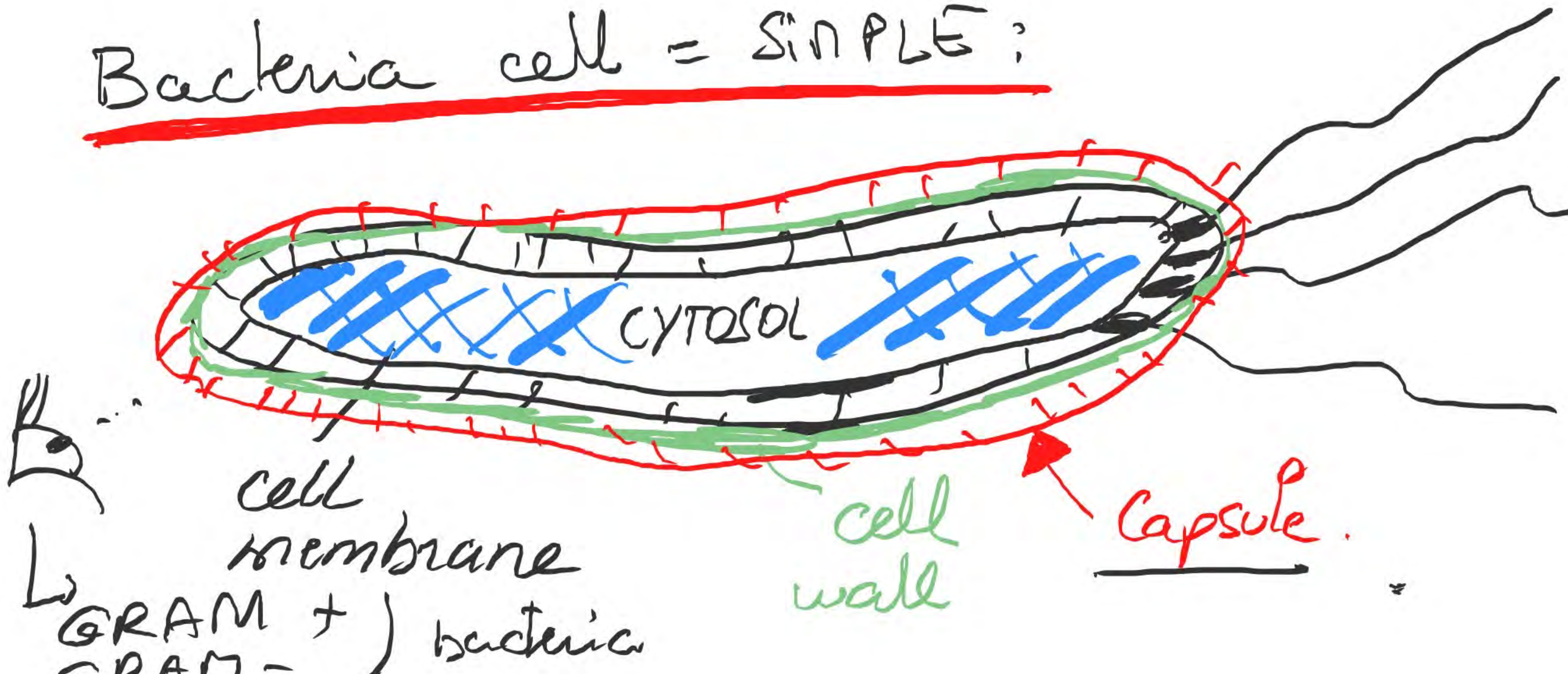
Figure 3.5 **The Three Domains of Life.** Biologists distinguish domains Bacteria, Archaea, and Eukarya based on unique features of cell structure and biochemistry. The small evolutionary tree shows that archaea are the closest relatives of the eukaryotes.

: Fatty acid



Ⓐ BACTERIA: Most abundant type of cells. human body: 10x more bacteria than mamalian cells.

Bacteria cell = SIMPLE:



[cytosol]

[Temp, pH, structure...]
-constant-

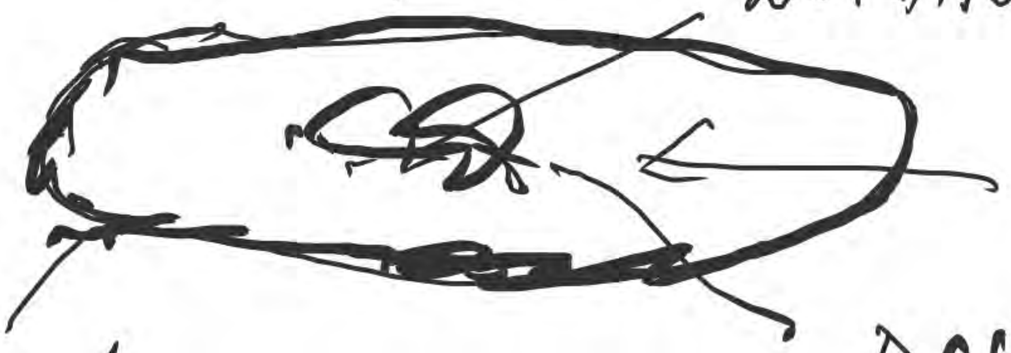
→ homeostasis.

Ribosomes ⊕ DNA ⊕ CYTOSOL

(B) ARCHAEA bact:

= Procaryotic (NO NUCLEUS)

NOTHING IMPORTANT ORGANELLES



NO NUCLEUS

"

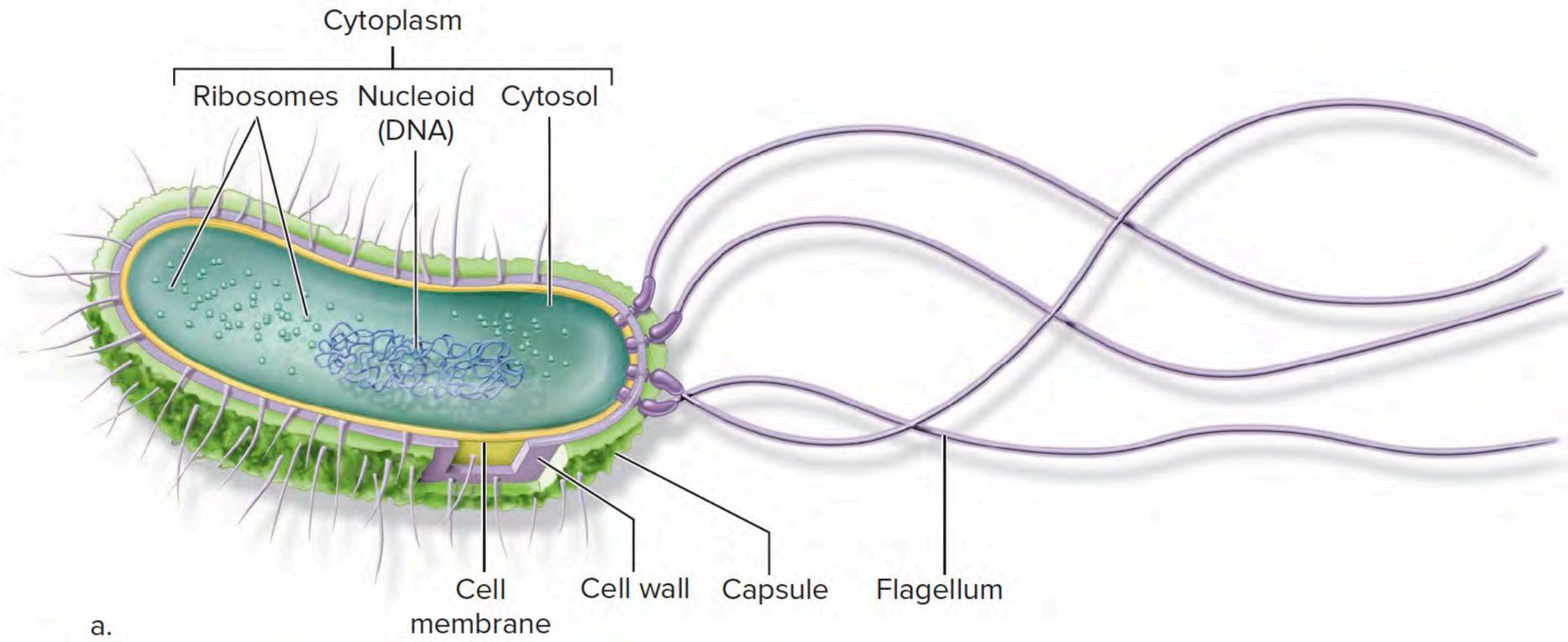
=

DNA + ribosomes.

lipids
(no fatty acids)

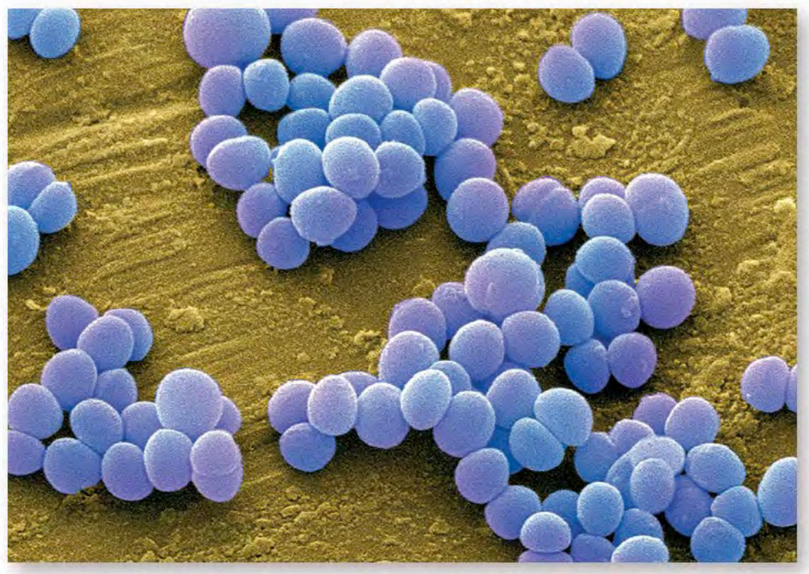
Figure 3.6 Anatomy of a Bacterium. (a) Bacterial cells lack internal compartments. (b) Rod-shaped cells of *E. coli* inhabit human intestines. (c) Spherical *Staphylococcus aureus* cells cause "staph" infections that range from mild to deadly. (d) Corkscrew-shaped *Campylobacter* cells often cause diarrhea.

(b): Science Photo Library/Getty Images;
(c): David McCarthy/Science Source;
(d): Source: Melissa Brower/CDC



a.

b. SEM (false color) 2 µm

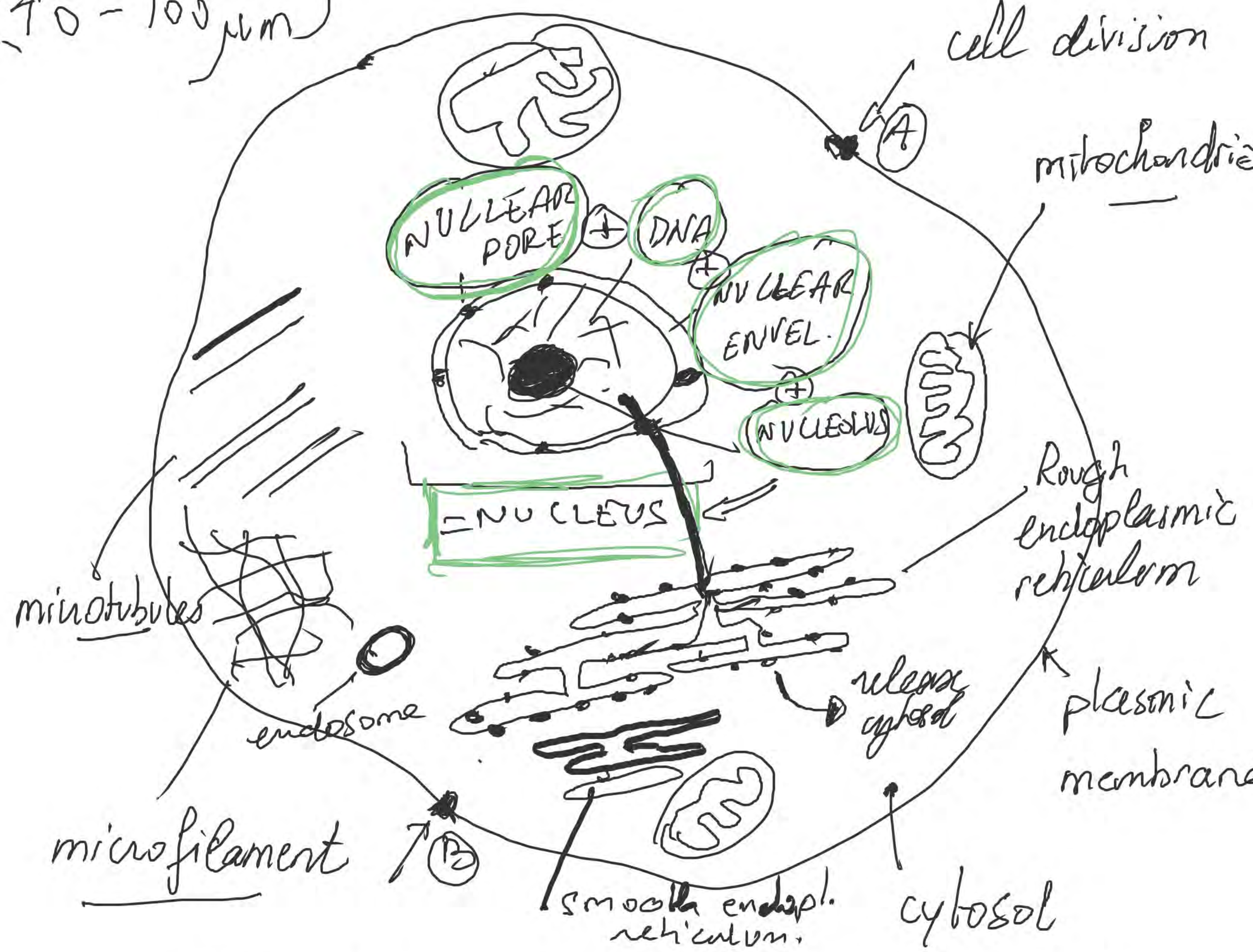


c. SEM (false color) 2 µm

d. SEM (false color) 2 µm

⑥ Eukaryote cell : Plant or animal cells:

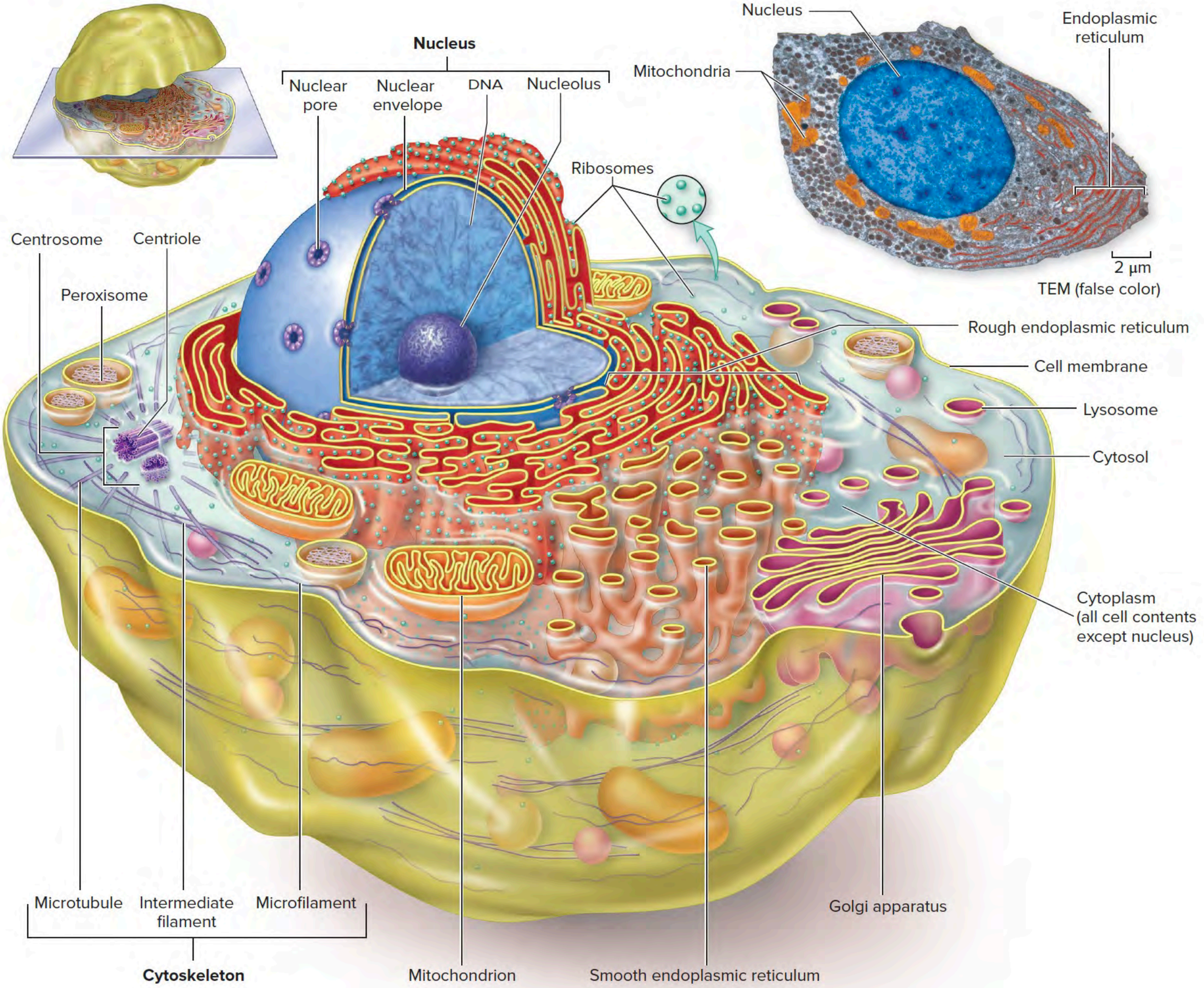
(10 - 100 µm)



when (A) fixes (B) ⇒ cell divison (microfilament + microtubules)

Figure 3.8 Anatomy of an Animal Cell. The large, generalized view shows the relative sizes and locations of a typical animal cell's components. The electron micrograph at right shows a rat's pancreas cell with a prominent nucleus and many mitochondria.

Photo: Biophoto Associates/Science Source



Plant cells:

Smooth endoplasmic reticulum

Golgi apparatus

NUCLEUS

$(CH_2O)_n$

SAME THAN ANIMAL

central vacuole

specific feature

CHLOROPLAST

PHOTOSYNTHESIS
LIGHT → chemical energy

cell wall

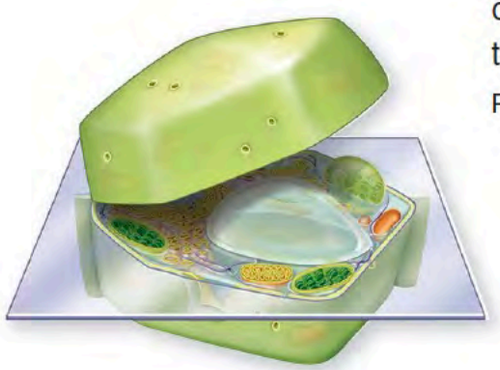
plasmic membrane

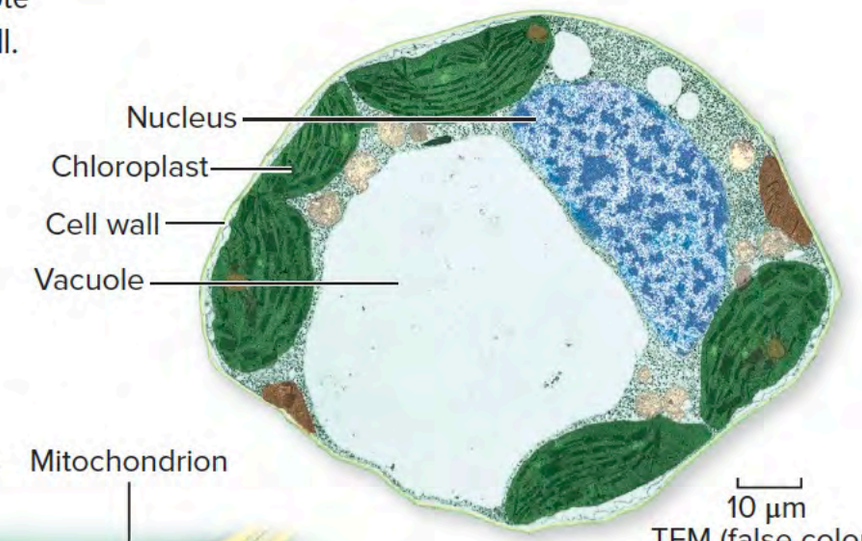
LIGHT
CO_2
H_2O

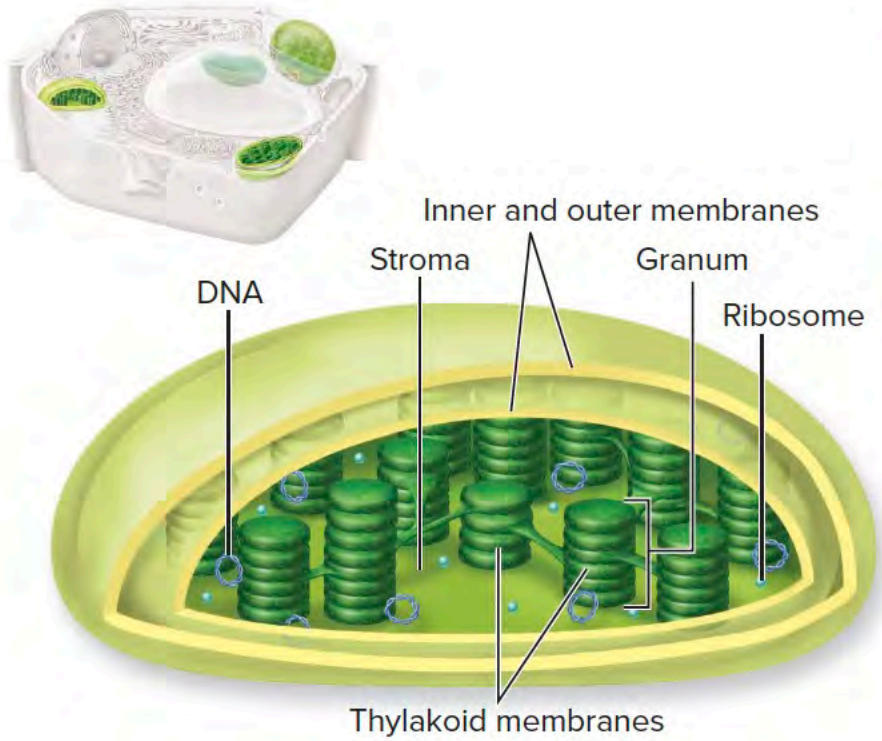
Carbohydrate
$= C_{(n)}(H_2O)_{(n)}$
$+$
O_2

Figure 3.9 Anatomy of a Plant Cell. The large, generalized view illustrates key features of a typical plant cell. The electron micrograph at right shows a leaf cell; note the prominent nucleus, vacuole, chloroplasts, and cell wall.

Photo: Biophoto Associates/Science Source







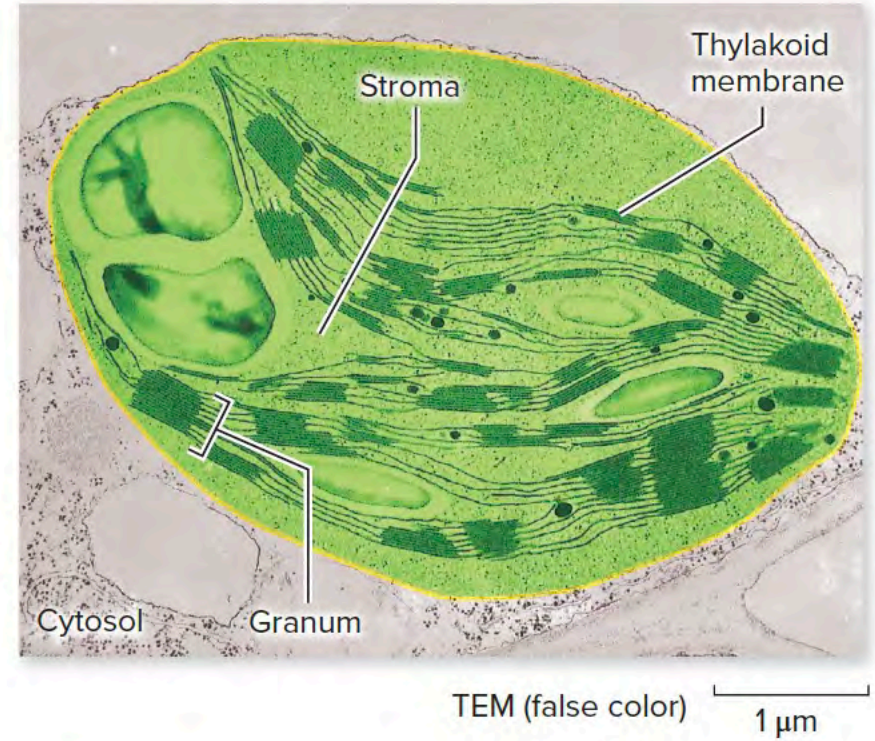
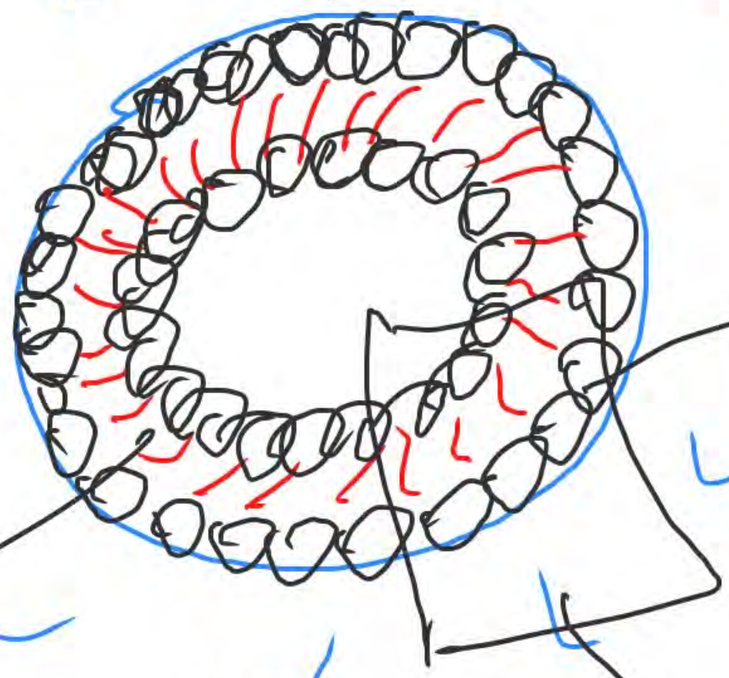


Figure 3.22
Chloroplasts.
Photosynthesis occurs inside chloroplasts. Each chloroplast contains stacks of thylakoids that form the grana within the inner compartment, the stroma. Enzymes and light-harvesting pigments embedded in the thylakoid membranes convert the energy in sunlight to chemical energy.

Photo: Biophoto Associates/ Science Source

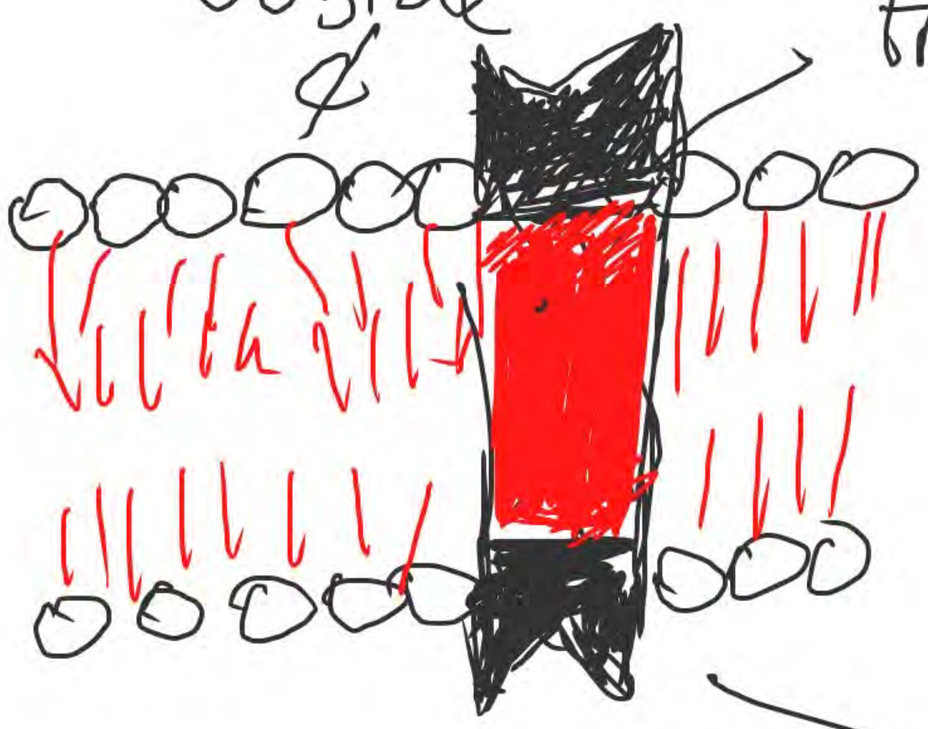


water

hydrophilic part of the Phospholipid

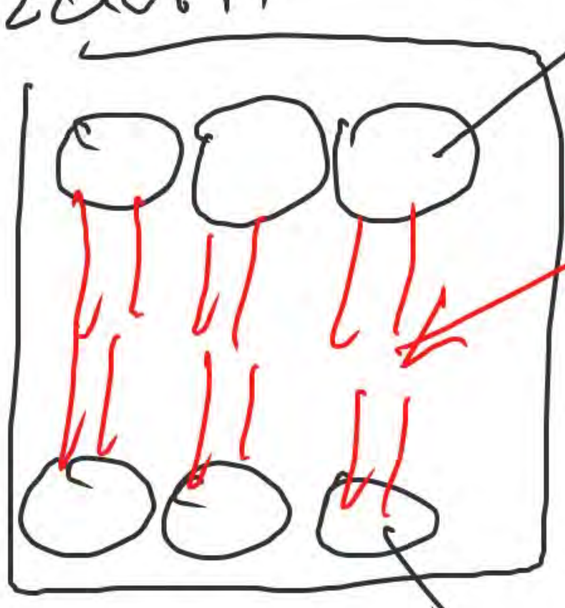
bilayer of phospholipids

outside & inside of cell



transporter = proteins

Zoom



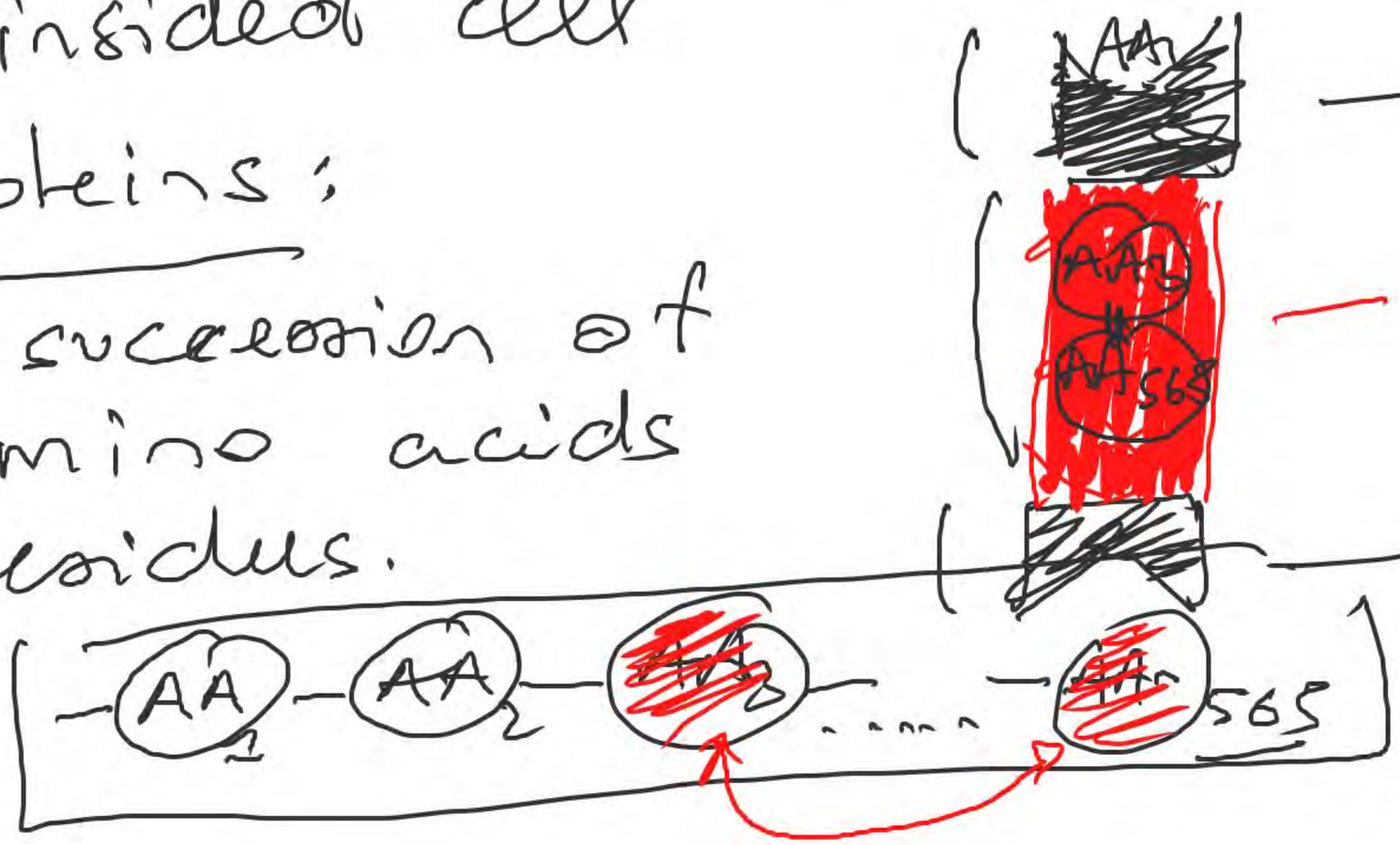
hydrophilic

hydrophilic

protein = transporter

Proteins:

= succession of amino acids residues.



hydrophilic domain

hydrophobic domain

hydrophilic domain

How a protein is expressed and released ?

(messenger RNA)

Ribosomes

mRNA

smooth endoplasmic reticulum. = place where lipids are made

DNA +

lipids

protein direction

transport vesicles

NUCLEUS

lipids

Golgi apparatus = mix all

vesicles "independant" from the golgi apparatus = proteins + lipids

release of lipids + proteins

mRNA moves

Rough endoplasmic reticulum

DNA ↓ mRNA

mRNA

Ribosomes

= "protein in construction" = succession of amino acids residus.

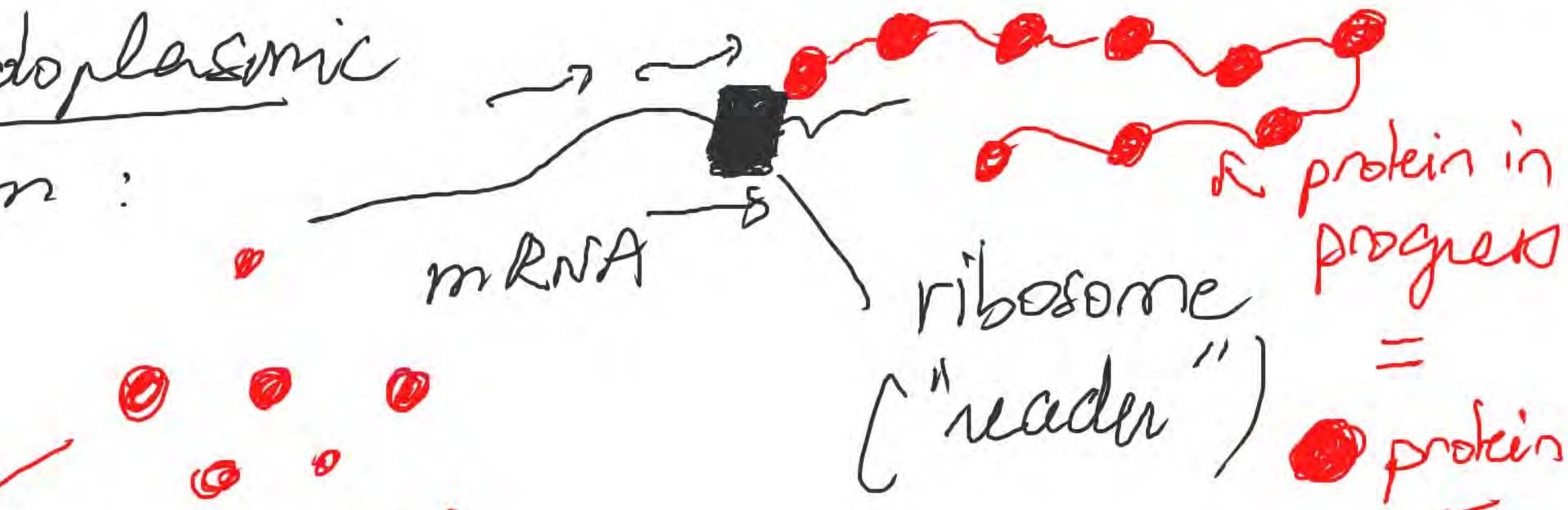
Role of the ≠ parts:

Nucleus: have the DNA ⟶ ≀ machinerie ⟶ on RNA

DNA = double strand molecule

RNA = single strand molecule

Rough endoplasmic reticulum:



Smooth endoplasmic reticulum: - synthesize lipids - proteins

Golgi apparatus: "packaging site of the cells"

Lysosomes, vacuoles, peroxisomes = DIGESTION CENTERS:

Lysosomes:

pH specific (acid) ~4.8 (rest of cell pH = 7.4)

Enzymes (cut, destroy molecules)

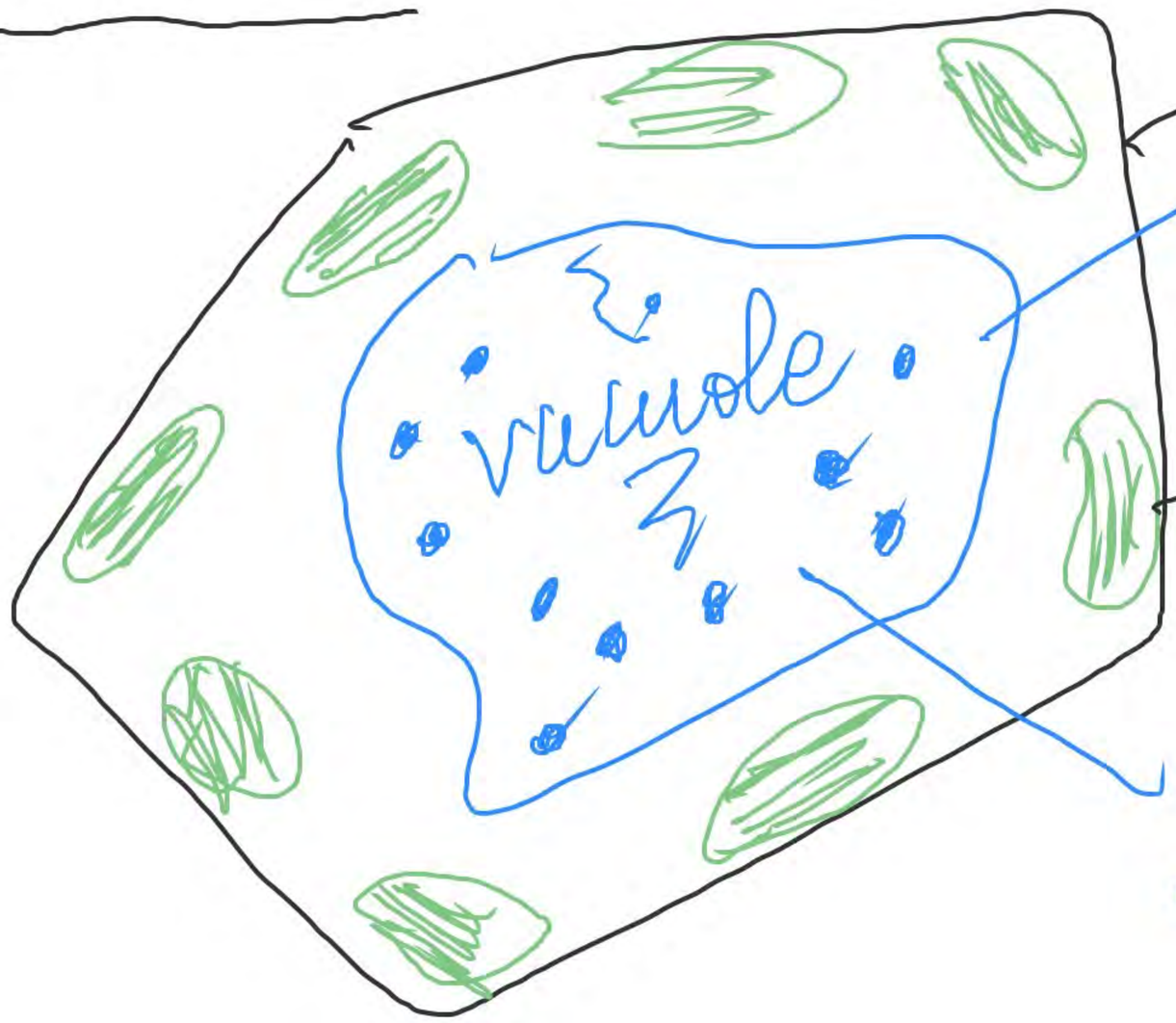
what exactly can it destroy?

= foreign particles, old organelle (Golgi apparatus, old mitochondria ...), captured bacteria, food ...

= pH inside lysosome is acidic (pH = 4.8) (≠ pH cell = 7.4) = Enzymes digestion work well at pH = 4.8.

= "Recycling" material from inside the cell or "outside" the cell.

vacuoles:



plant cell

≈ 90% of the volume of cell

chloroplast

" watery solution containing ENZYMES "

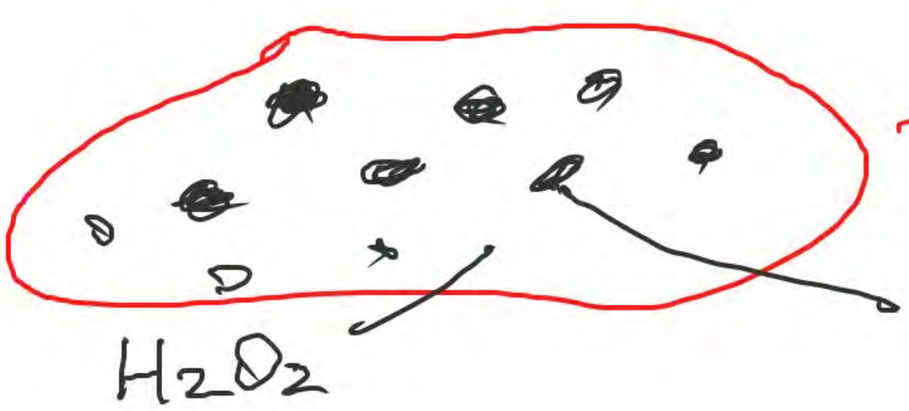
⚠ most plants do NOT have lysosomes.

VACUOLE : ✱ WATER, ENZYMES,
✱ SALTS, SUGARS, WEAK ACIDS.
✱ PIGMENTS → color of fruits, leaves vegetable, flowers...

Perixosomes: = similar name than hydrogen peroxide = H_2O_2

all eucaryotes cells.

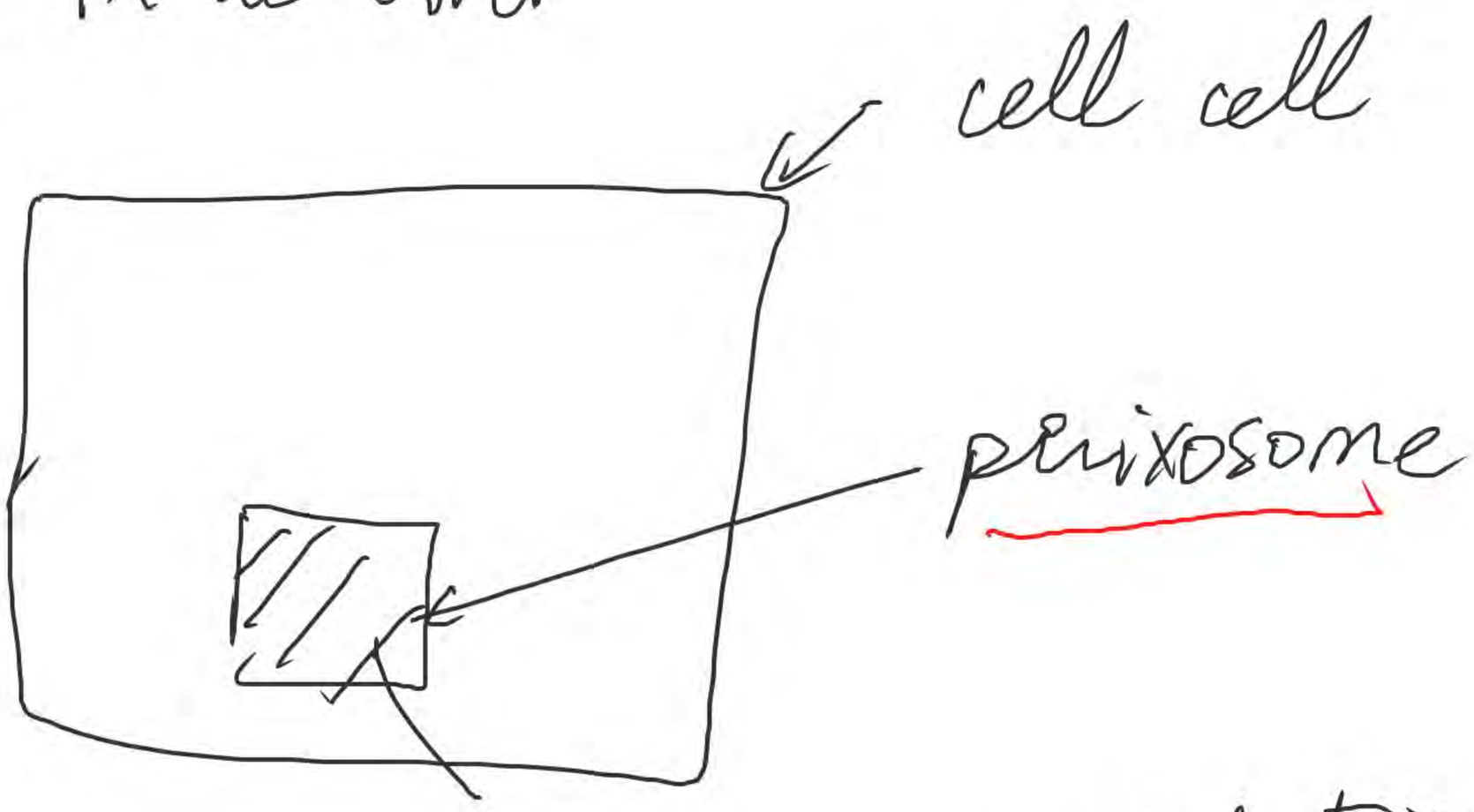
dealing with toxic molecules (NO RECYCLING)



perixosomes

[Enzyme] so high → CRYSTAL (electronic microscope)

Ex: in the liver



H_2O_2 = very oxydative molecule
= "distroy", neutralize any
toxic molecules.