

HYPERTONIC

WATER

HYPERTONIC



WATER

WATER

WATER

PLANT CELL

FLACCID CELL

PLANT CELL

WATER

WATER

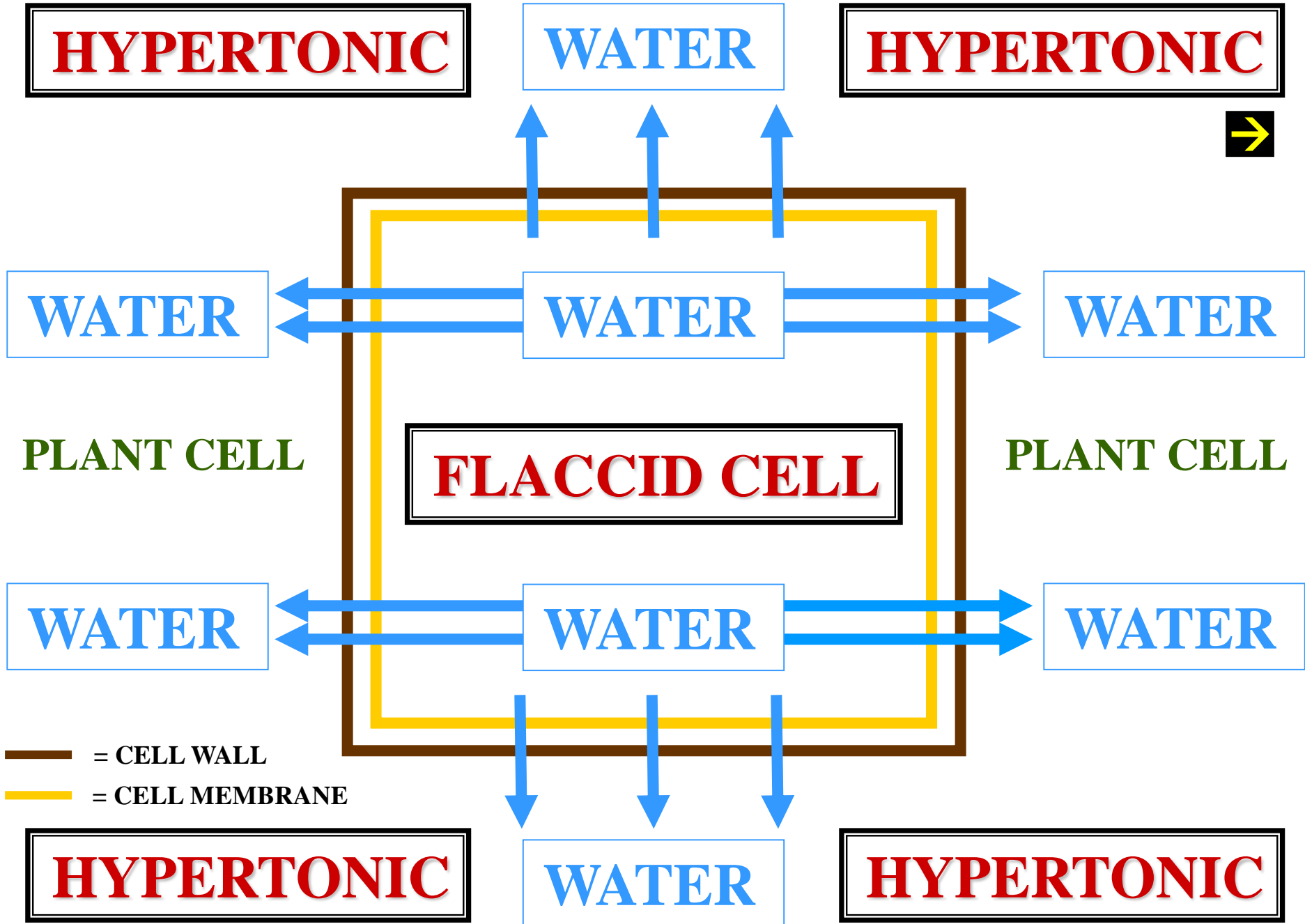
WATER

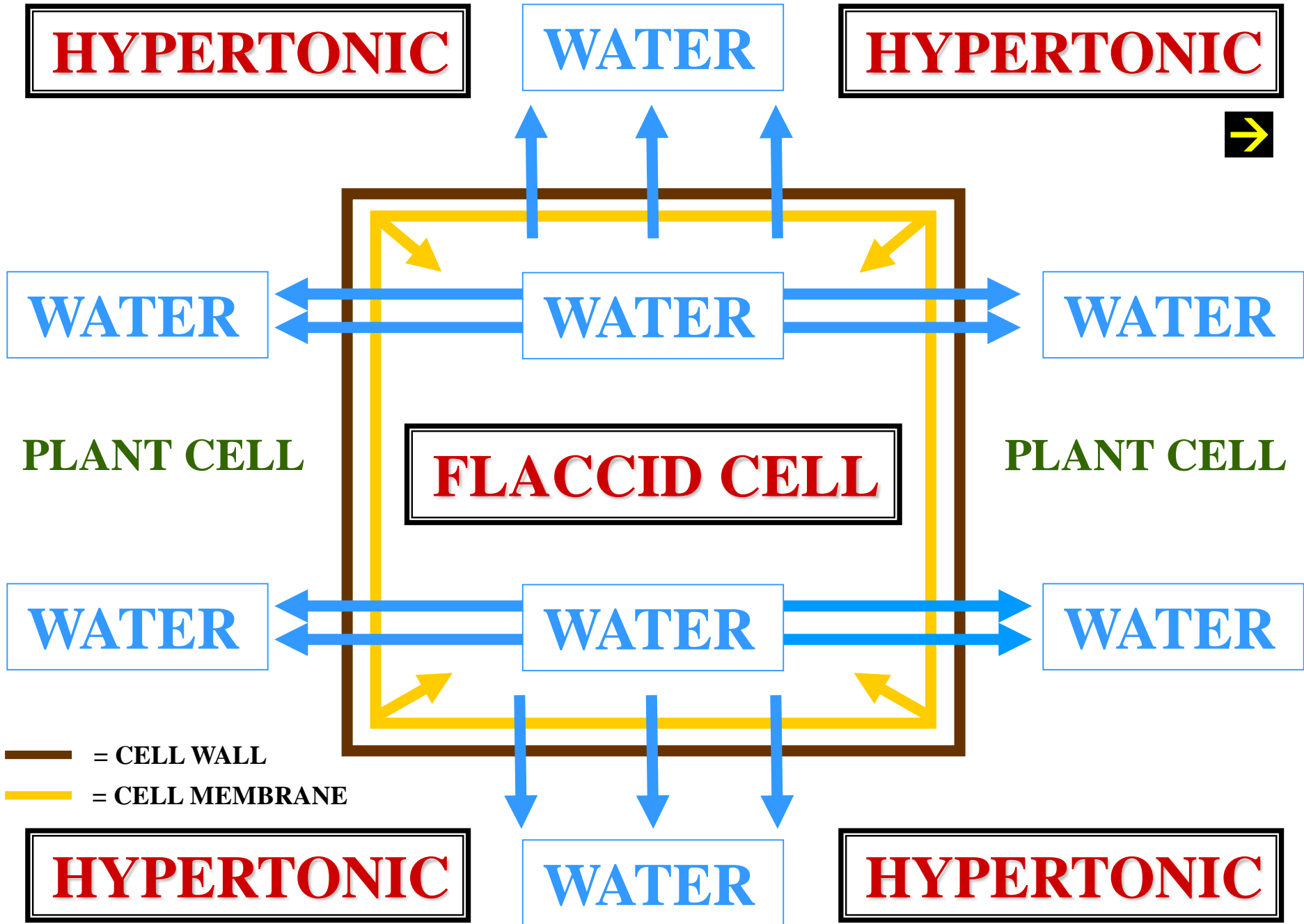
— = CELL WALL
— = CELL MEMBRANE

HYPERTONIC

WATER

HYPERTONIC





HYPERTONIC

WATER

HYPERTONIC

P

WATER

WATER

WATER

PLANT CELL

CELL MEMBRANE
CONTRACTS FROM
PLANT CELL WALL

CELL MEMBRANE
CONTRACTS FROM
PLANT CELL WALL

PLANT CELL

WATER

WATER

WATER

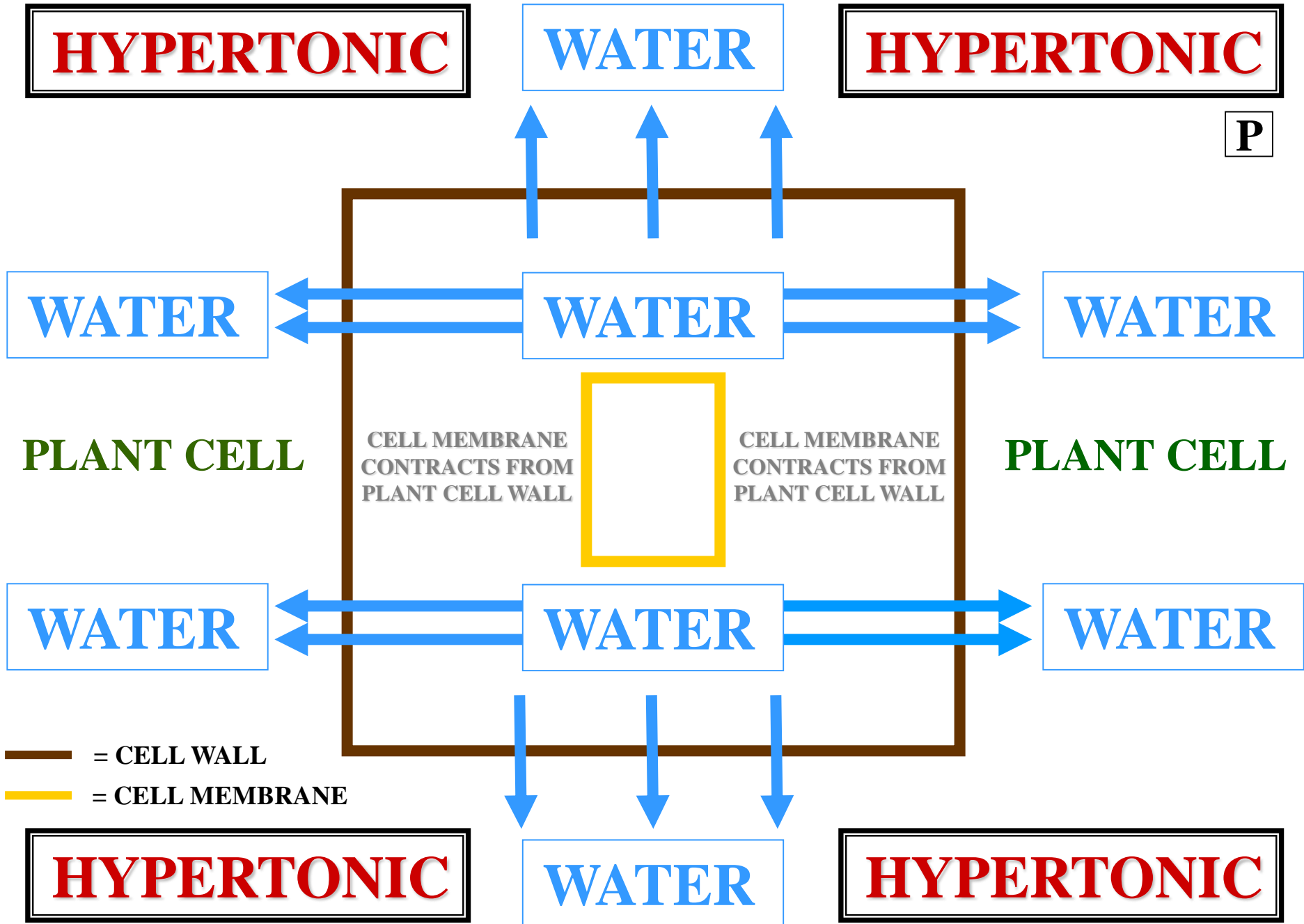
= CELL WALL

= CELL MEMBRANE

HYPERTONIC

WATER

HYPERTONIC



HYPERTONIC

WATER

HYPERTONIC

P

WATER

WATER

WATER

PLANT CELL

PLASMOLYSIS

PLANT CELL

WATER

WATER

WATER

= CELL WALL

= CELL MEMBRANE

HYPERTONIC

WATER

HYPERTONIC

PLASMOLYSIS

PLASMOLYSIS

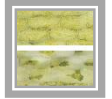
CELL MEMBRANE
CONTRACTS FROM
PLANT CELL WALL

PLASMOLYSIS



EXAMPLE
TURGOR
PRESSURE
PLASMOLYSIS
ELODEA

ALABAMA LAKE OR ALABAMA POND

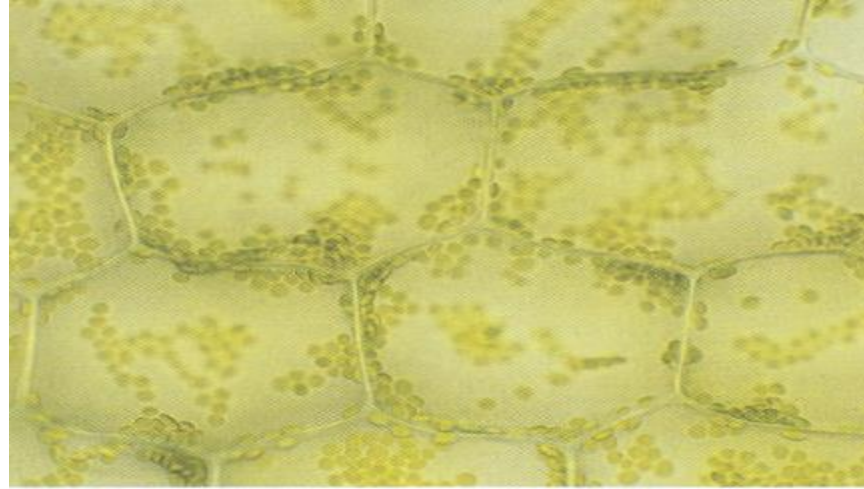


ELODEA



ELODEA

TUGOR PRESSURE



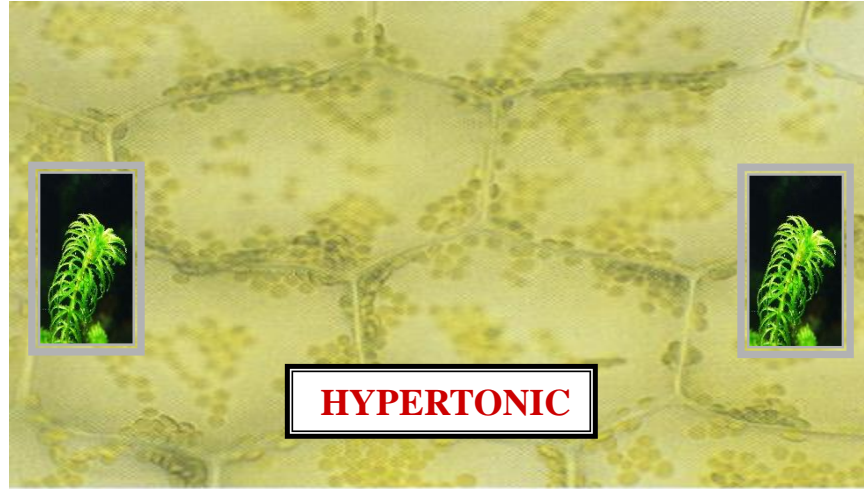
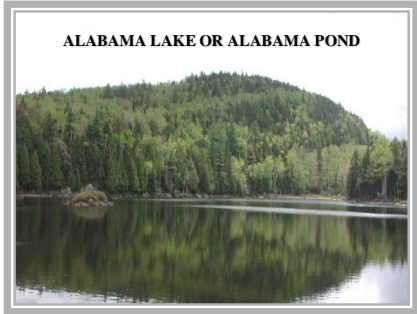
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ELODEA

TUGOR PRESSURE

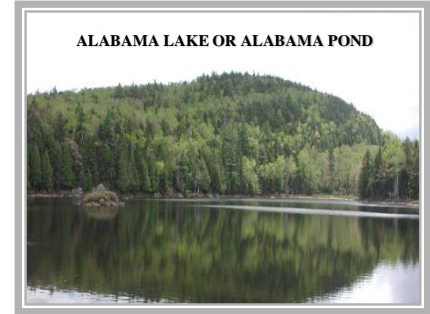
HYPOTONIC



HYPERTONIC

ELODEA

HYPOTONIC



ELODEA

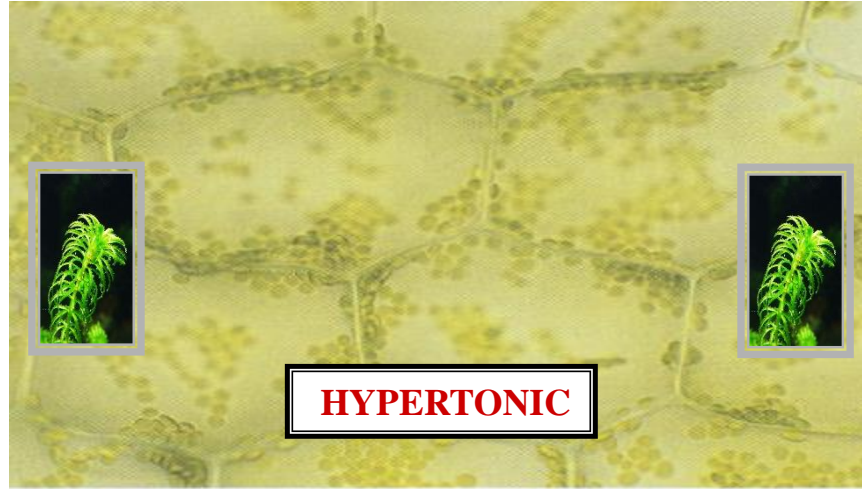
TUGOR PRESSURE



OSMOSIS

HYPOTONIC

OSMOSIS



HYPERTONIC

ELODEA

OSMOSIS

HYPOTONIC

OSMOSIS

ALABAMA LAKE OR ALABAMA POND

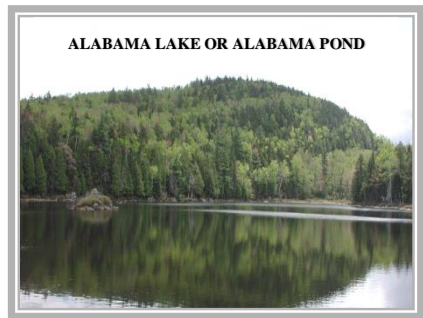
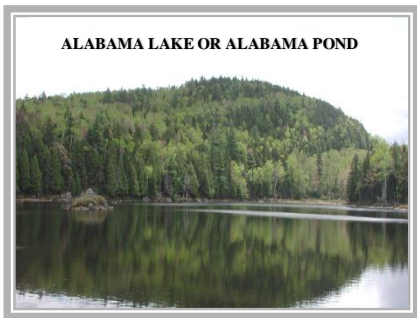
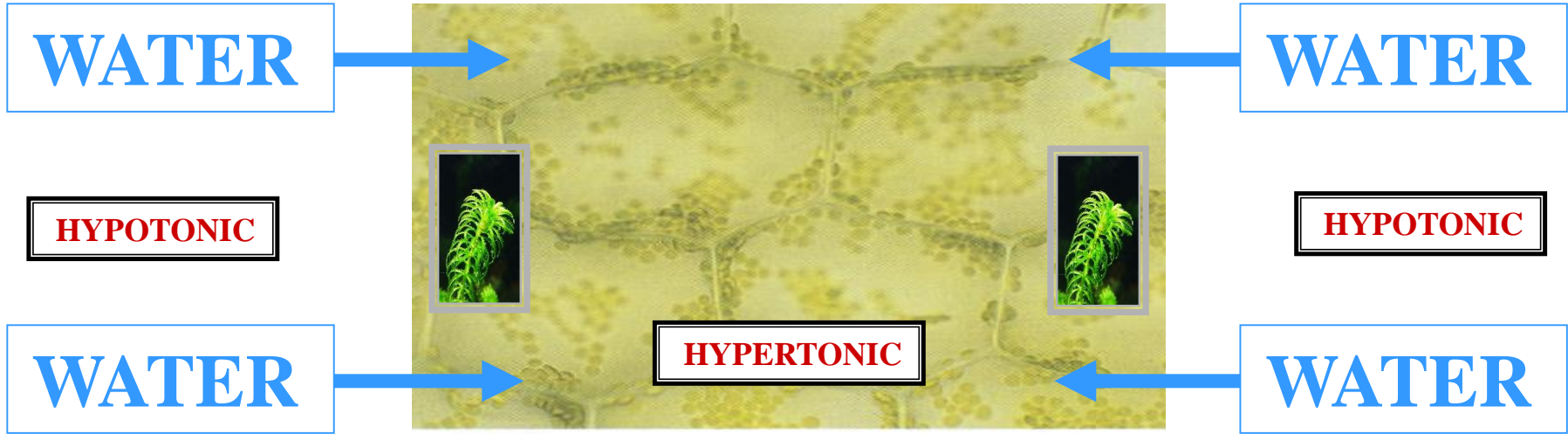


ALABAMA LAKE OR ALABAMA POND



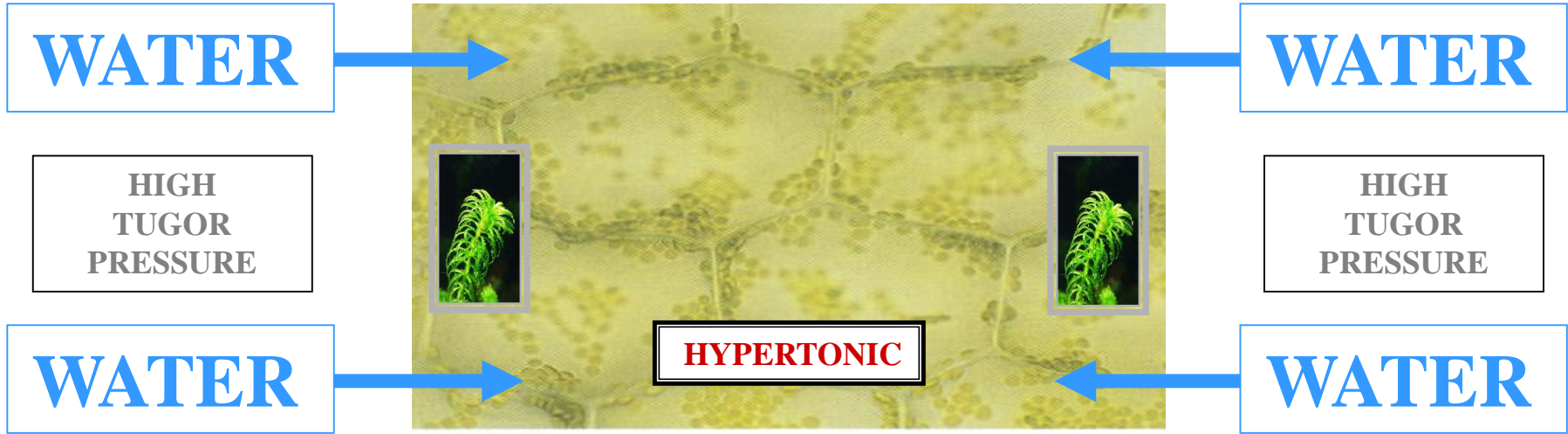
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TUGOR PRESSURE

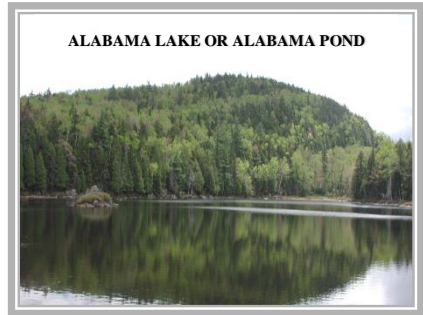
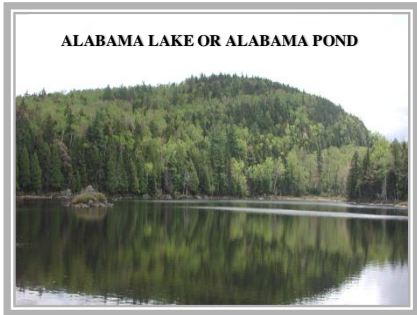


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TUGOR PRESSURE

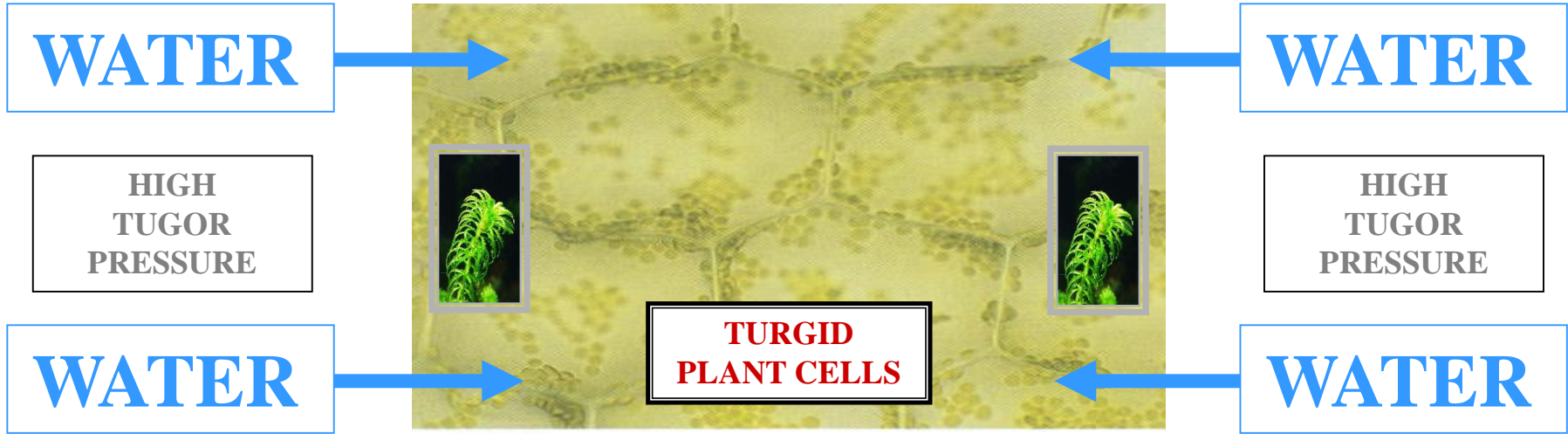


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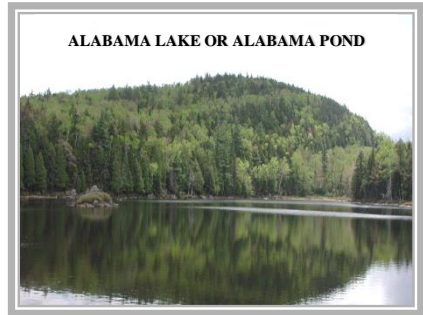
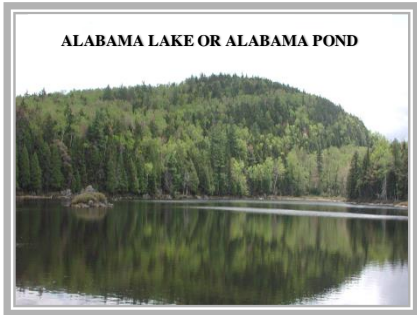


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TUGOR PRESSURE

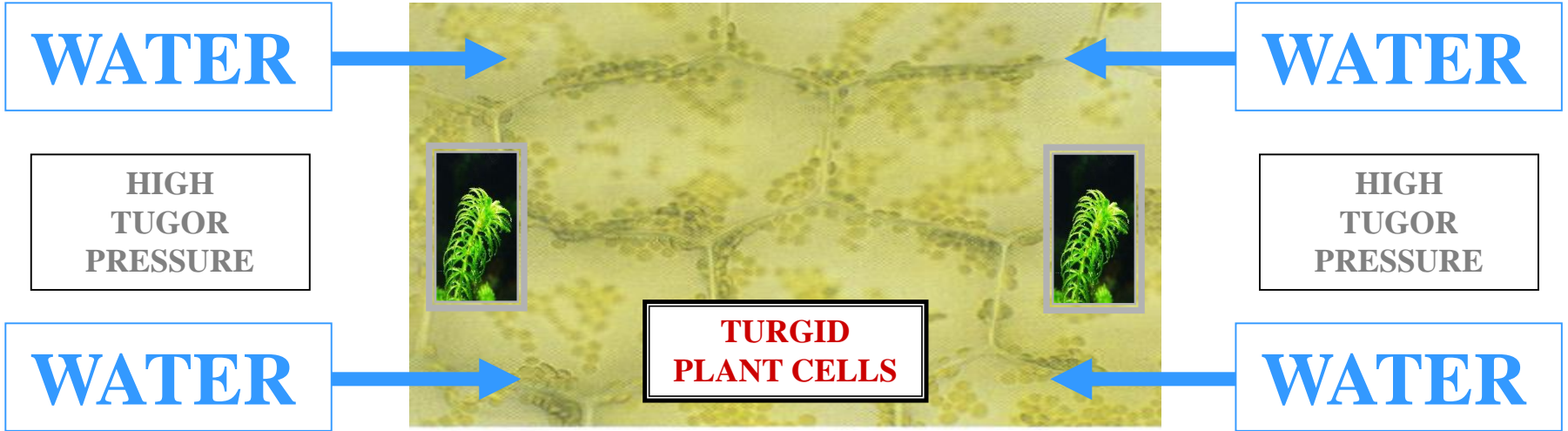


ELODEA



ELODEA

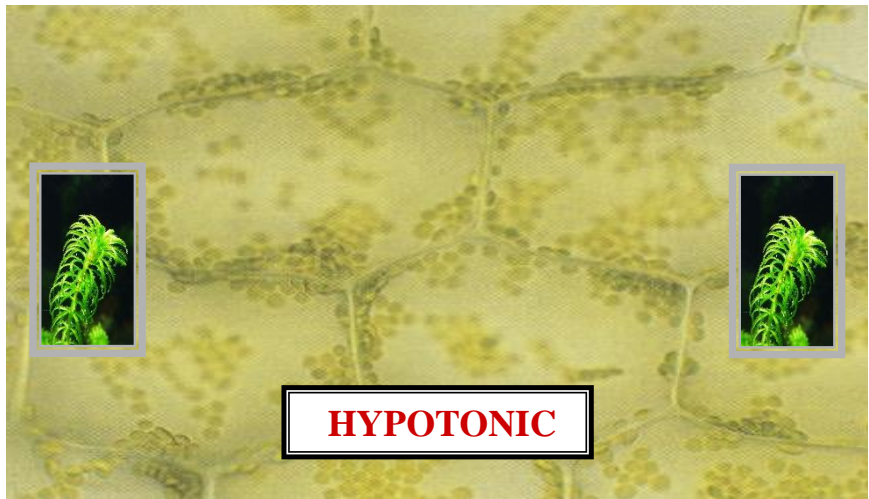
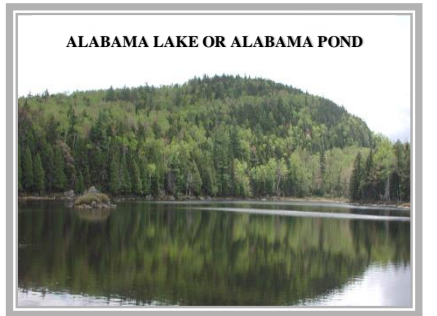
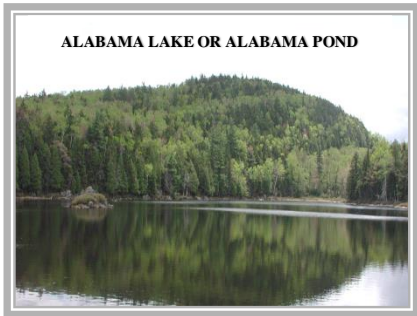
TUGOR PRESSURE



ELODEA

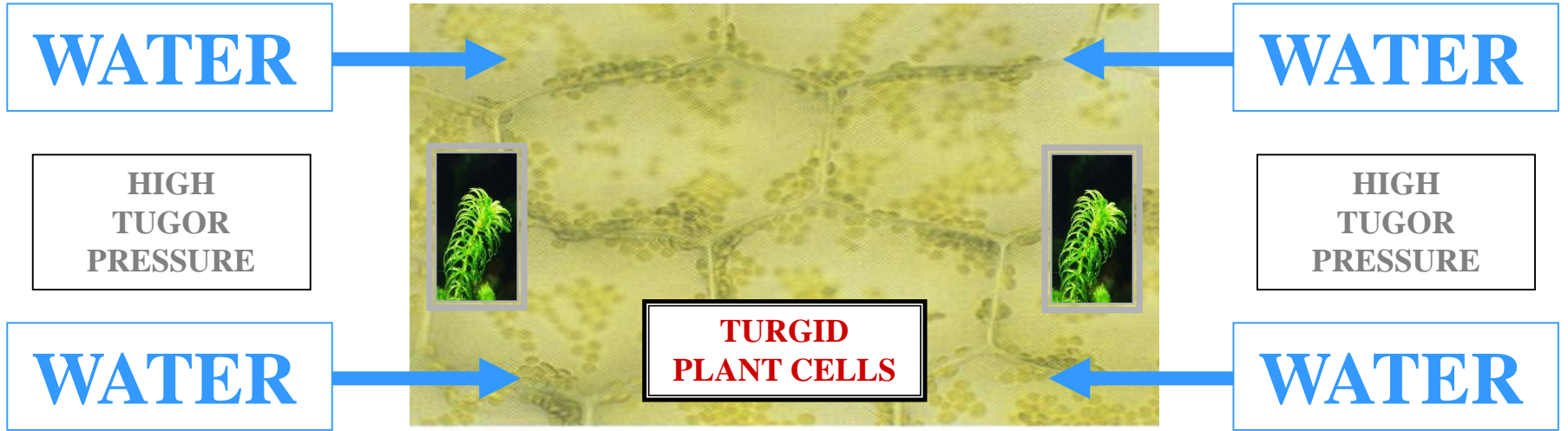
HYPERTONIC

HYPERTONIC

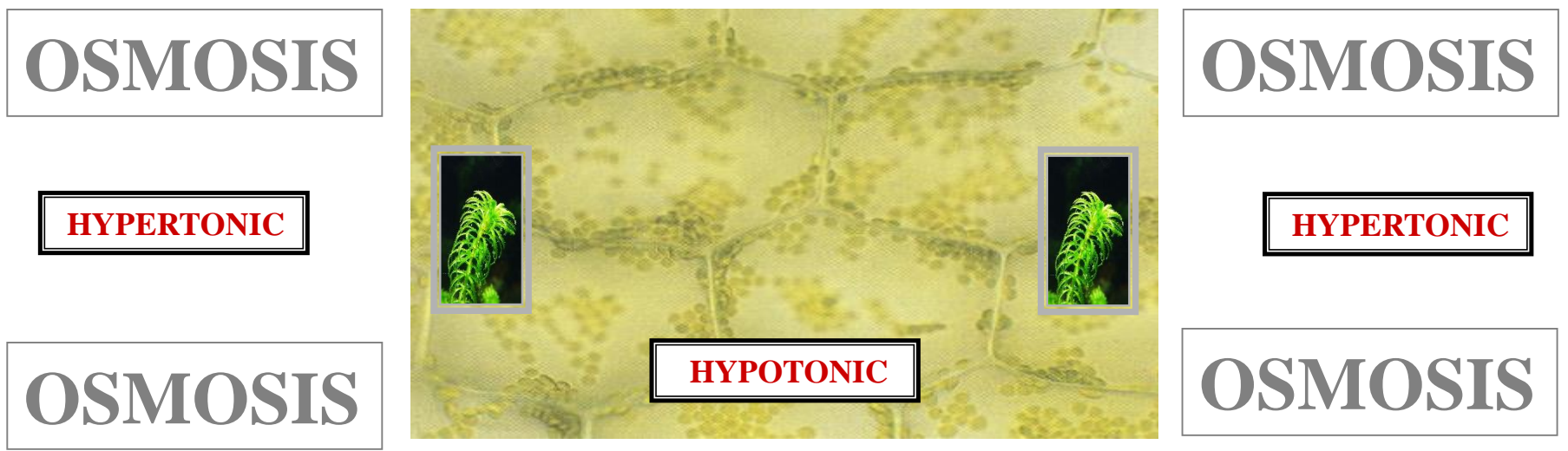


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TUGOR PRESSURE

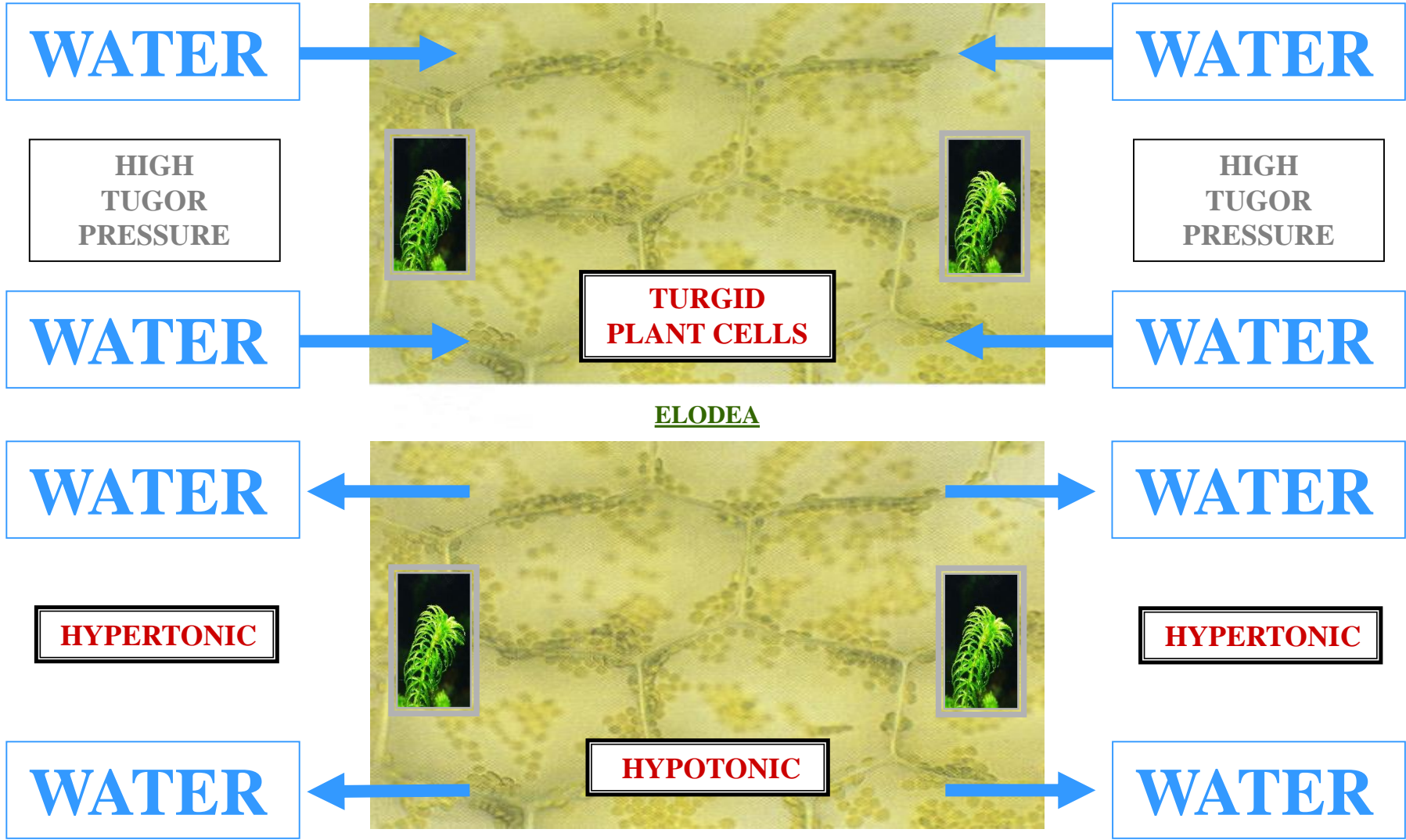


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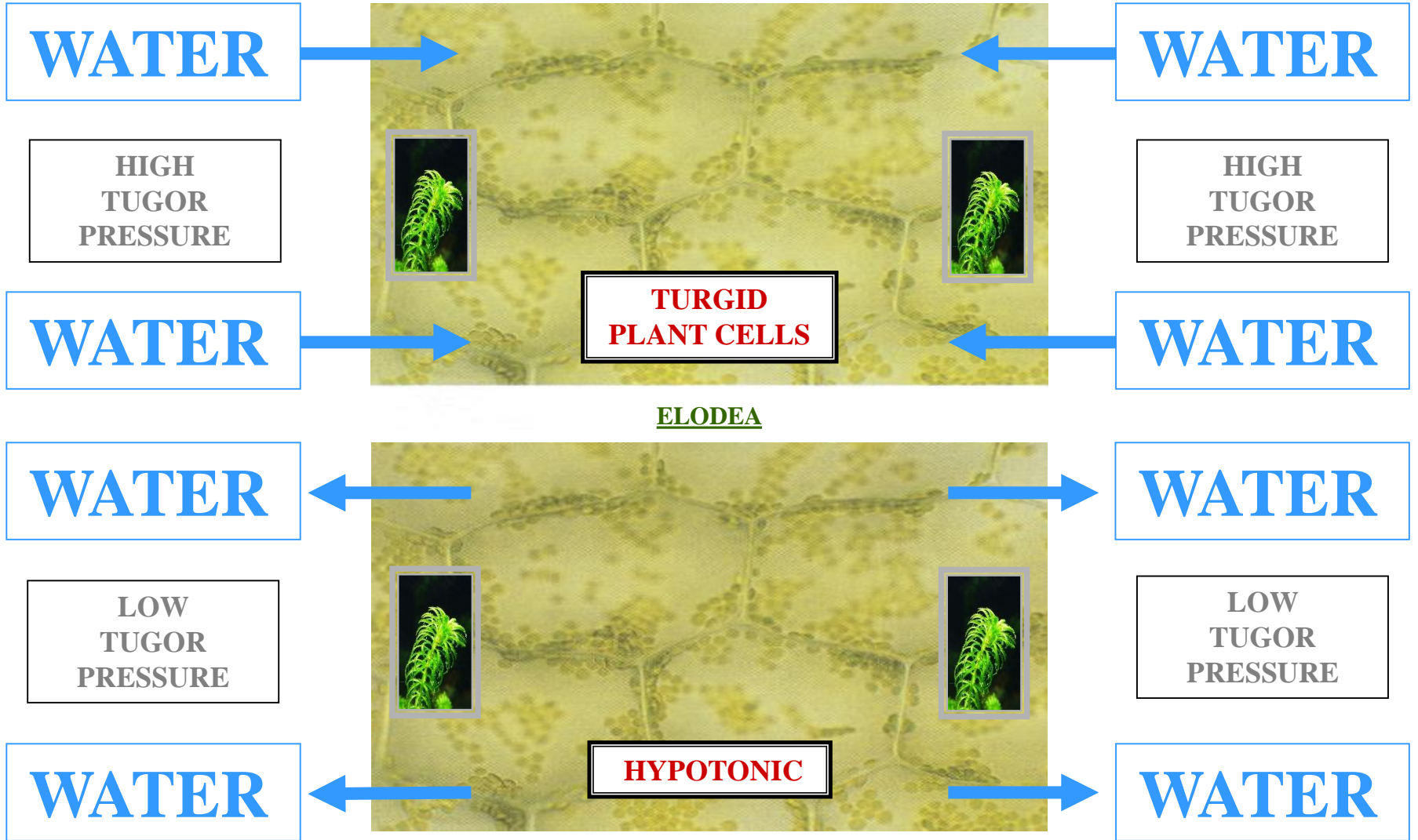
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TUGOR PRESSURE



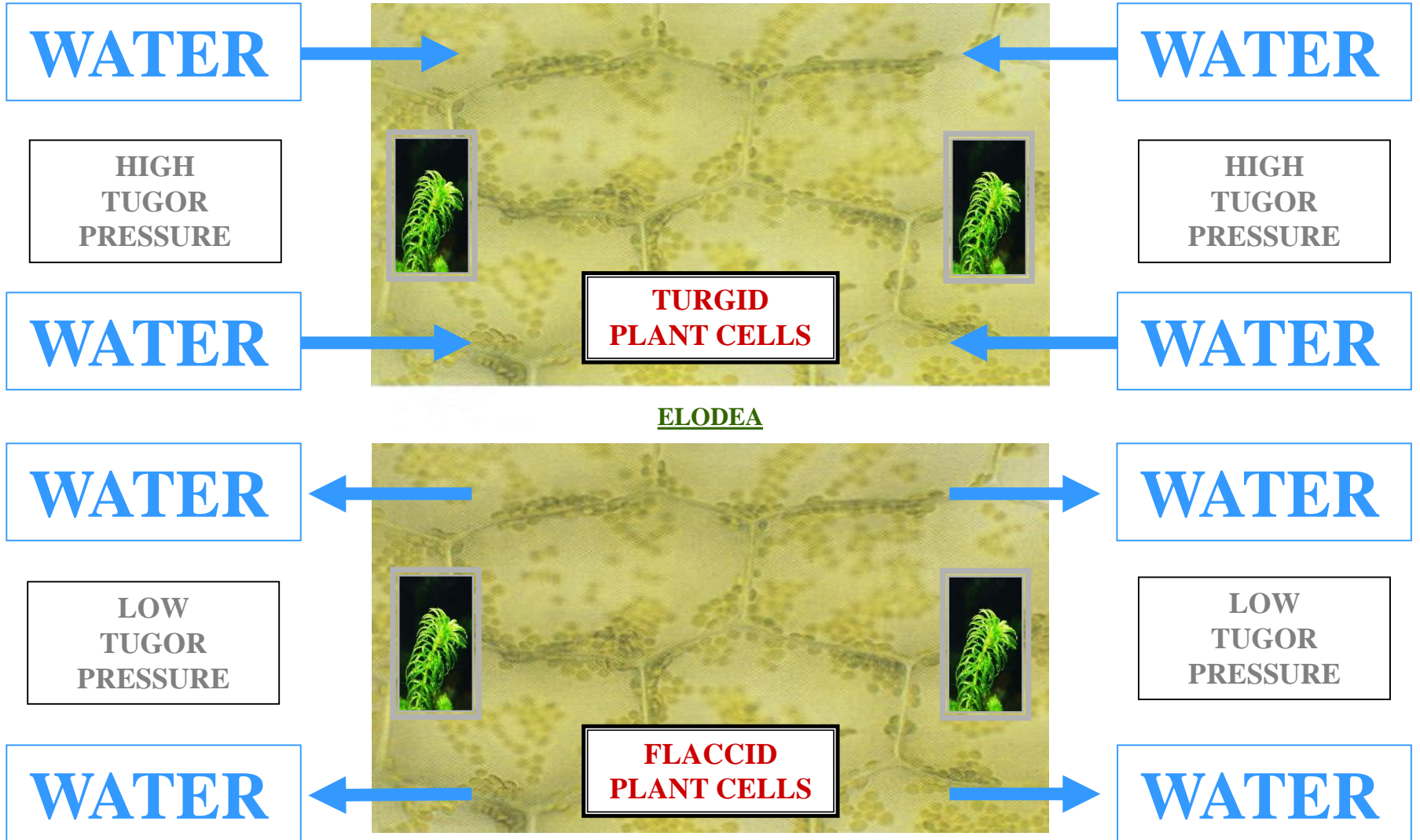
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TUGOR PRESSURE



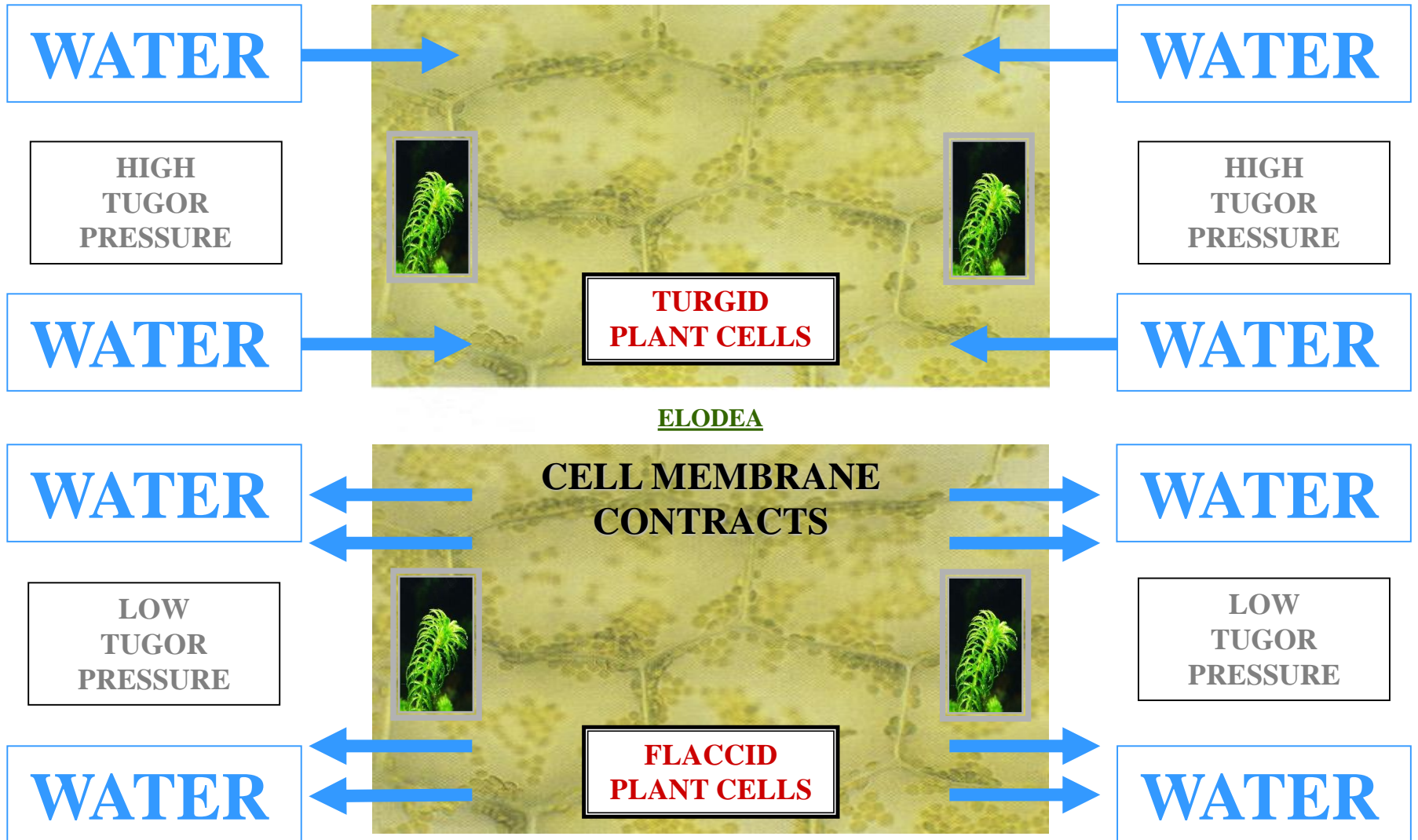
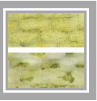
ELODEA

TUGOR PRESSURE



ELODEA

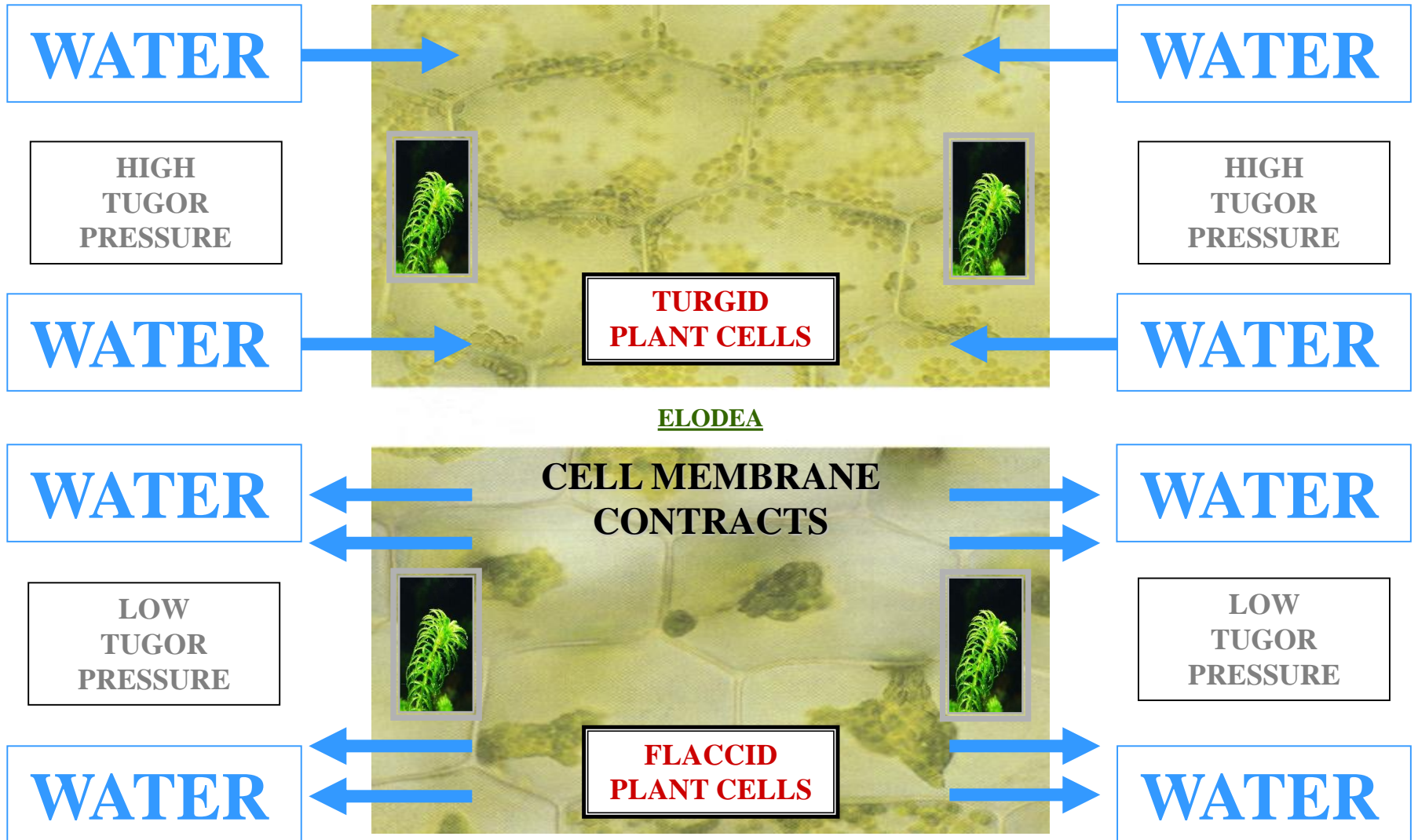
TUGOR PRESSURE





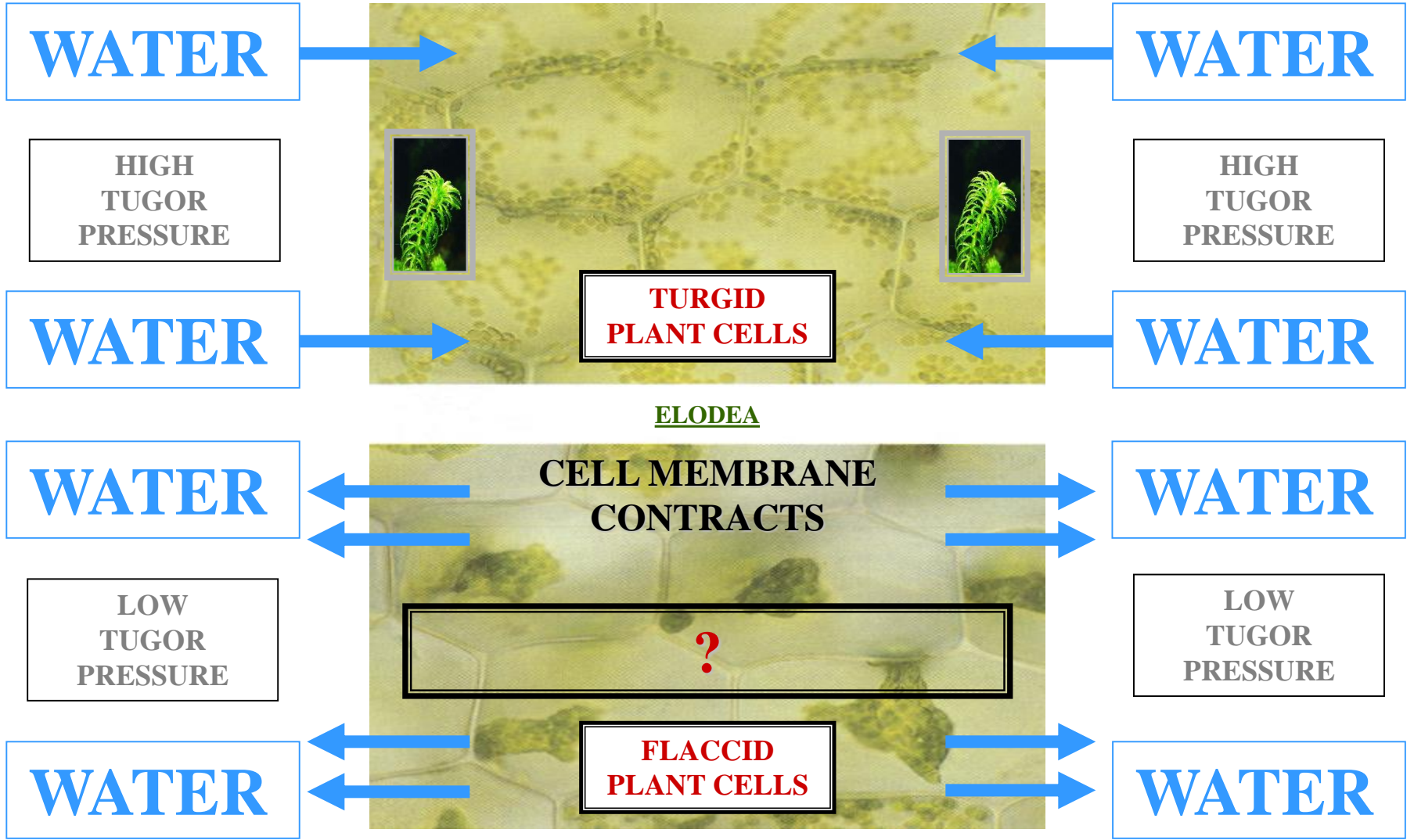
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TUGOR PRESSURE



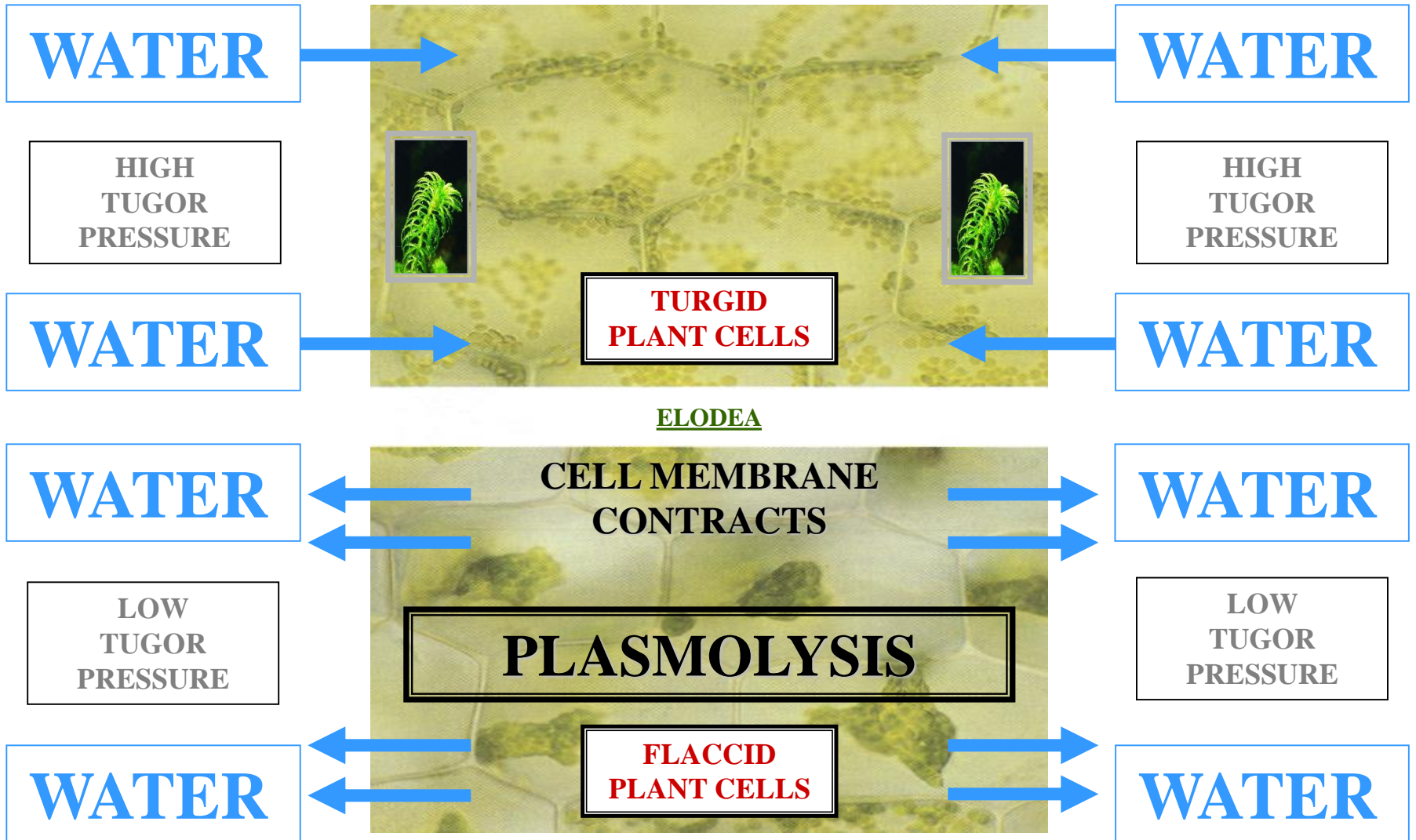
ELODEA

TUGOR PRESSURE



ELODEA

TUGOR PRESSURE





EXOCYTOSIS VS ENDOCYTOSIS

MEMBRANE TRANSPORT

An electron micrograph showing a cross-section of a cell. The image displays various organelles, including a large nucleus with a prominent nucleolus, rough endoplasmic reticulum with ribosomes, and several mitochondria with visible internal folds (cristae). The text 'MEMBRANE TRANSPORT MICROMOLECULES' is overlaid in large red letters. In the top right corner, there are three small icons: a red 'S' in a white box, another red 'S' in a white box, and a white '+' in a black box.

S

S

+

MEMBRANE TRANSPORT MICROMOLECULES



**MEMBRANE
TRANSPORT
MICROMOLECULES
SOLUTES
&
SOLVENT**

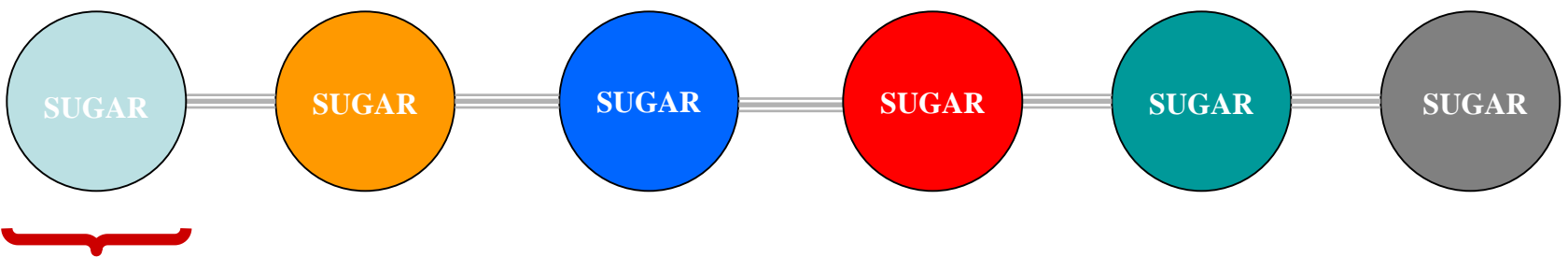
MEMBRANE TRANSPORT

An electron micrograph showing a cross-section of a cell. The image displays various organelles, including a large nucleus with a prominent nucleolus, several mitochondria with visible internal cristae, and a network of endoplasmic reticulum. The text is overlaid in the center of the image.

**MEMBRANE
TRANSPORT
MACROMOLECULES**

MEMBRANE TRANSPORT

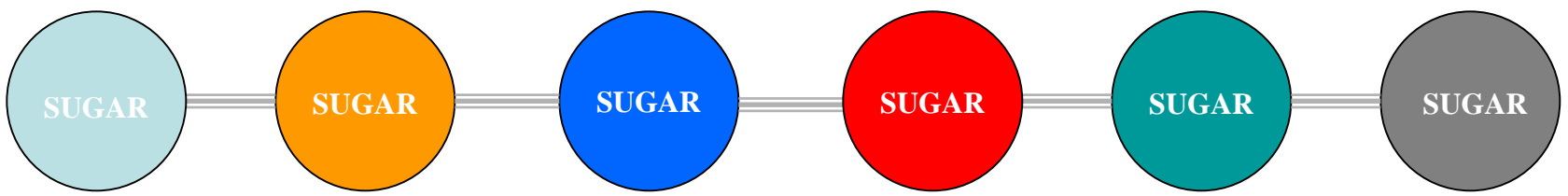
MACROMOLECULE



MONOSACCHARIDE **≡ = BOND**

MEMBRANE TRANSPORT

MACROMOLECULE



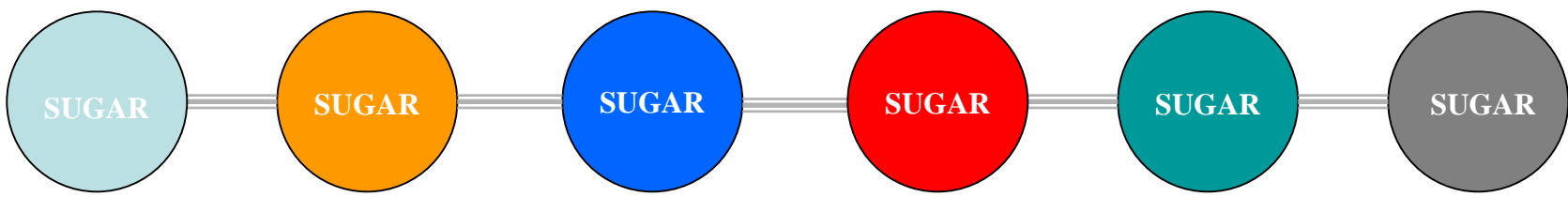
MONOSACCHARIDE **≡ = BOND**



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MEMBRANE TRANSPORT

MACROMOLECULE



MONOSACCHARIDE **≡ = BOND**



POLYSACCHARIDE

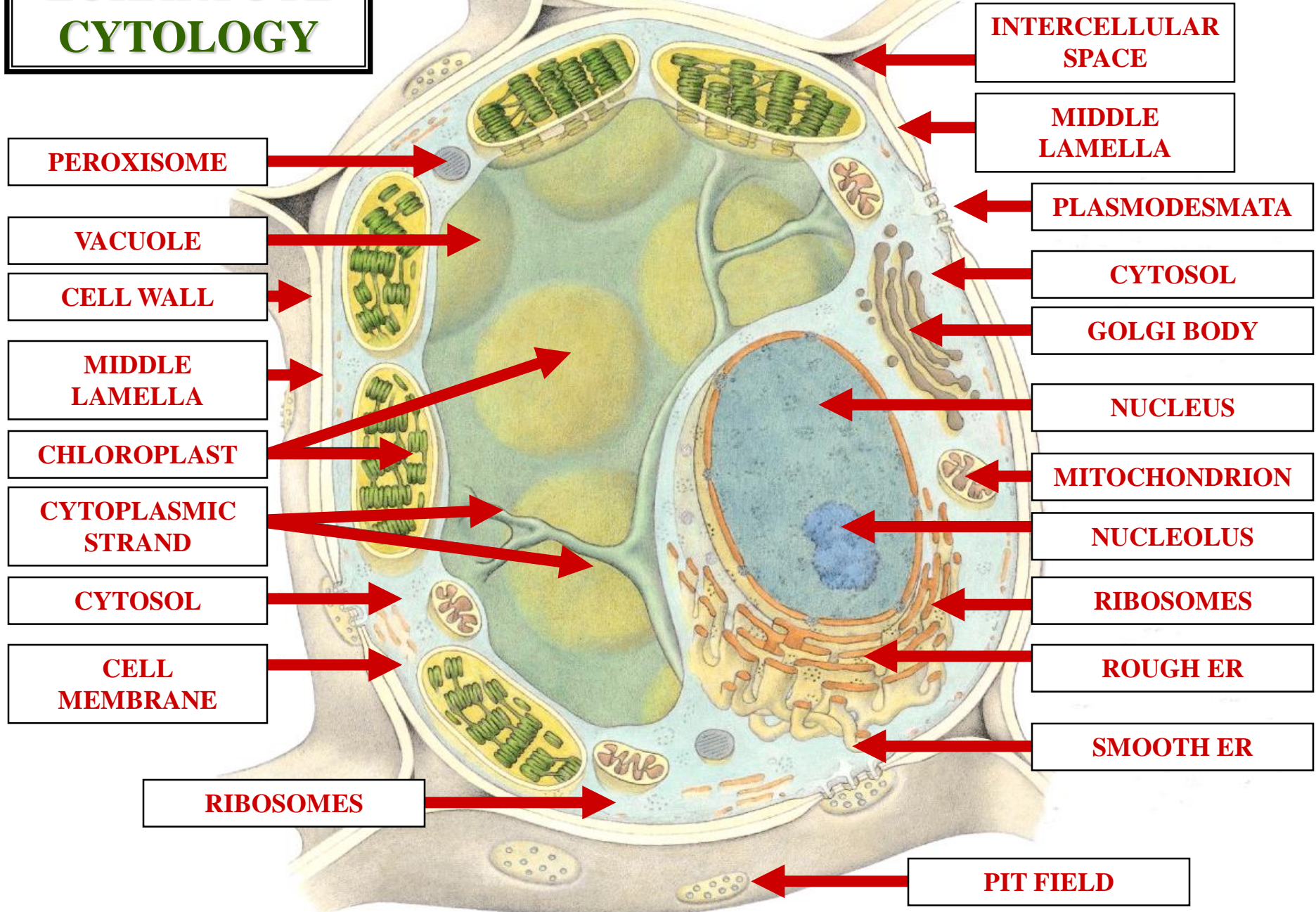
EXTERNAL PASSAGE



EXOCYTOSIS

EUKARYOTE CYTOLOGY

G

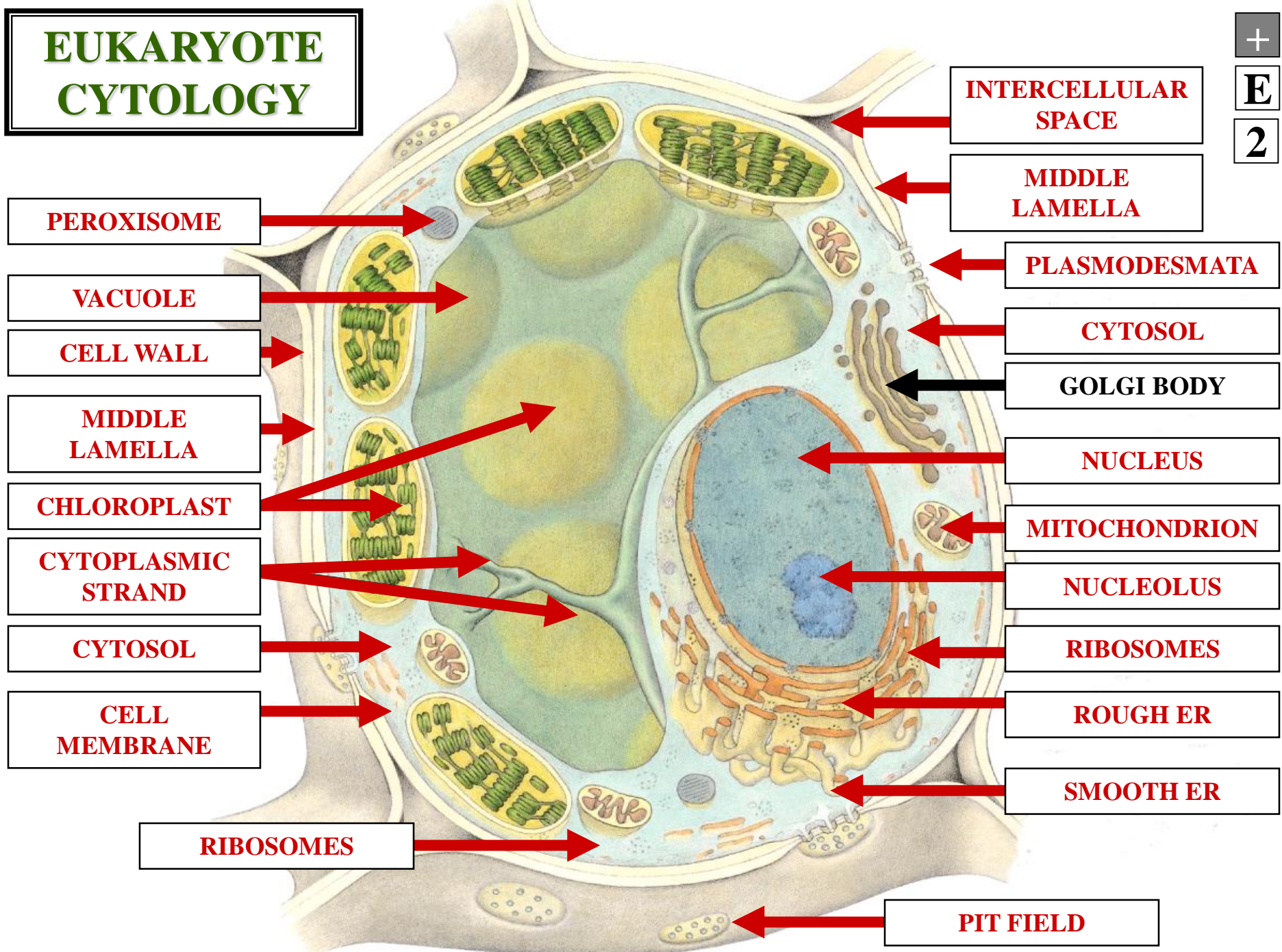


EUKARYOTE CYTOLOGY

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E

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EXOCYTOSIS

GOLGI BODY VESICLES

FUSE WITH

CELL MEMBRANE

AND

EXIT MACROMOLECULES

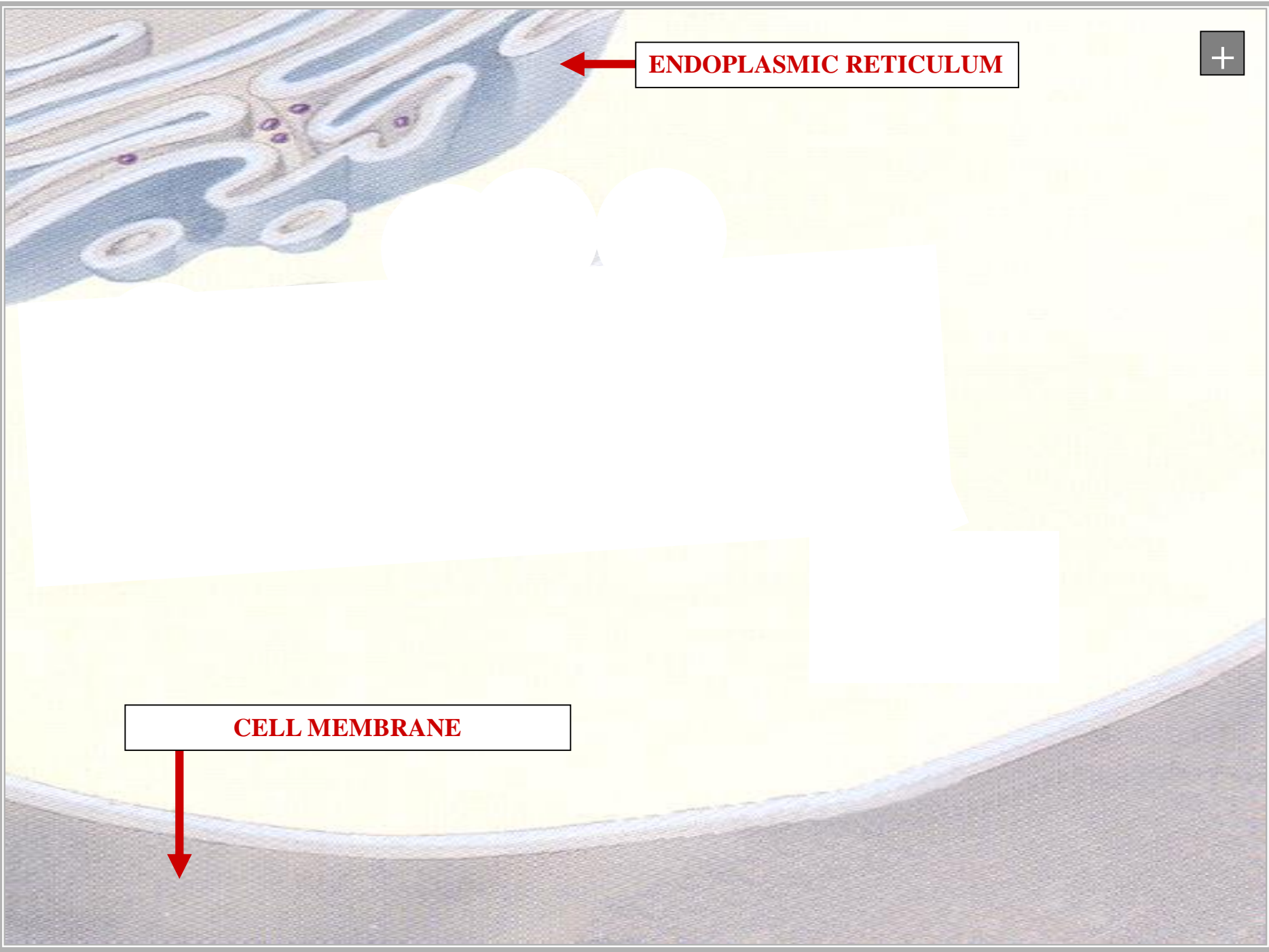
FROM CELL

EXOCYTOSIS



ENDOPLASMIC RETICULUM

CELL MEMBRANE





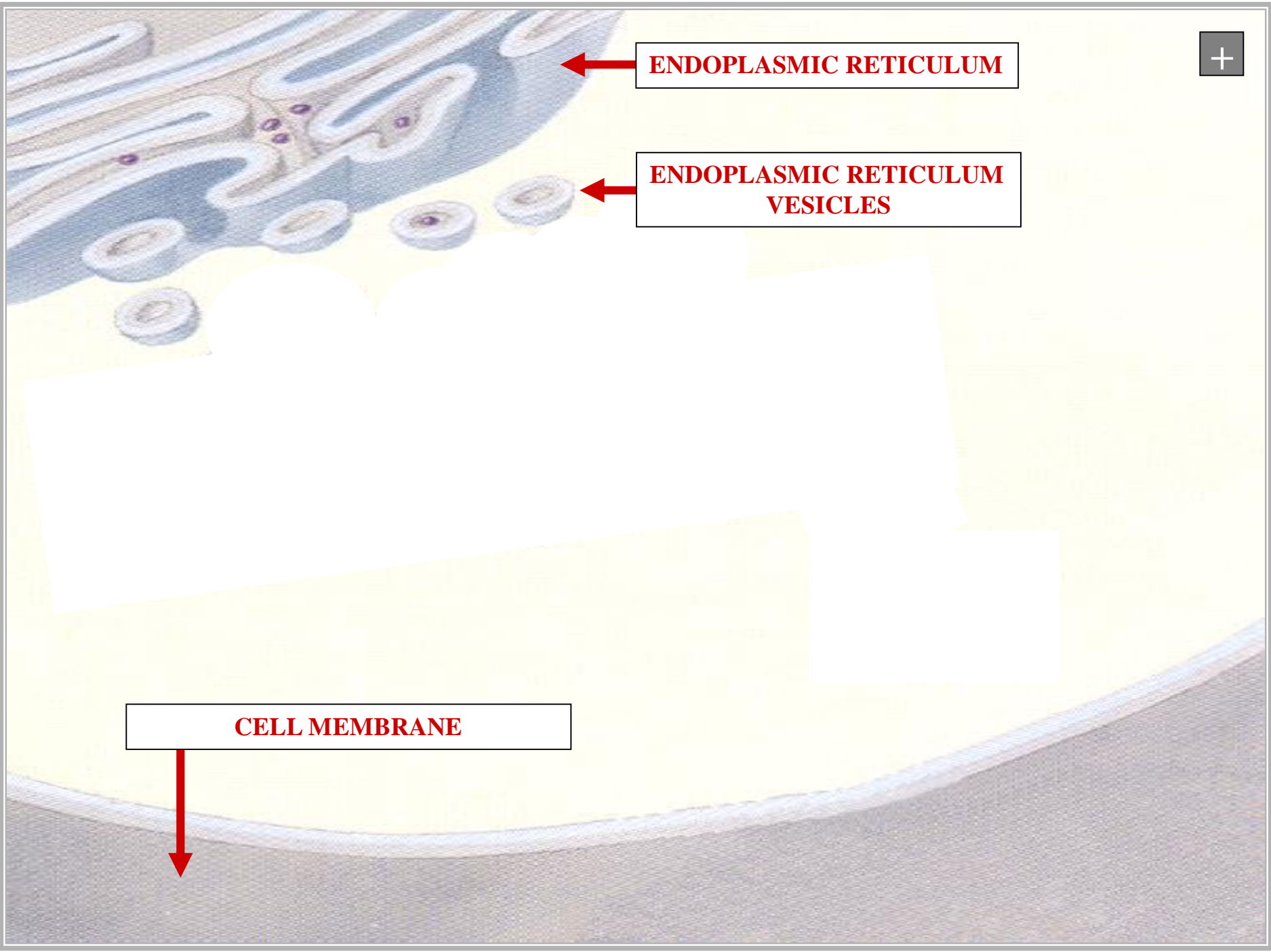
ENDOPLASMIC RETICULUM



**ENDOPLASMIC RETICULUM
VESICLES**



CELL MEMBRANE





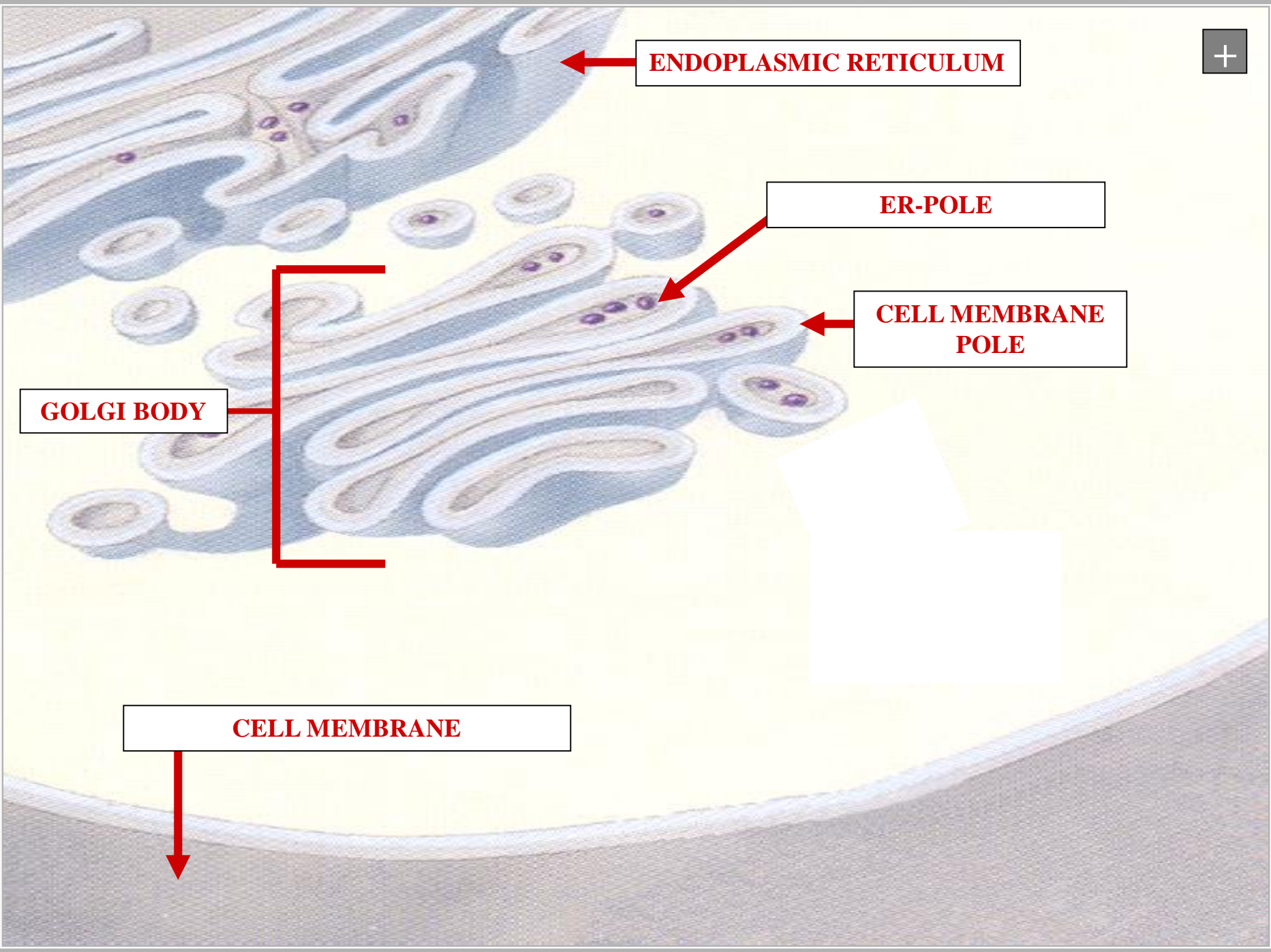
ENDOPLASMIC RETICULUM

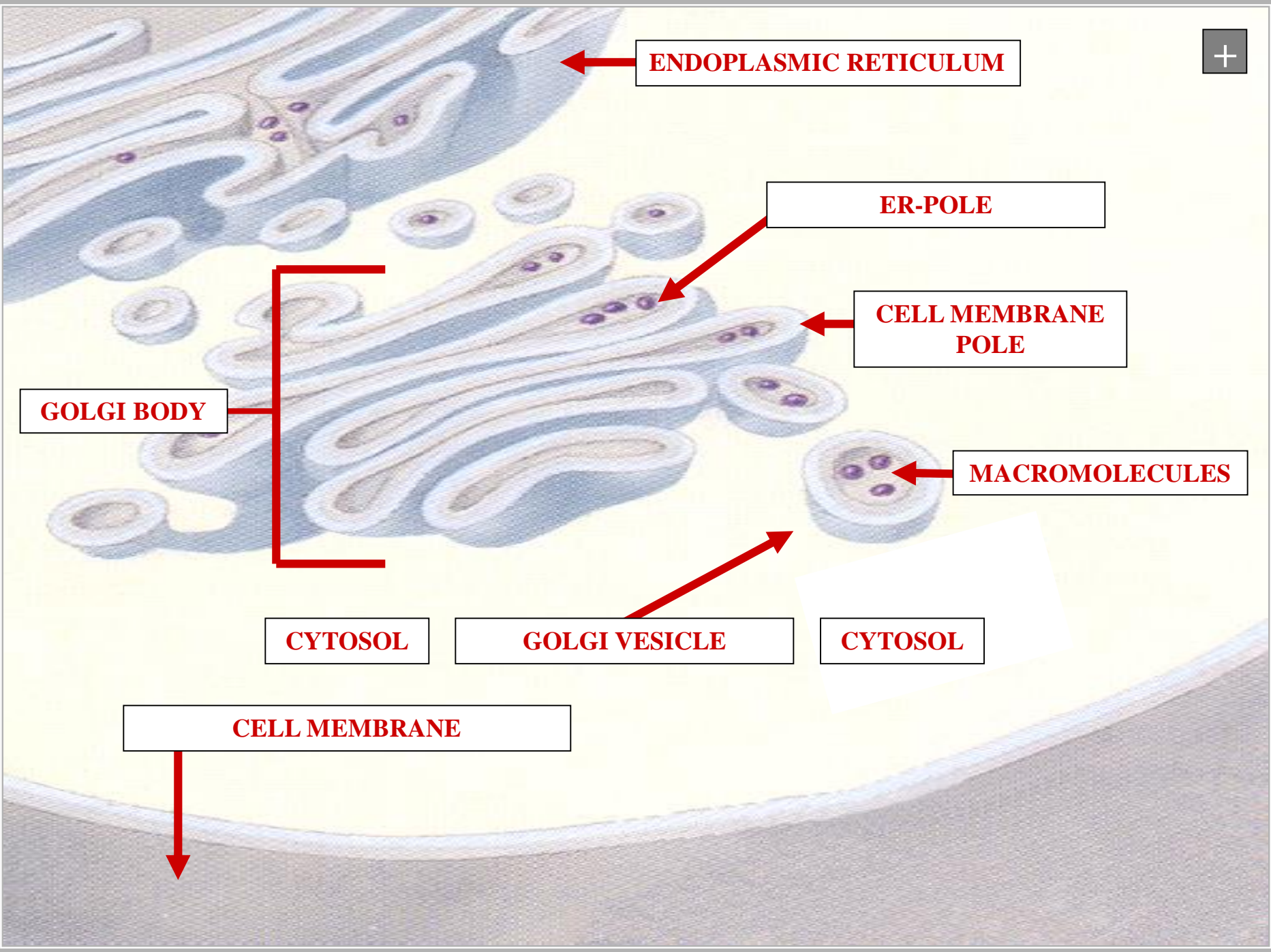
ER-POLE

**CELL MEMBRANE
POLE**

GOLGI BODY

CELL MEMBRANE





ENDOPLASMIC RETICULUM

ER-POLE

**CELL MEMBRANE
POLE**

GOLGI BODY

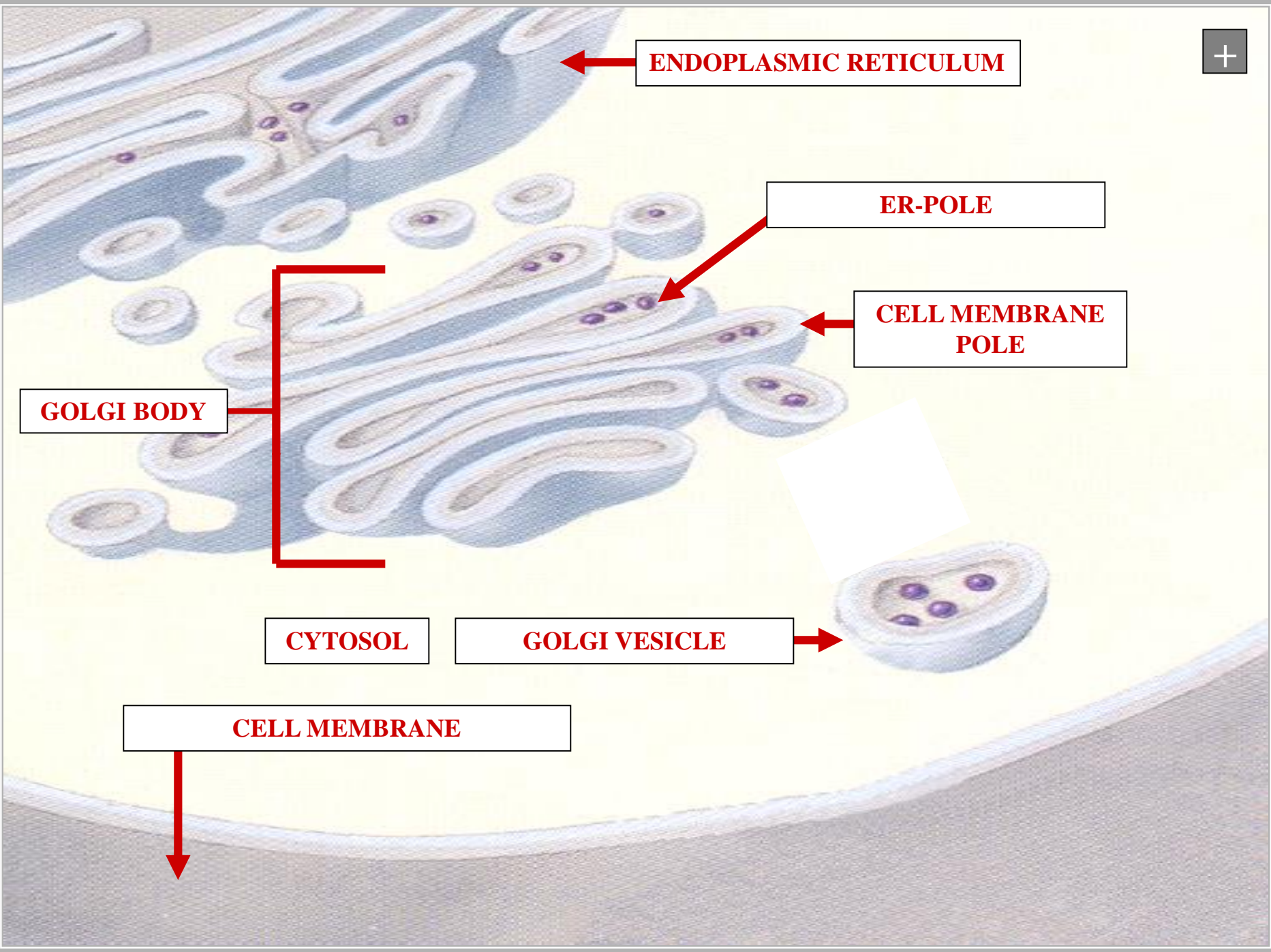
MACROMOLECULES

CYTOSOL

GOLGI VESICLE

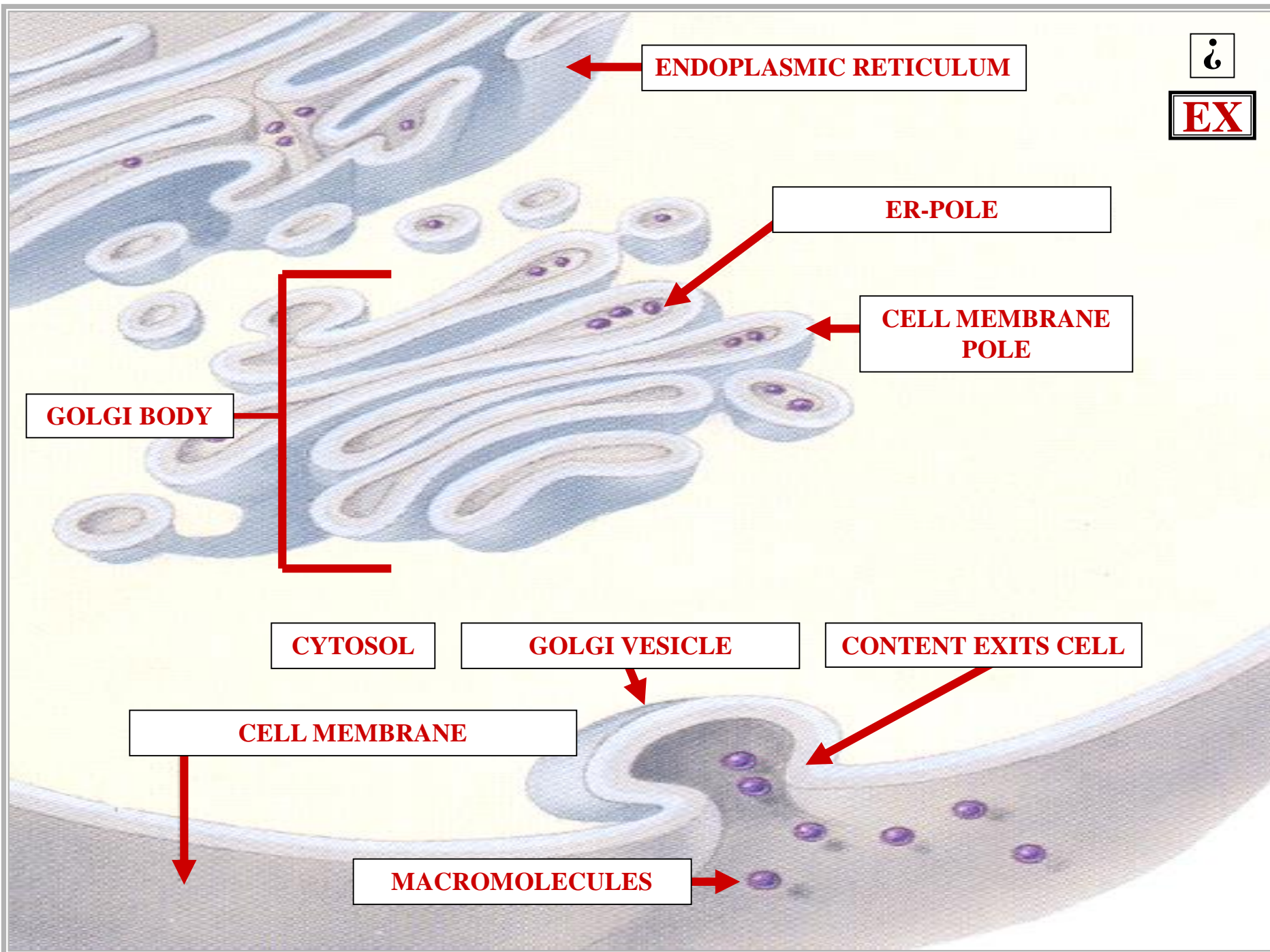
CYTOSOL

CELL MEMBRANE





EX



ENDOPLASMIC RETICULUM

ER-POLE

**CELL MEMBRANE
POLE**

GOLGI BODY

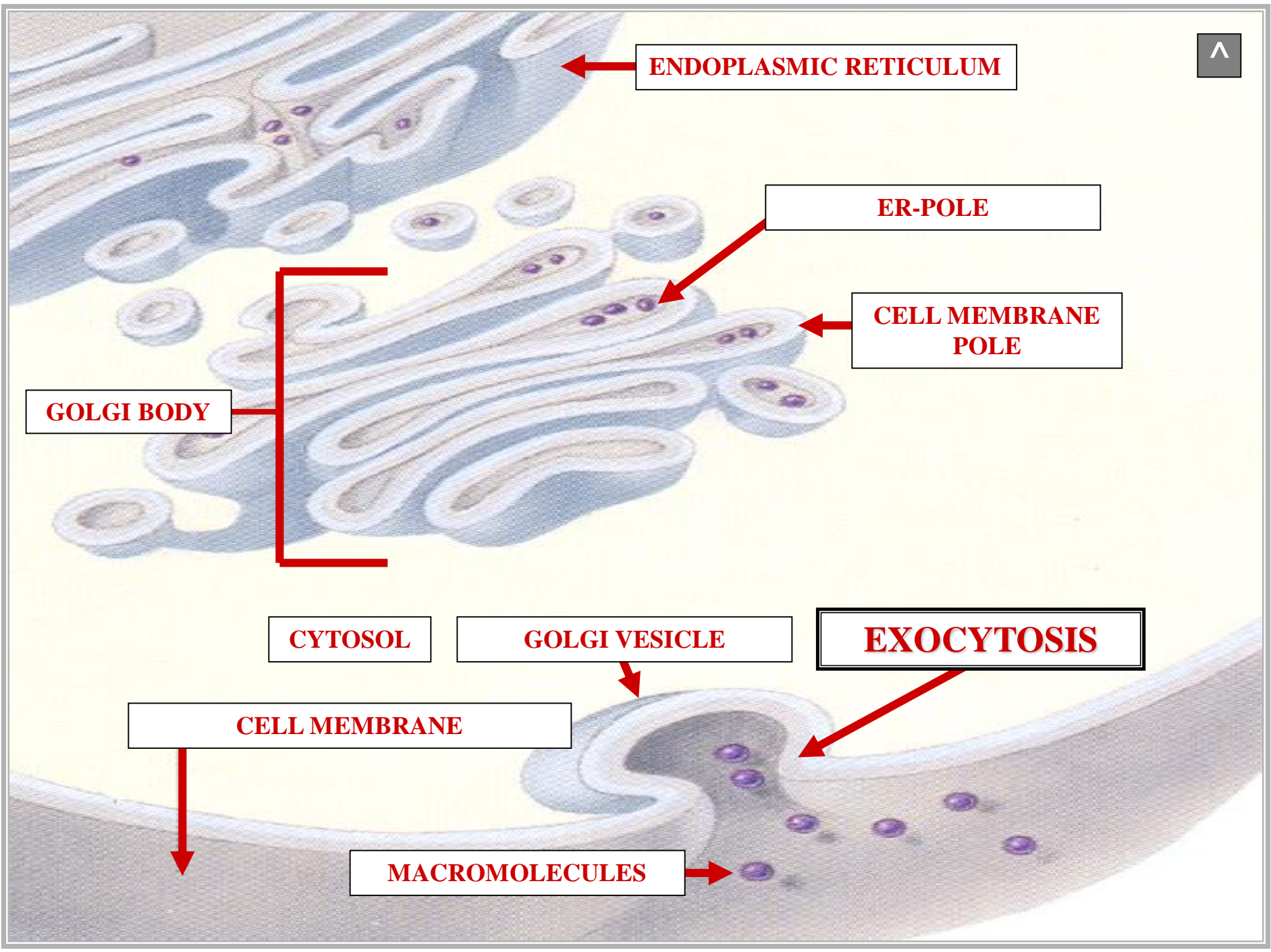
CYTOSOL

GOLGI VESICLE

CONTENT EXITS CELL

CELL MEMBRANE

MACROMOLECULES



ENDOPLASMIC RETICULUM

ER-POLE

**CELL MEMBRANE
POLE**

GOLGI BODY

CYTOSOL

GOLGI VESICLE

EXOCYTOSIS

CELL MEMBRANE

MACROMOLECULES

INTERNAL PASSAGE

ENDOCYTOSIS

ENDOCYTOSIS



CELL MEMBRANE ENGULFS
EXTERNAL MACROMOLECULES
AND ENTERS MACROMOLECULES
INTO CELL

ENDOCYTOSIS



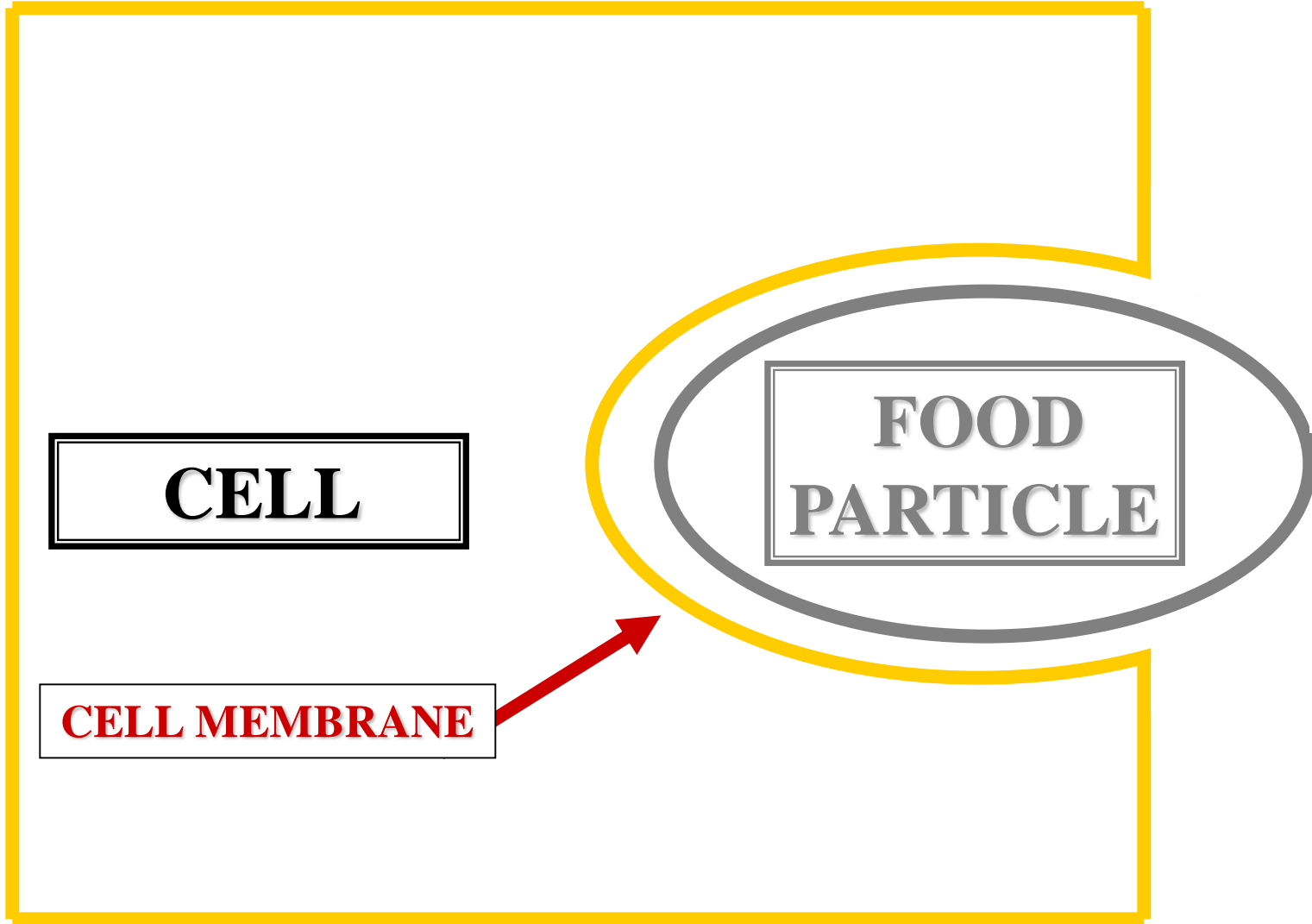
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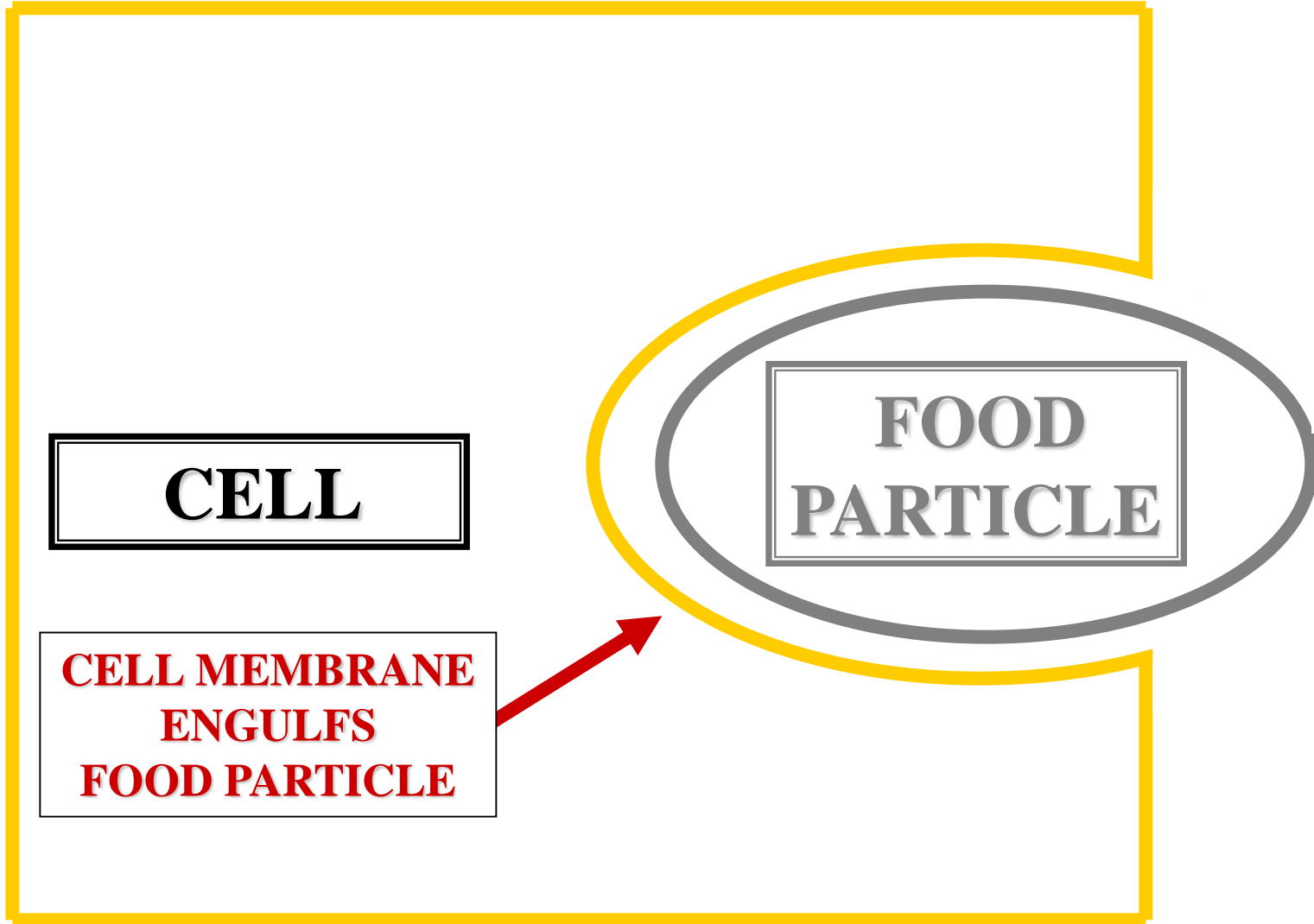


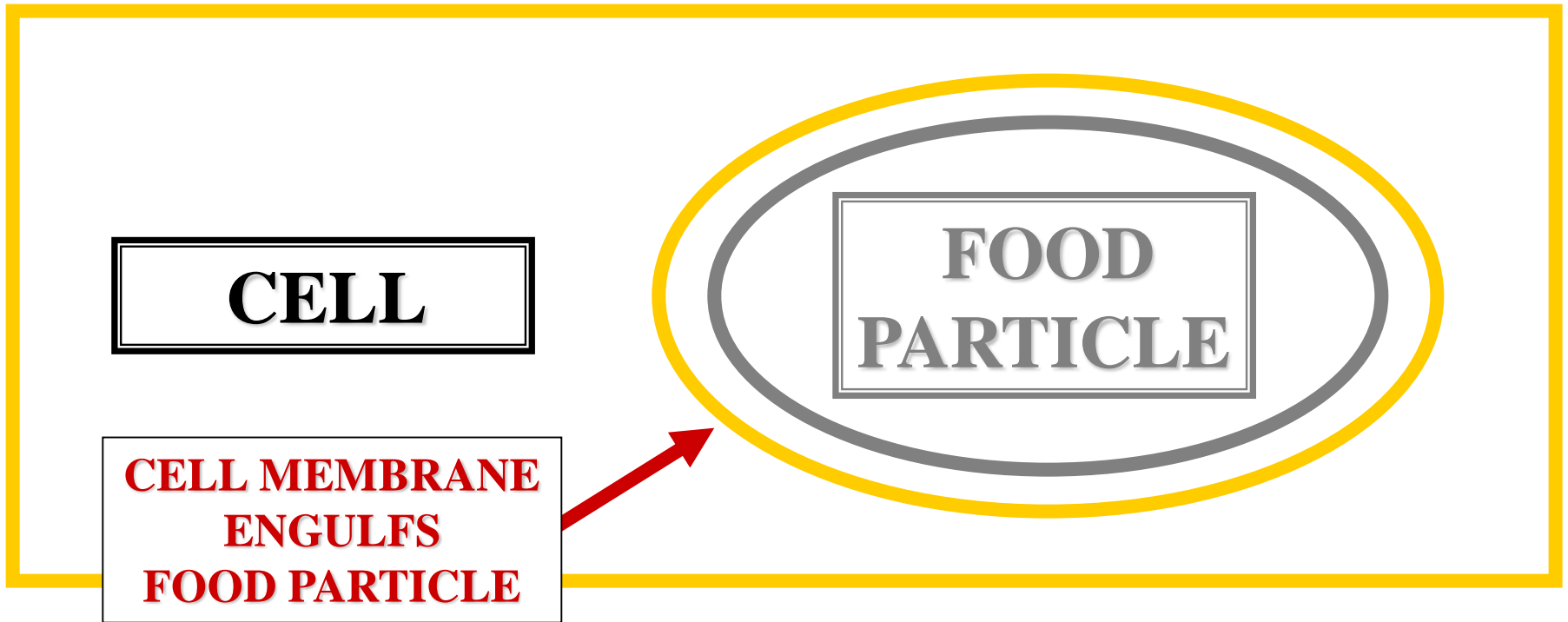
CELL MEMBRANE

**FOOD
PARTICLE**





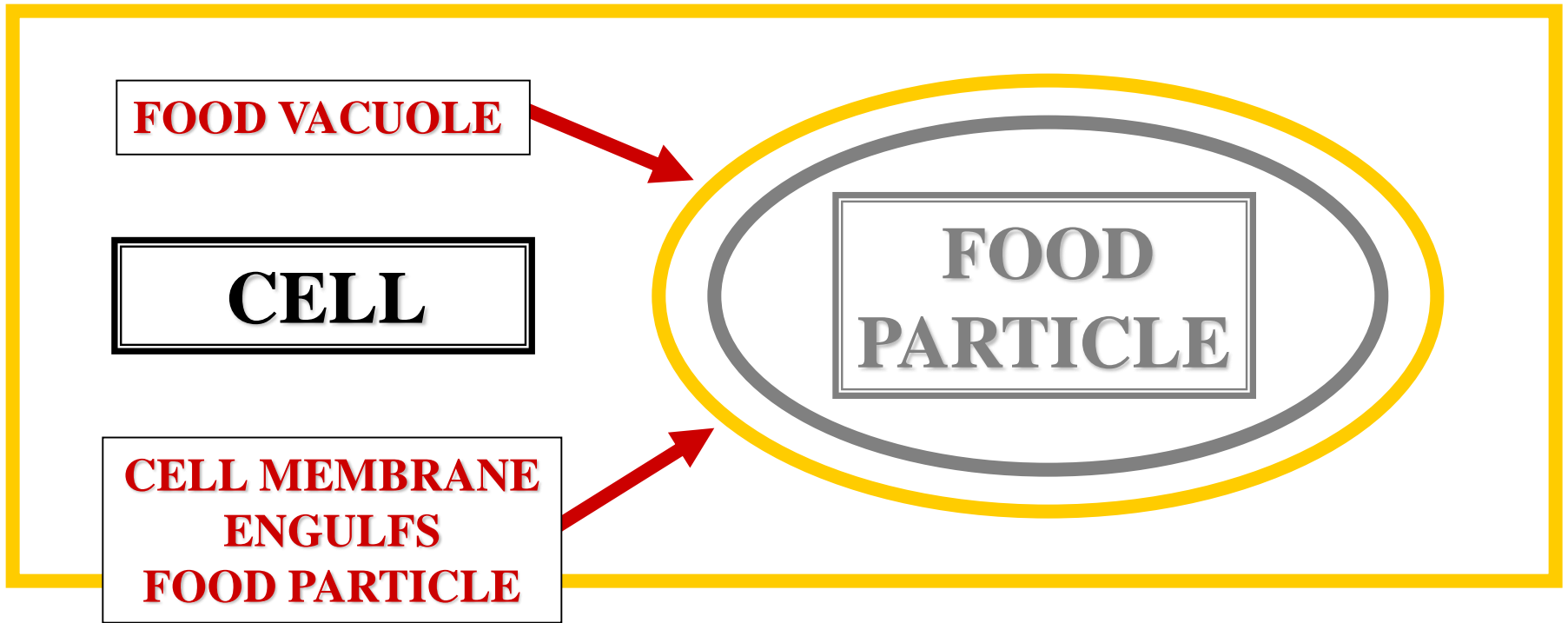


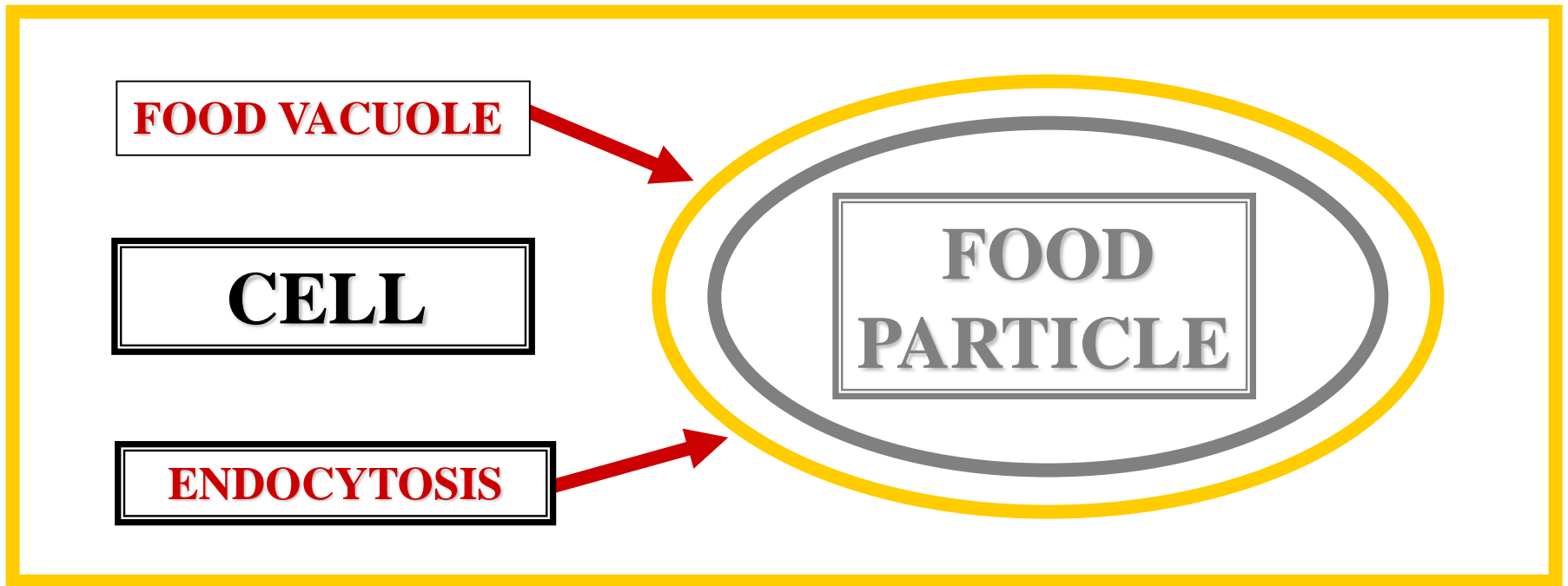


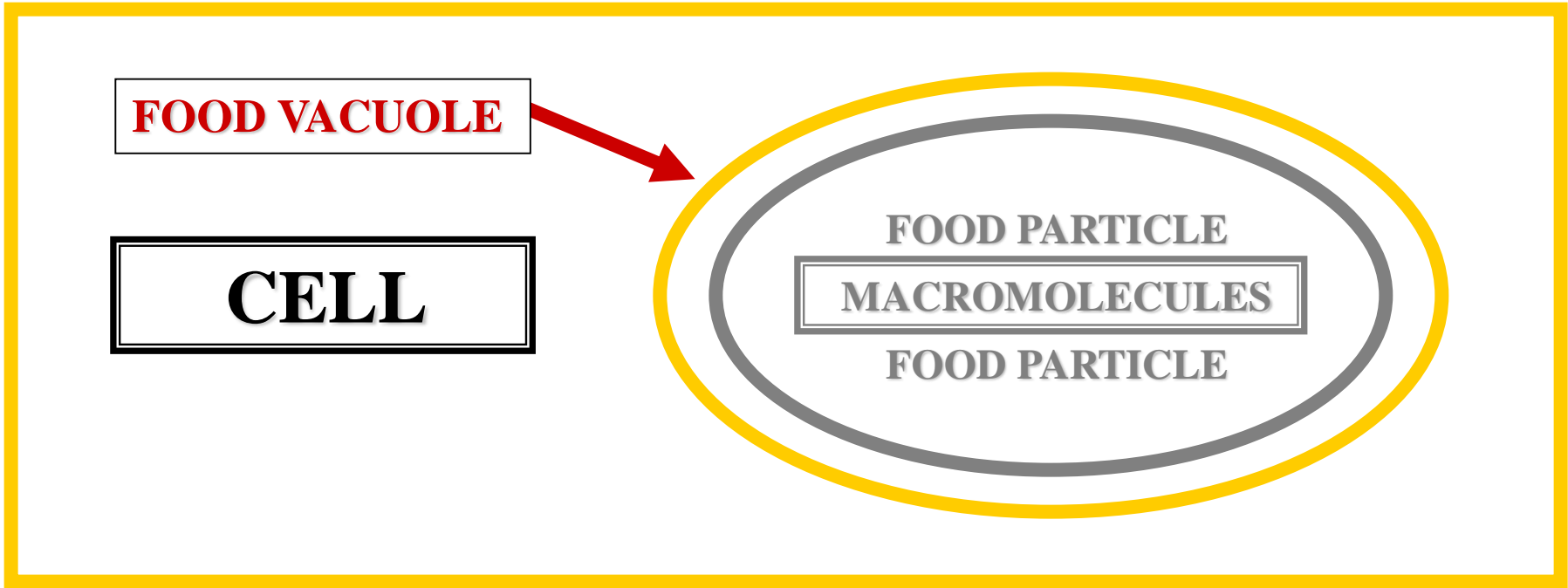
CELL

**FOOD
PARTICLE**

**CELL MEMBRANE
ENGULFS
FOOD PARTICLE**



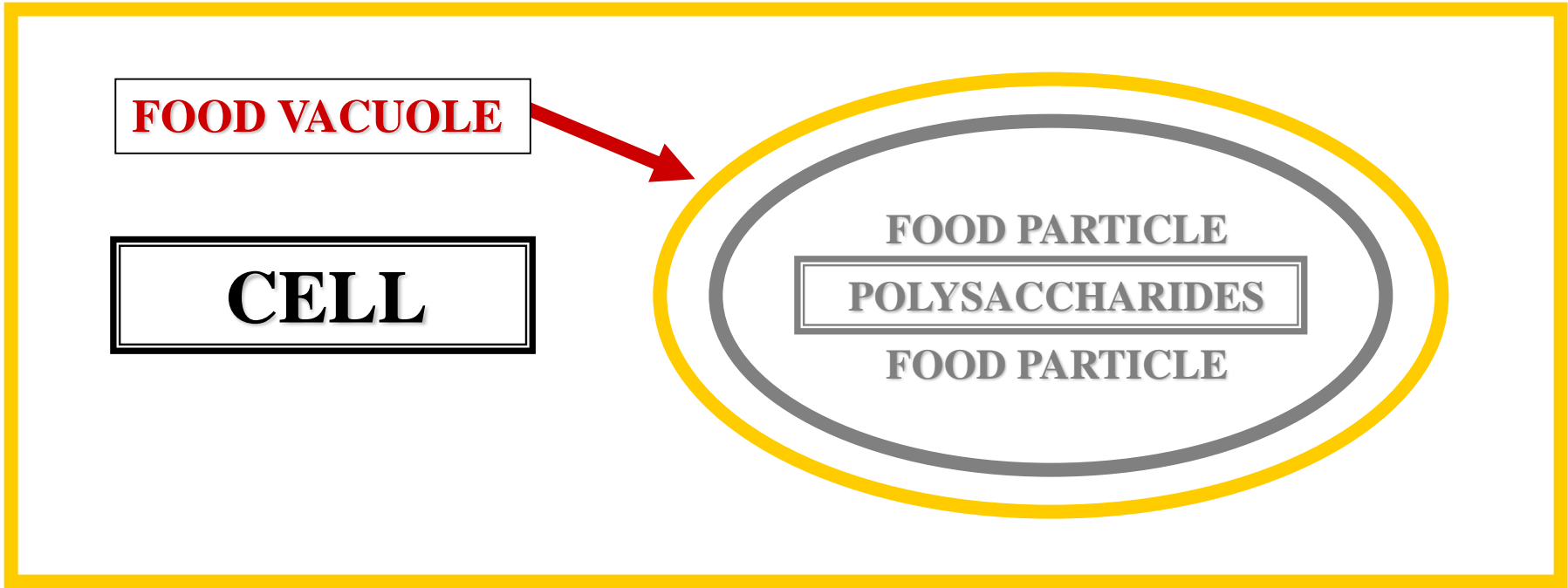




FOOD VACUOLE

CELL

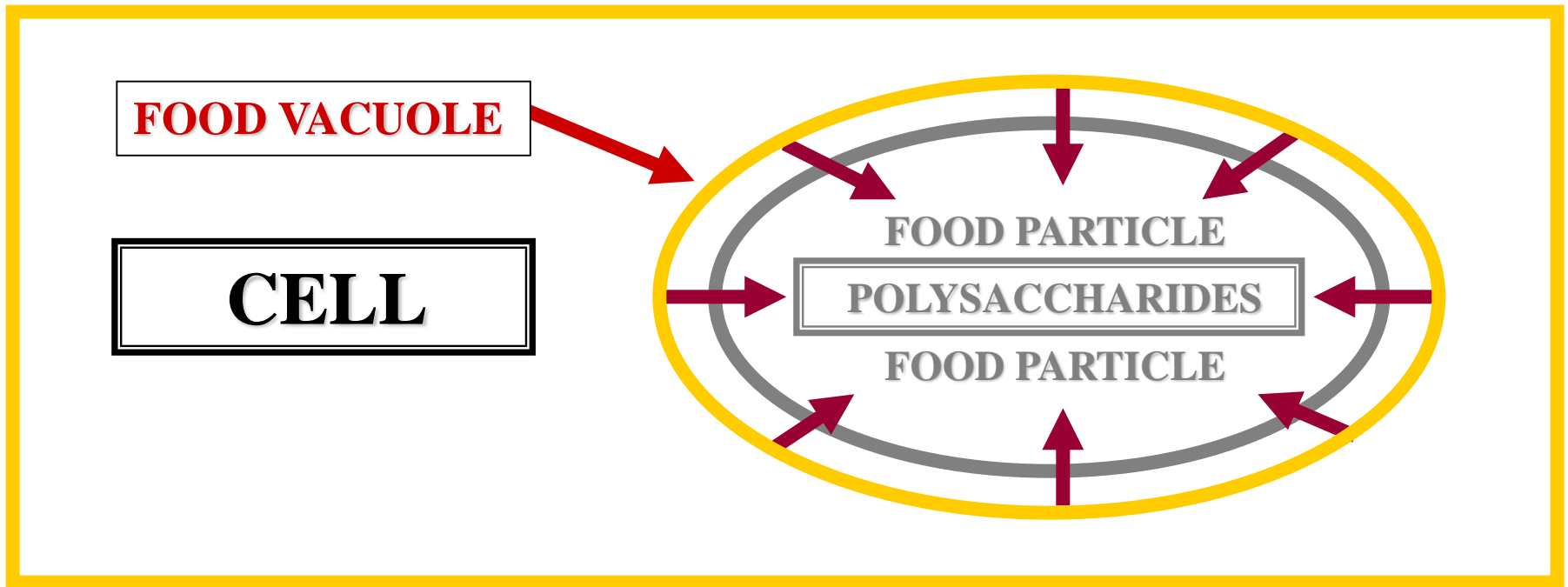
FOOD PARTICLE
MACROMOLECULES
FOOD PARTICLE



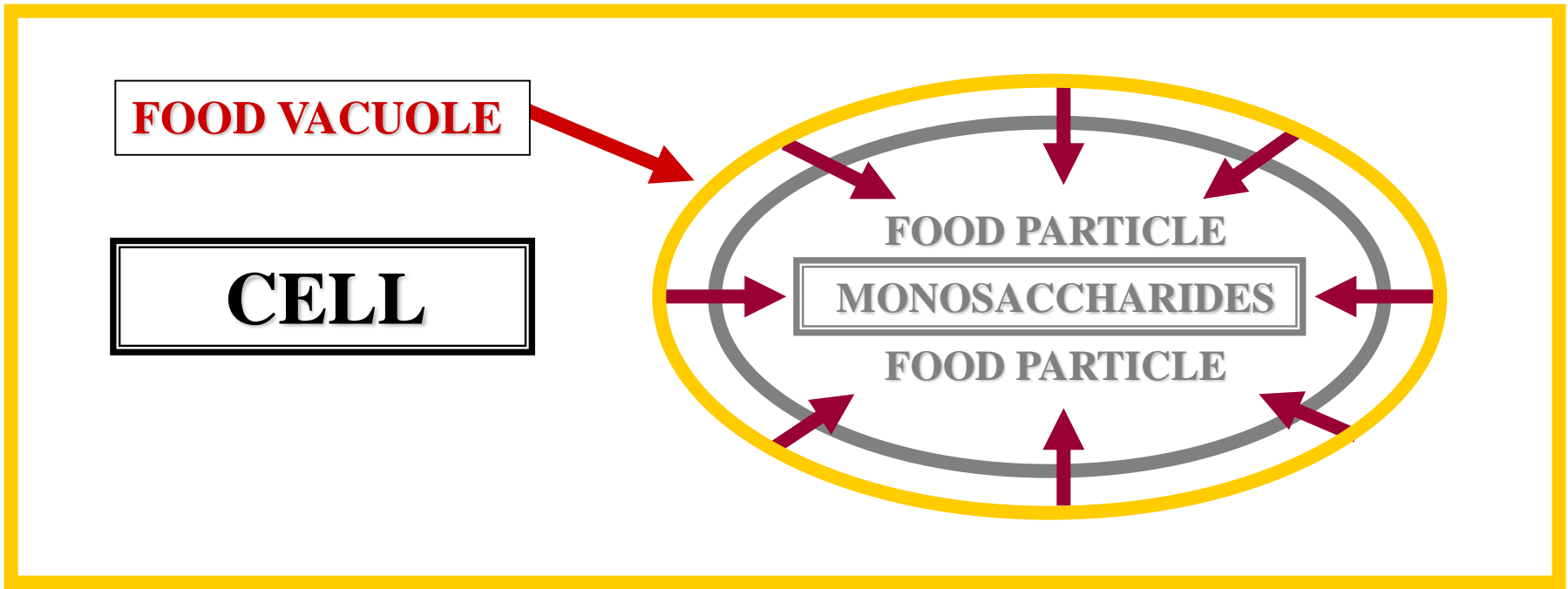
FOOD VACUOLE

CELL

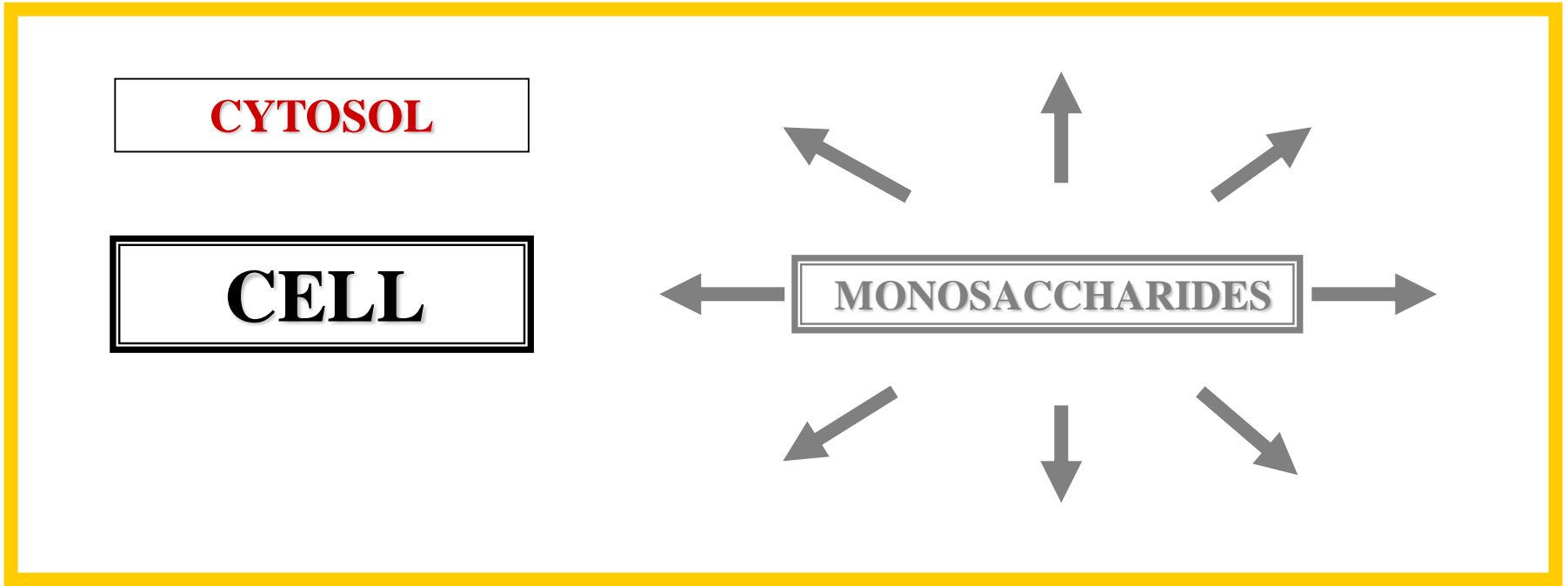
FOOD PARTICLE
POLYSACCHARIDES
FOOD PARTICLE

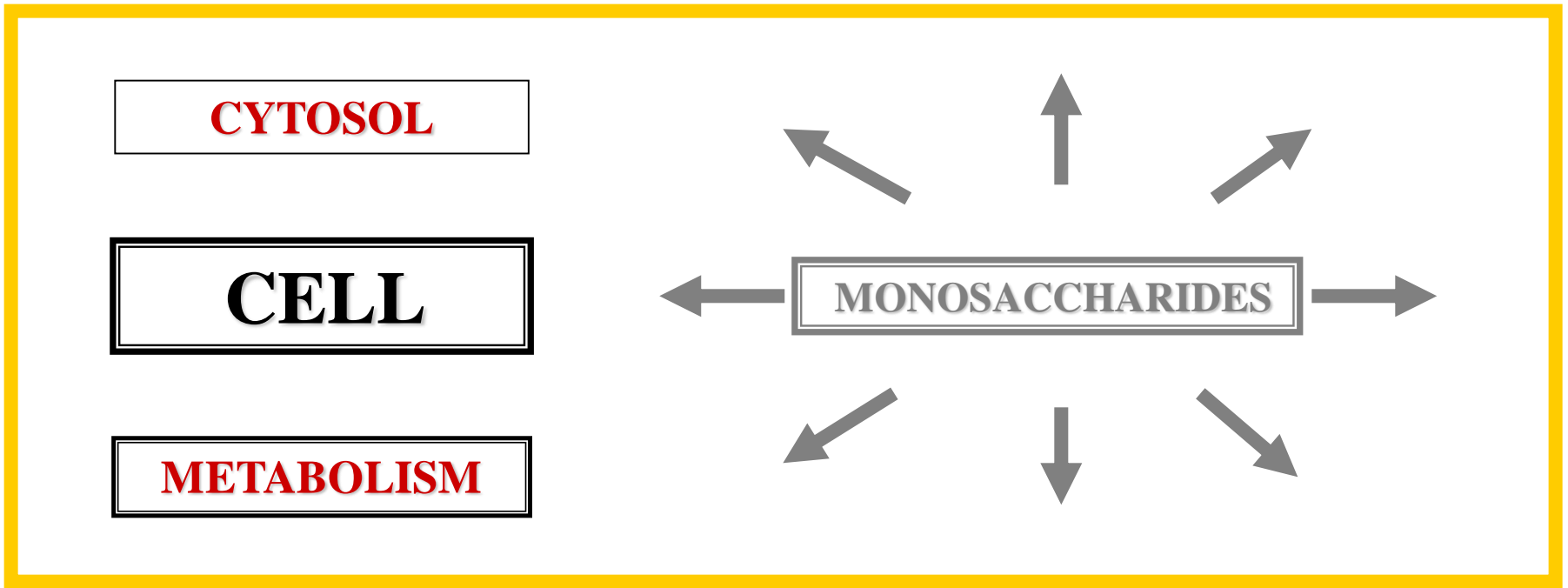


→ = HYDROLYTIC ENZYMES



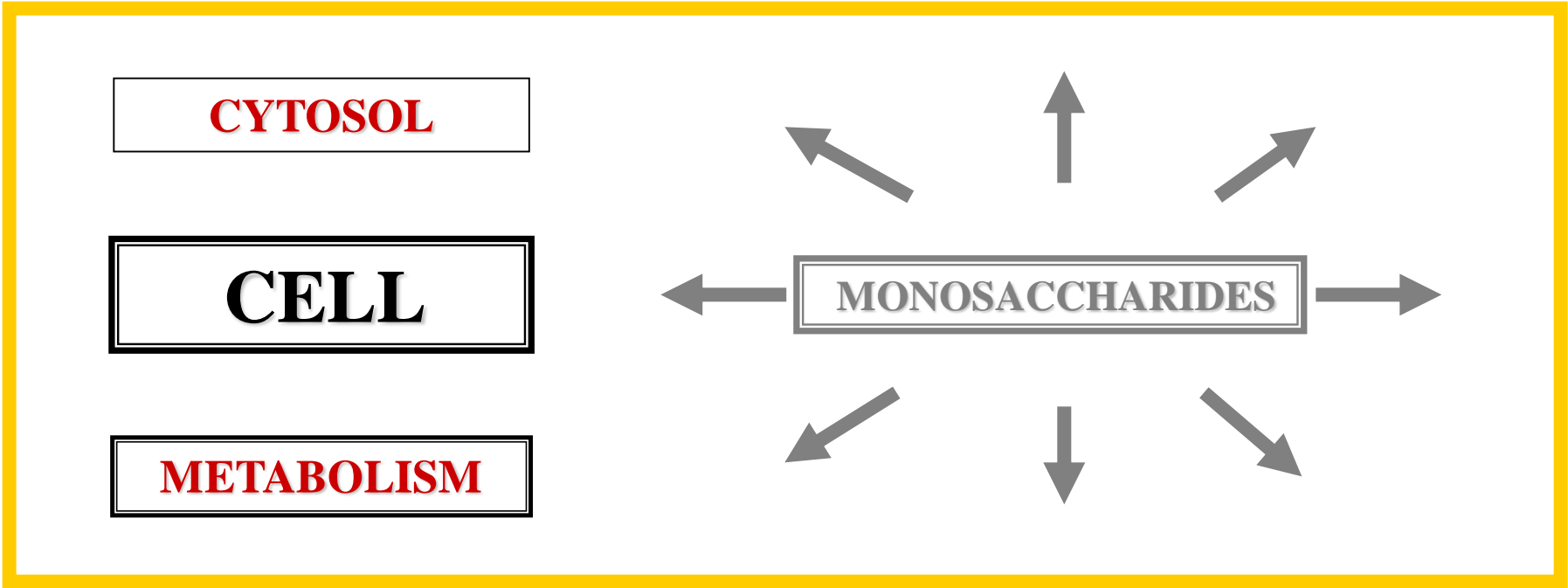
 = **HYDROLYTIC ENZYMES**







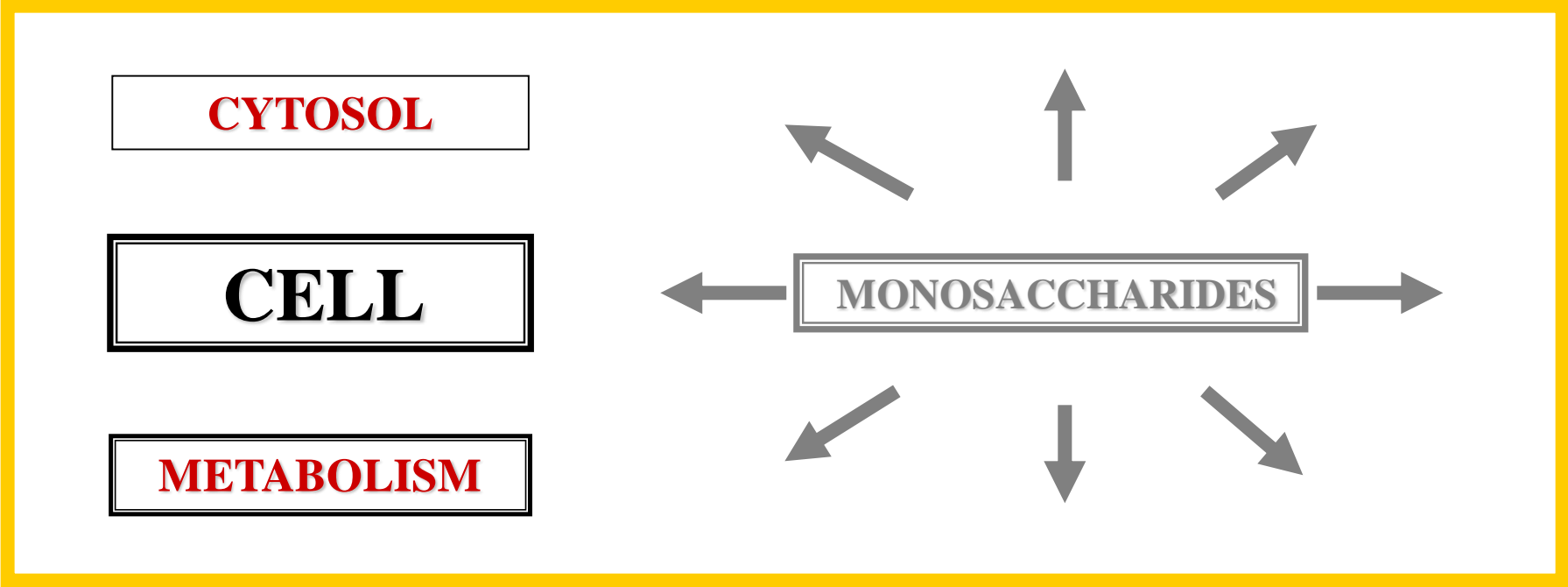
EFFICIENT METABOLISM



EFFICIENT METABOLISM

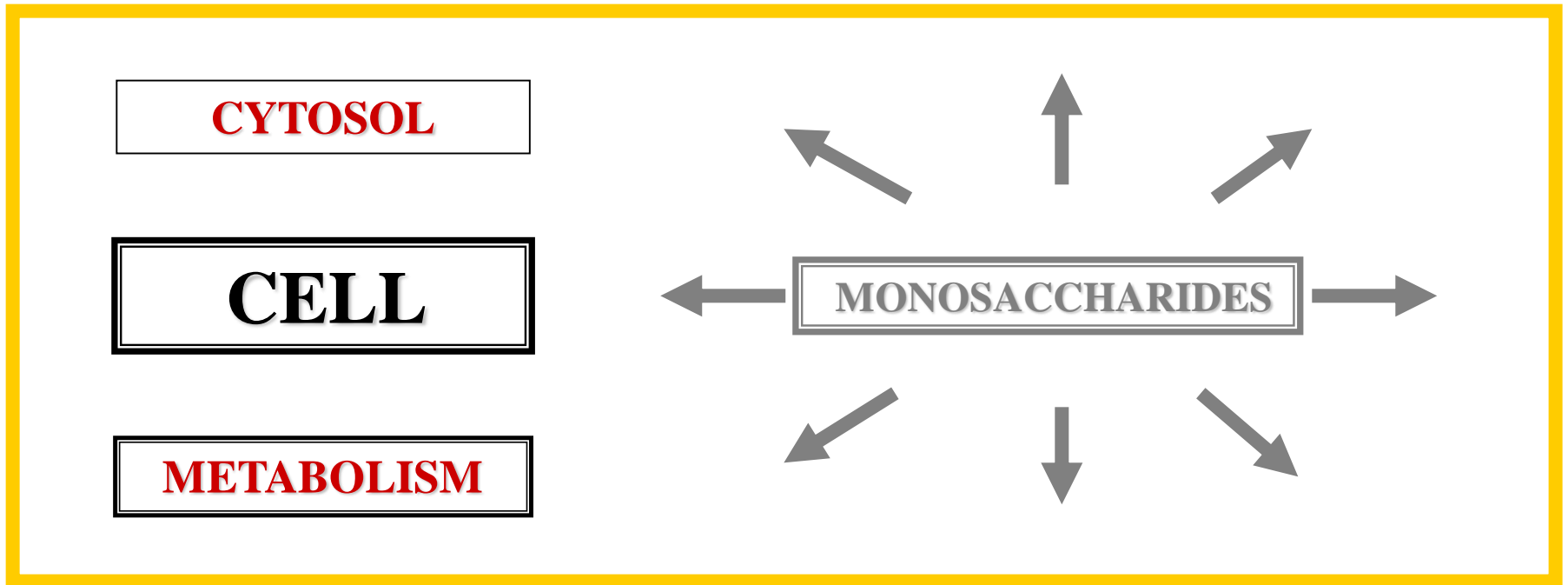


ORGANIZATION INCREASES



ORGANIZATION INCREASES

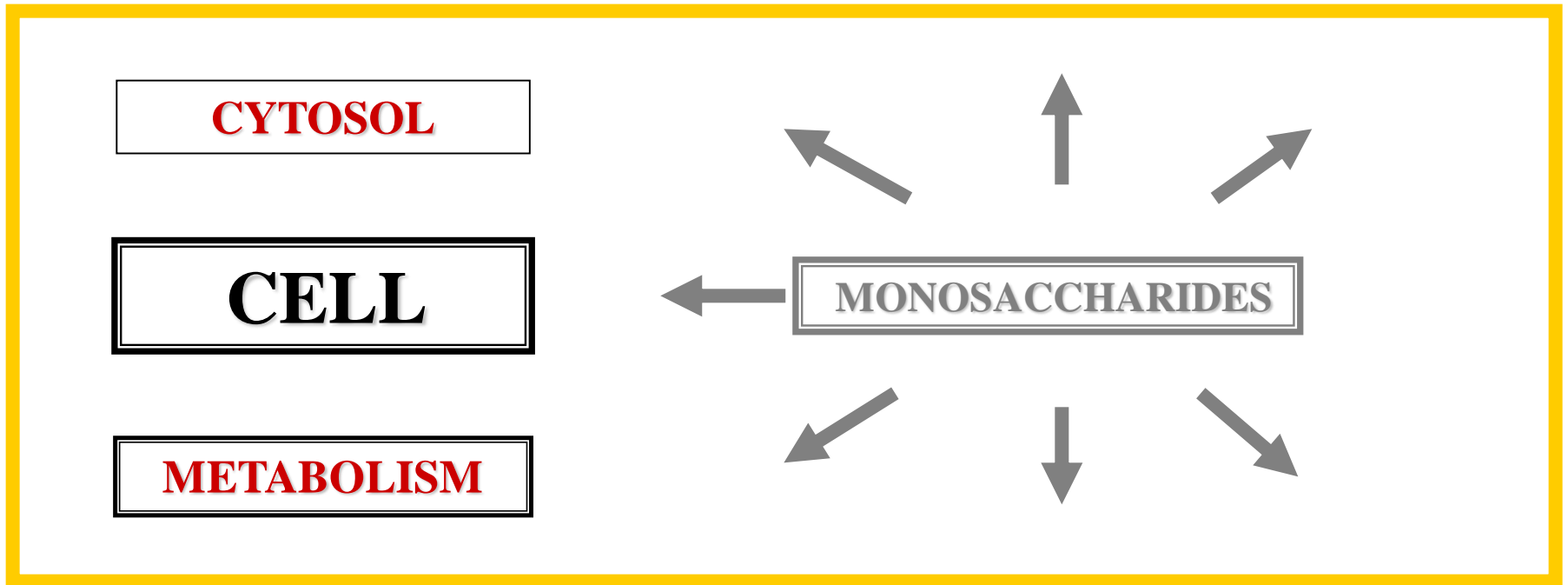
ENTROPY DECREASES



ENTROPY DECREASES



HOMEOSTASIS

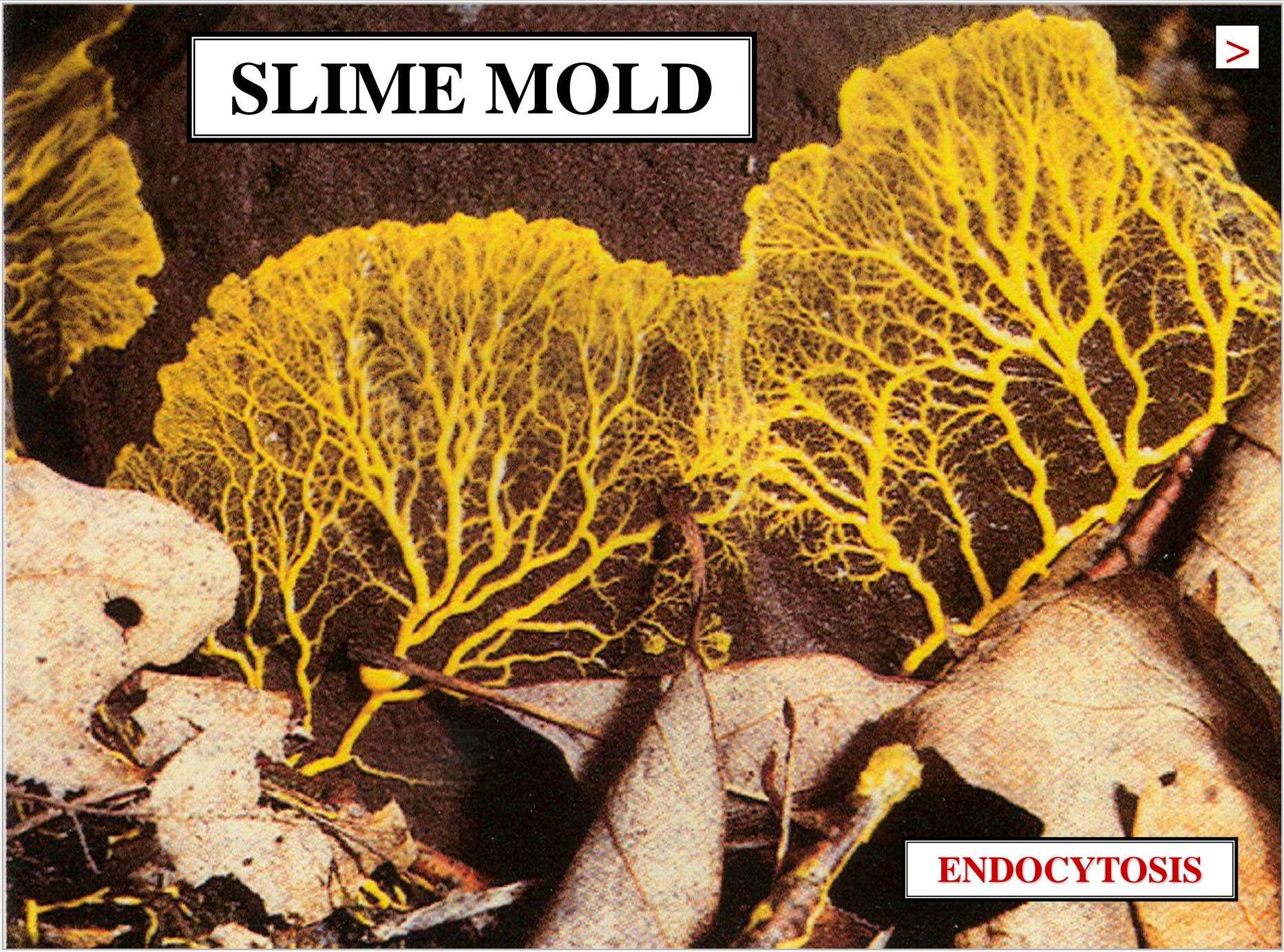


HOMEOSTASIS

SLIME MOLD



ENDOCYTOSIS



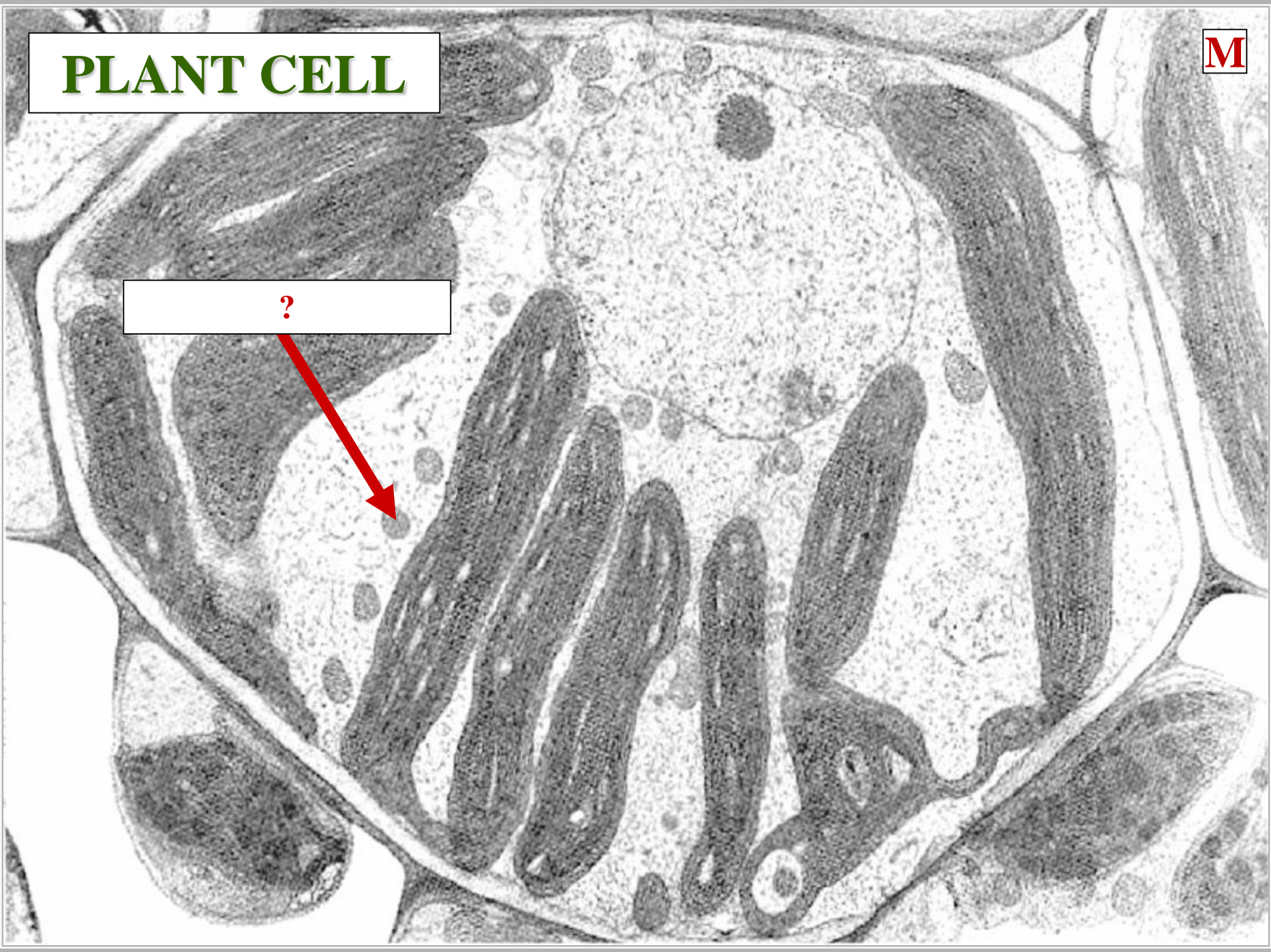
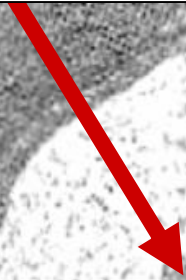


**ENDOCYTOSIS
ESSENTIAL
ENDOSYMBIOTIC
THEORY**

PLANT CELL

M

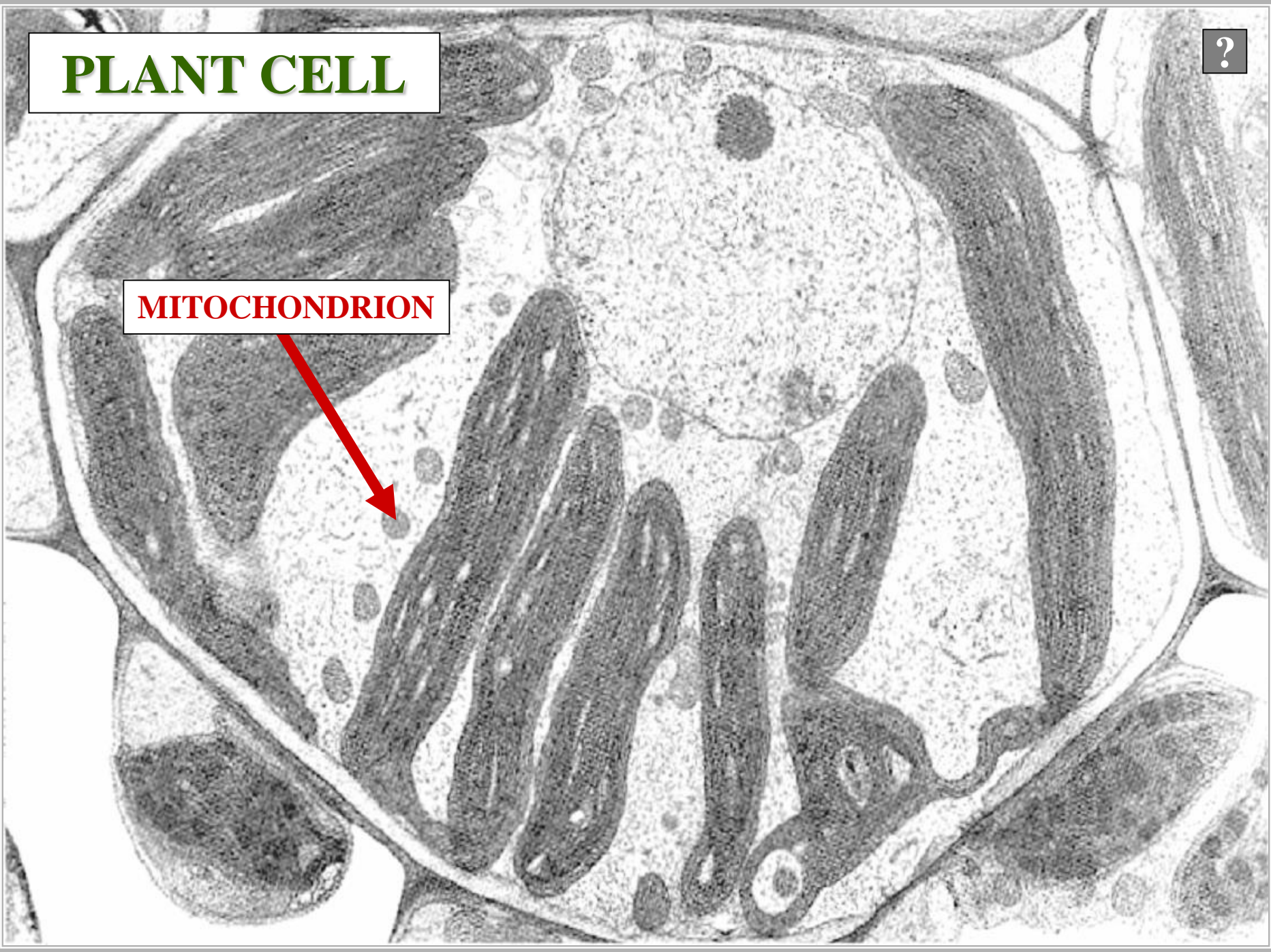
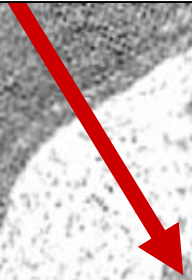
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PLANT CELL

?

MITOCHONDRION

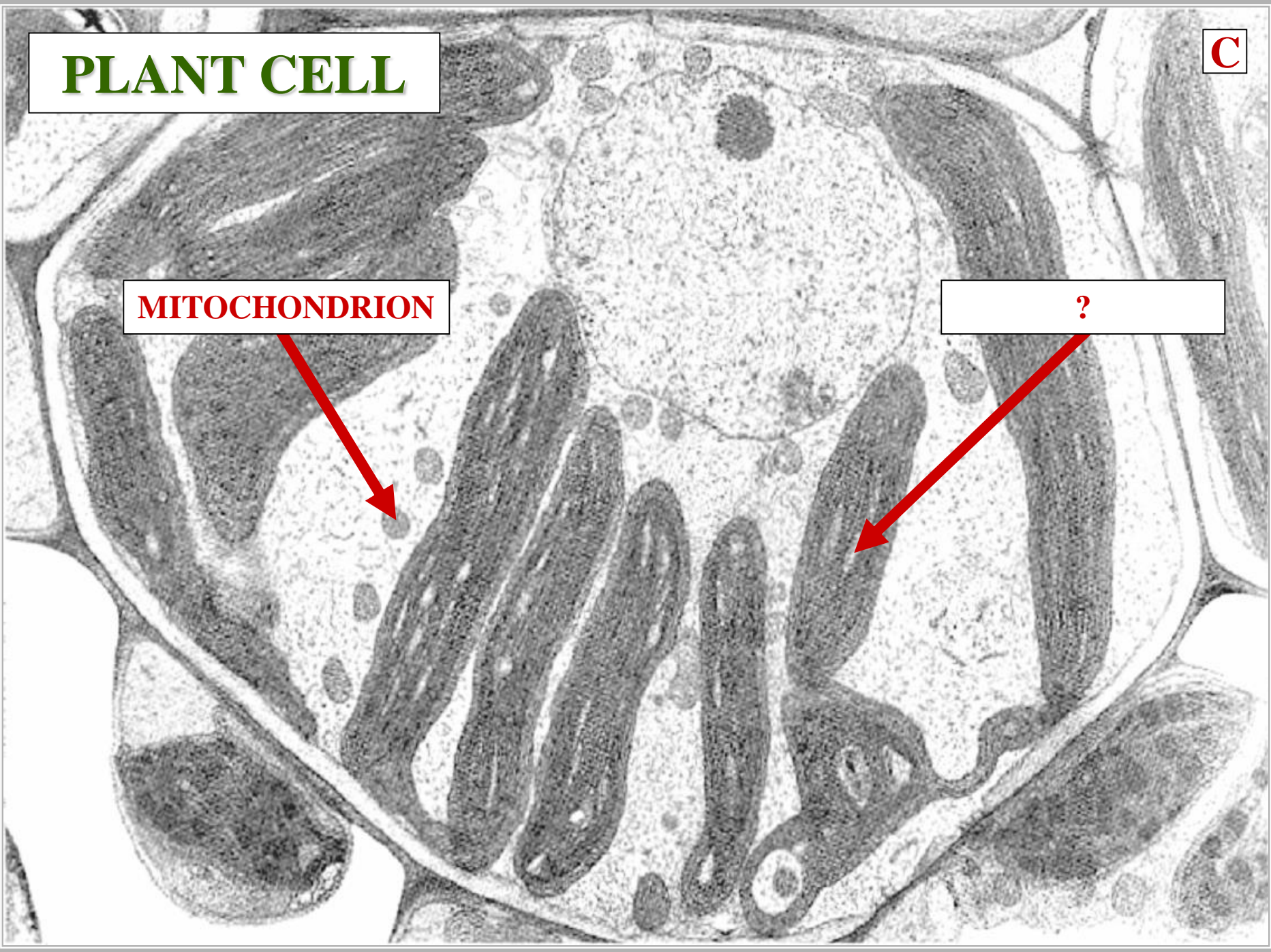


PLANT CELL

C

MITOCHONDRION

?

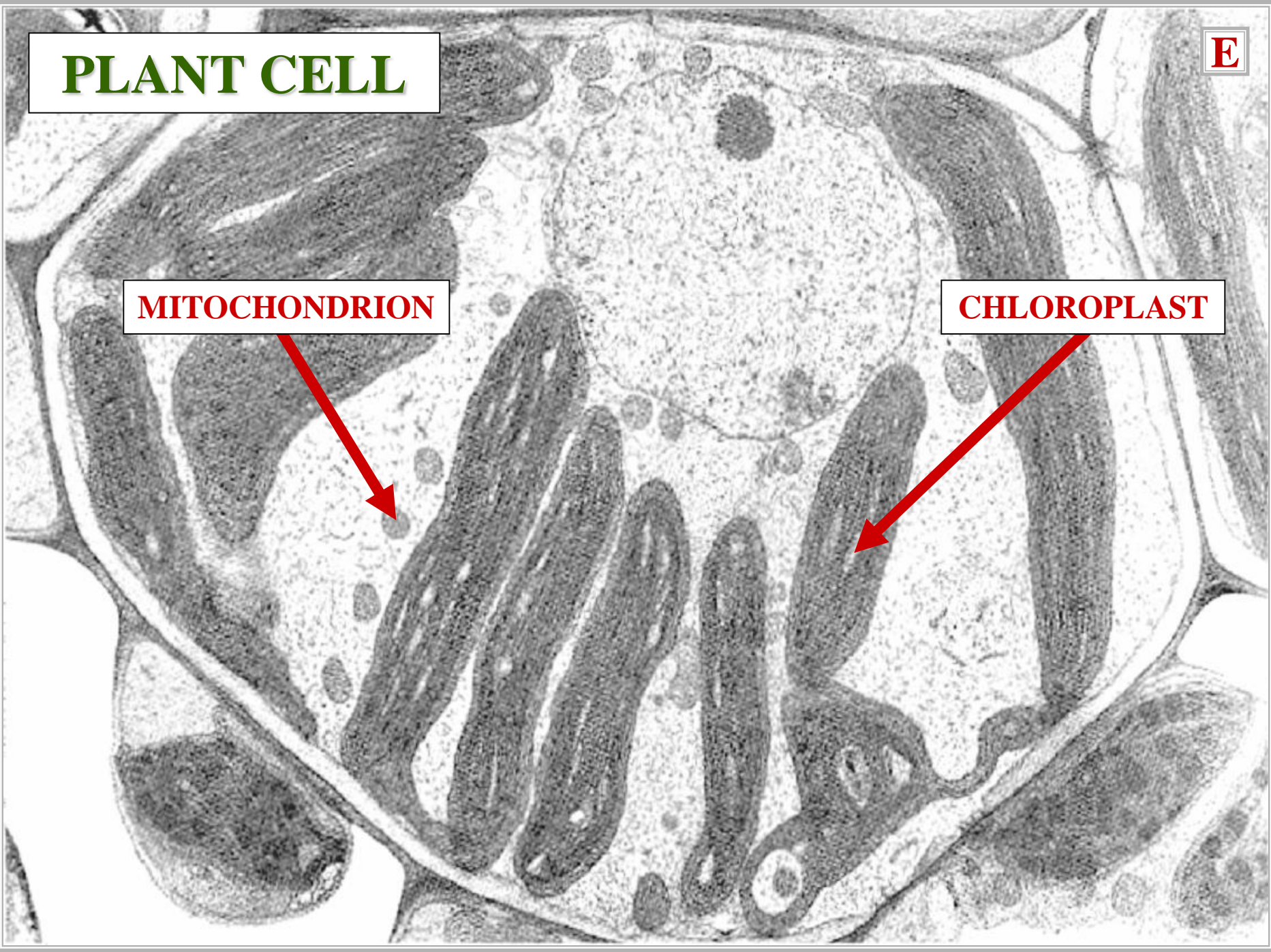


PLANT CELL

E

MITOCHONDRION

CHLOROPLAST



PLANT CELL

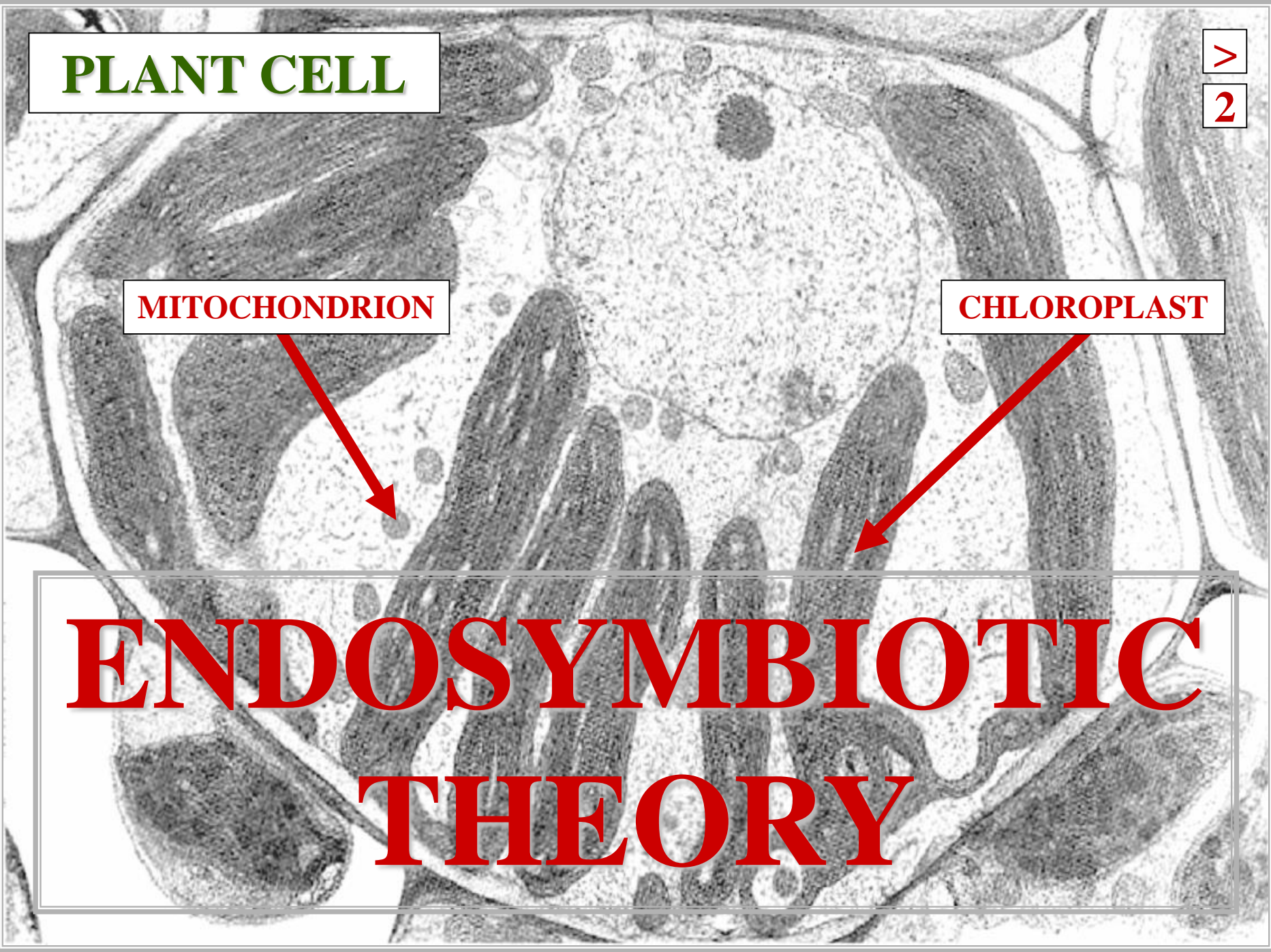
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MITOCHONDRION

CHLOROPLAST

ENDOSYMBIOTIC THEORY





**ENDOCYTOSIS
ESSENTIAL
ENDOSYMBIOTIC
THEORY**



CHAPTER 10

PHOTOSYNTHESIS

QUESTION

WHAT DO BIOLOGISTS
CALL THE STUDY OF
BIOCHEMISTRY?

QUESTION

ANSWER

PHYSIOLOGY

ANSWER

PHYSIOLOGY

PHYSIOLOGY



**STUDY
BIOCHEMISTRY**

PHYSIOLOGY



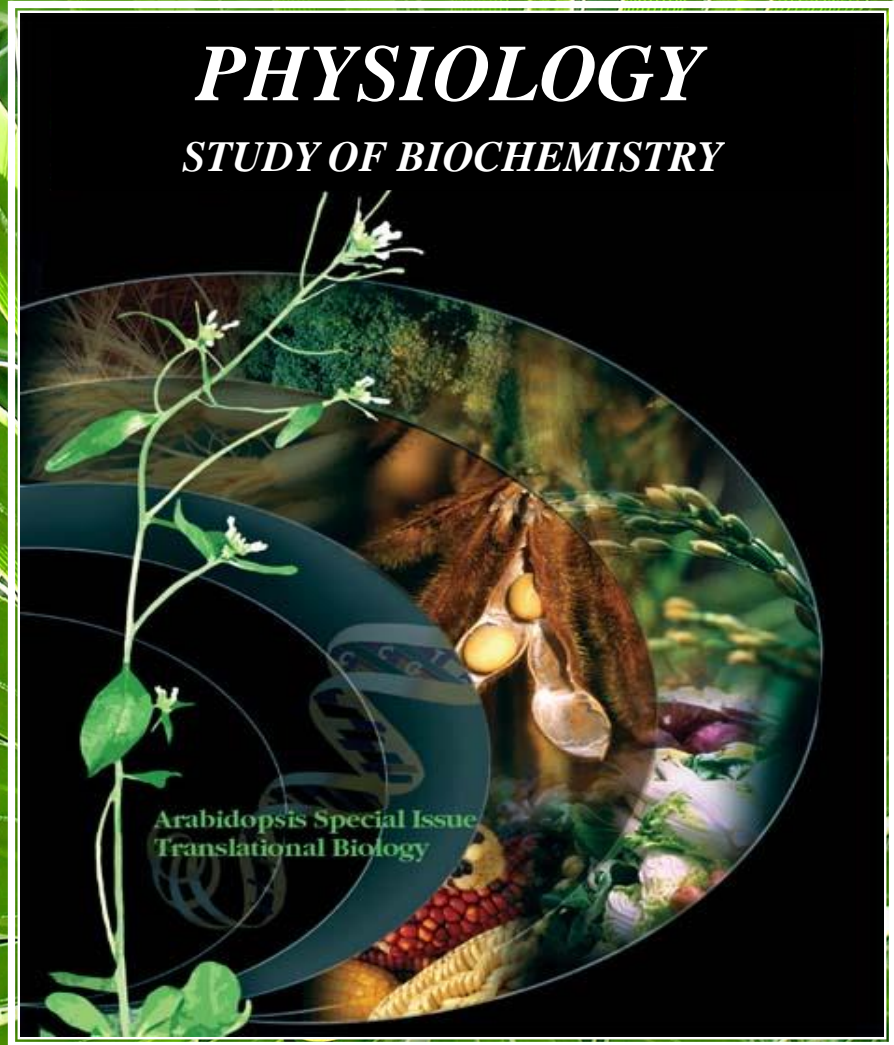
PHYSIOLOGY
STUDY
BIOCHEMISTRY

STUDY
BIOCHEMICAL
PATHWAYS
PHYSIOLOGY

Photosynthesis



PHYSIOLOGY
STUDY OF BIOCHEMISTRY

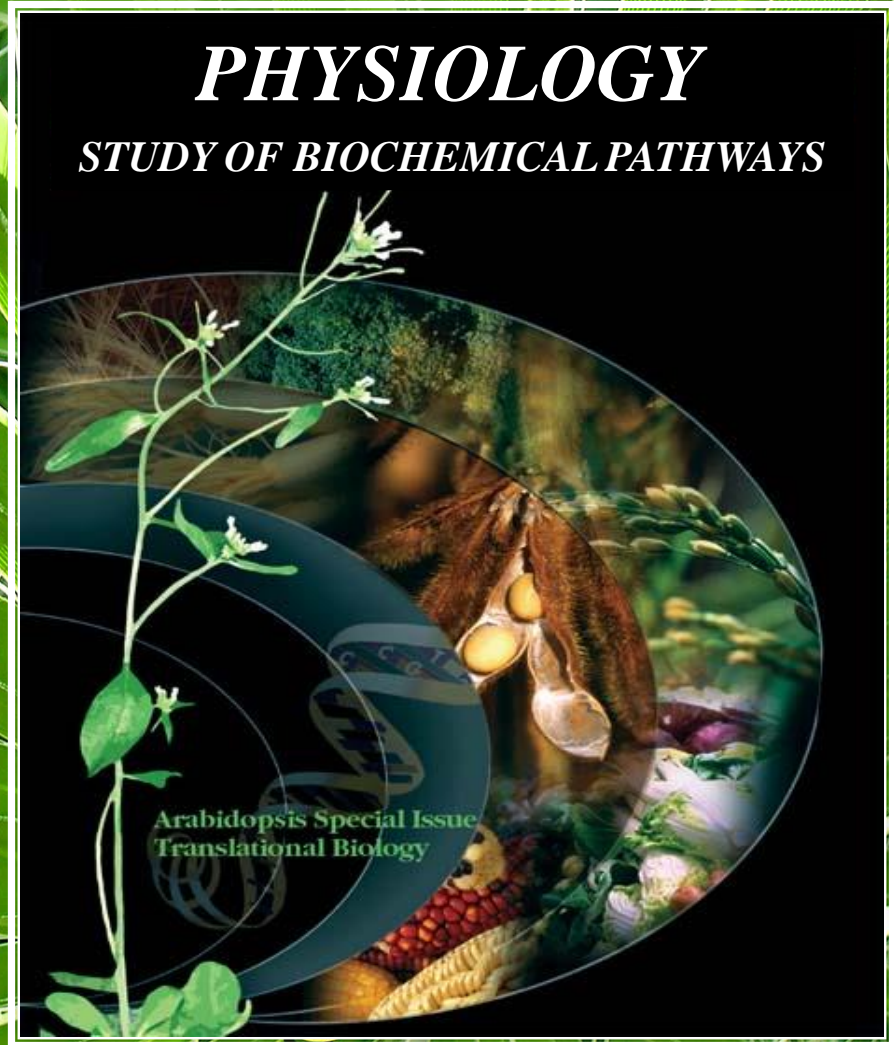


Arabidopsis Special Issue
Translational Biology

Photosynthesis



PHYSIOLOGY
STUDY OF BIOCHEMICAL PATHWAYS



Arabidopsis Special Issue
Translational Biology

Photosynthesis



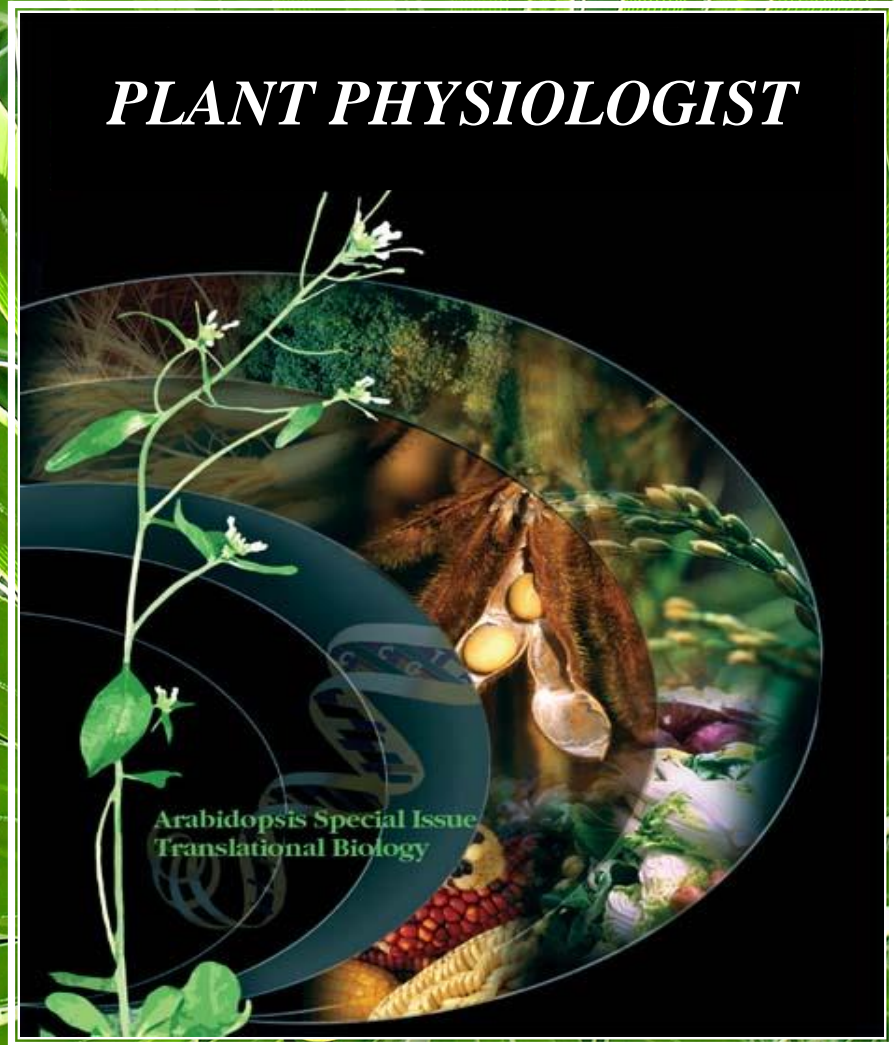
PHOTOSYNTHESIS

Arabidopsis Special Issue
Translational Biology

Photosynthesis



PLANT PHYSIOLOGIST



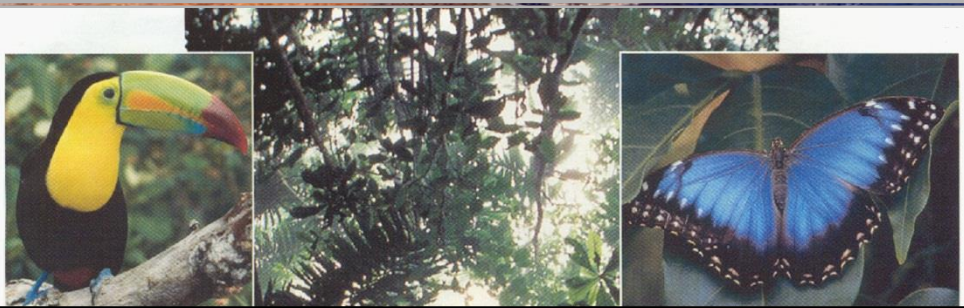


HETEROTROPHS VS AUTOTROPHS

H

A

+



~10 MILLION SPECIES



EARTH



HETEROTROPHS

~10 MILLION SPECIES

AUTOTROPHS

EARTH

HETEROTROPHS



HETEROTROPHS

**INCAPABLE
CARBOHYDRATE
SYNTHESIS**

HETEROTROPHS

A

NORTH AMERICAN GRASSLAND

HETEROTROPHS



AUTOTROPHS



AUTOTROPHS

**CAPABLE
CARBOHYDRATE
SYNTHESIS**

AUTOTROPHS

A lush tropical rainforest scene with dense green foliage, including various ferns and broad-leafed plants. A prominent orange flower is visible on the right side. The background is slightly blurred, emphasizing the text overlaid on it.

**TROPICAL
RAINFOREST**



AUTOTROPHS

A lush tropical rainforest scene with dense green foliage, including various ferns and plants. A prominent orange flower is visible on the right side. The text is overlaid on the image.

TROPICAL
RAINFOREST

PHOTOSYNTHESIS

PHOTOSYNTHESIS DEFINED



PHOTOSYNTHESIS

Photosynthesis

L

**CONVERSION
LIGHT ENERGY
TO
CHEMICAL ENERGY**

Photosynthesis

**LIGHT
ENERGY**

Photosynthesis



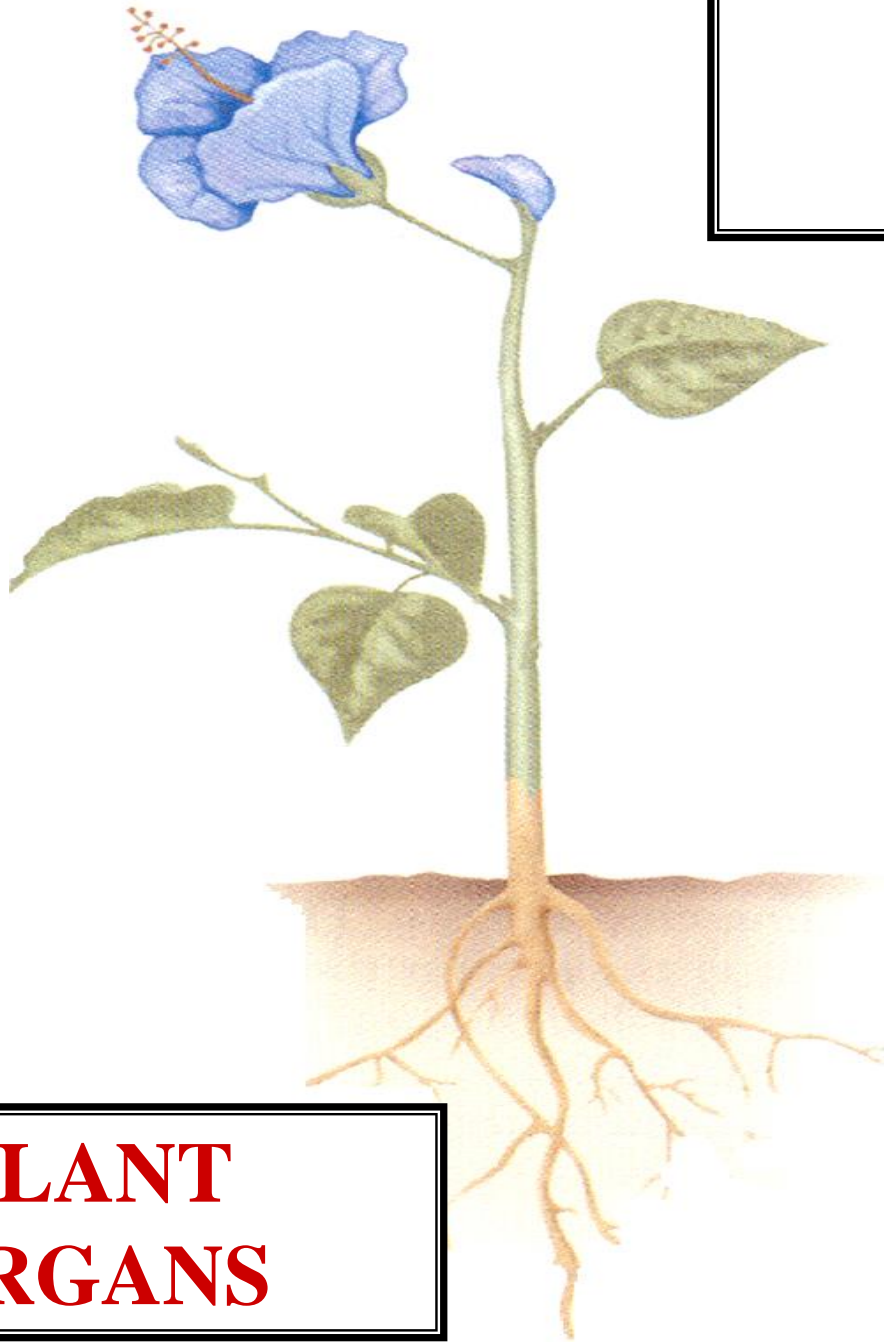
**CHEMICAL
ENERGY**

Photosynthesis



GLUCOSE

TYPICAL PLANT



**PLANT
ORGANS**

TYPICAL PLANT ORGANS

TYPICAL PLANT ORGANS

ROOT

TYPICAL PLANT ORGANS