Warm-Up

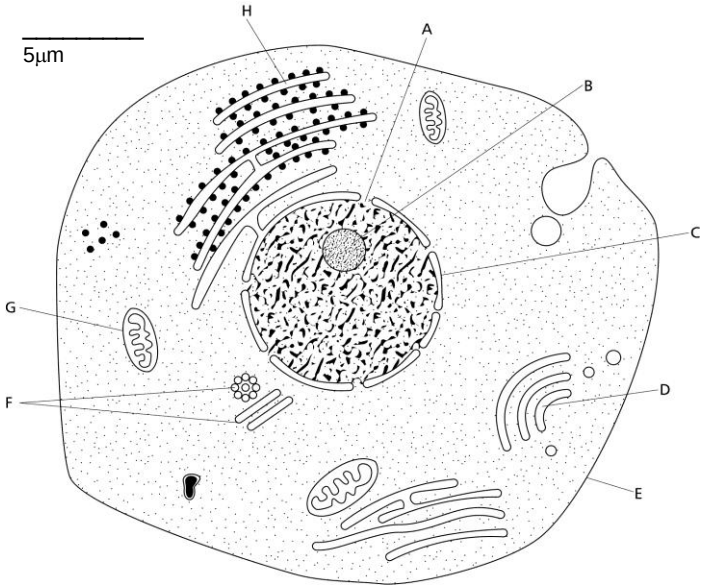
In Pairs – Discuss the diagram

What is it?

Where does it come from?

Which parts can you label? (in pencil)

Why do you think you will learn about it?



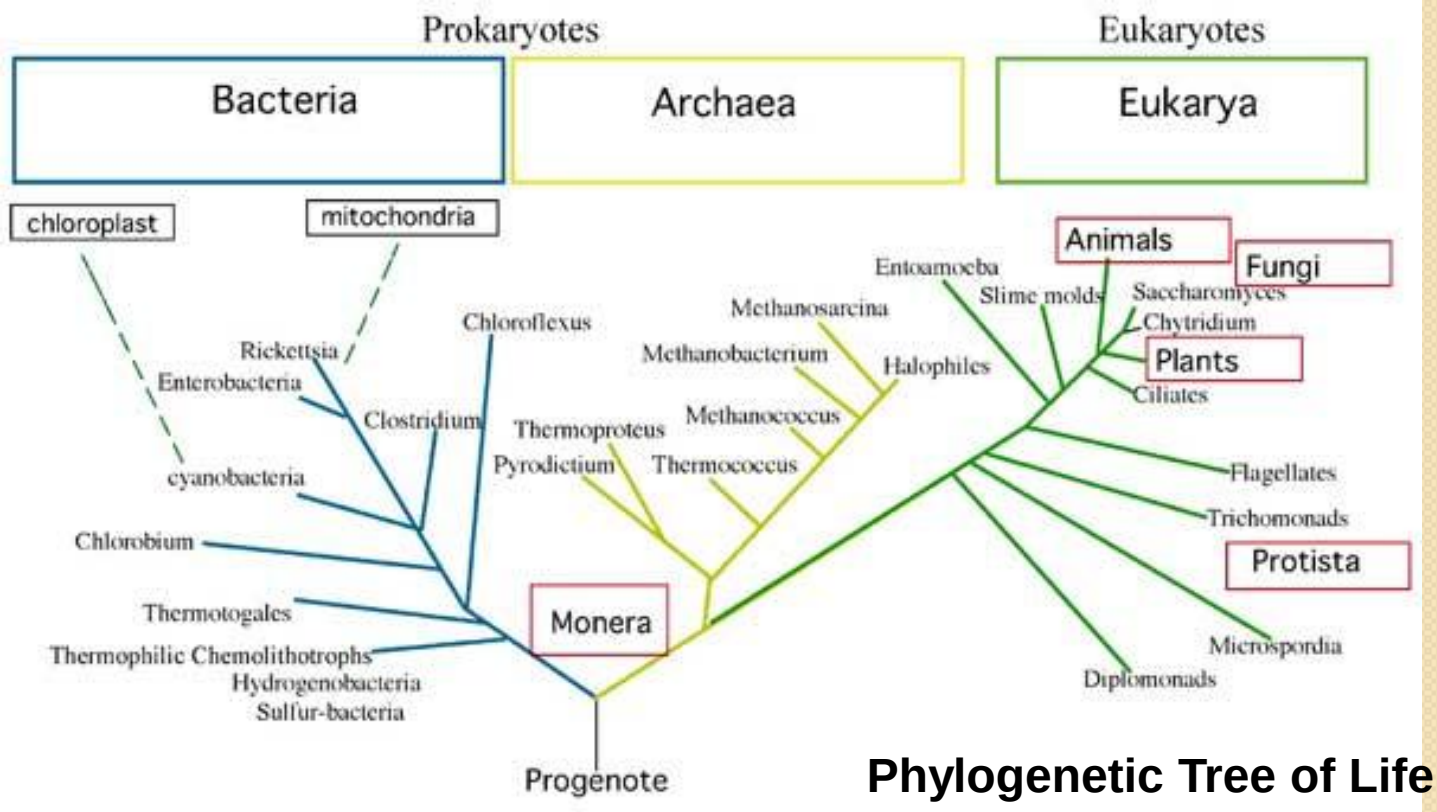
Eukaryote: Organelles, Structure and Function

AIMS

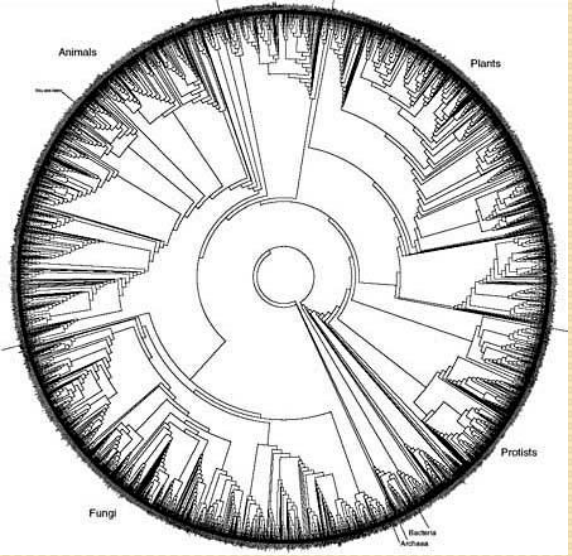
- **Recognise** animal cell structures under the electron microscope
- **Outline** the function of the different animal cell organelles

What is a Eukaryote?

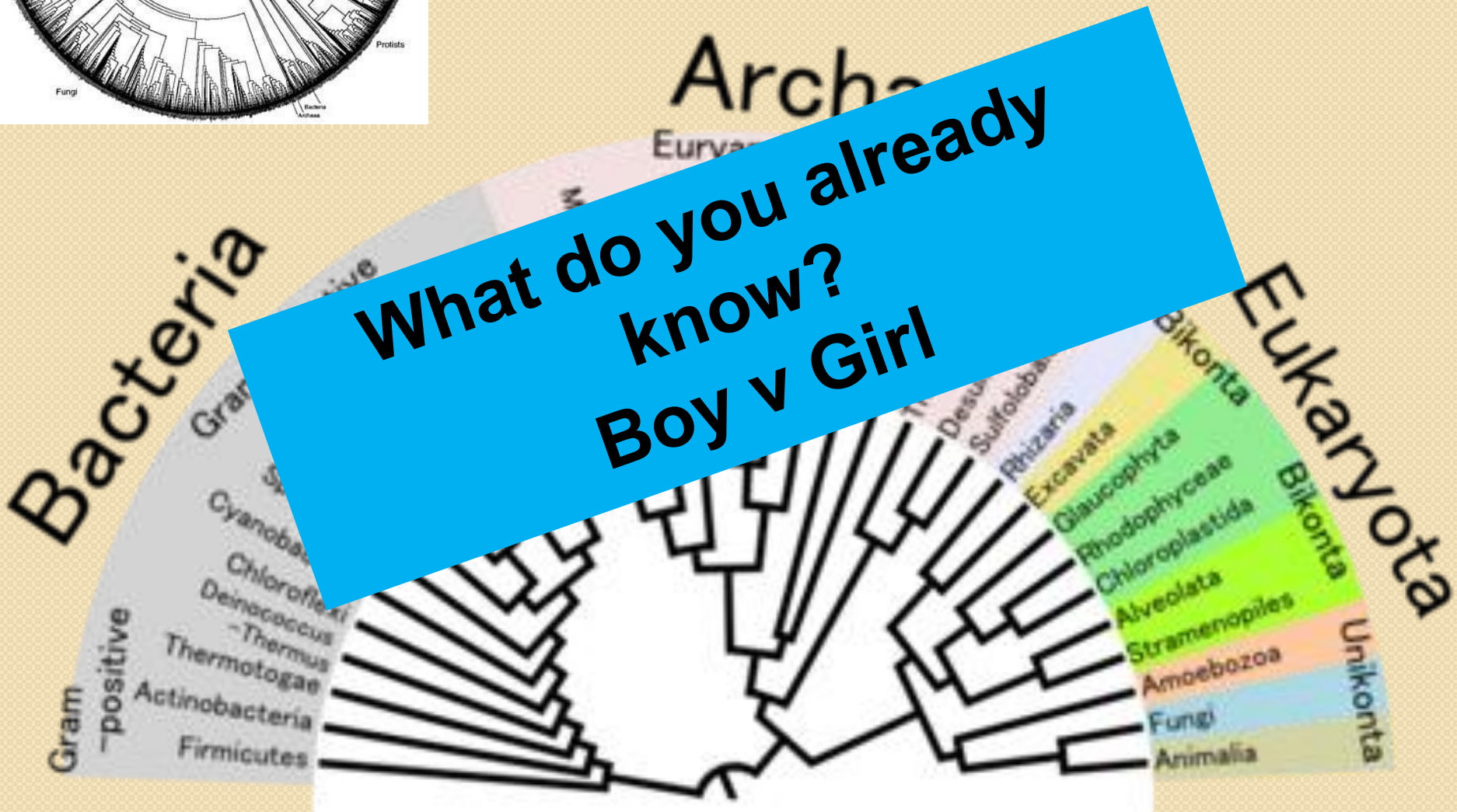
- Eu = True, Karyote = Nucleus (Seed)
- Membrane bound organelles
- Complex organisms
- Organelles viewable under electron microscope



Phylogenetic Tree of Life (Simple)



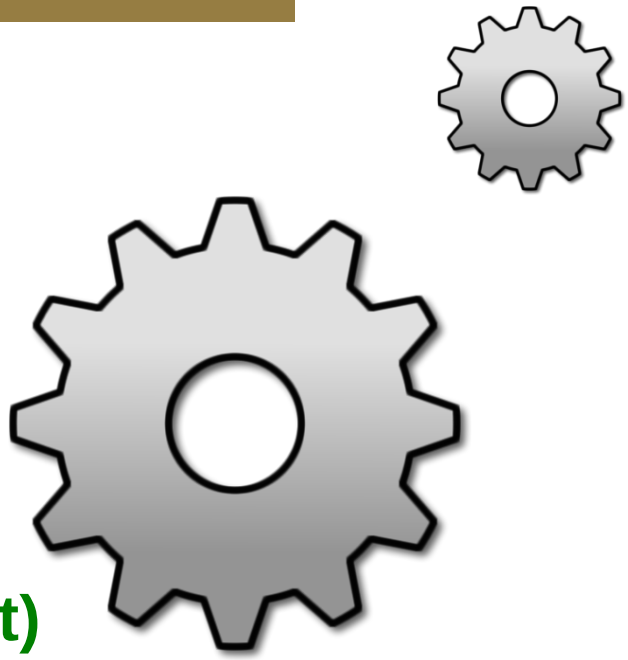
Phylogenetic Tree of Life (Proper)



What do you already know?
Boy v Girl

Eukaryote Organelles

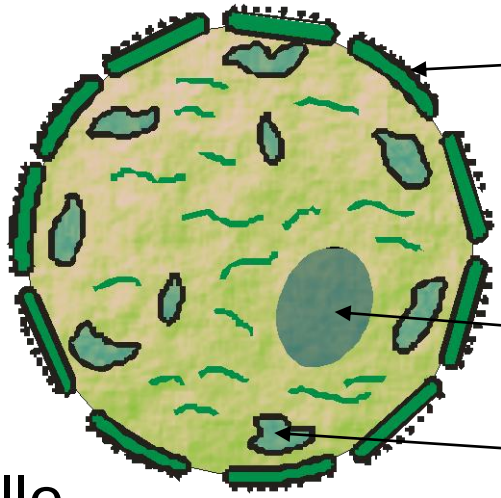
1) Nucleus
2) Endoplastic reticulum
3) Golgi apparatus
4) Mitochondria
5) Lysosomes
6) Ribosomes
7) Centrioles
8) Vacuole (large-tonoplast)
9) Cell Wall
10) Chloroplasts
11) Plasmodesma



http://www.youtube.com/watch?v=4DWaAIVlW3k&feature=related

As we go through… Label the organelles on your diagram

Nucleus



The MASTER CONTROLLER

Structure

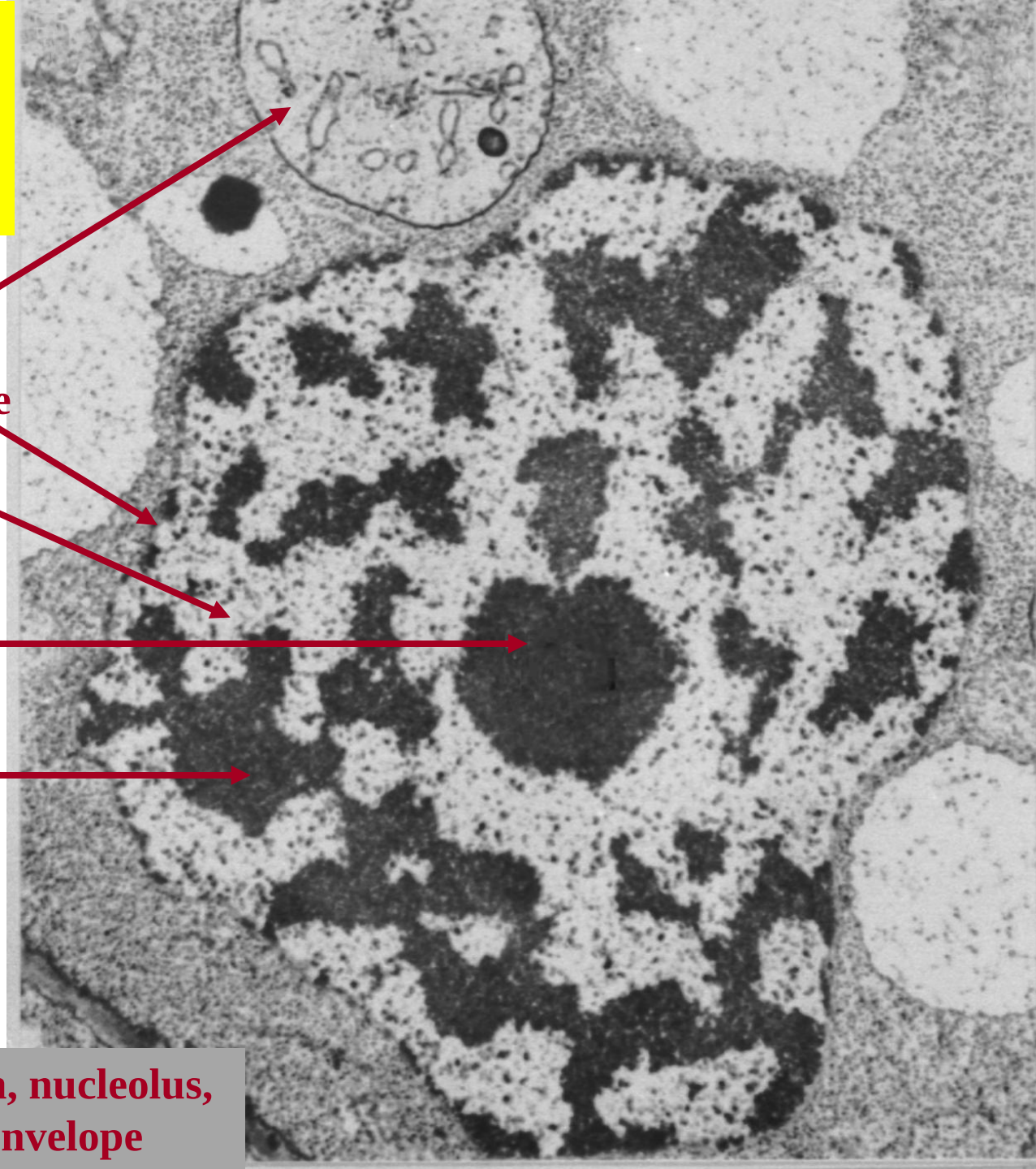
- Largest organelle
- Dark patches = chromatin – DNA & histone protein
- Surrounded by **nuclear envelope** - 2 fluid filled membranes
- **Nuclear pores** allows large molecules to pass to cytoplasm
- Nucleolus inside

Function

- Contains genetic material.
- When cells divide, chromatin condenses to visible chromosomes
- Nucleolus makes RNA and ribosomes

ELECTRON MICROGRAPH OF

Courtesy of Electron Microscopy Unit
University of Lancaster



Chromatin, mitochondrion, nucleolus, nuclear pore, nuclear envelope

Endoplasmic Reticulum (ER)

Structure:

- Flattened network of membrane bound sacs – **cisternae**, continuous with outer nuclear membrane

2 types

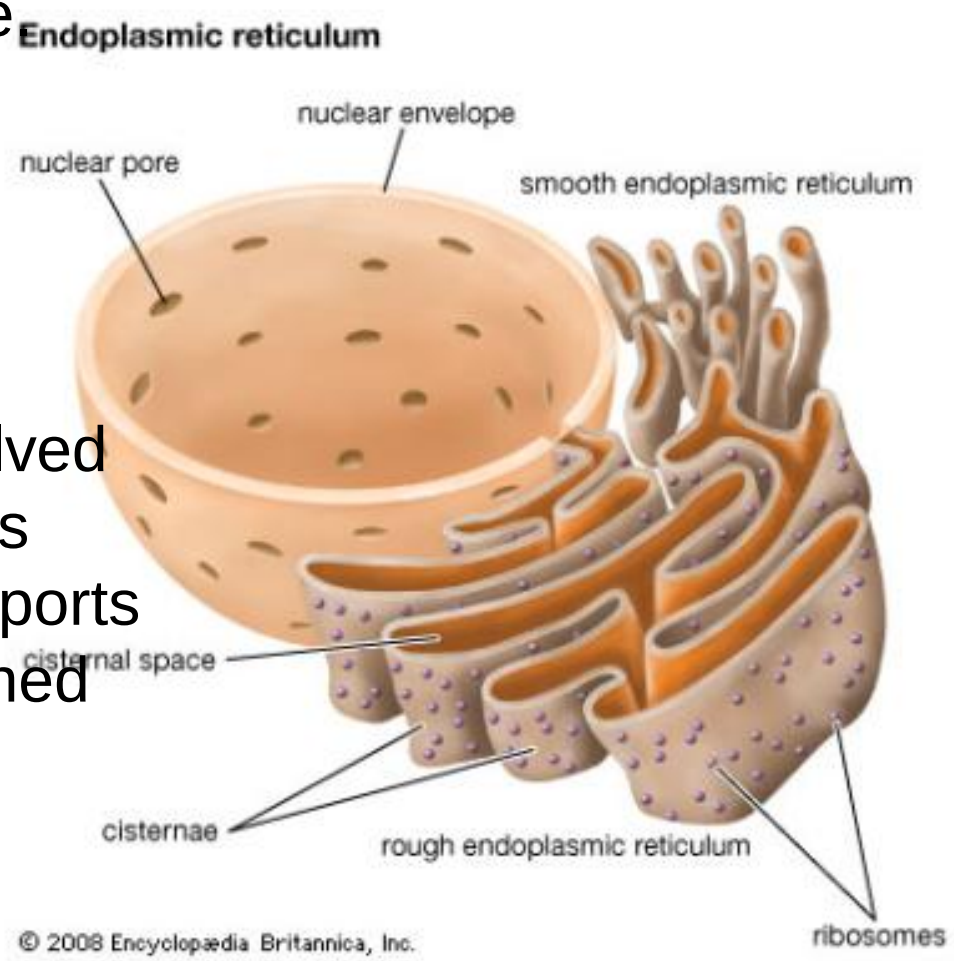
- RER- Ribosomes
- SER - no Ribosomes

Function:

➢**Smooth (SER)** - Involved in making lipids, steroids

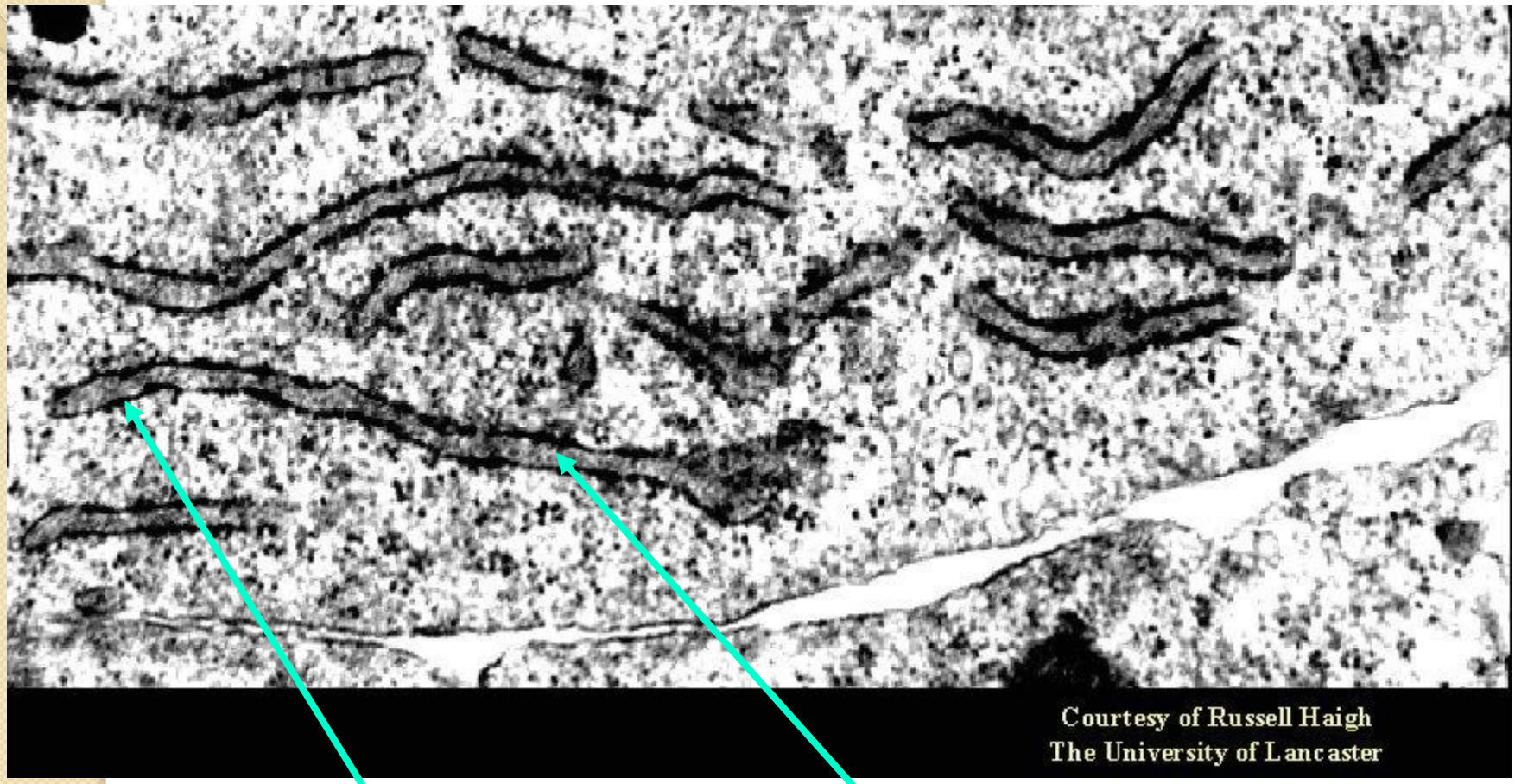
➢**Rough (RER)** - Transports proteins made on attached ribosomes

The TRANSPORTER



Endoplasmic reticulum

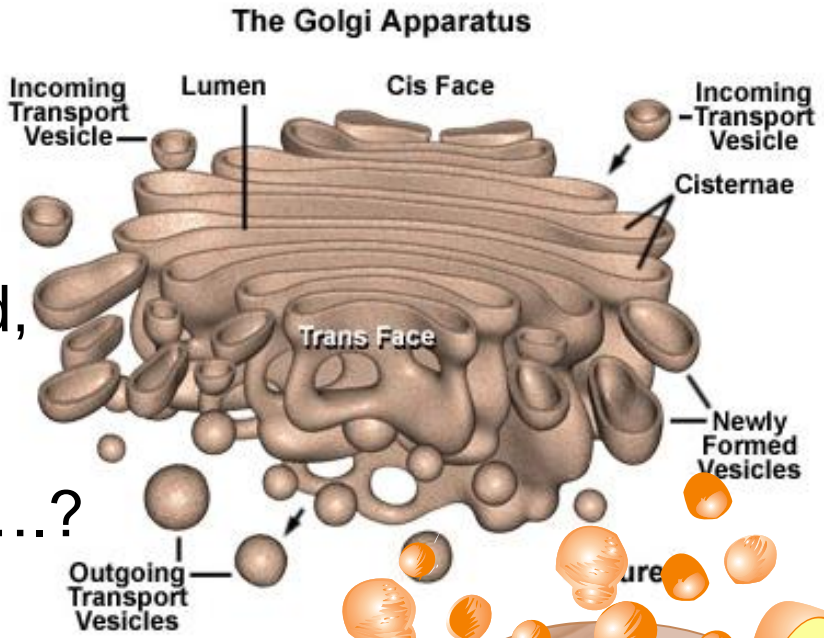
ELECTRON MICROGRAPH OF



Ribosome

Cavity of cisterna

Golgi Apparatus

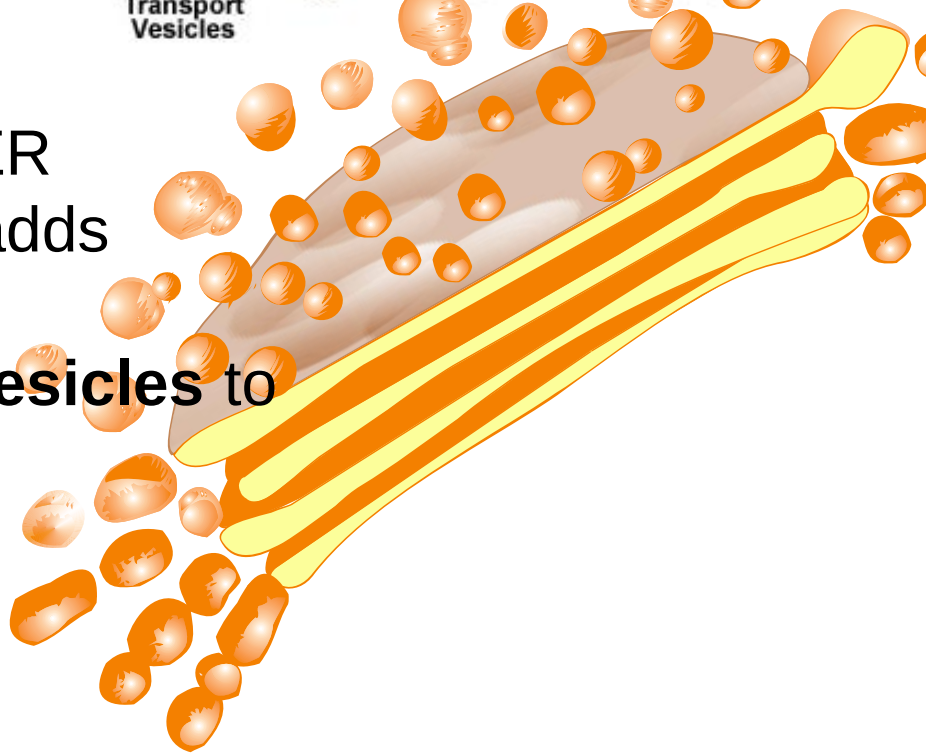


Structure:

- Stack of membrane-bound, flattened sacs (not continuous with nuclear membrane)
- Dense in some cell types….?

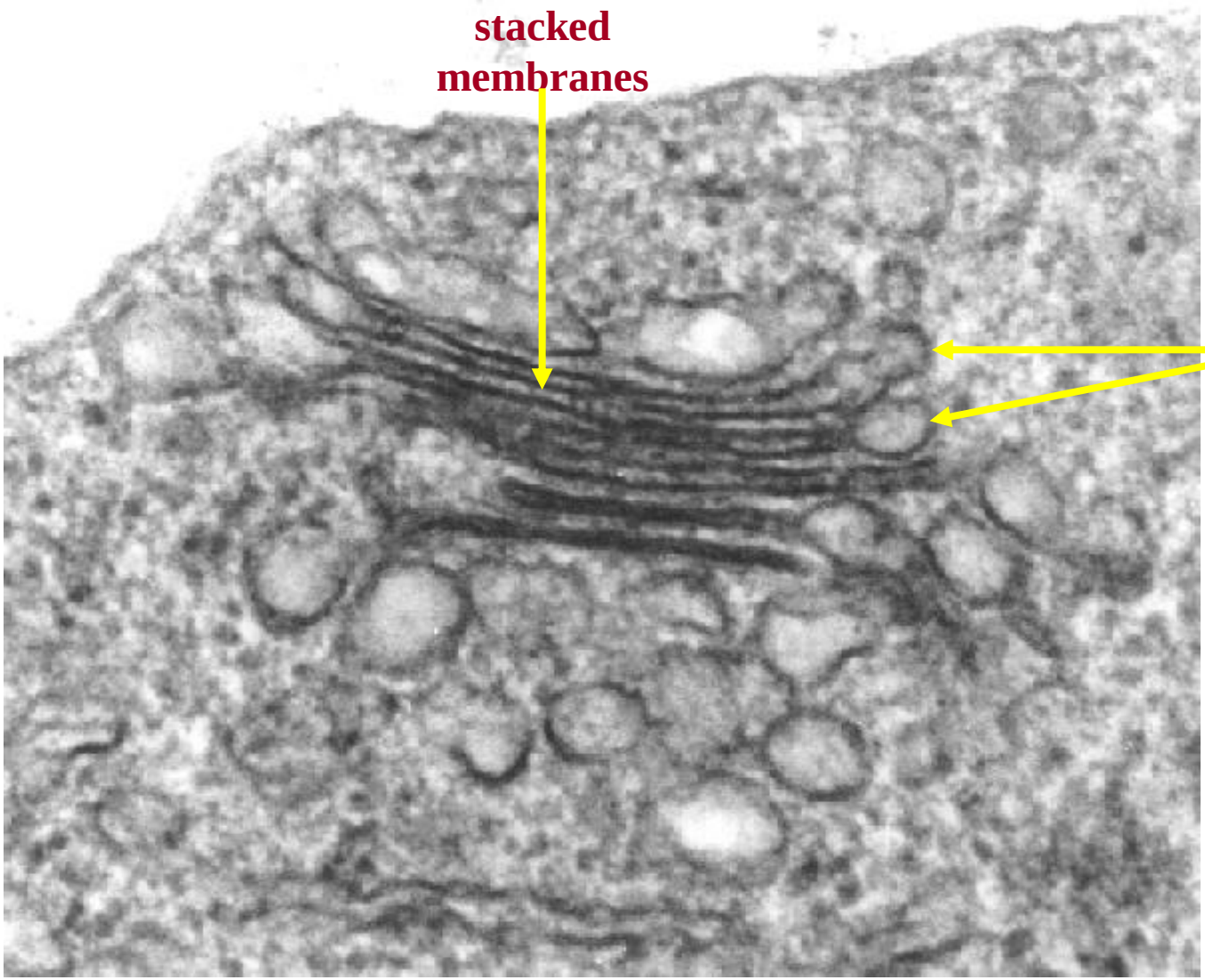
Function:

- Receives proteins from ER
- Modifies/Packages e.g. adds sugar (Post office)
- Packages proteins into **vesicles** to be transported



The POST OFFICE

ELECTRON MICROGRAPH OF (

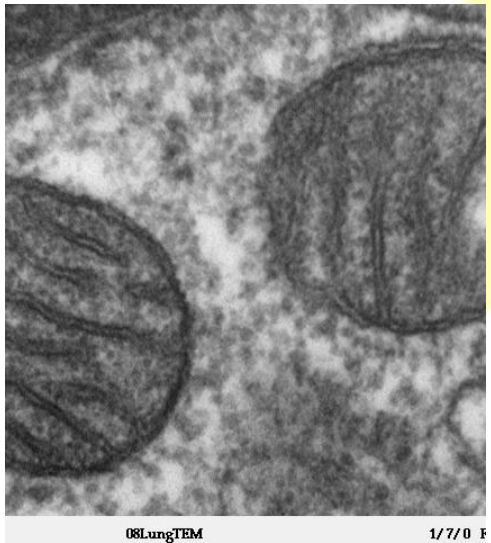


Courtesy of Dr. Julian Thorpe – EM & FACS Lab, Biological Sciences University Of Sussex

Mitochondria

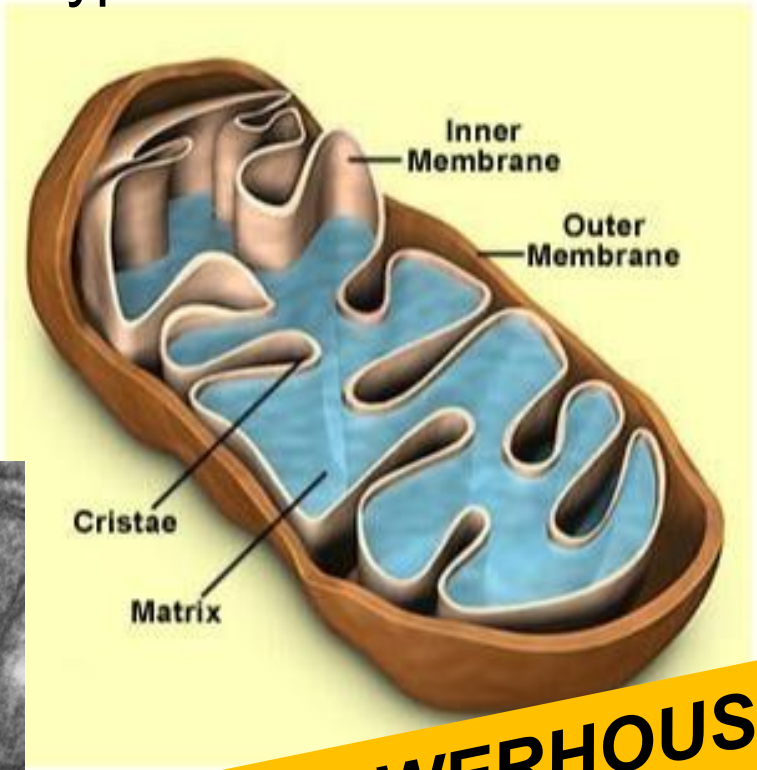
Structure:

- Double membranes separated by fluid filled space
- Inner membrane folded to form **cristae** (increasing SA)
- Central part is the **matrix**.



Function

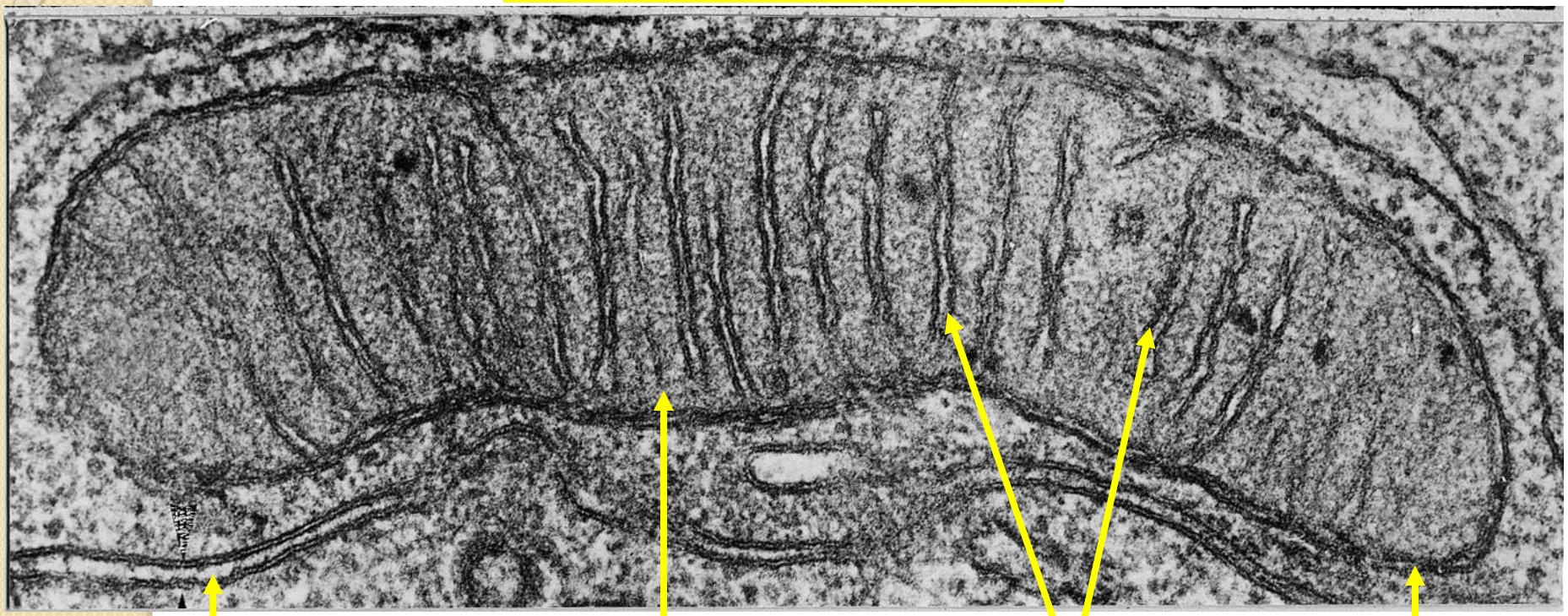
- Site of ATP production (aerobic respiration)
- Dense in some cell types…..?



The POWERHOUSE of the cell

ELECTRON MICROGRAPH OF

Courtesy of Electron Microscopy Unit
University of Lancaster



endoplasmic reticulum

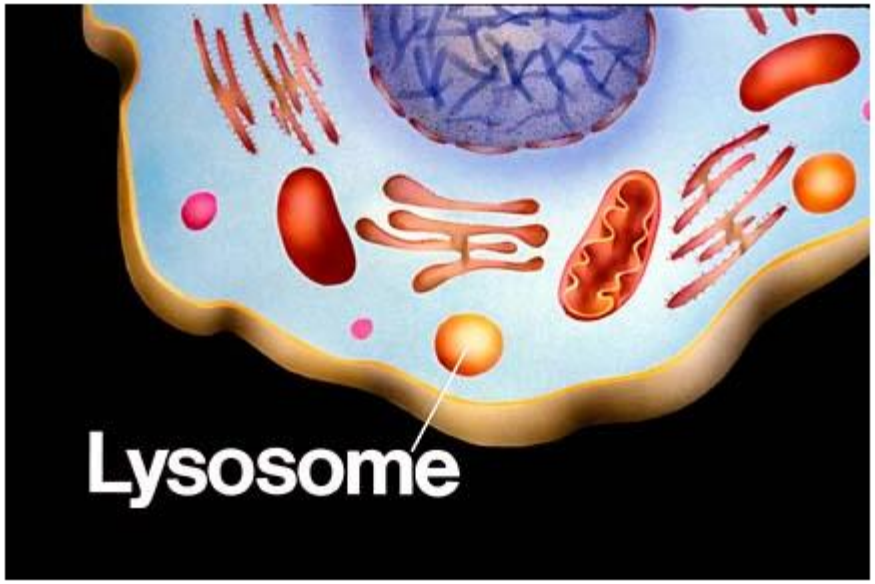
fluid matrix

cristae

outer membrane

ER, cristae, fluid matrix, ribosome, outer membrane

Lysosomes



Function:

- Contain digestive enzymes which break down materials.

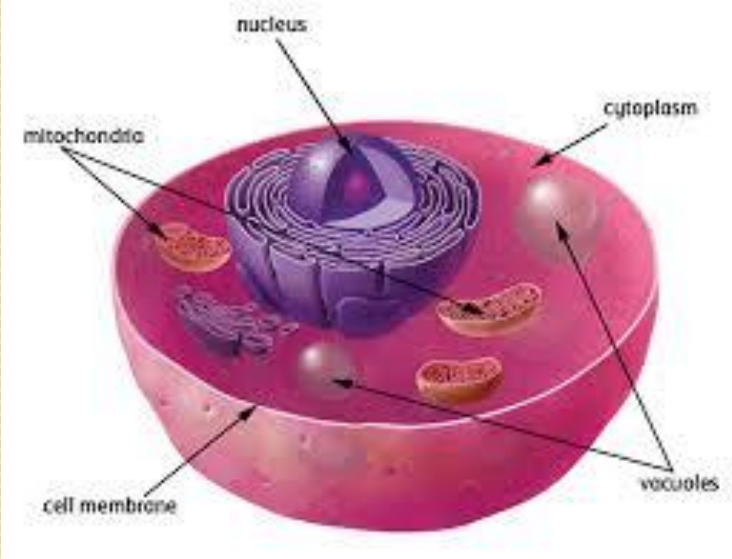
- ‘Mop’ up debris, foreign bodies, damaged organelles

- E.g: Specialised lysosome in head of sperm cells helps it penetrate egg.

Structure:

- Spherical sacs surrounded by a single membrane.
- Low pH inside - hydrolytic enzymes

The DESTROYER



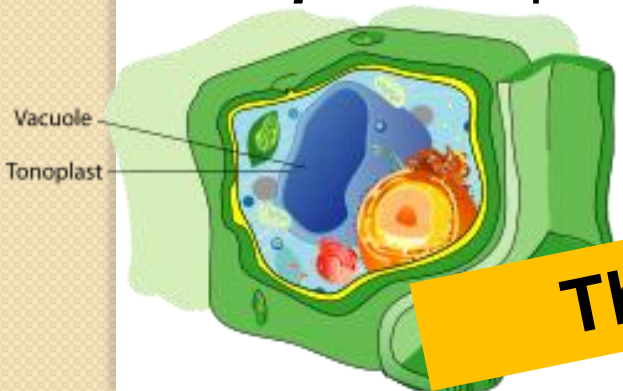
Vacuole

Function:

- Animals: Formed in phagocytosis or contractile for osmoregulation.
- Plants: Storage sites and sap maintain turgor.

Structure:

- Small vesicles in animal cells, often many.
- Large and surrounded by a ***tonoplast*** in plant cells.



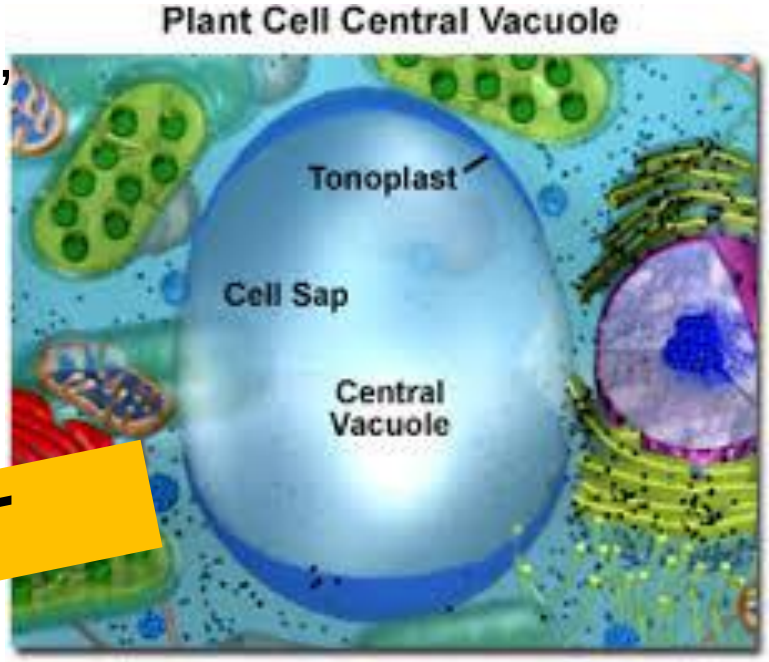


Figure 1

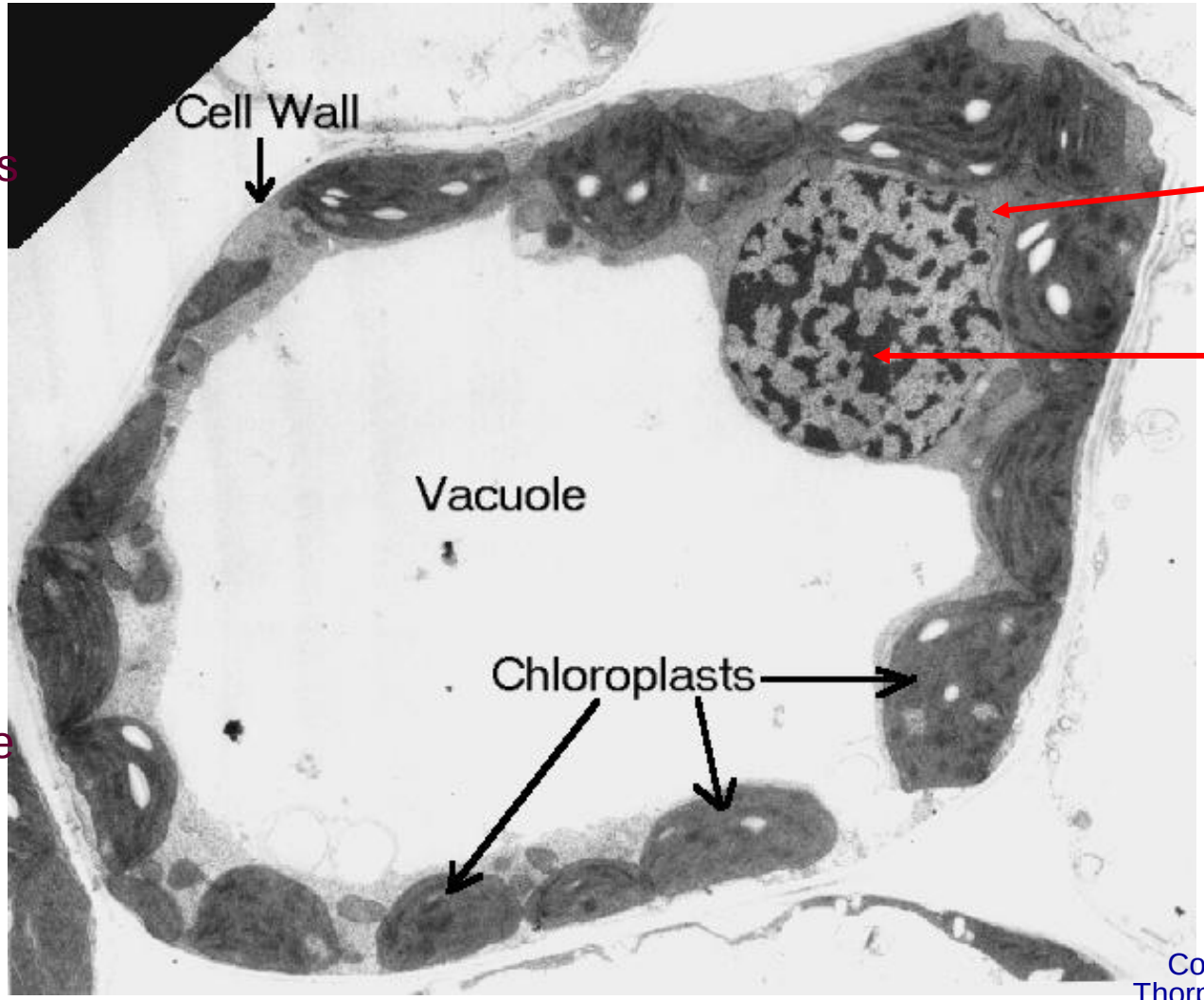
The SUPPORT

The electron micrograph displayed below illustrates many of the plant cell characteristics discussed

The cell wall, large central vacuole and chloroplasts are clearly visible

Also visible is the clearly defined nucleus containing chromatin

The vacuole in this mature plant cell from a leaf is large, and occupies about 80% of the cell volume



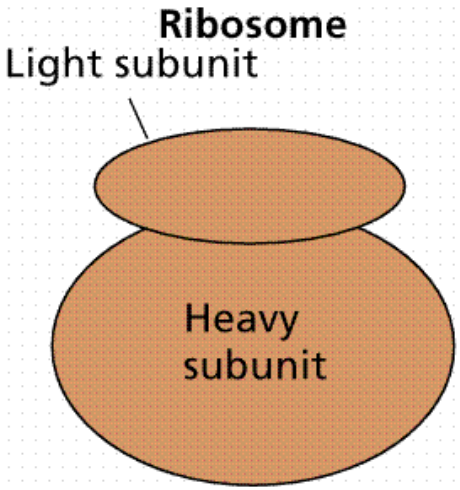
NEXT

Courtesy of Dr. Julian Thorpe – EM & FACS Lab, Biological Sciences University Of Sussex

Non-Membrane Bound Organelles

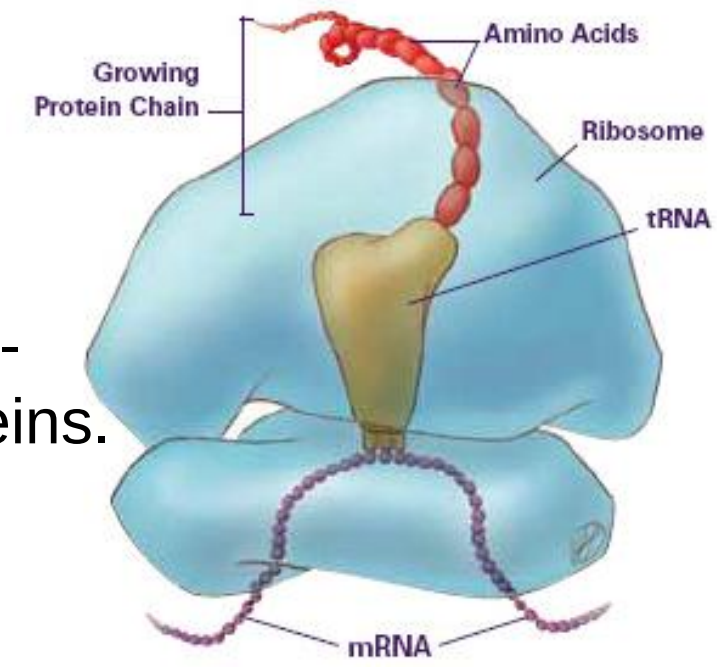
- Ribosomes
- Centrioles

Ribosome



Structure

- ❑ Very small organelles in cytoplasm, bound to RER & nuclear envelope.
- ❑ Made of ribosomal RNA (rRNA)
- ❑ Consist of 2 subunits.

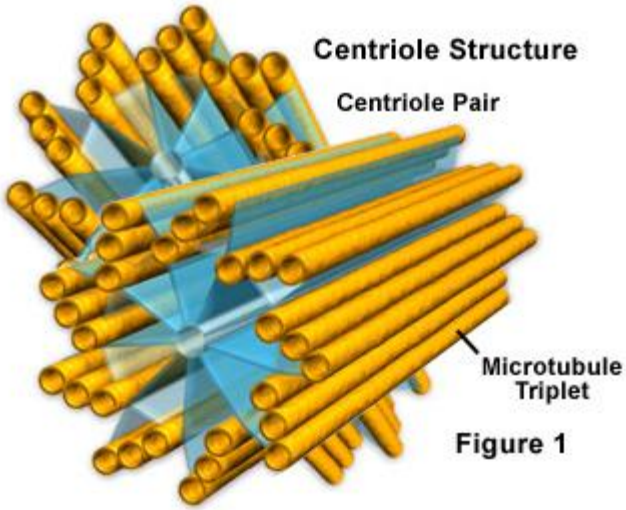


Function:

- ❑ Site of **protein synthesis** - use mRNA to assemble proteins.

The ASSEMBLY LINE

Centriole

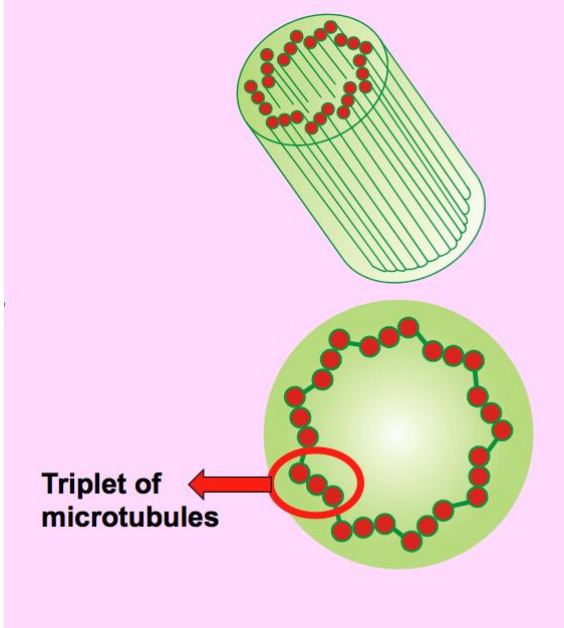


Structure

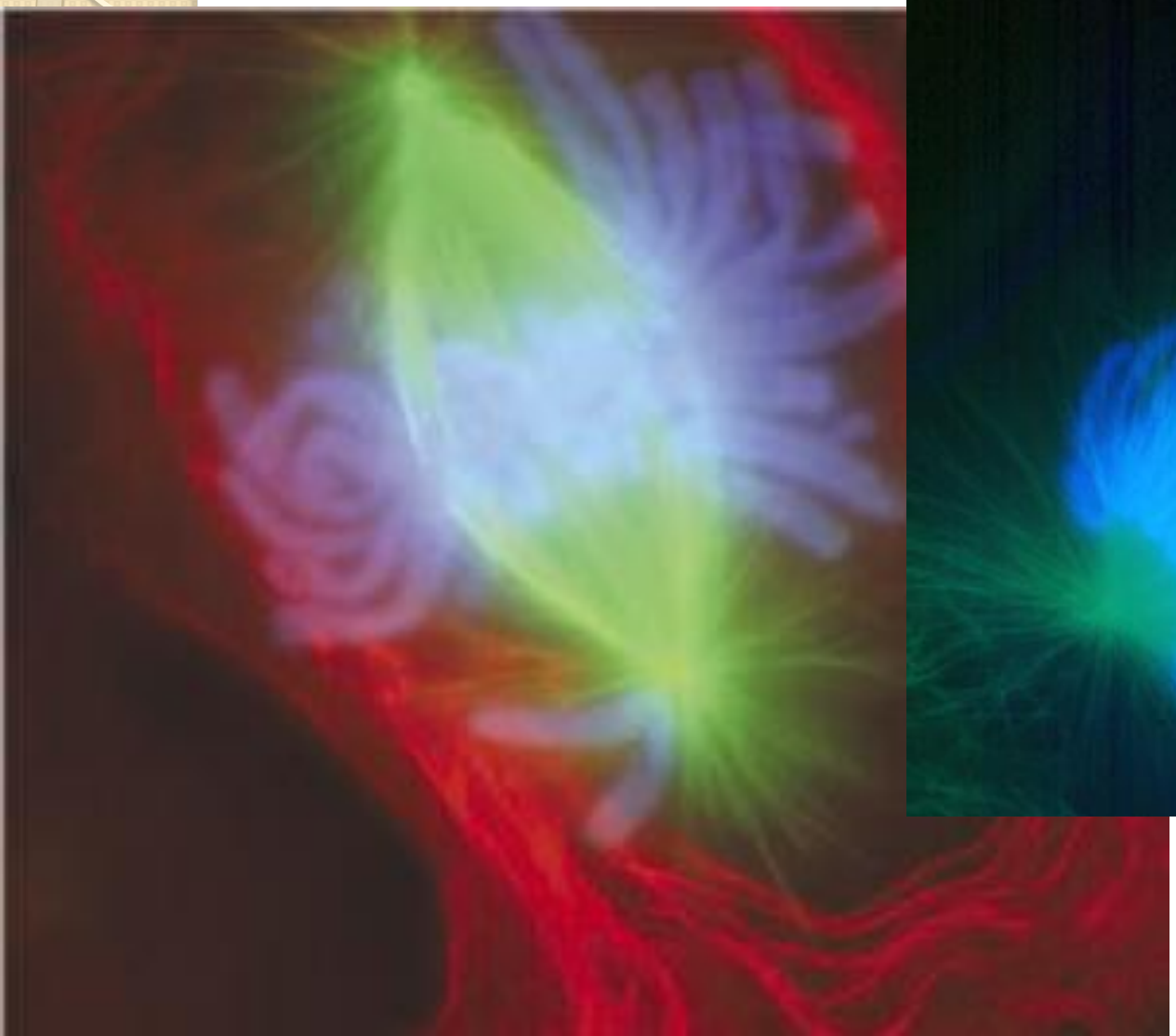
- Outside nucleus two centrioles at right angles to each other
- Small protein tubes of microtubules

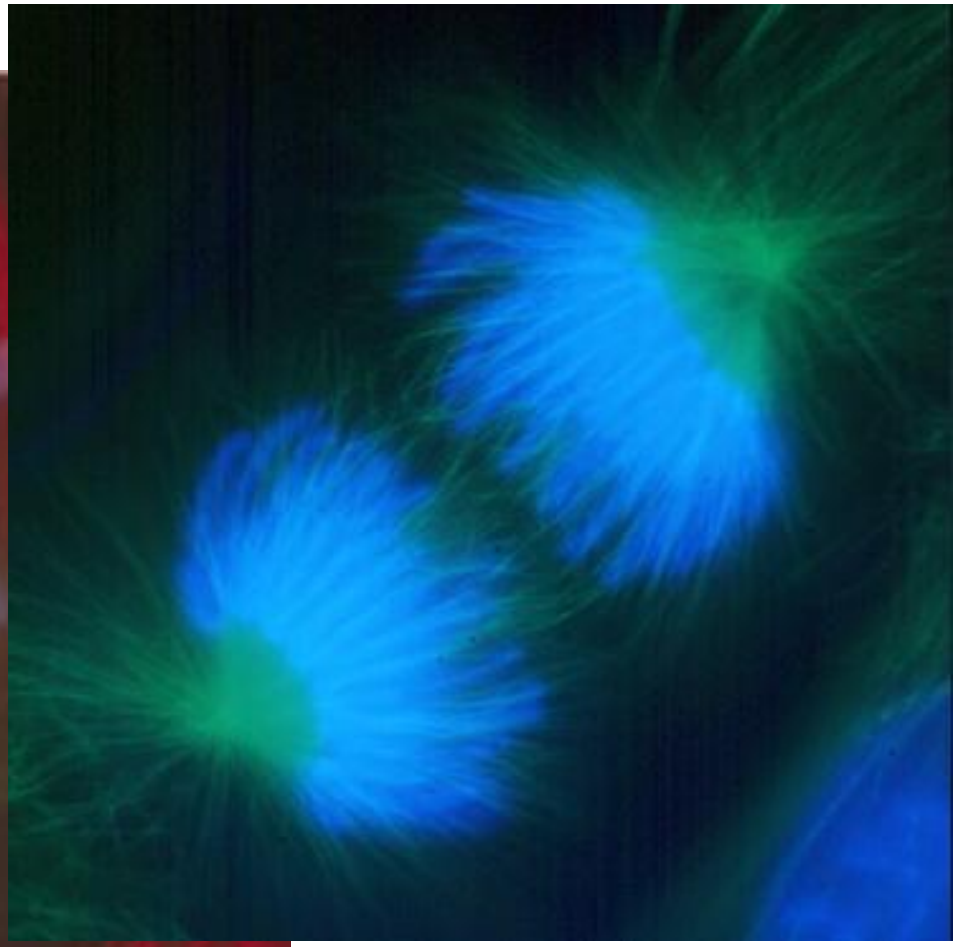
Function:

- Form fibres in cell division called spindles which separate chromosomes
- Not present in plants

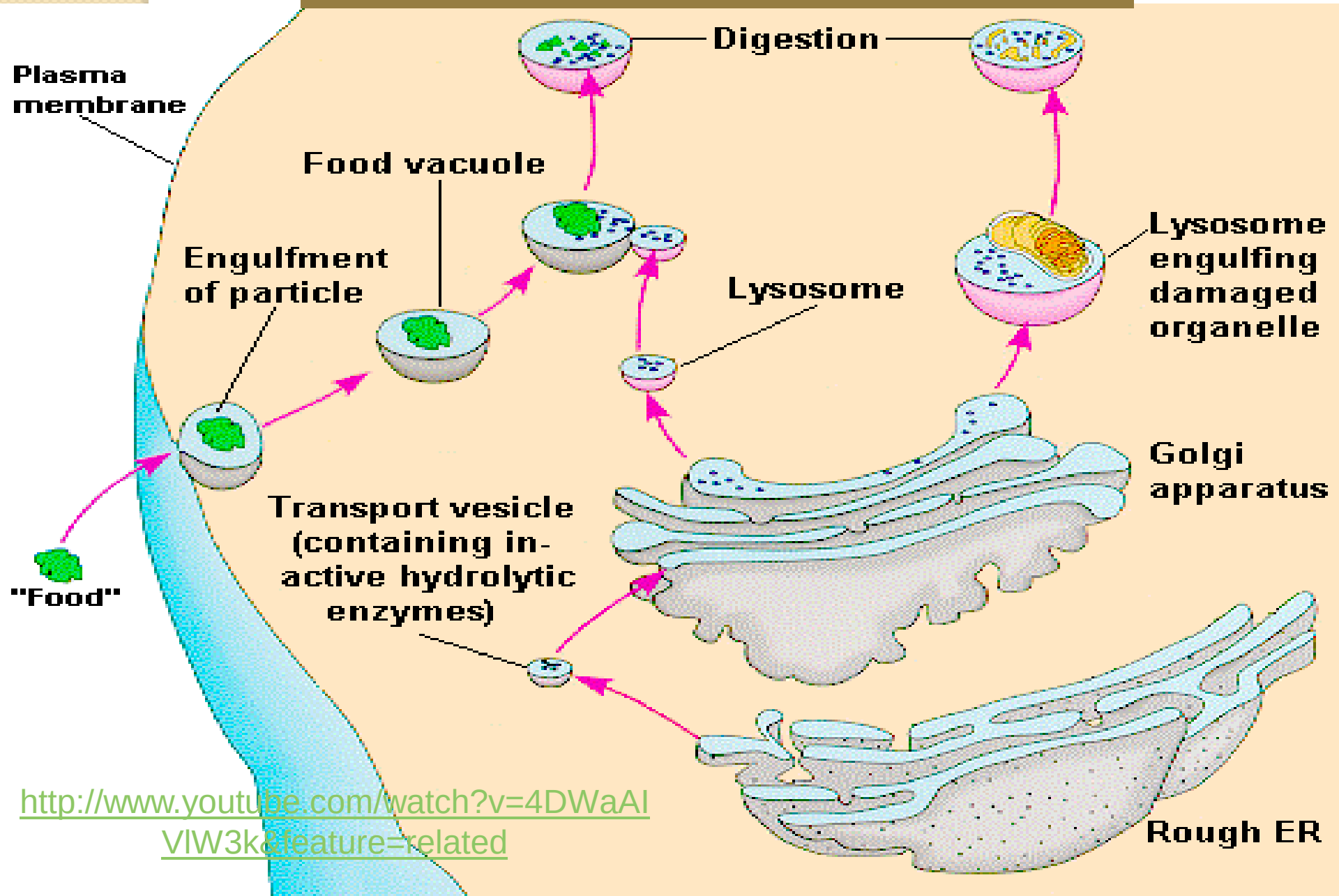


Centrioles organise the mitotic spindle





Journey Through A Cell



http://www.youtube.com/watch?v=4DWaAIVlW3k&feature=related

Summary

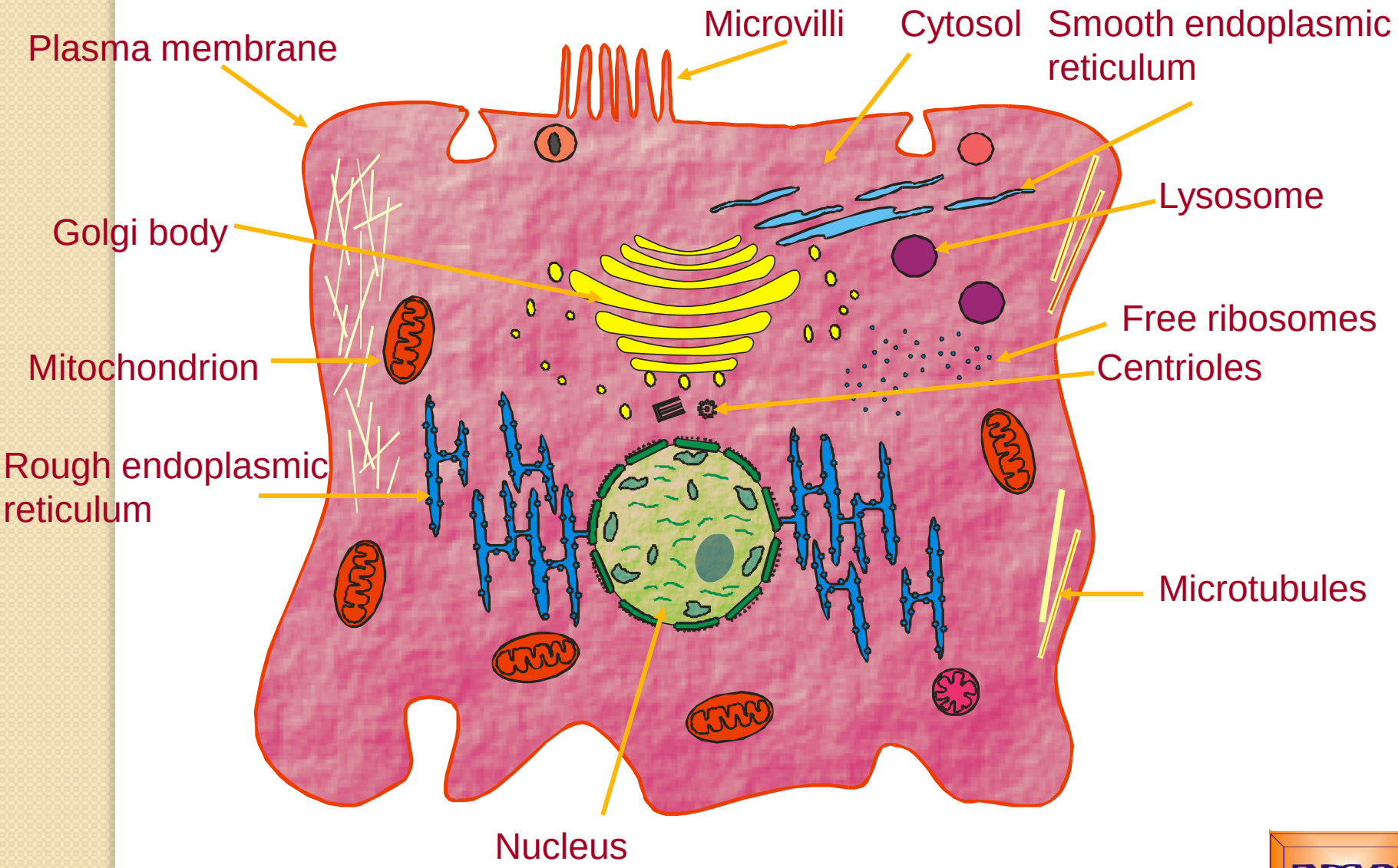
- **Have you labelled your cell? (check its correct)**

- Complete the table on your worksheet then:

Play: “What am I” !?
ROUND 1 : Structure questions
ROUND 2 : Function questions

Today - Animal cells! – Tomorrow PLANTS!

Summary

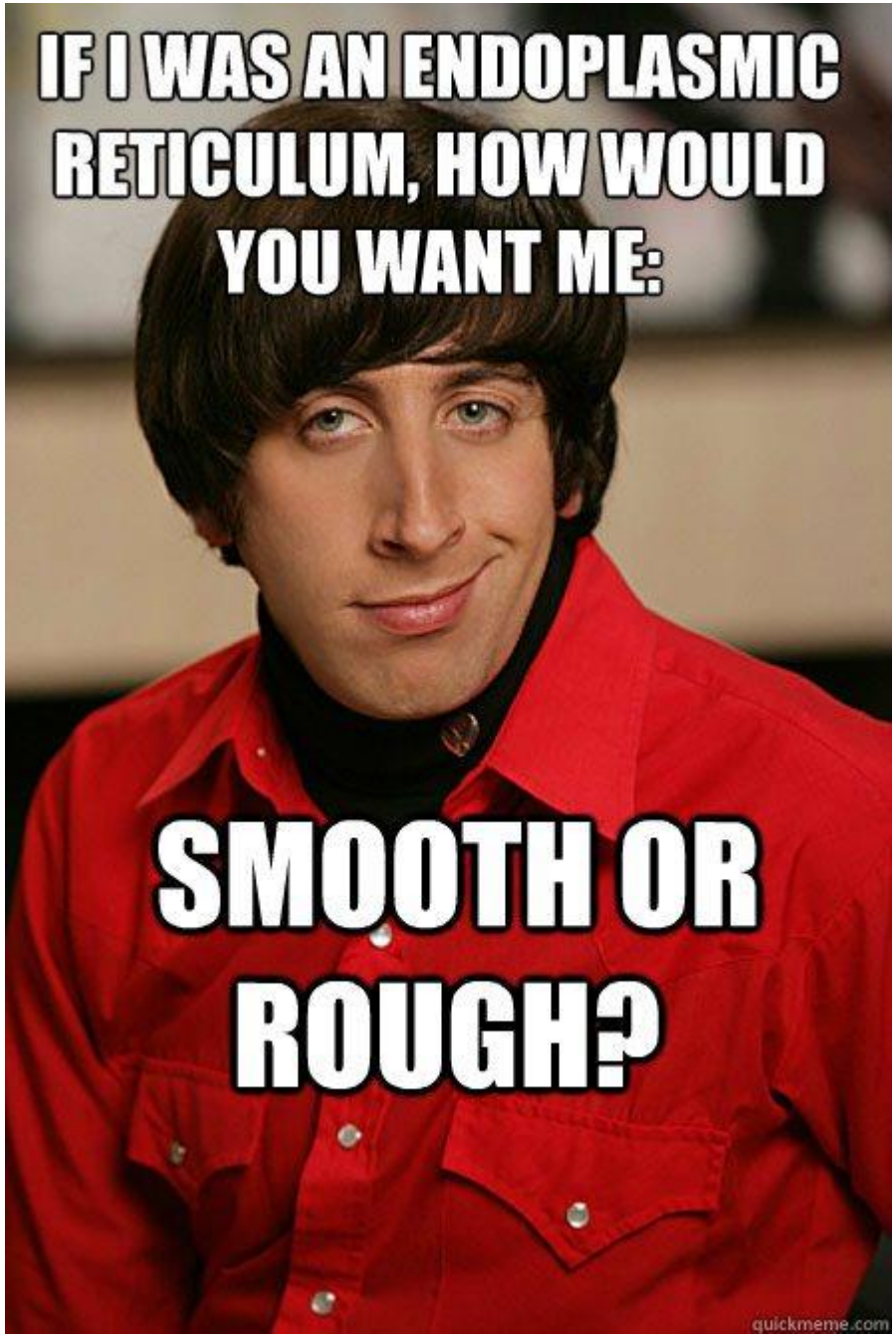


END SHOW

Eukaryote:
Organelles, Structure and Function

AIMS

- **Recognise** animal cell structures under the electron microscope
- **Outline** the function of the different animal cell organelles


IF I WAS AN ENDOPLASMIC RETICULUM, HOW WOULD YOU WANT ME:
SMOOTH OR ROUGH?
quickmeme.com

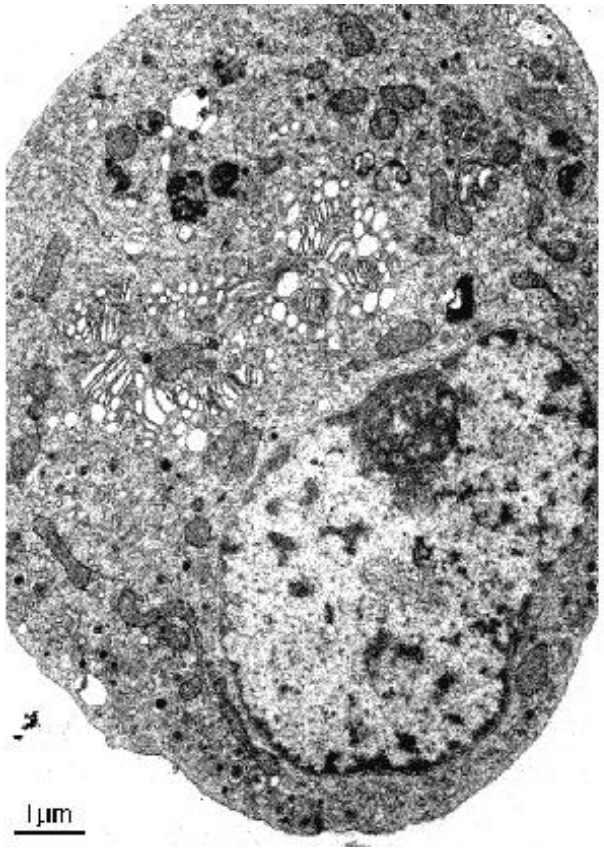
Eukaryote:
Organelles, Structure and Function

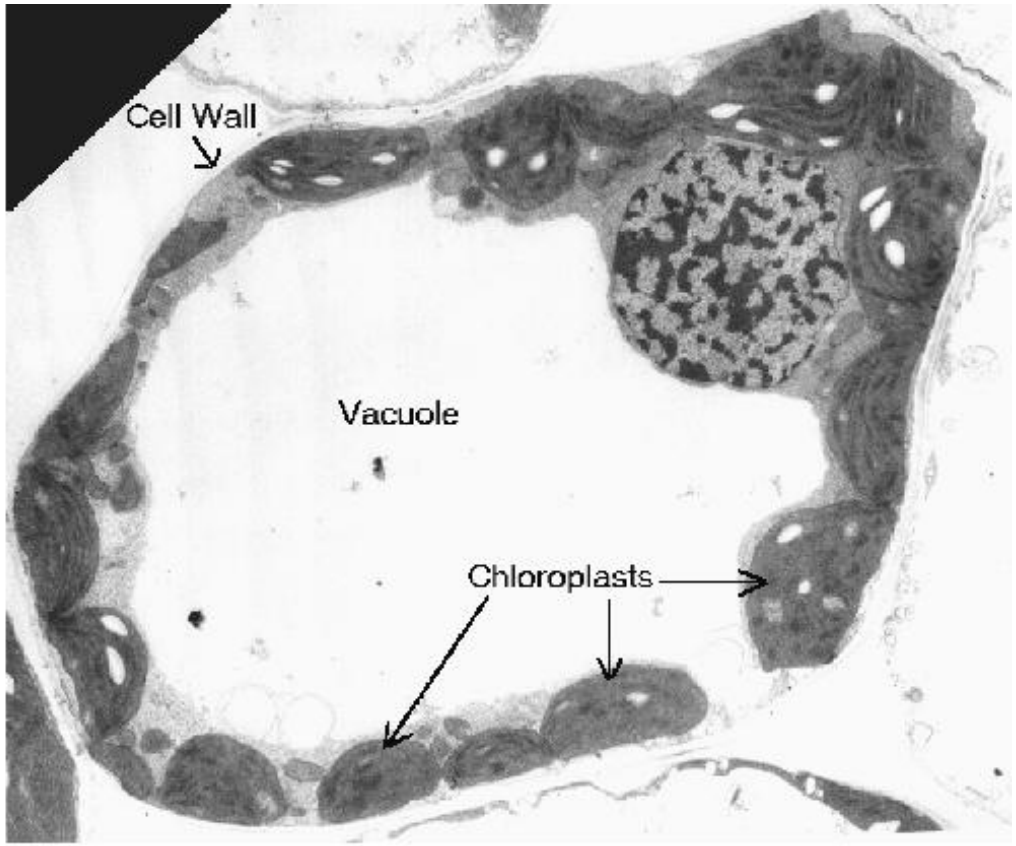
AIMS

- **Recognise** animal & plant cell structures under the electron microscope
- **Outline** the functions of eukaryotic cell organelles

Starter: Right Order

Transmission Electron Micrographs of Typical Plant & Animal Cells





Animal

Plant

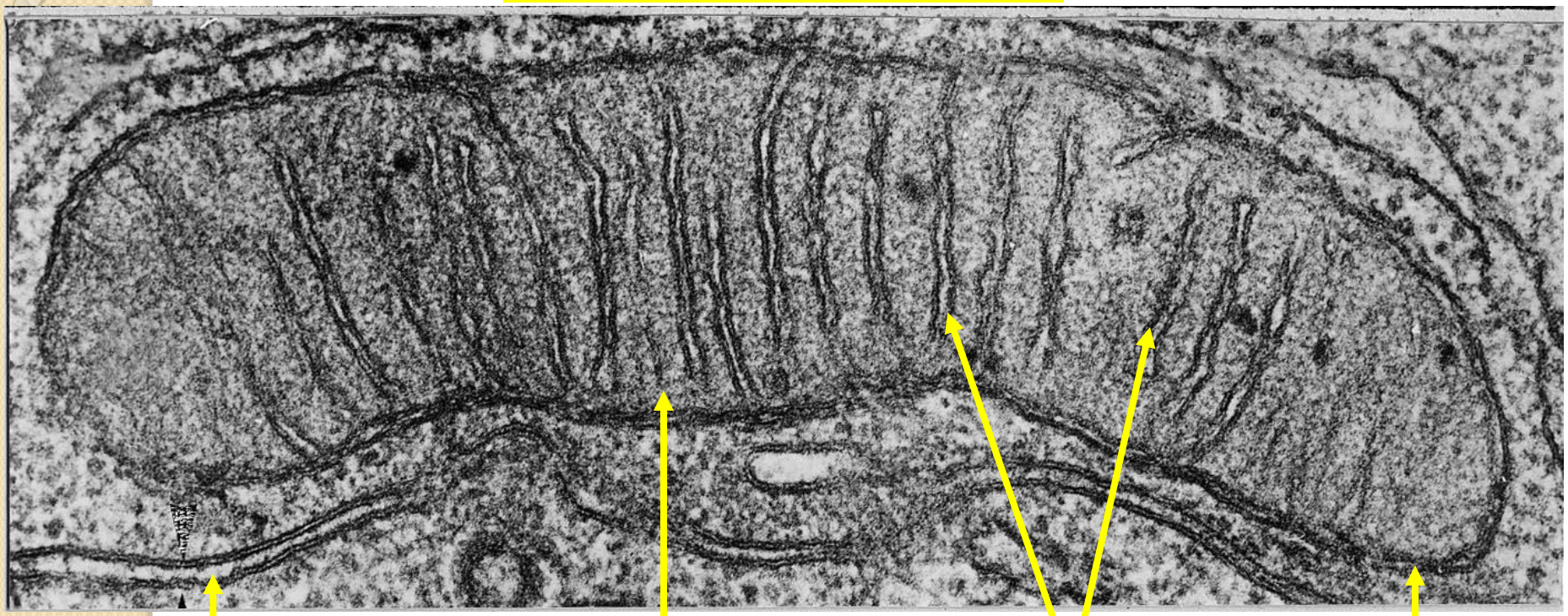
Courtesy of Dr. Julian Thorpe – EM & FACS Lab, Biological Sciences University Of Sussex

Observe the differences

NEXT

ELECTRON MICROGRAPH OF

Courtesy of Electron Microscopy Unit
University of Lancaster



endoplasmic reticulum

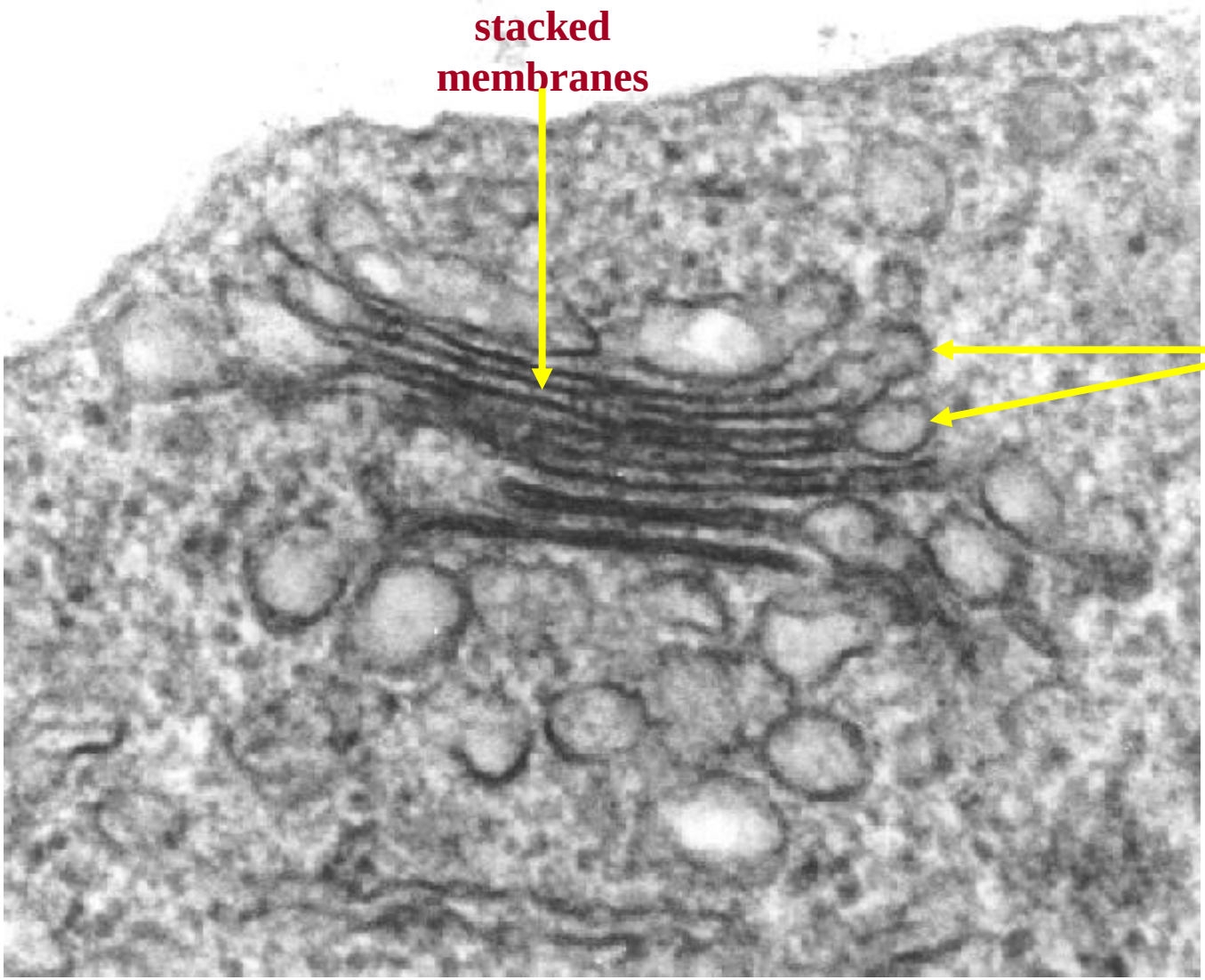
fluid matrix

cristae

outer membrane

ER, cristae, fluid matrix, ribosome, outer membrane

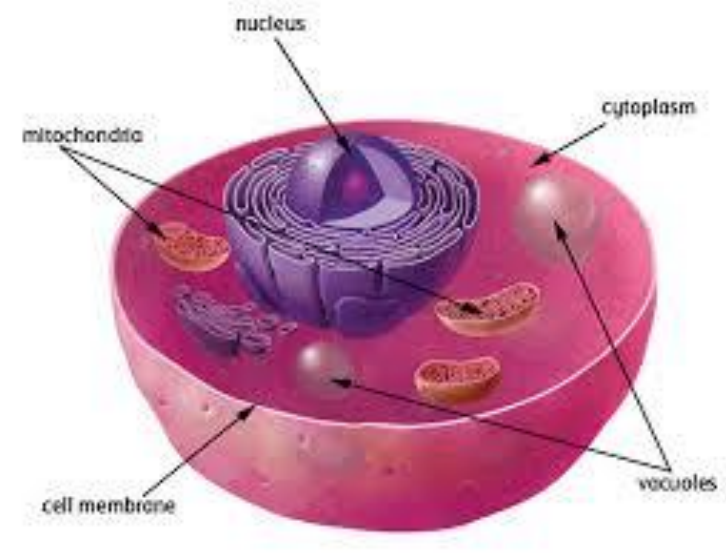
ELECTRON MICROGRAPH OF (



Courtesy of Dr. Julian Thorpe – EM & FACS Lab, Biological Sciences University Of Sussex

Eukaryotic Cell organelles

1) Nucleus
2) Endoplastic reticulum
3) Golgi apparatus
4) Mitochondria
5) Lysosomes
6) Ribosomes
7) Centrioles
8) Vacuole (large-tonoplast)
9) Cell wall
10) Chloroplasts
11) Plasmodesma



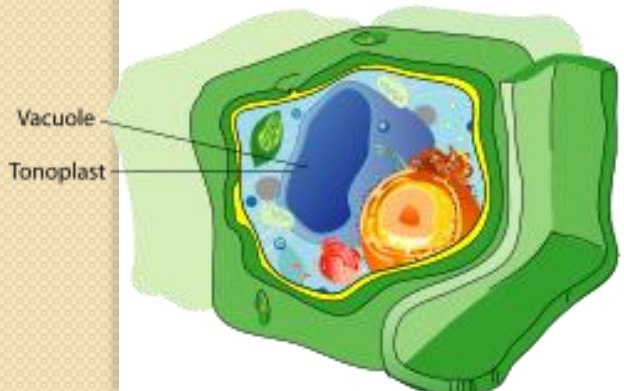
Vacuole

Function:

- Animals: Formed during phagocytosis, can store food & waste.
- Plants: Storage sites and sap maintain turgor.

Structure:

- Small vesicles in animal cells, often many.
- Large and surrounded by a ***tonoplast*** in plant cells.



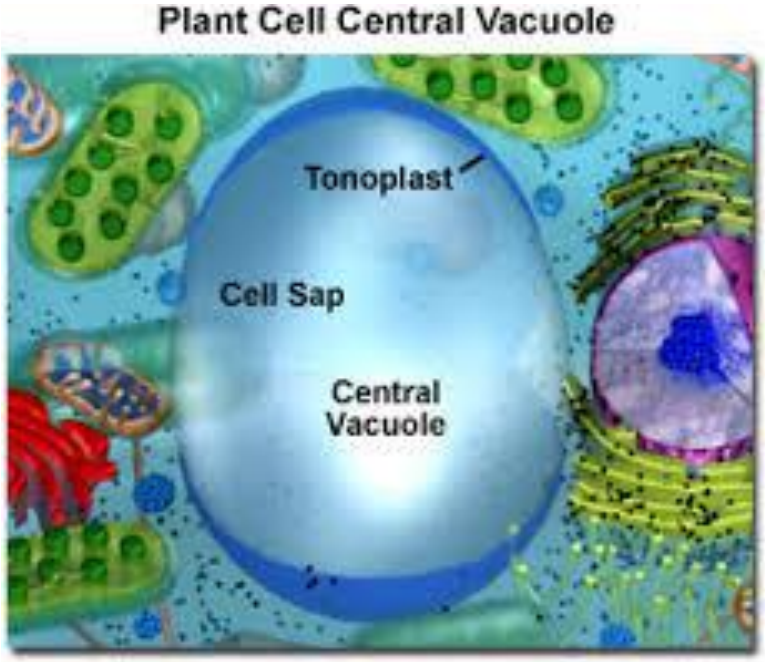


Figure 1

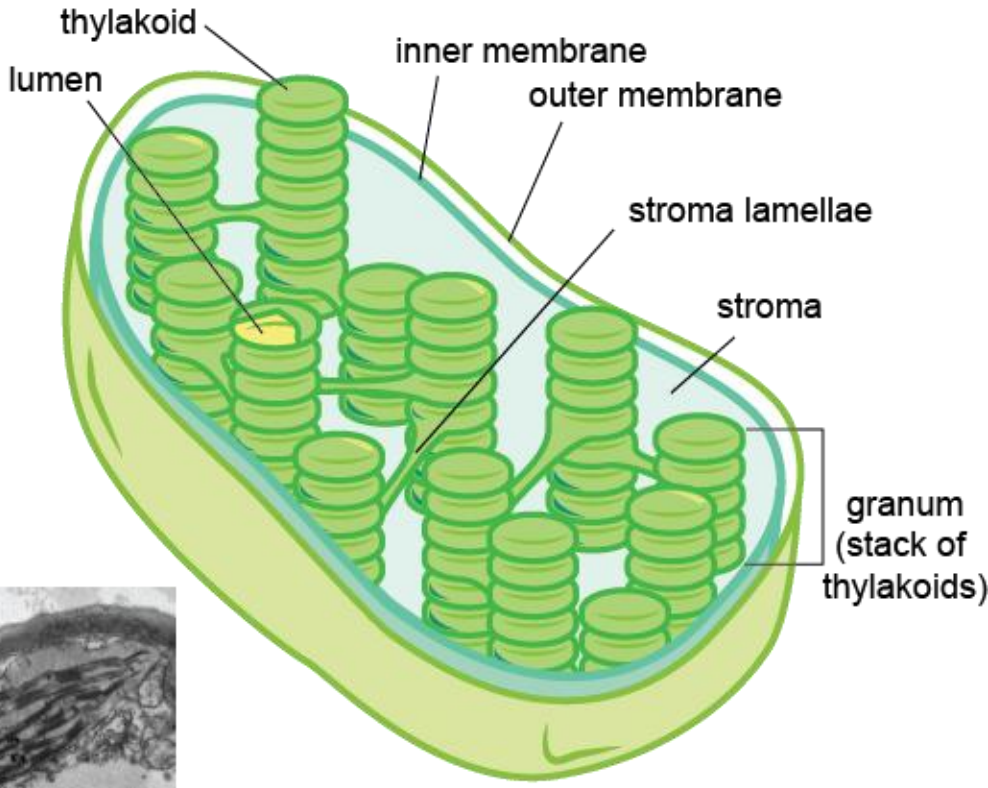
Chloroplasts

Structure:

- 2-membranes separated by fluid filled space
- Inner membrane continuous with network of **thylakoids**
- Stack of thylakoids**: granum**
- **Chlorophyll** molecules present on these membranes.

Function:

- Site of photosynthesis
- Light energy used to make carbohydrates from CO_2.



TEM image of a chloroplast (*Anemone sp.*, leaf cell)

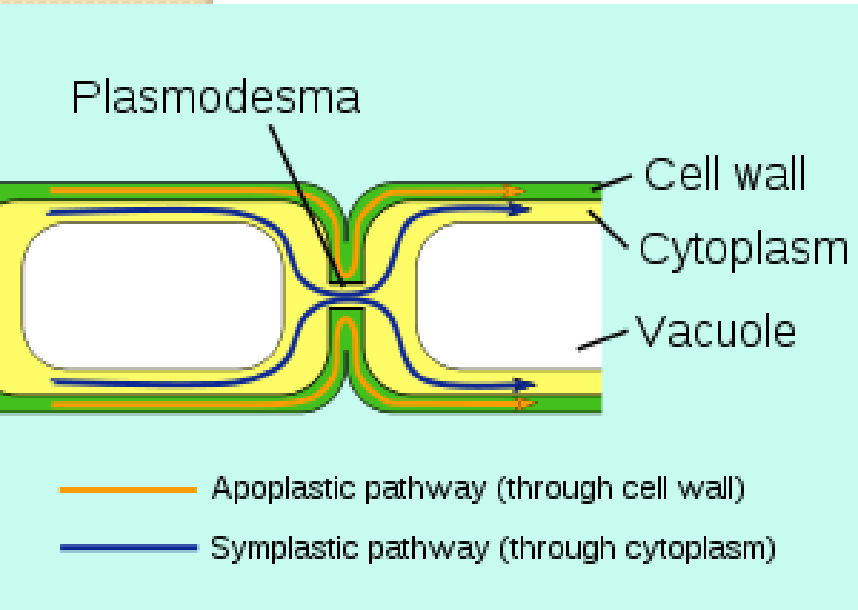
Plasmodesmata

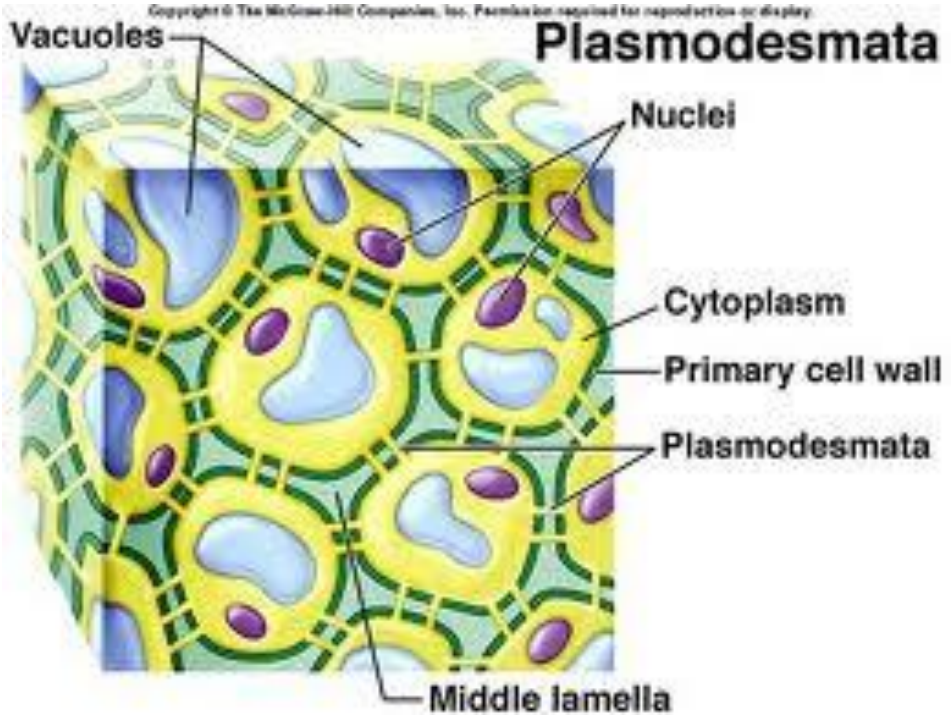
Structure:

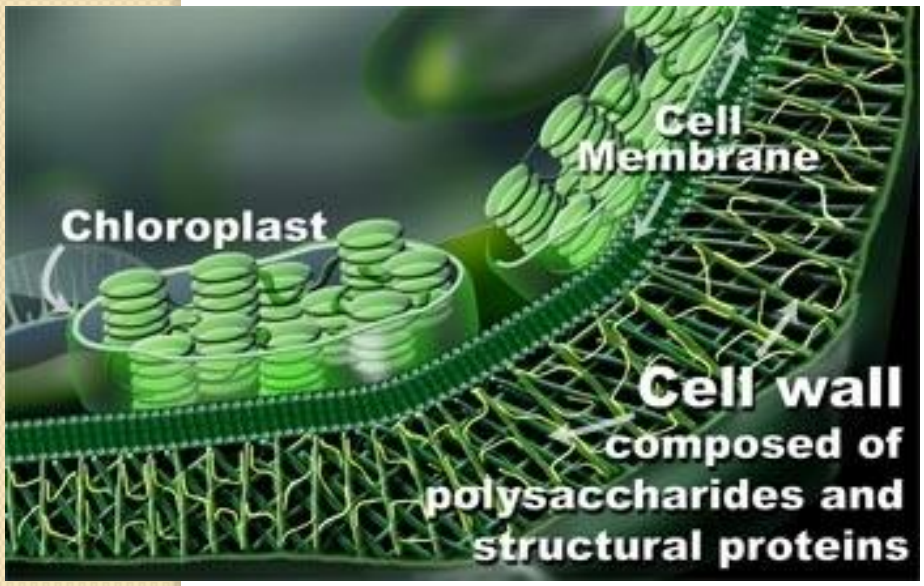
➢ Microscopic channels which traverse plant cell walls

Function:

▪ Regulated transport of substances through cells.







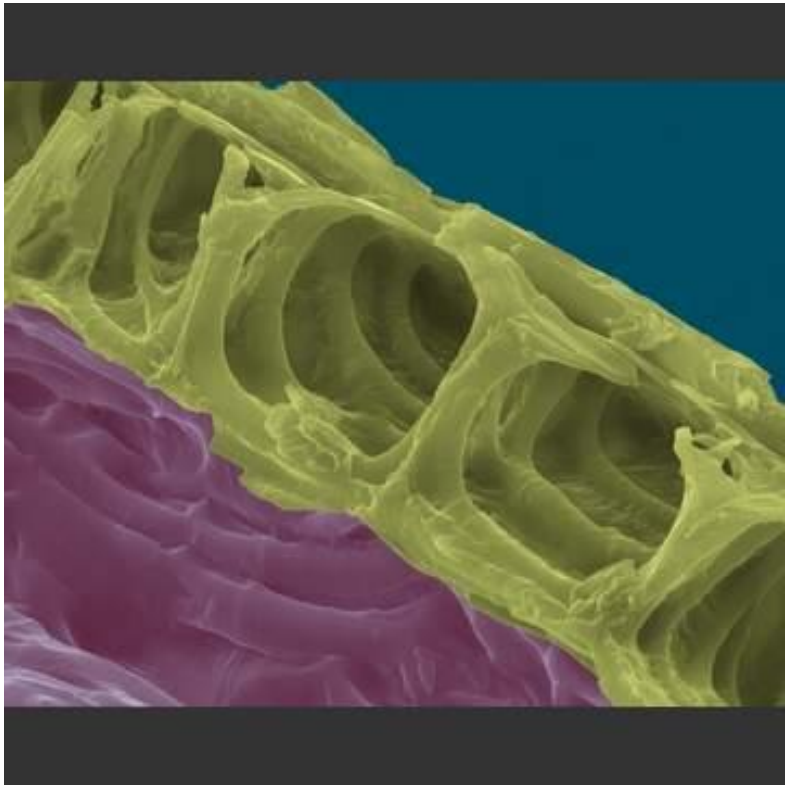
Cellulose Cell Wall

Function:

- Strength of cellulose cell wall prevents overexpansion.

Structure:

- Made of cellulose (most abundant organic molecule!)
- Mechanically strong
- Made of β-glucose molecules joined together to form a chain.



Quick Check

- Can you label a plant cell?
- Complete the plant organelles on the eukaryotic table then complete questions on parts of a plant cell.

	Animal	Plant
Membrane	Y	Y
Wall	N	Y
Vacuole	SMALL (IF AT ALL)	LARGE (CENTRAL)
Carbohydrate storage	GLYCOGEN	STARCH
Centrioles	Y	N
Chloroplast	N	Y
Mitochondria	Y	Y
Size (µm)	20-30	40-80

Homework: set - due -

'Draw a diagram of a prokaryotic & eukaryotic cell as observed under the electron microscope, highlighting differences between the two.'

Time

1.5 – 2 hrs

Resources

- http://www.cellsalive.com/cells/cell_model.htm
- http://www.s-cool.co.uk/a-level/biology/cells-and-organelles/revise-it/organelles

Criteria

→ Microscopy style pencil drawings (not sketchy or shaded) (Grade D)

→ Relative scale of each organelle within cell correct (Grade C)

→ Table showing organelles present/not present in each cell type (Grade B)

→ Mention of function in table (A)

→ Scale bar (Grade A) with correct unit (Grade A*)

Note

Please attach this sheet to the front of your work as the criteria will be used for marking!

Eukaryote:
Organelles, Structure and Function

AIMS

- **Recognise** animal & plant cell structures under the electron microscope
- **Outline** the functions of eukaryotic cell organelles

Starter: Right Order