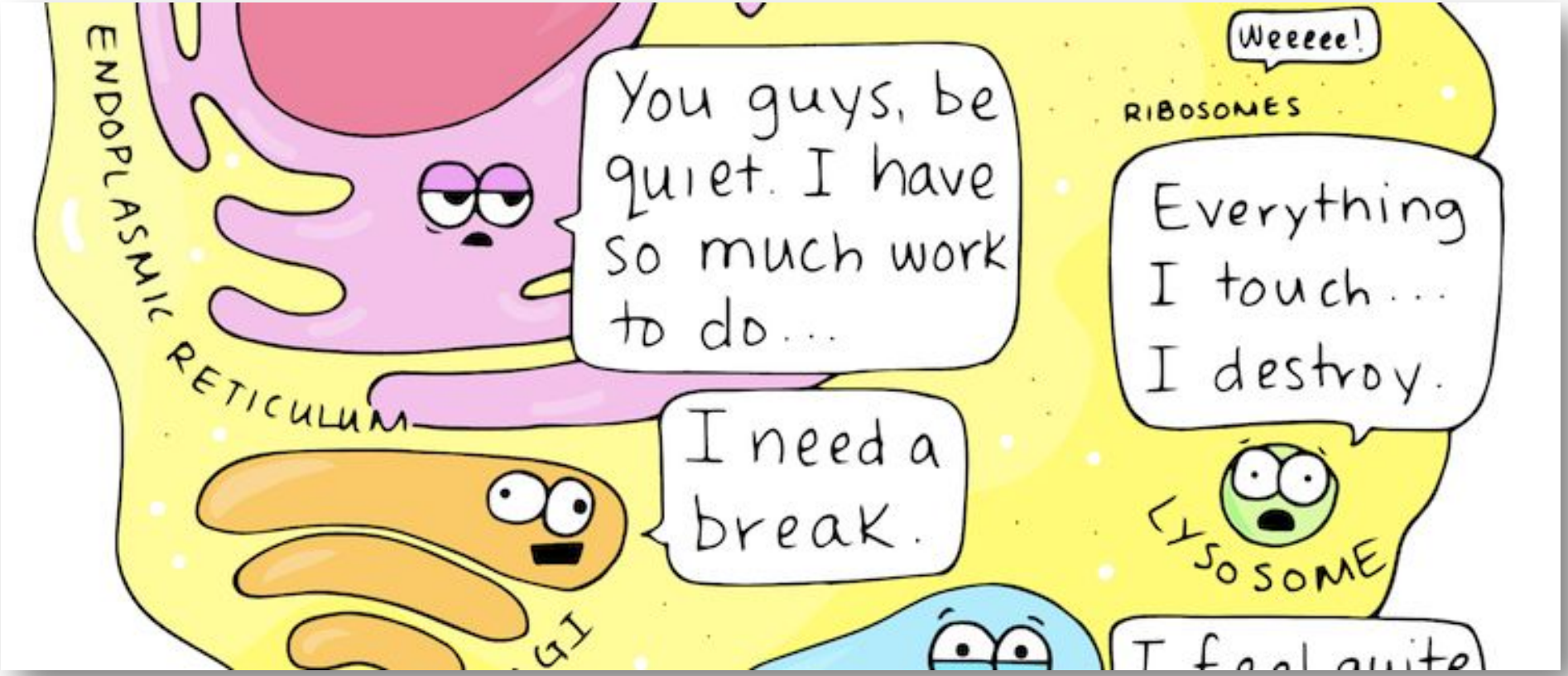
Seminar B5
The cell: Organelles



What is a Cell?

- A cell is the basic unit of life
- All organisms are made of cells
- In the hierarchy of biological organization, the cell is the simplest collection of matter that can be alive
- Many forms of life exist as single-celled organisms
- More complex organisms, including plants and animals, are multicellular
- Multicellular organisms are cooperatives of many kinds of specialized cells that could not survive for long on their own. However, the cell remains the organism's basic unit of structure and function

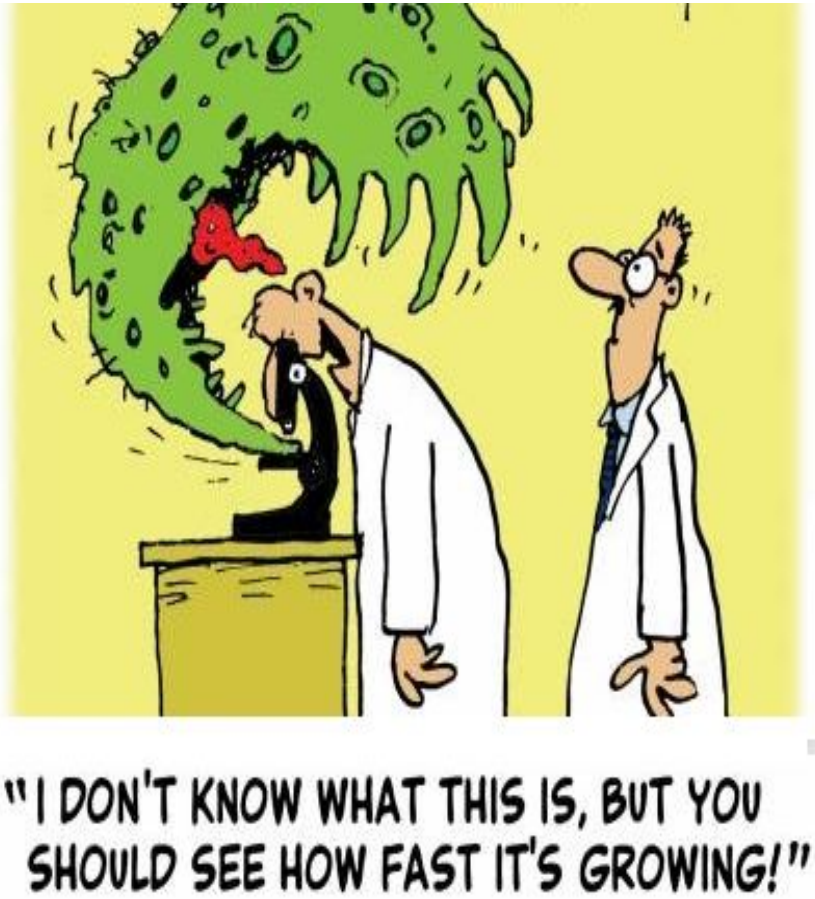
What do we call the study of cells?

- Cytology

- But… How can we study cells?

- The most obvious way is by observing them

- How can we observe cells?



Microscopy!!!

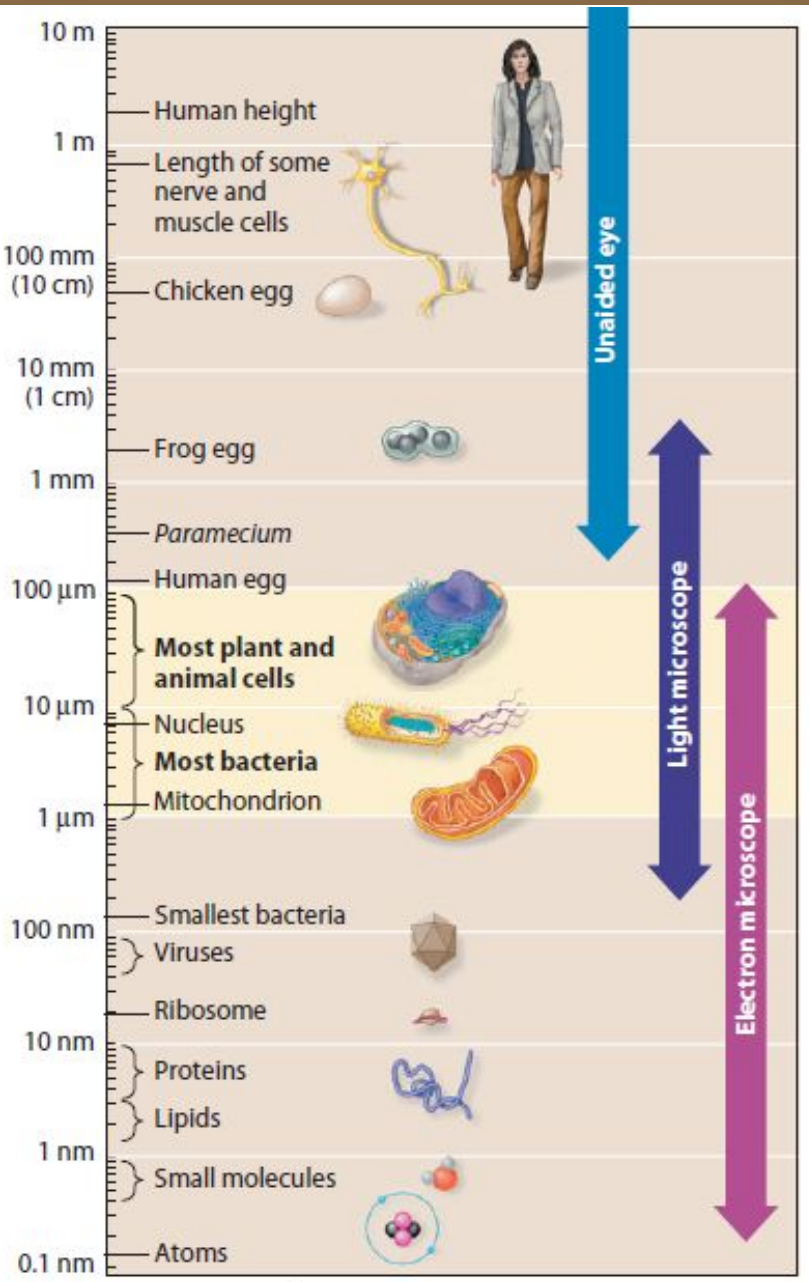
What types of microscopy do you know?

Microscopy Terms

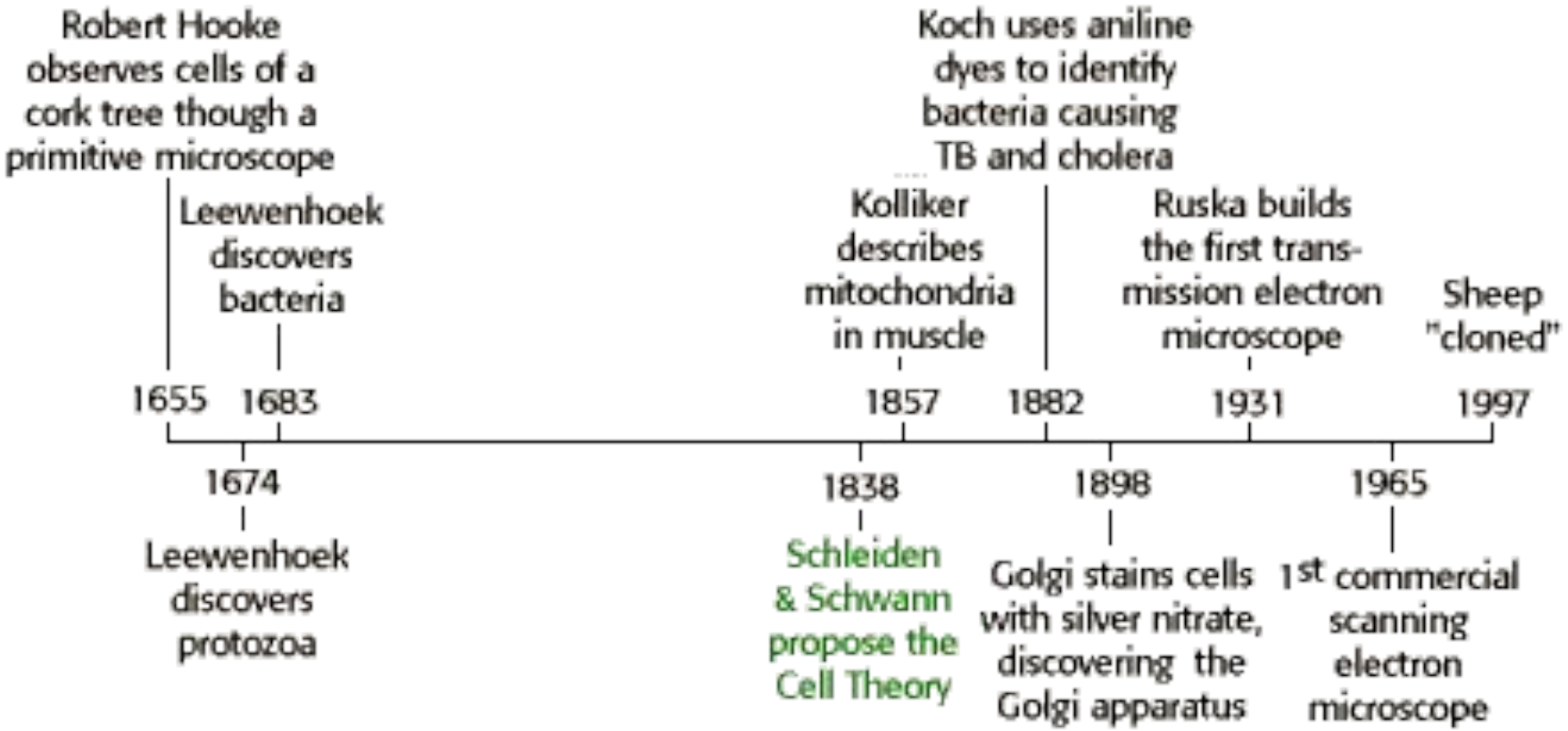
- ***Magnification*** is the increase in an object's image size compared with its actual size.
- ***Resolution*** is a measure of the clarity of an image. It is the ability of an instrument to show two nearby objects as separate.

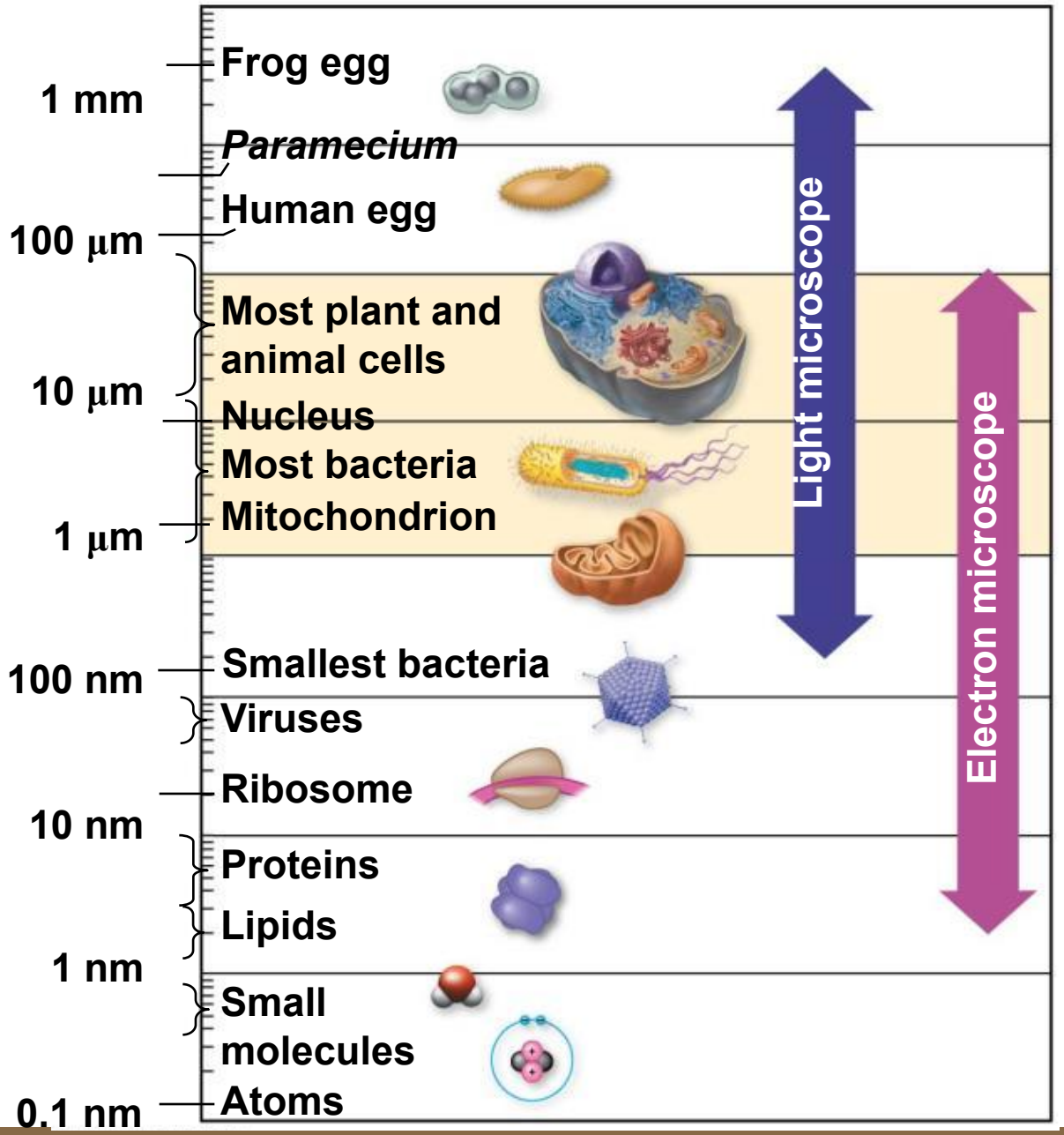
The Discovery

- The progress in cell discovery is associated with the evolution of microscopy.
- Larger cells were spotted first while smaller organisms had to wait for the technology to be developed.



Major events in cell biology & imaging

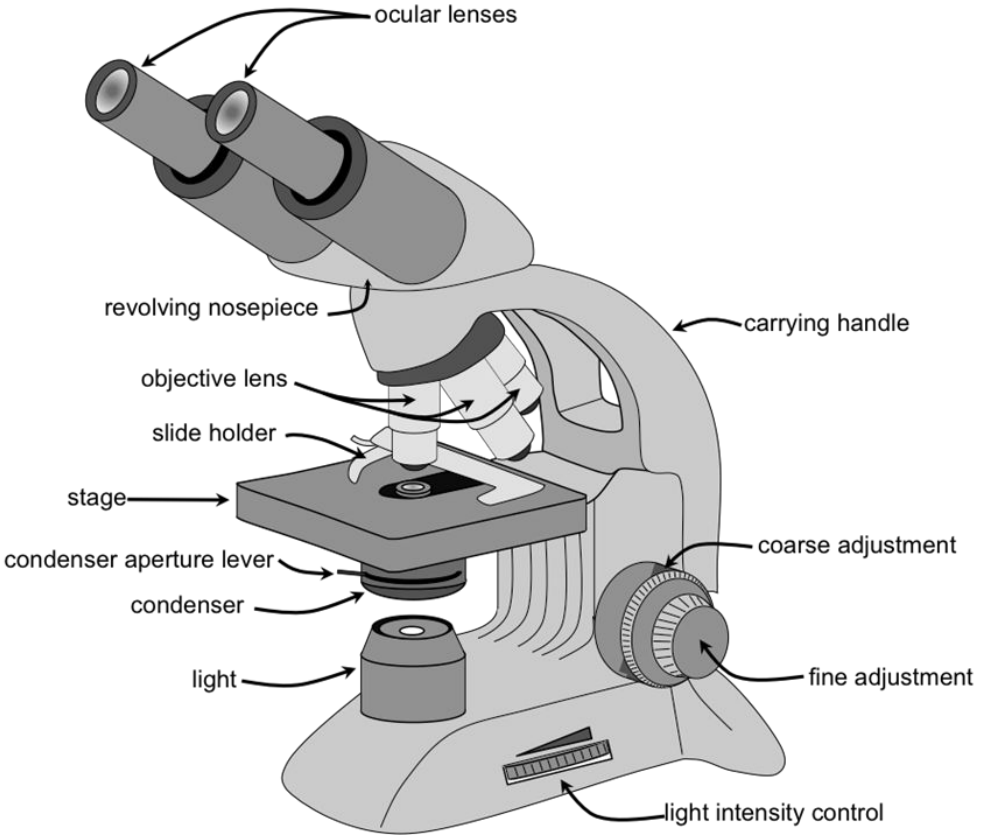



1 mm
Frog egg
Paramecium
Human egg
100 μm
Most plant and animal cells
10 μm
Nucleus
Most bacteria
Mitochondrion
1 μm
100 nm
Smallest bacteria
Viruses
Ribosome
10 nm
Proteins
Lipids
1 nm
Small molecules
Atoms
0.1 nm
Light microscope
Electron microscope

Microscopes reveal the world of the cell

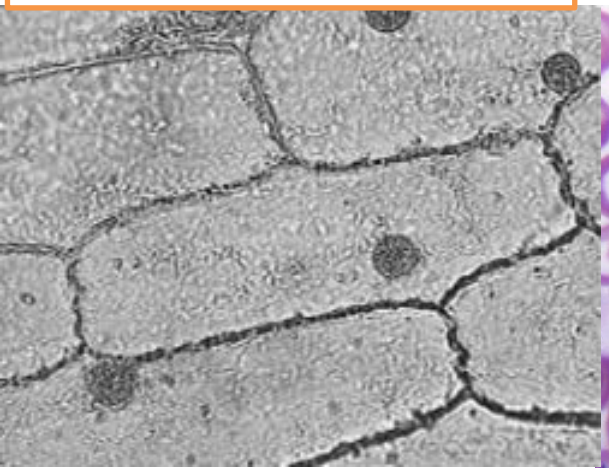
The first microscopes were light microscopes.

In a **light microscope** (**LM**), visible light passes through a specimen, then through glass lenses, and finally is projected into the viewer's eye.

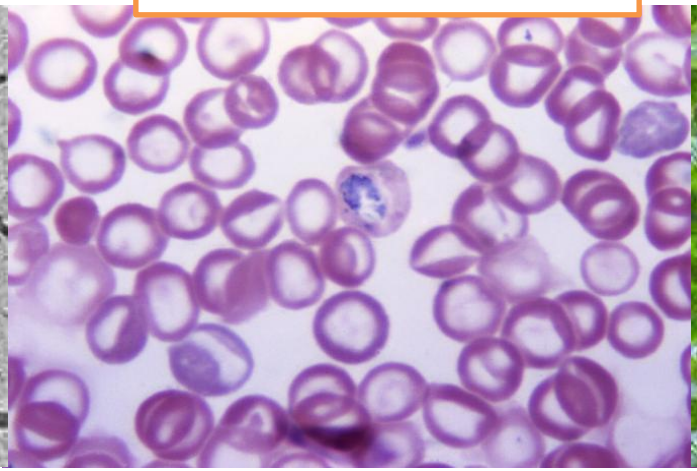


What can we see with an LM?

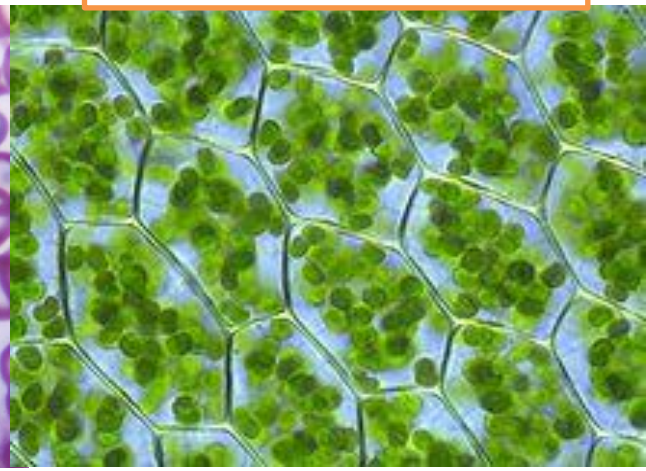
Plant cell (non-leaf)



Red blood cells



Plant cell (leaf)



Electron microscopes

- Beginning in the 1930s, scientists started using a very powerful microscope called the **electron microscope** (**EM**) to view the ultrastructure of cells.
- Instead of light, EM uses a beam of electrons.
- Electron microscopes can
  - resolve biological structures as small as 0.2 nm
  - magnify up to 1,000,000 times.

What do they look like?

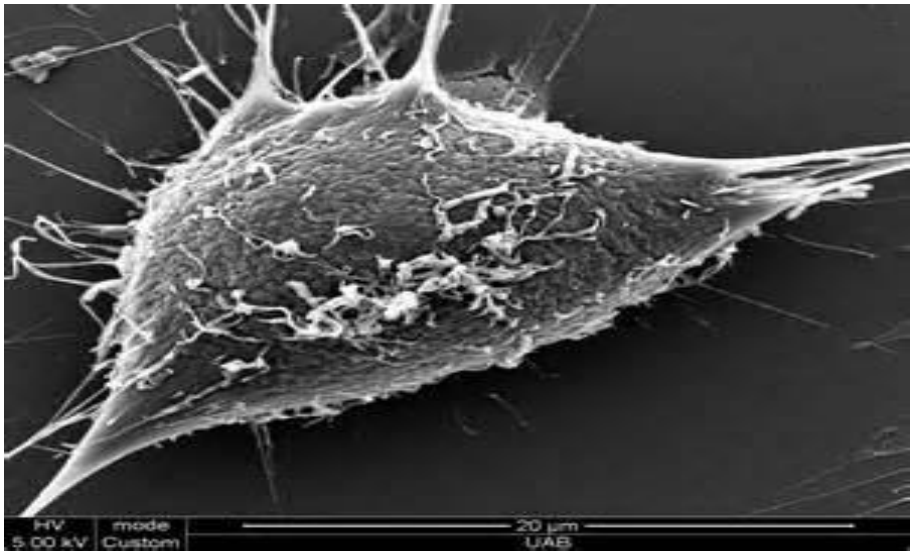
Scanning Electron Microscope

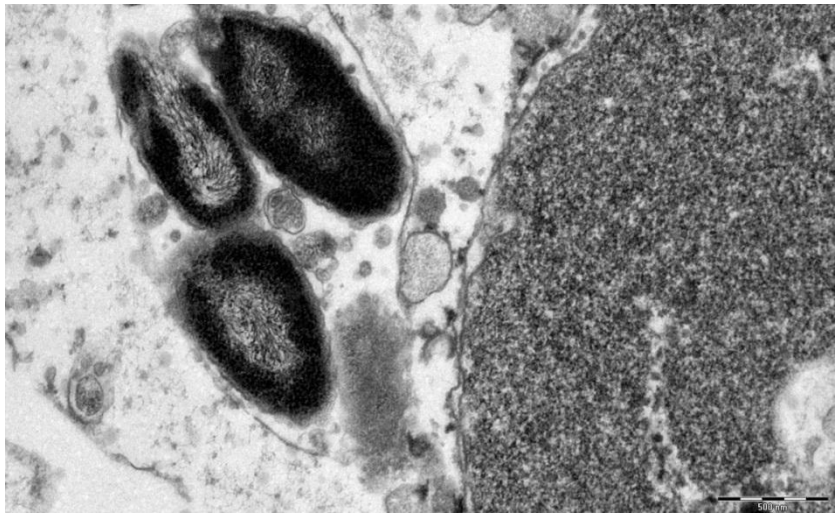
Transmission Electron Microscope

Electron Microscopy

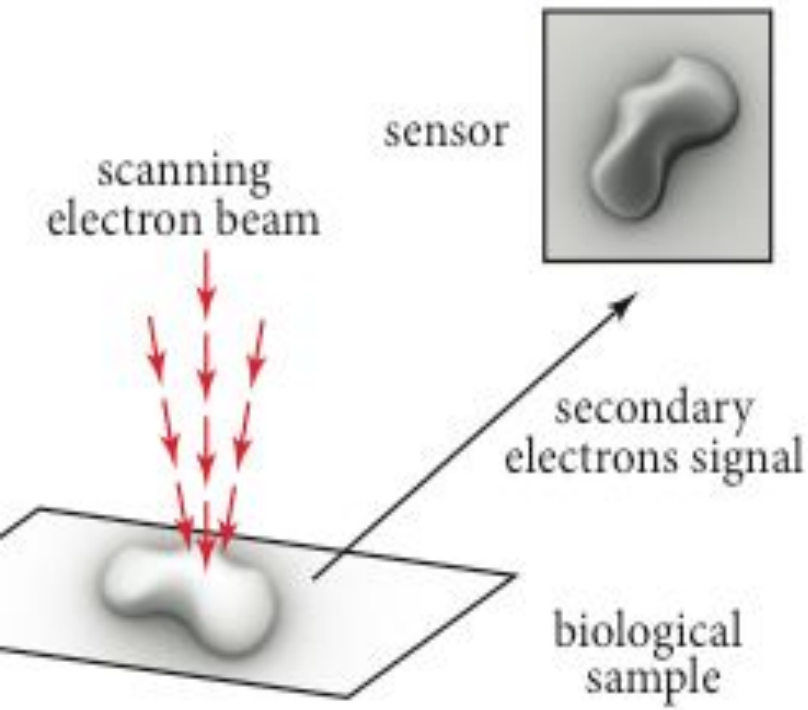
Electron microscopes use a beam of electrons to view very small objects. The beam acts in different ways:

It will either **scan the surface** or **pass through the samples.**



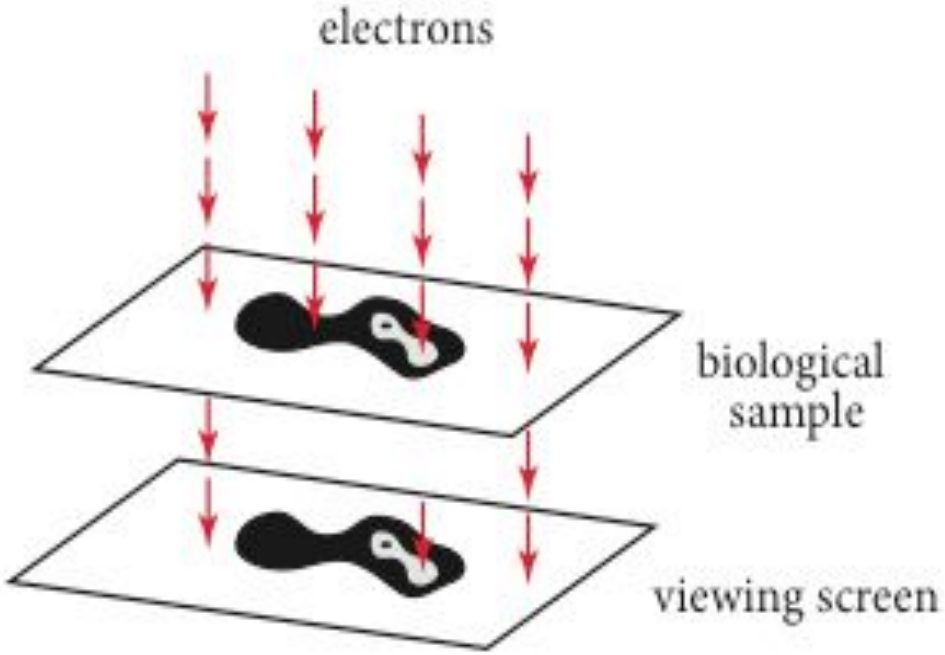


SEMs vs TEMs



SEM

Scanning Electron Microscope



TEM

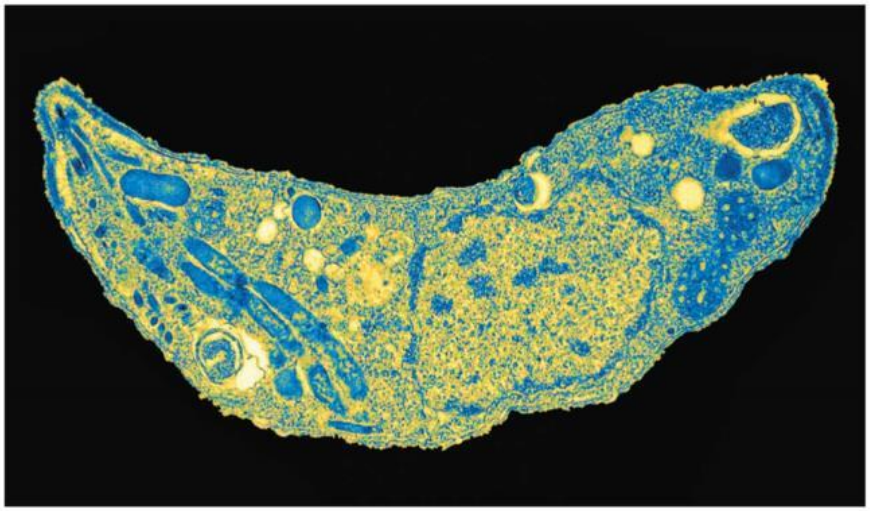
Transmission Electron Microscope

SEMs vs TEMs

Scanning electron microscopes (**SEMs**) show the detailed architecture of cell surfaces.

Transmission electron microscopes (**TEMs**) show the details of internal cell structure.

Scanning electron micrograph of *Paramecium*



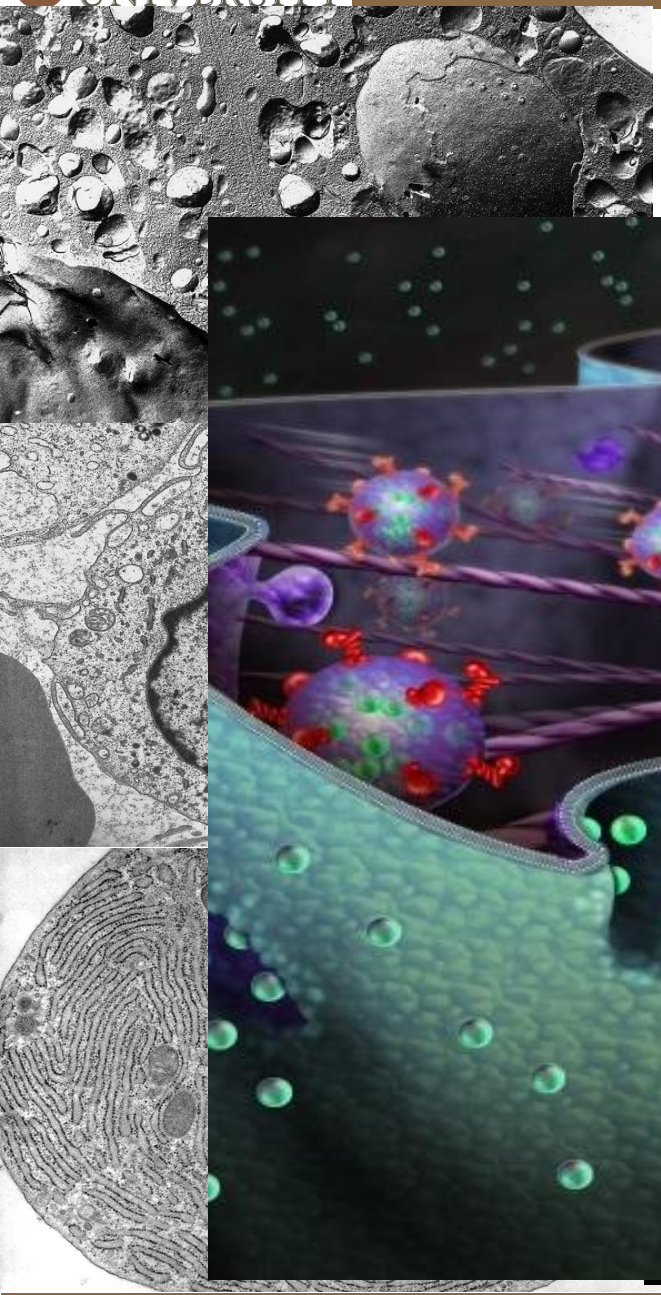
Transmission electron micrograph of *Toxoplasma*

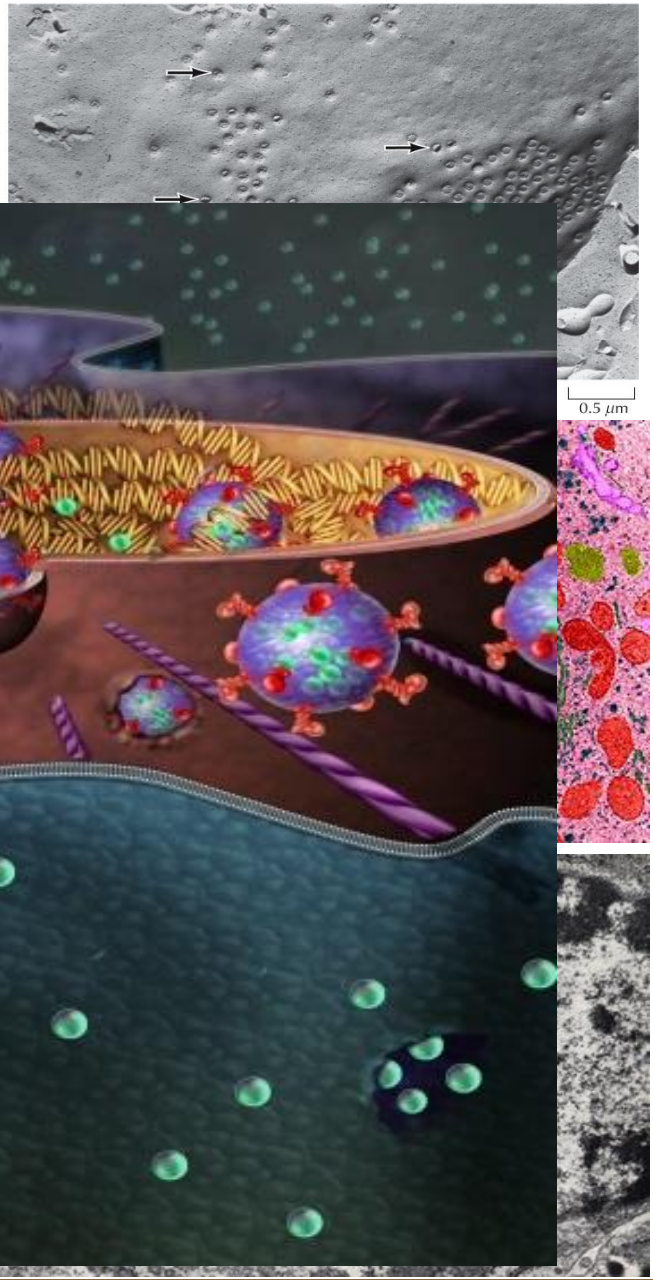
Your Task

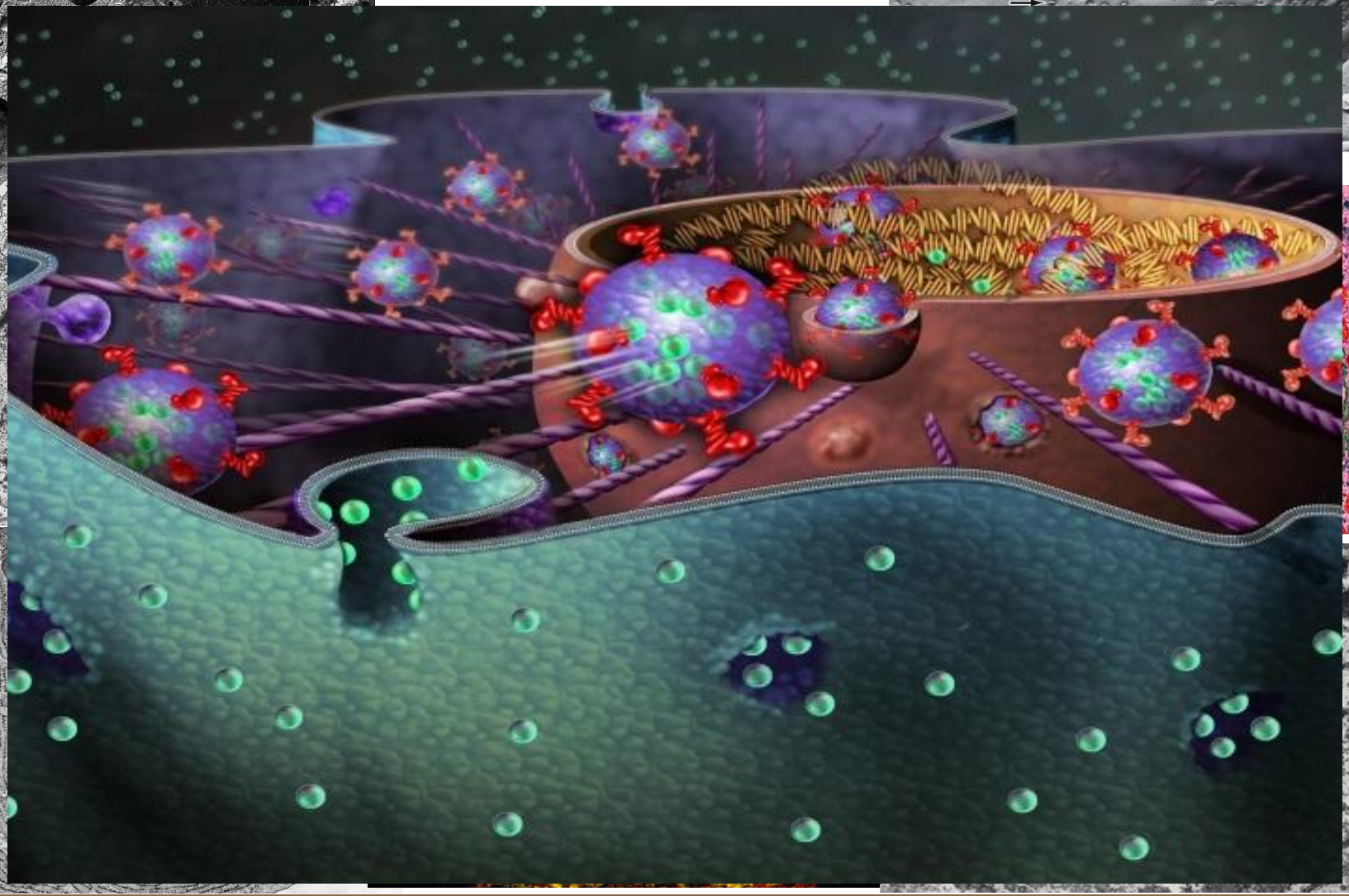
- You are going to be given a set of cards with pictures of 8 organelles.
- There are 6-8 pictures for each organelle.
- For each organelle:
  - Collect the micrographs showing that organelle
  - Identify the drawing that shows the organelle
  - Choose the correct description
- Hint: you can spy on other groups to confirm your ideas.

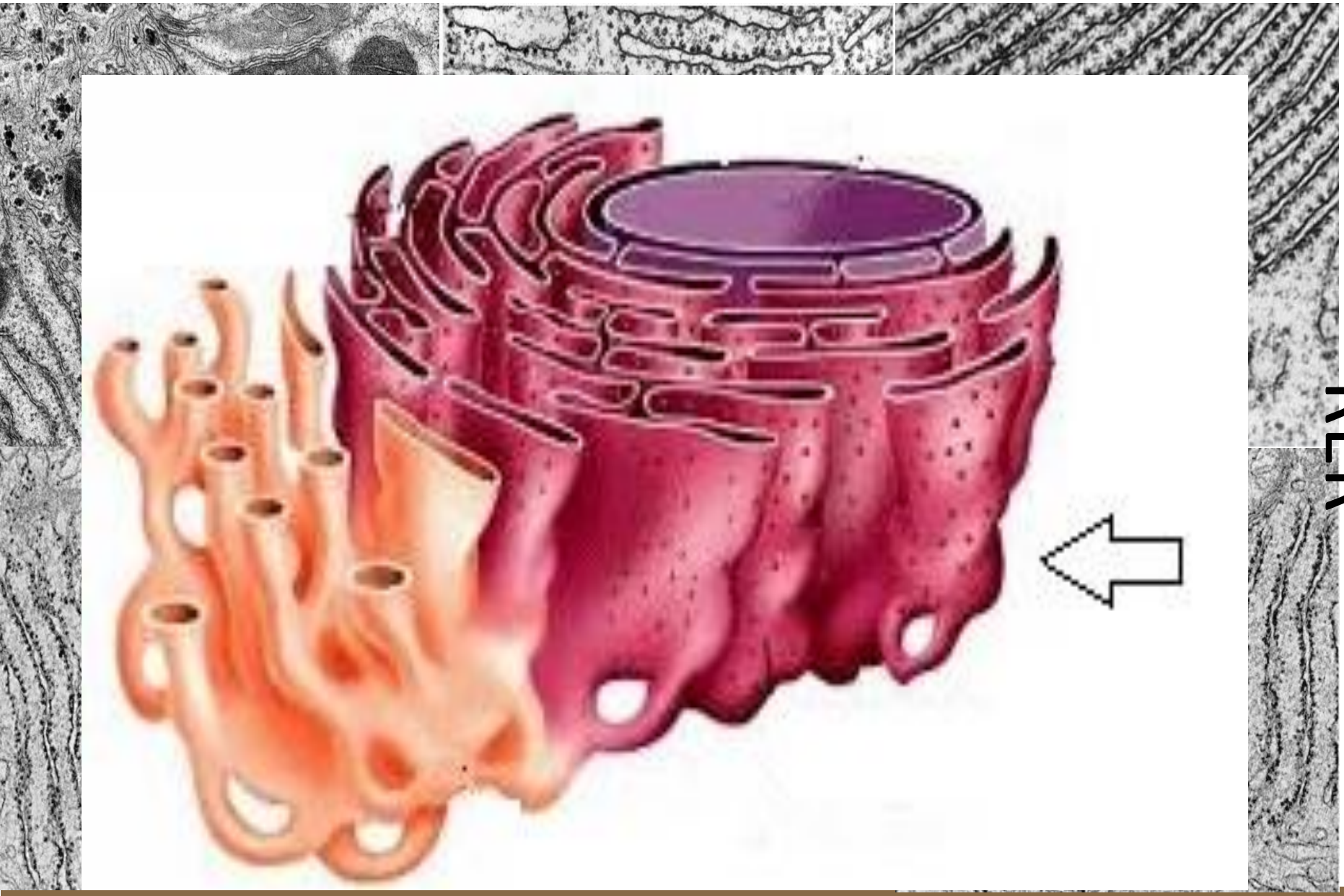
Let’s check your conclusions!!

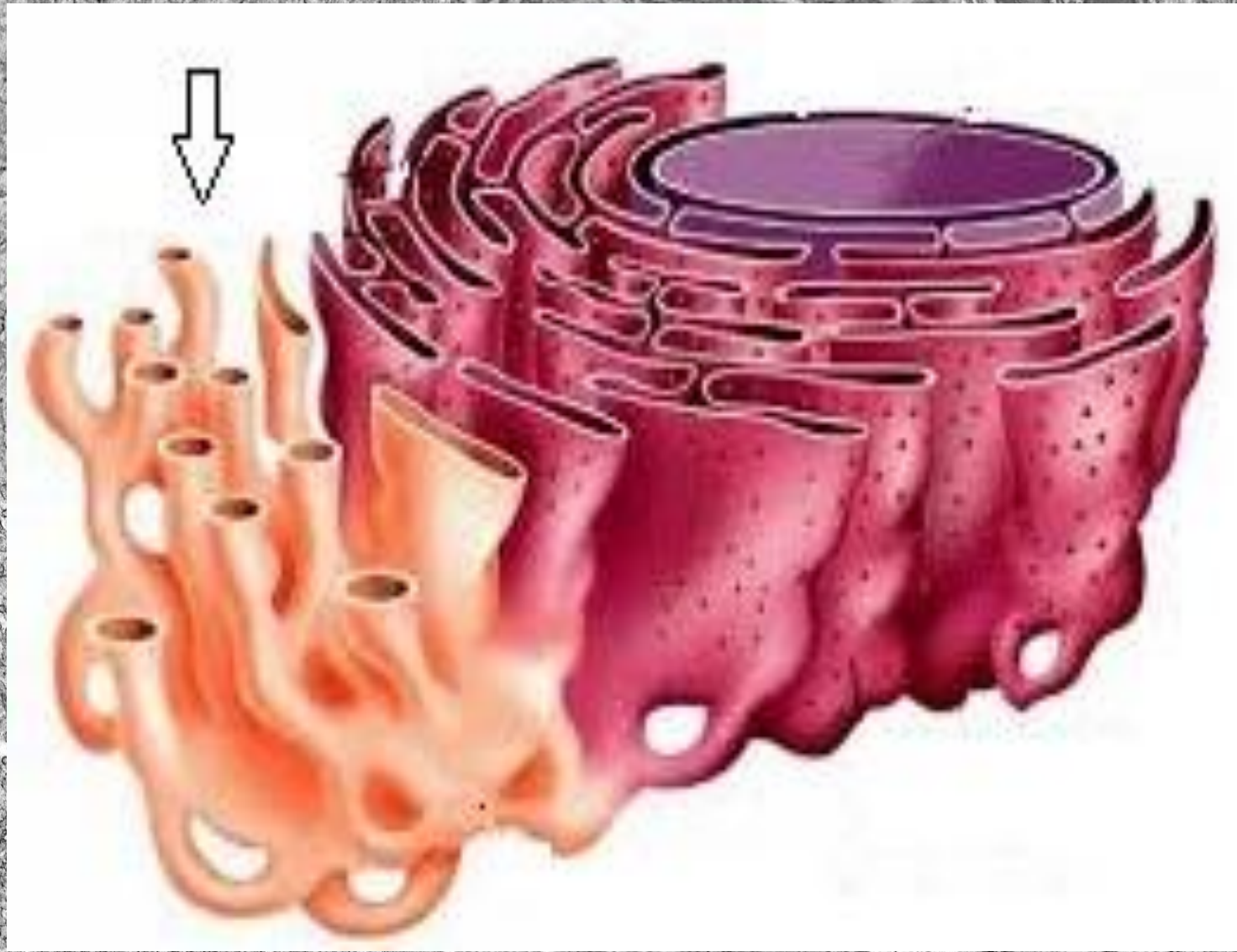
Nucleus





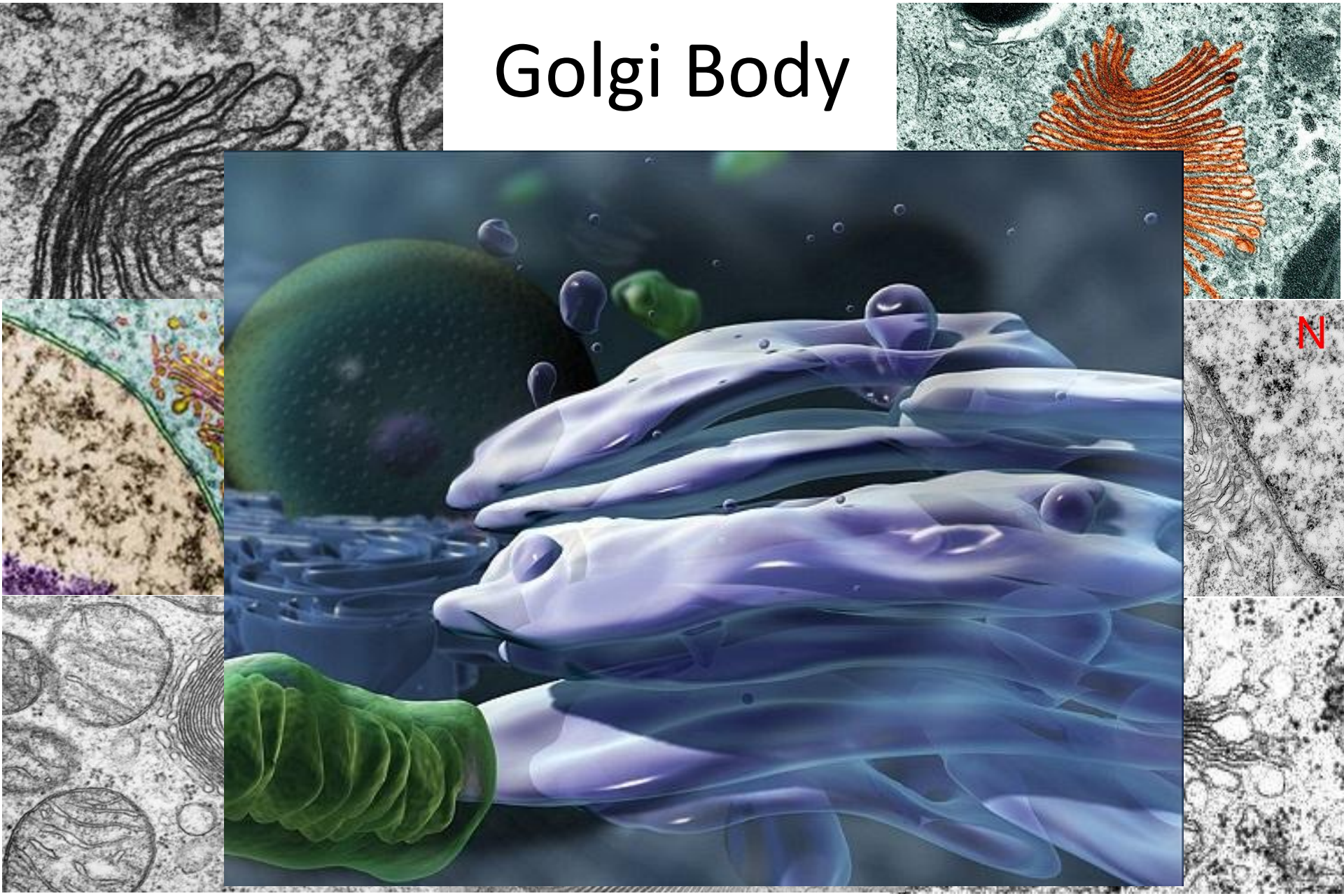



RER

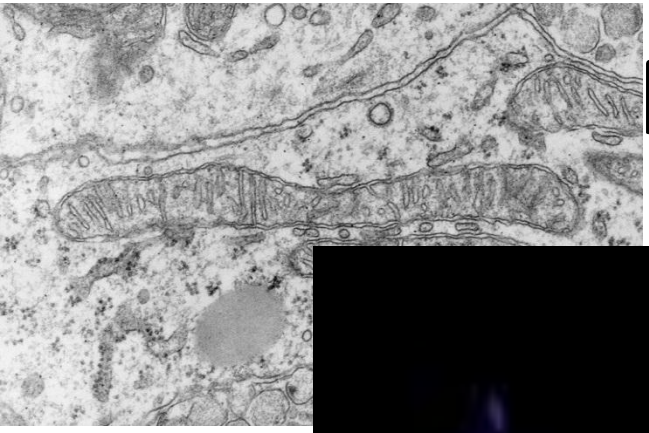
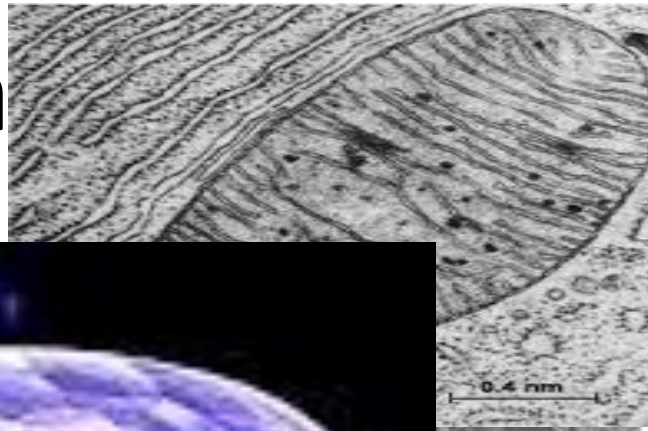


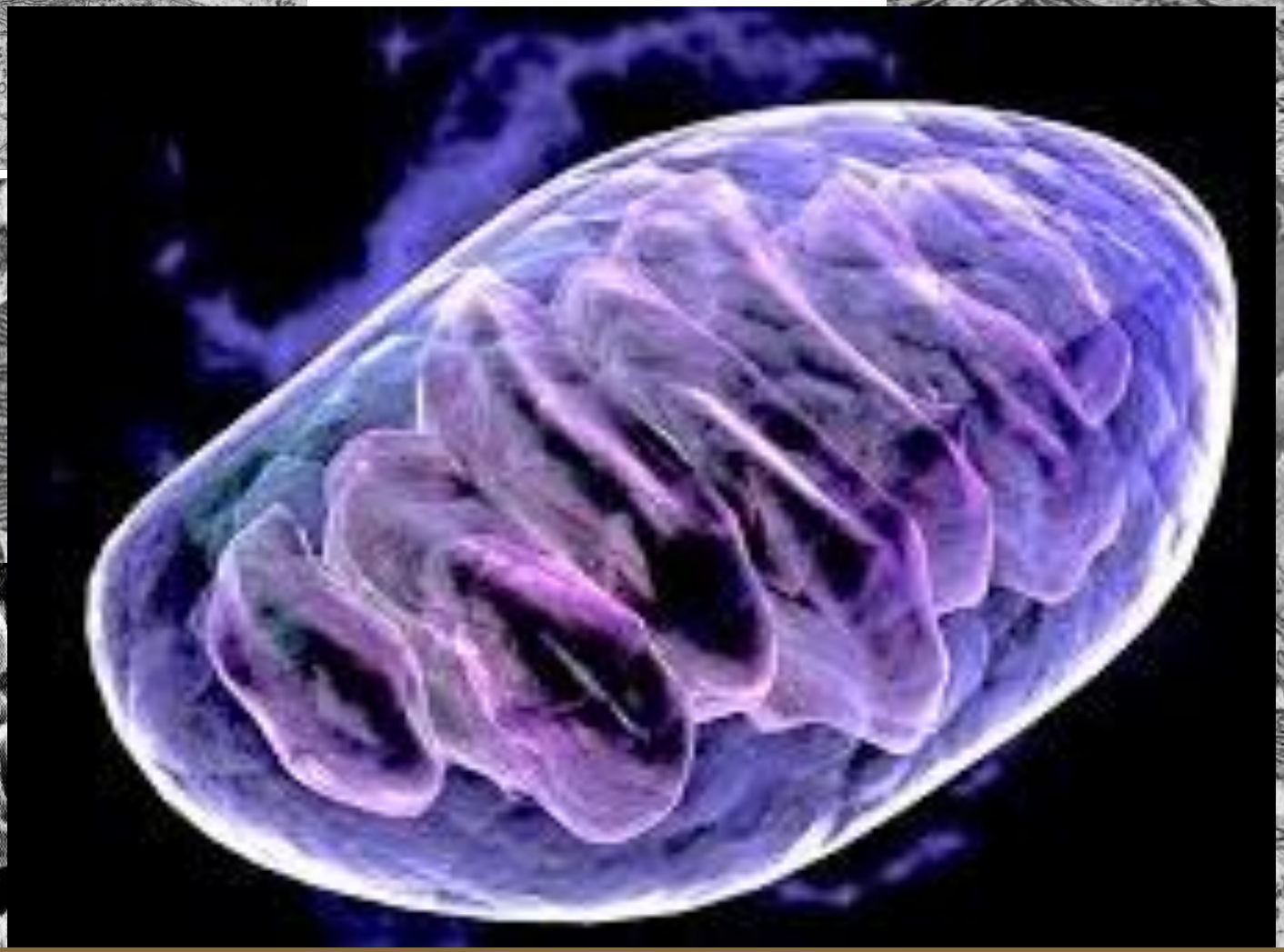
SER

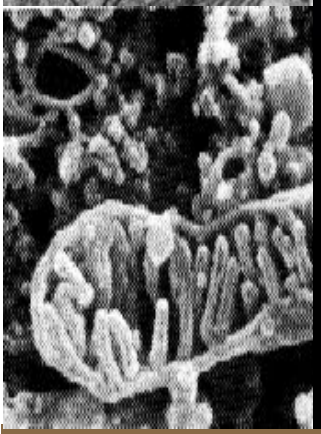
Golgi Body



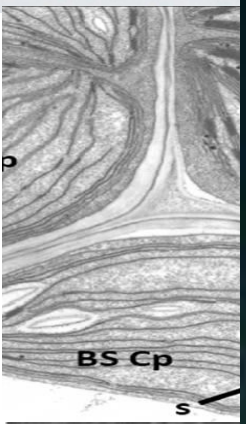
Mitochondria

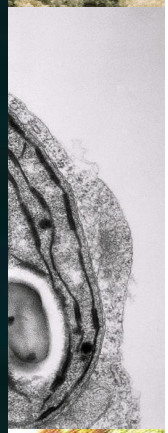



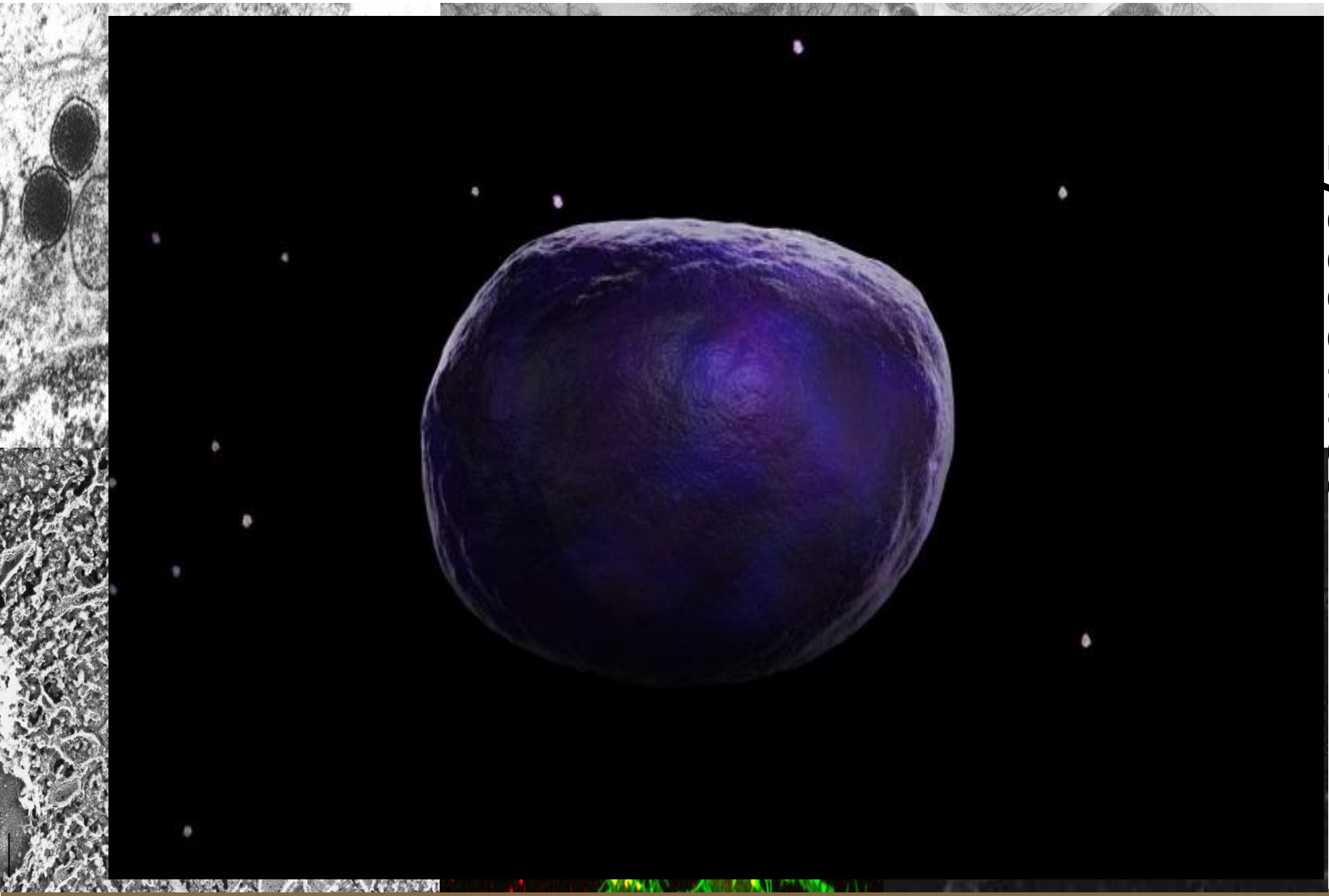



Chloroplast

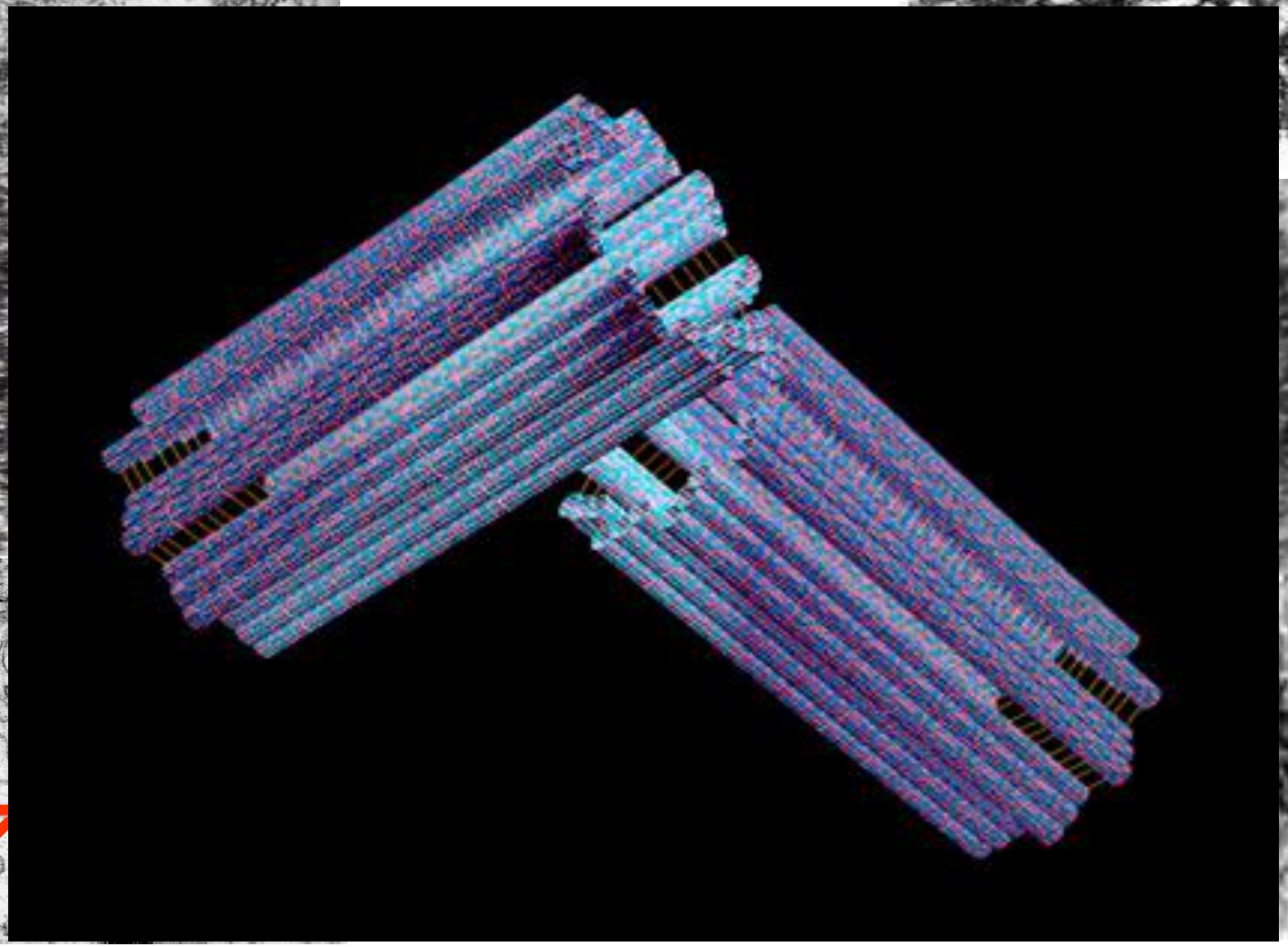






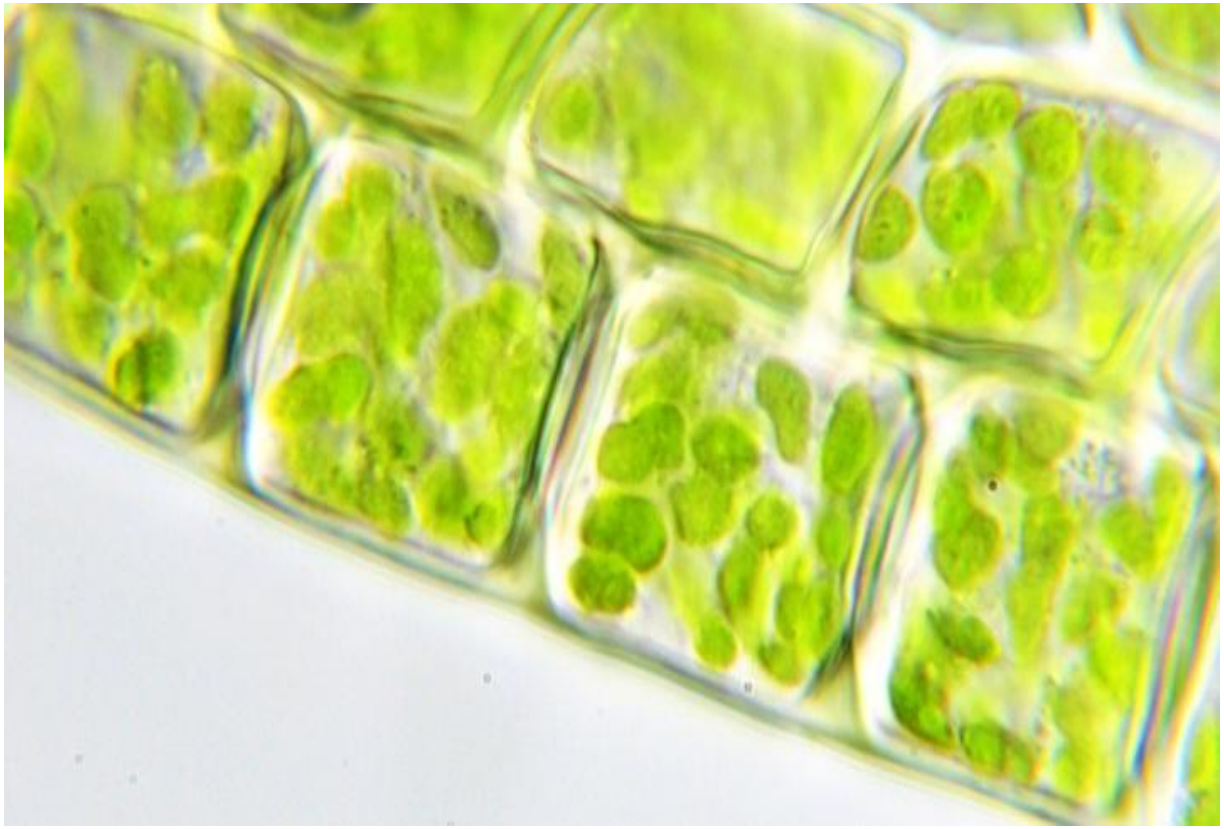
Lysosomes

Centrioles/Flagella

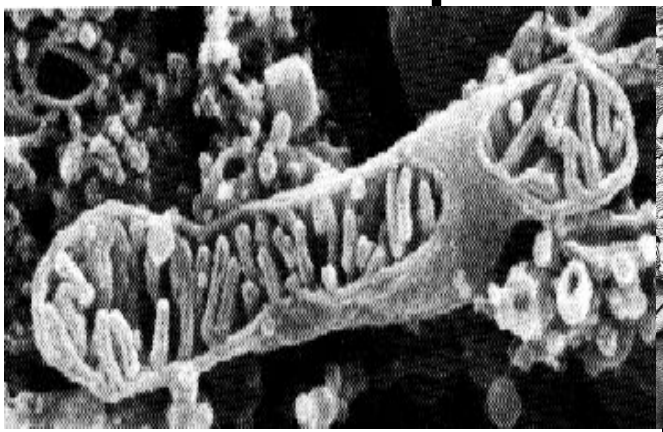


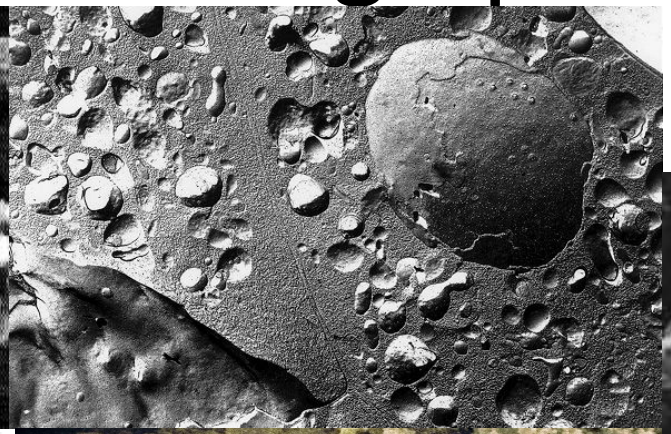
Would you be able to tell which photomicrographs are from…

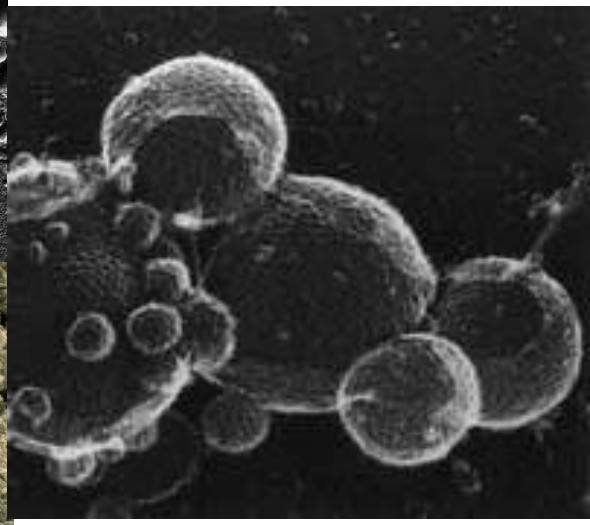
- Light microscope?

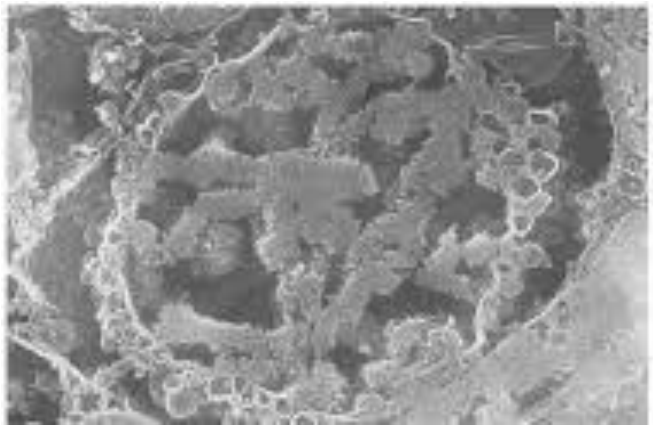


Which photomicrographs are SEM?









TEM?

- ALL THE REST!!!

- Thanks For Your Attention!!