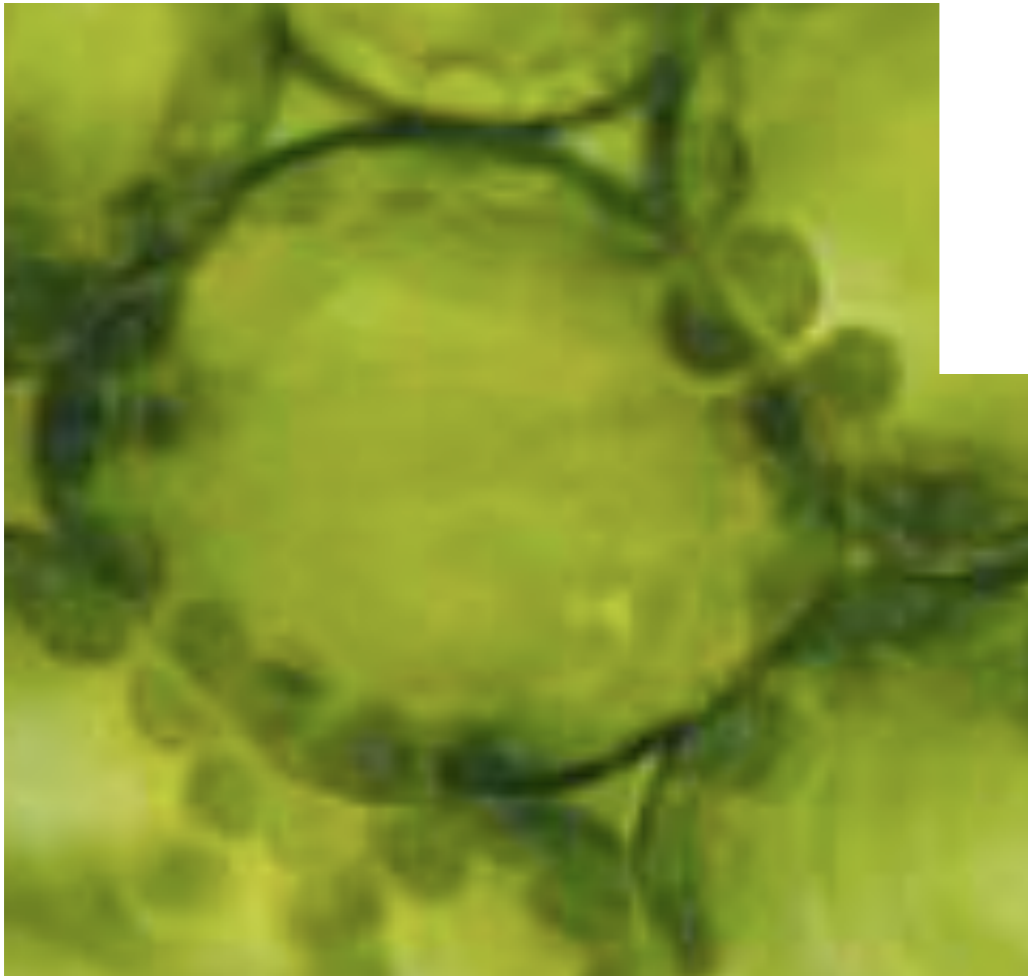


# 1.2 Ultrastructures of Cells





# Electron Microscope



# Electron Microscope (EM)

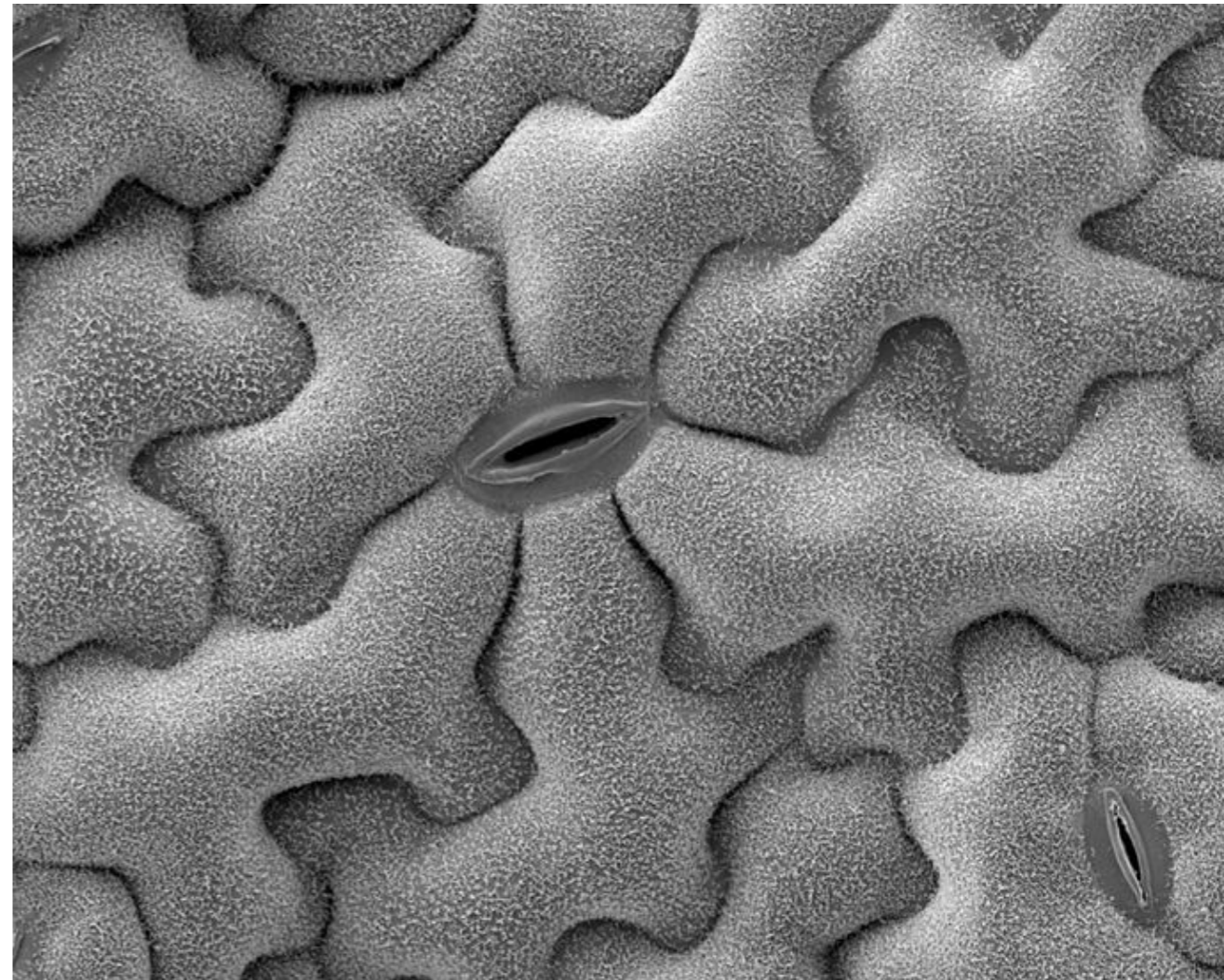
- Light microscopes are limited in magnification by visible light with large wavelengths (400-700 nm)
- LM have a resolution to  $0.2\mu\text{m}$
- EM have much smaller wavelength and have a resolution to  $0.001\mu\text{m}$  (200X greater than LM)
- Understanding the workings of cells became more evident with the improved visibility of the ultra structures

# T.E.M S.E.M

**Transmission**



**Scanning**



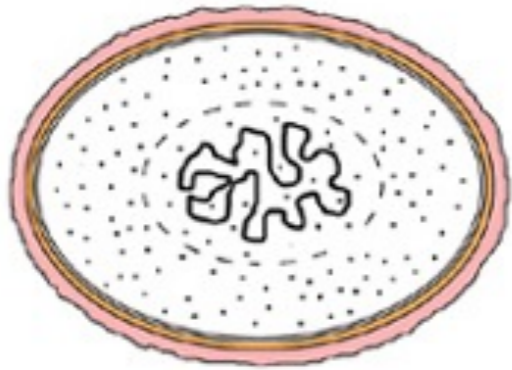
- What differences do you notice about the two cell types?



**Prokaryotic**

**VS**

**Eukaryotic**



Prokaryotic Cell

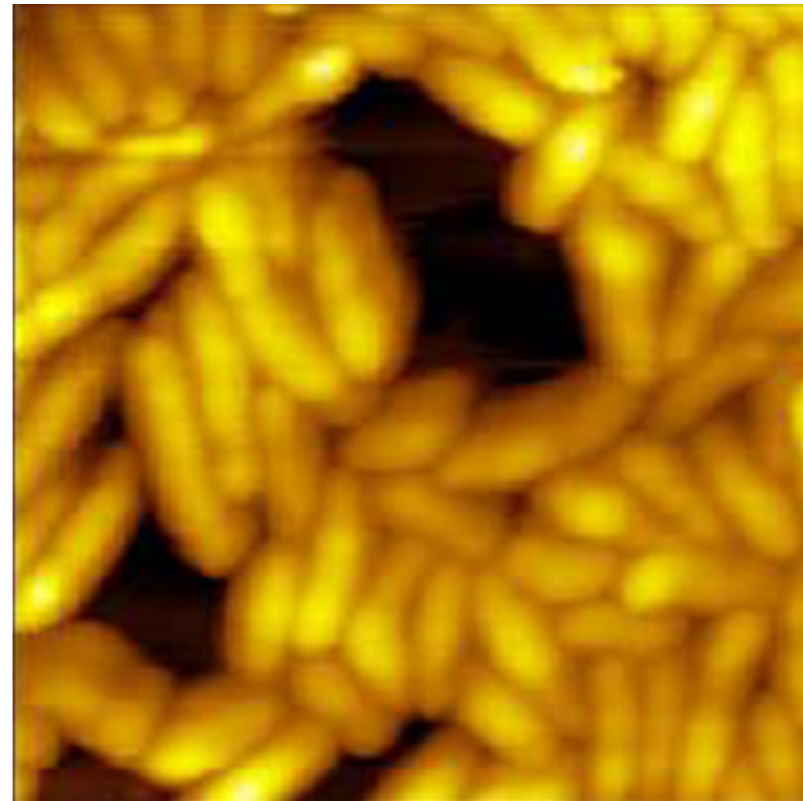
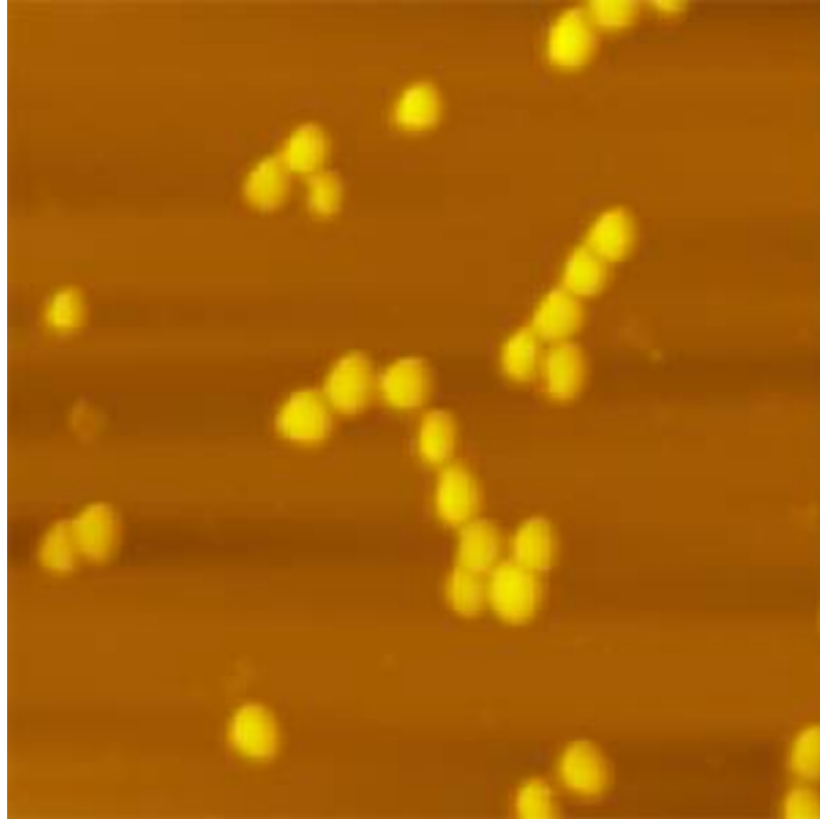


Animal (Eukaryotic) Cell

# Prokaryotic Vs. Eukaryotic

## Prokaryotic Cells

eg: Bacteria & Archaea



# Prokaryotic Vs. **Eukaryotic**

## **Eukaryotic Cells** (*having true nucleus*)

eg: Animal, Plant, and Fungi

- Amoeba

- Cheek

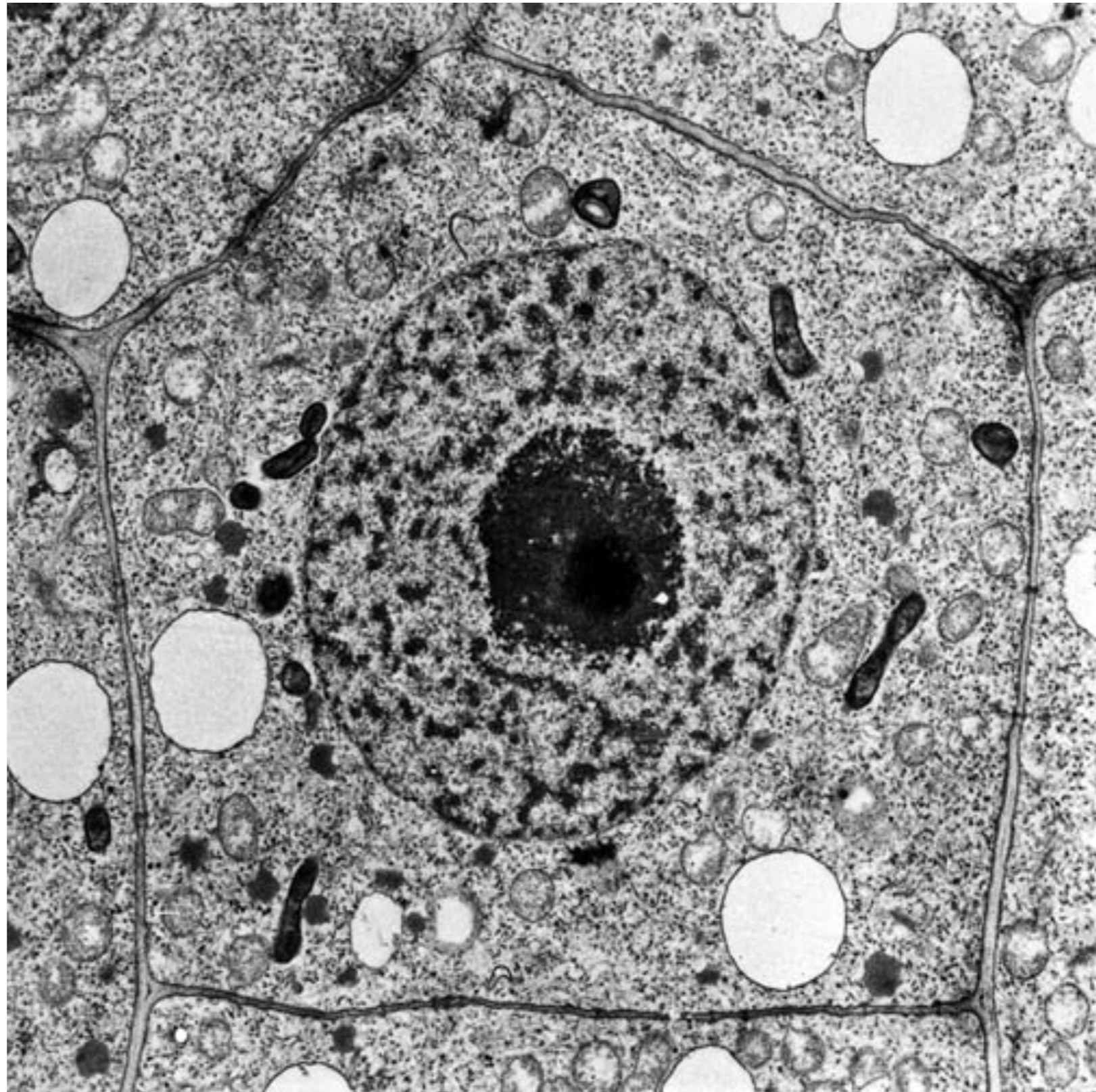




# Prokaryote



# Eukaryote



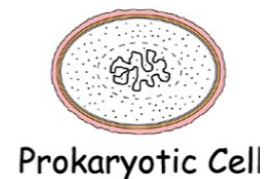
# Prokaryotic VS Eukaryotic

## Prokaryotic Cell :

- Small and simple (lack membrane bound organelles) but have a membrane and a wall
- Single circular strand of DNA
- always single celled
- primitive; evolved first (4 bya?)

## Eukaryotic Cells :

- Organelles that are membrane-bound
- DNA in a double membrane nucleus
- single or multicellular
- evolved from prokaryotic cells
- (2 bya?)



Prokaryotic Cell



Animal (Eukaryotic) Cell

# Advantages of Organelles

- Specialized roles and function
- Membrane bound compartments provide protection
  - eg. Lysosomes are organelles that could destroy the cell if exposed
- Different conditions could exist in different areas.
- They can be transported.

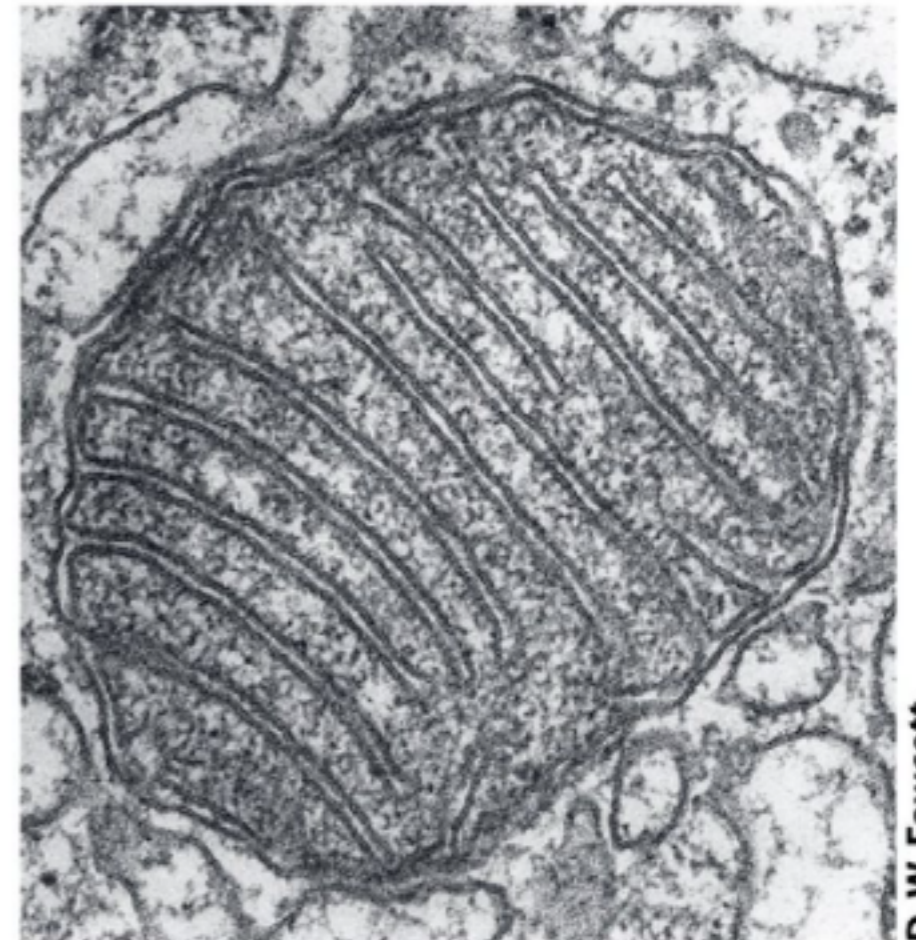
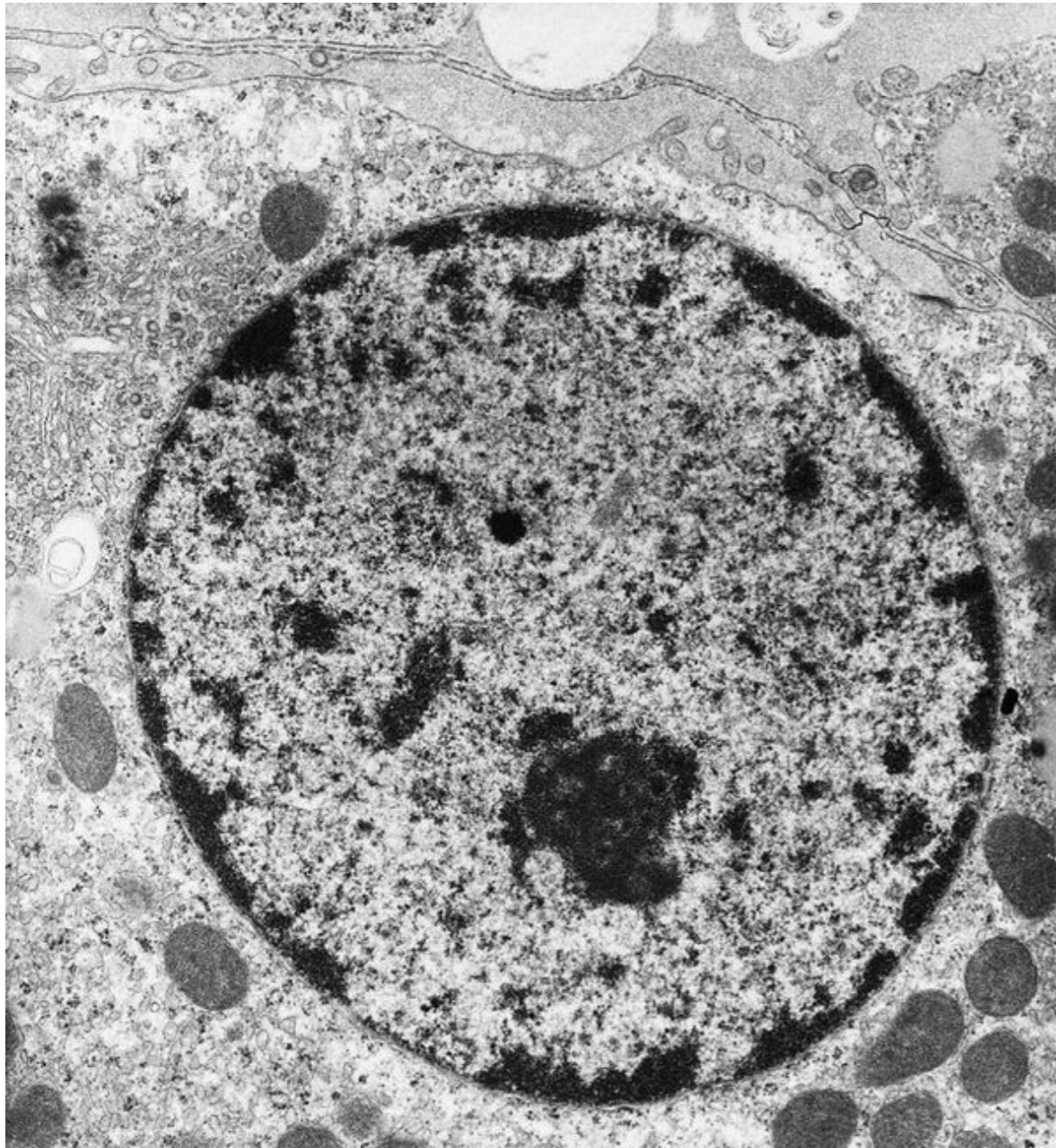


Figure 14-3b Brock Biology of Microorganisms 11/e  
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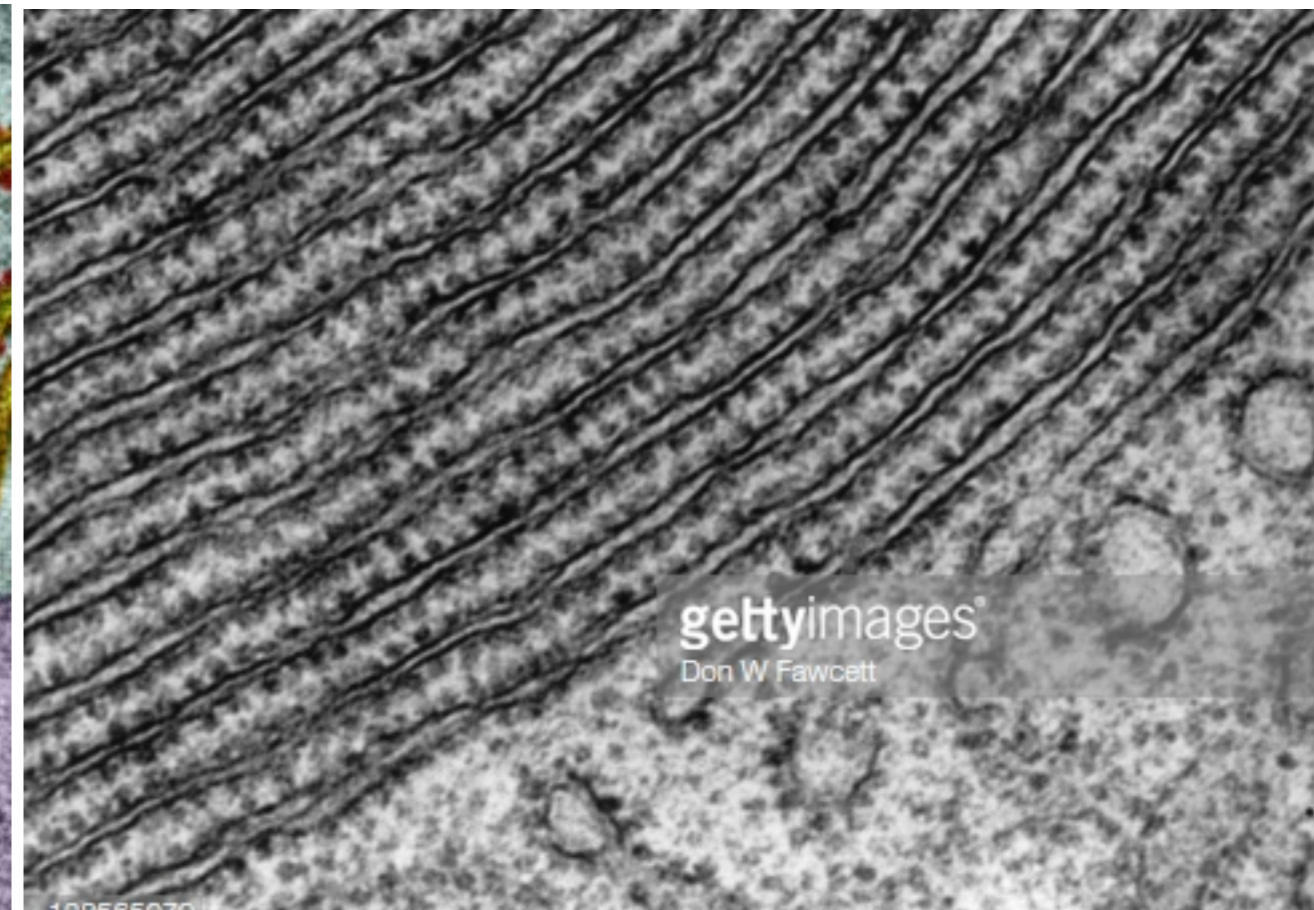
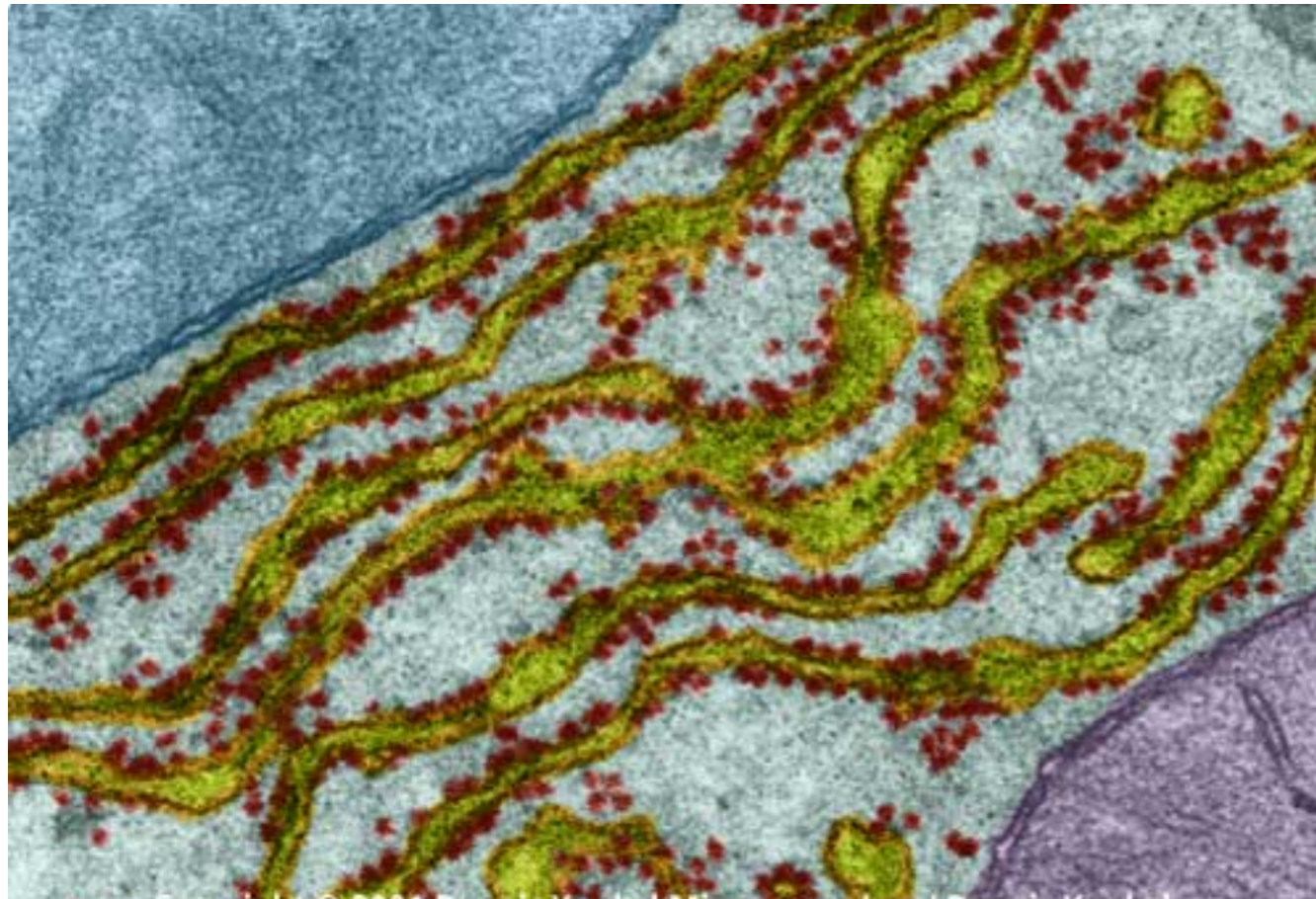
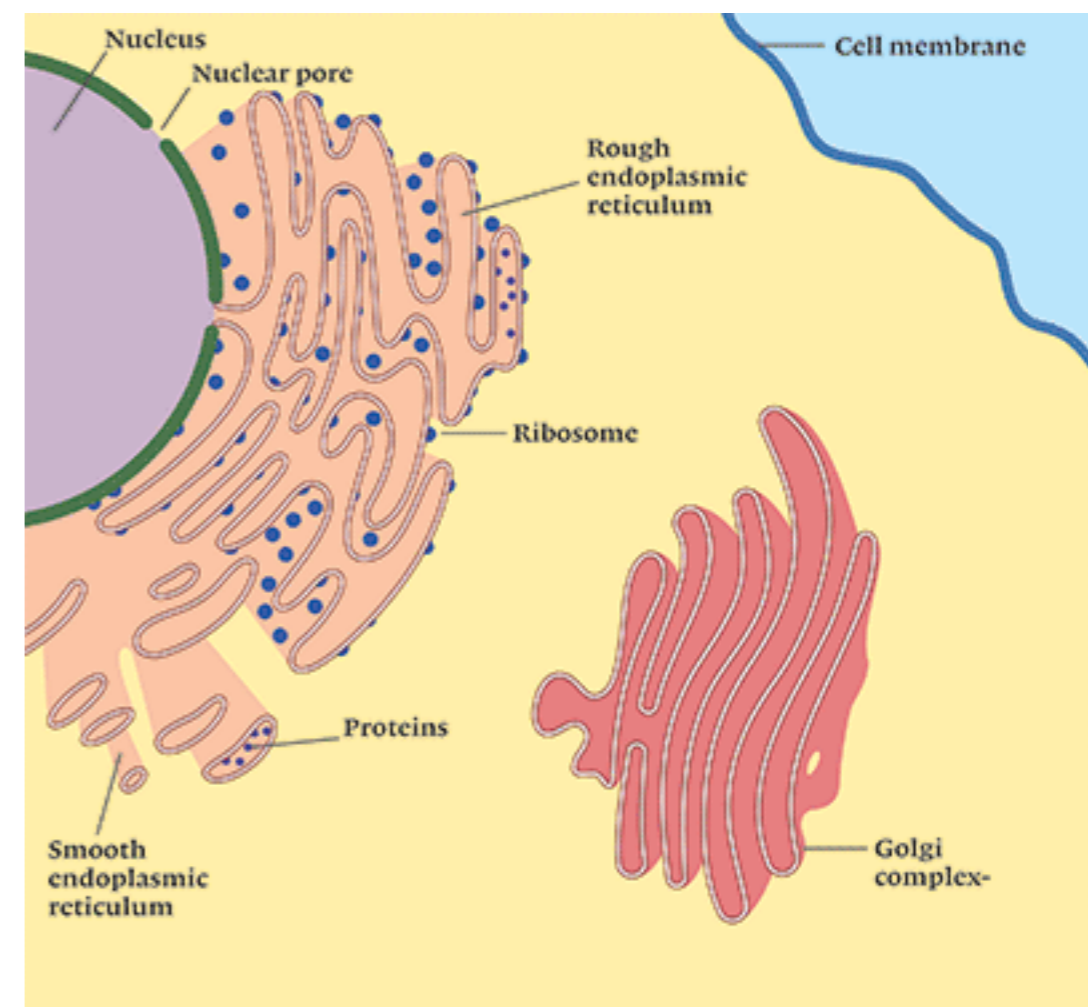
- Nucleus

- double membrane bound with pores
- contains chromatin- DNA that is coiled around proteins, Chromosomes during Mitosis.
- Contains a nucleolus where ribosomes are made



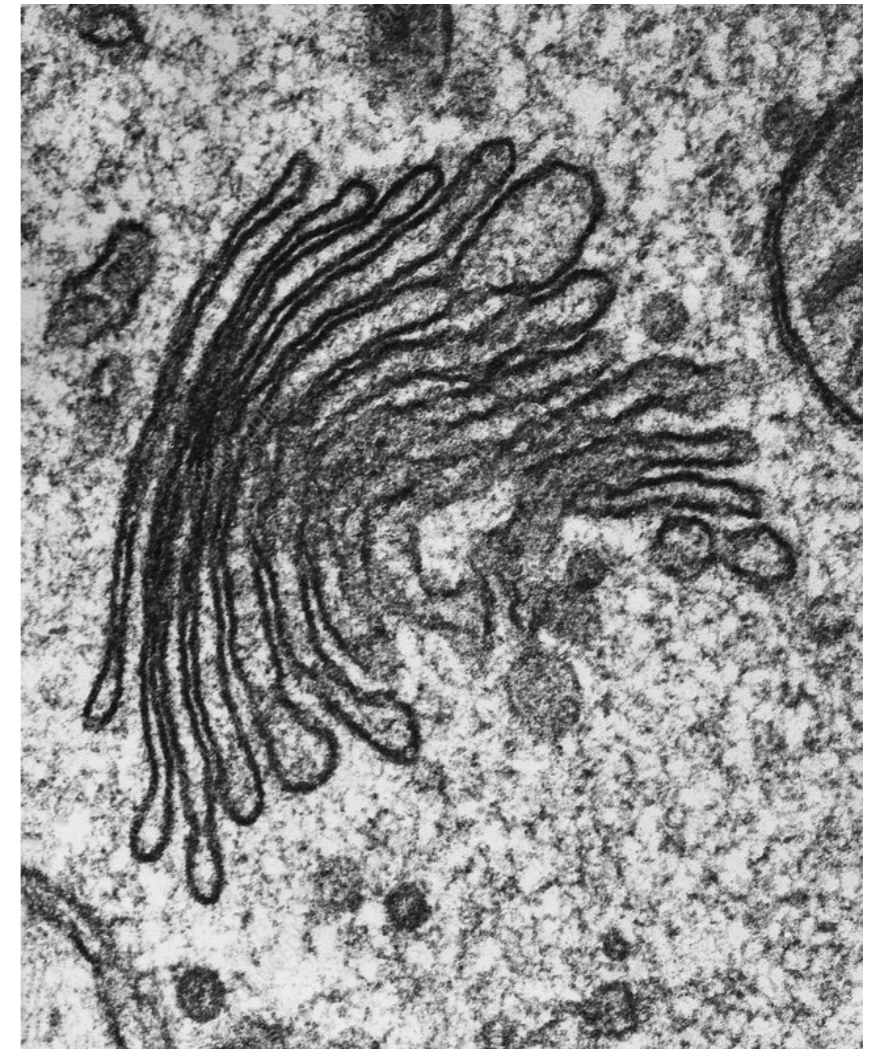
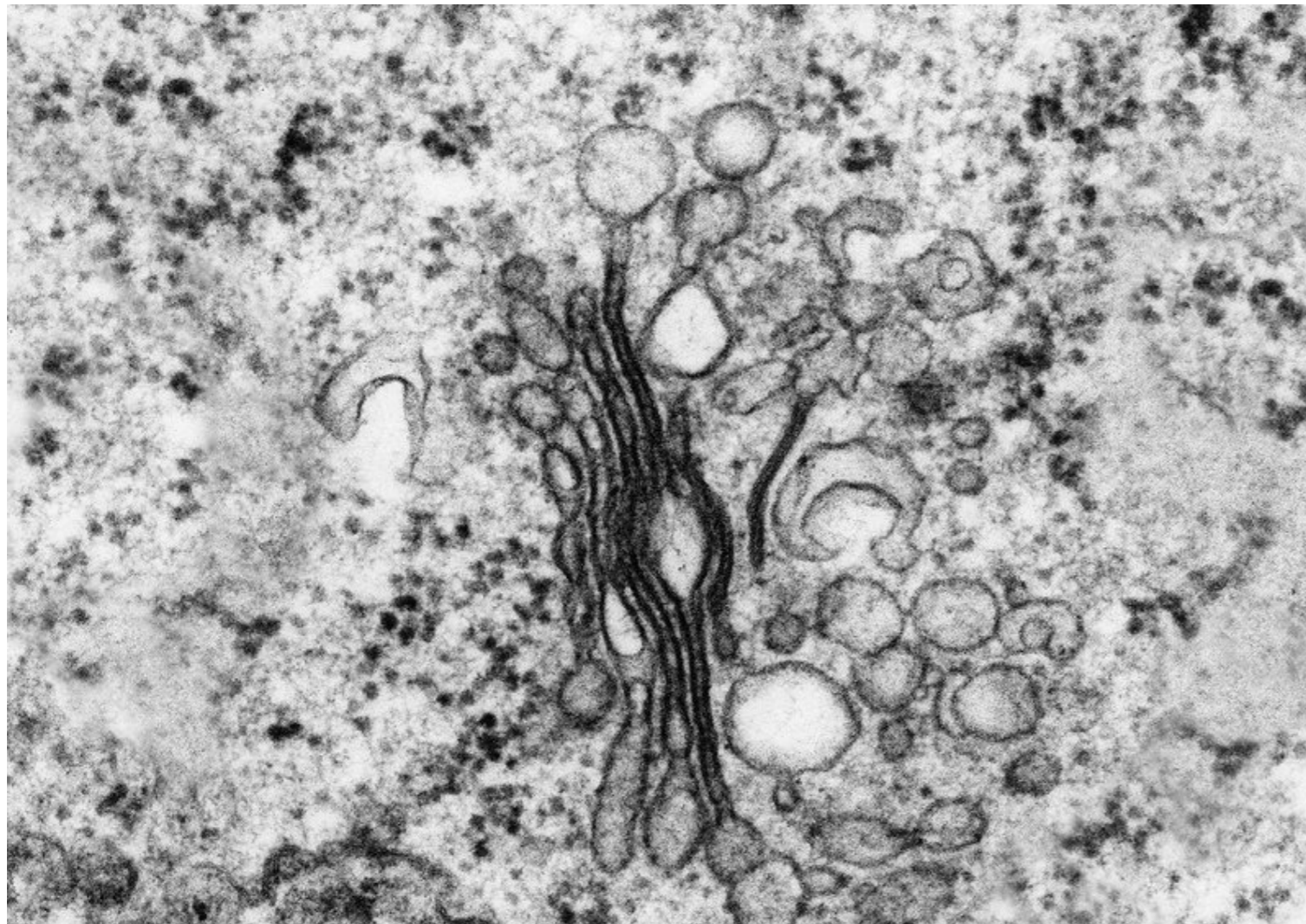
# • Rough Endoplasmic Reticulum

- flattened membrane sacs called **cisternae**
- function is to synthesize proteins for the cell to excrete
- ribosomes attached to the membrane make the proteins
- proteins are passed into cisternae then to vesicles



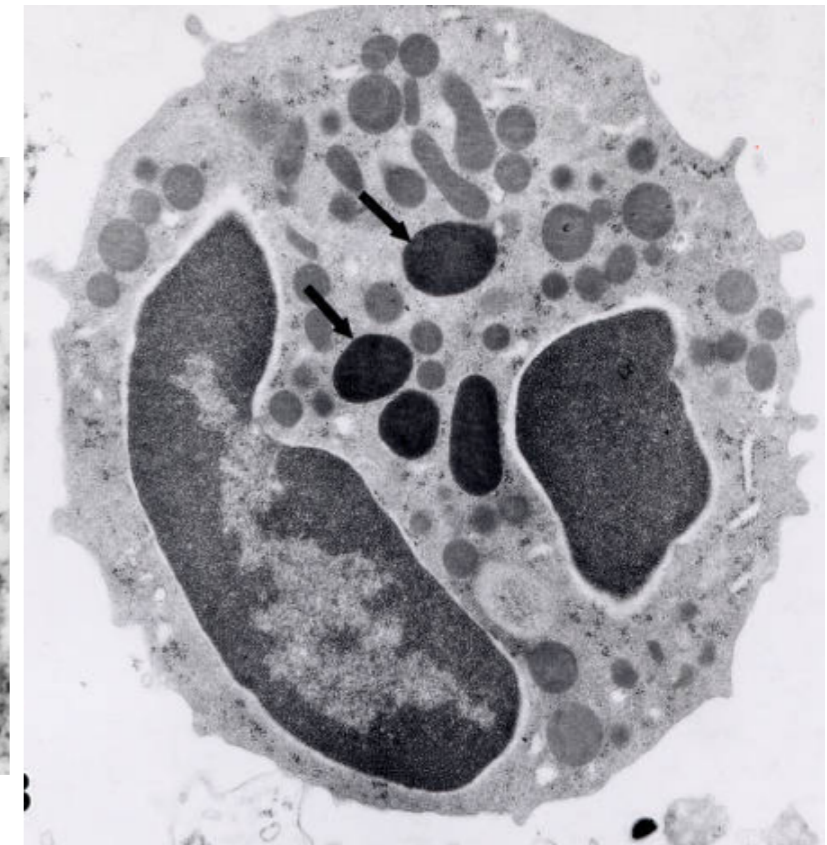
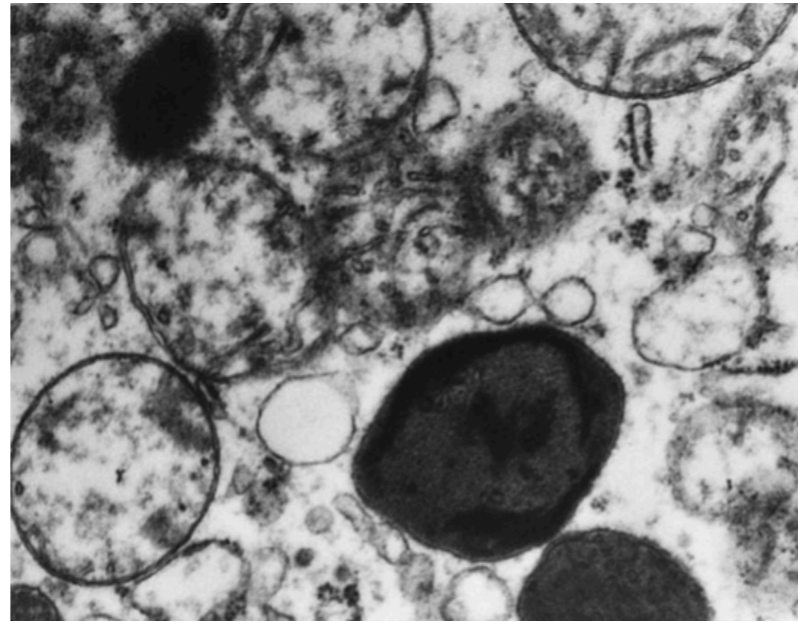
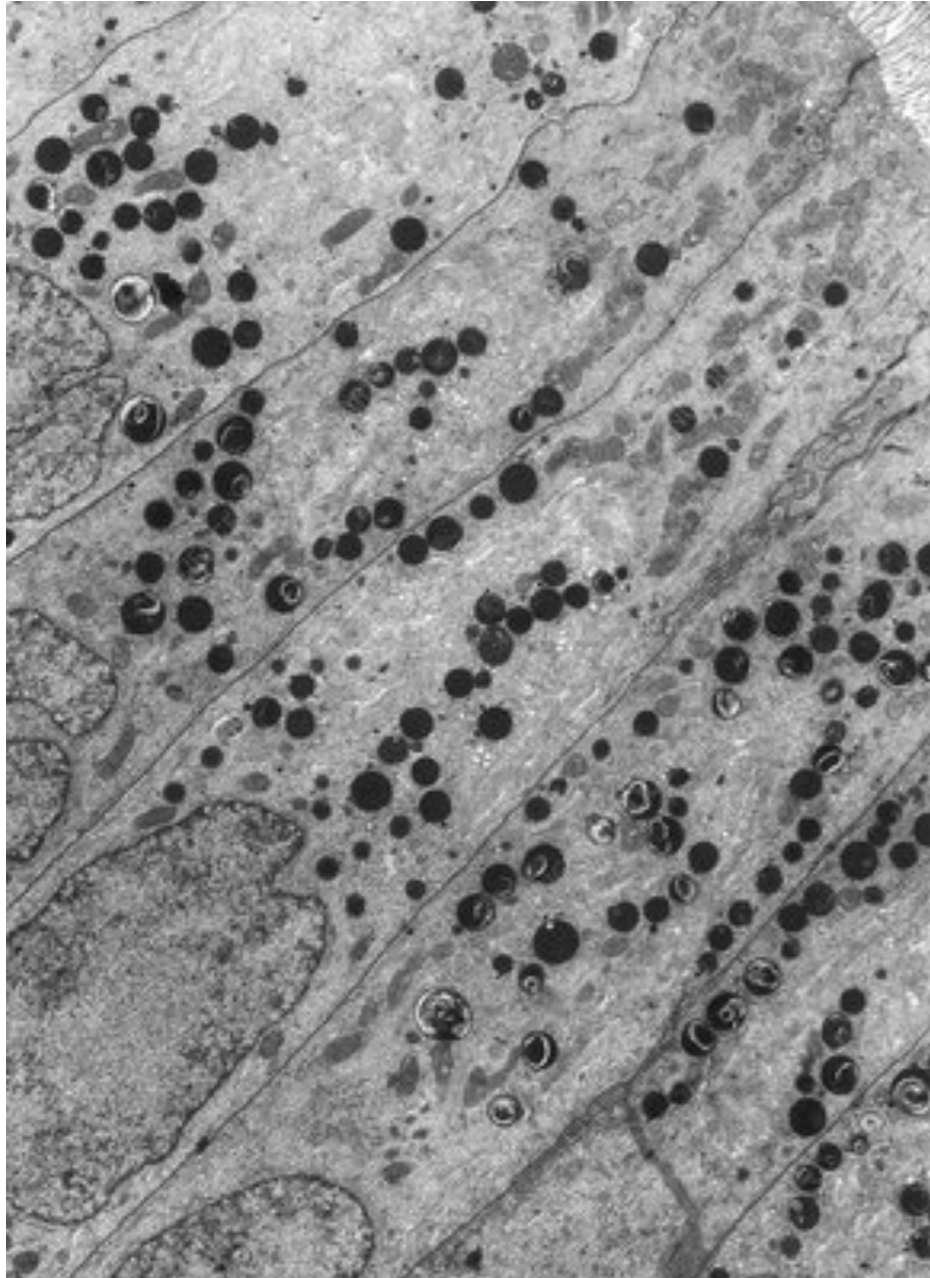
- Golgi Apparatus

- Similar structure to Rough E.R.
- Cisternae are shorter and stacked
- Proteins from the E.R. are received, processed, and then sent out of the cell.



- **Lysosome**

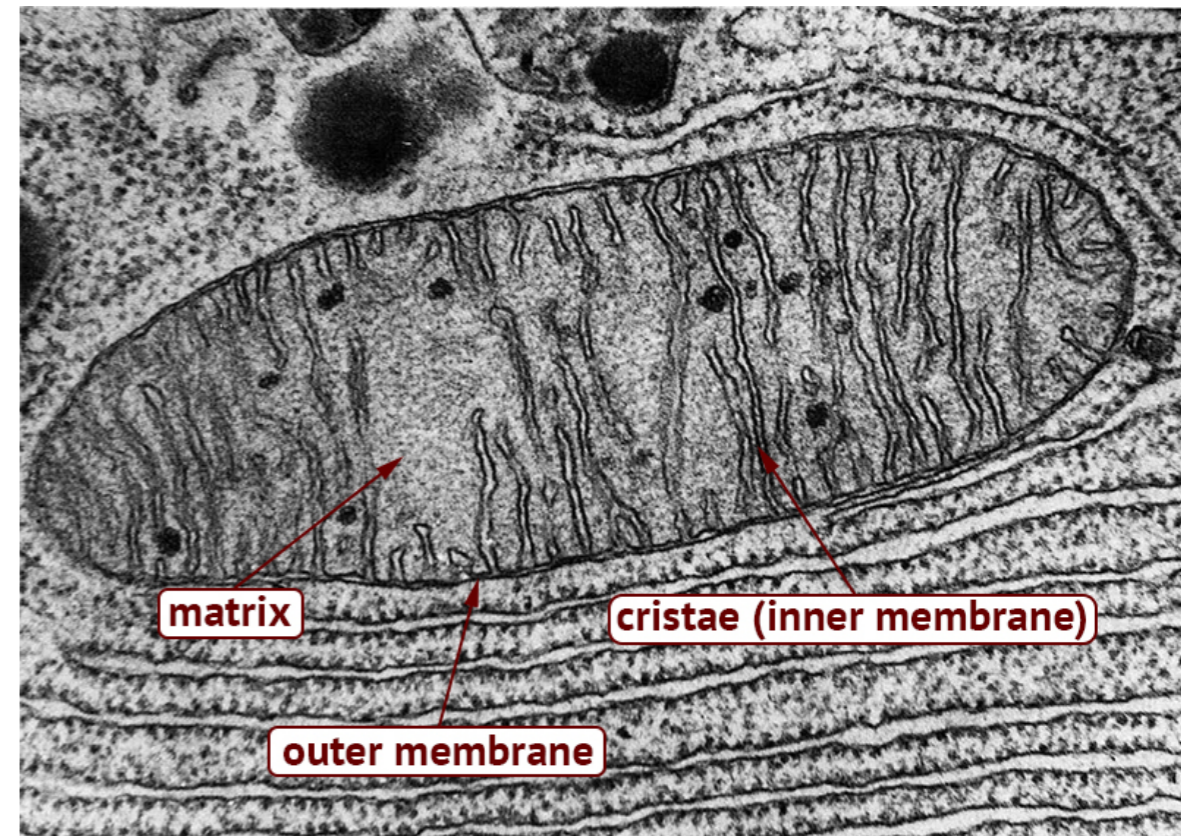
- spherical single membrane vesicles form by Golgi
- stain dark under EM caused of dense protein concentration
- Digestive organelle
- eventually breaks and kills the cell (apoptosis)





- **Mitochondria**

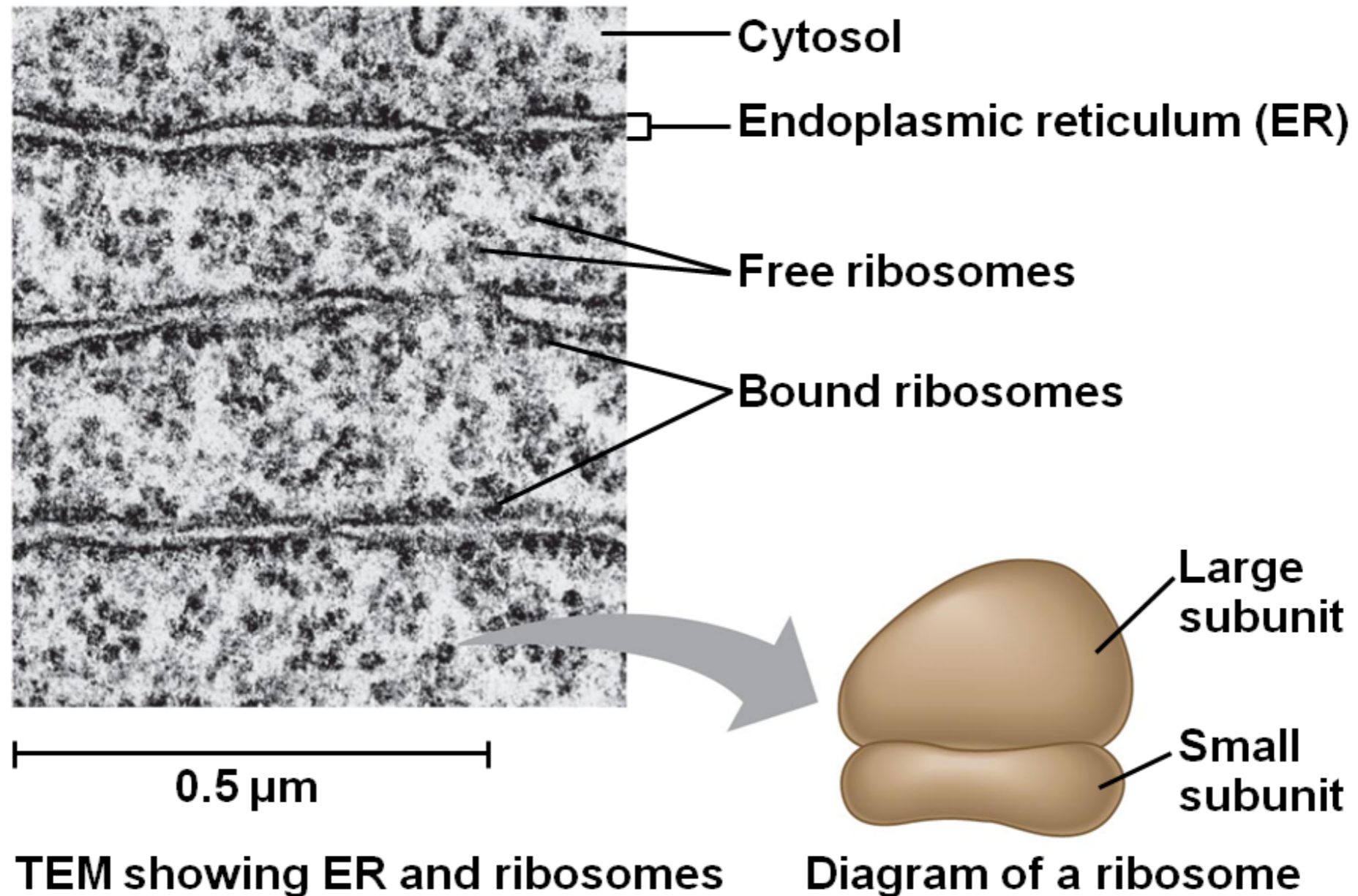
- double membraned
- inner membrane from folds called cristae
- inside is a fluid filled matrix where the cells energy molecule called ATP is made through cellular respiration



- **Free Ribosomes**

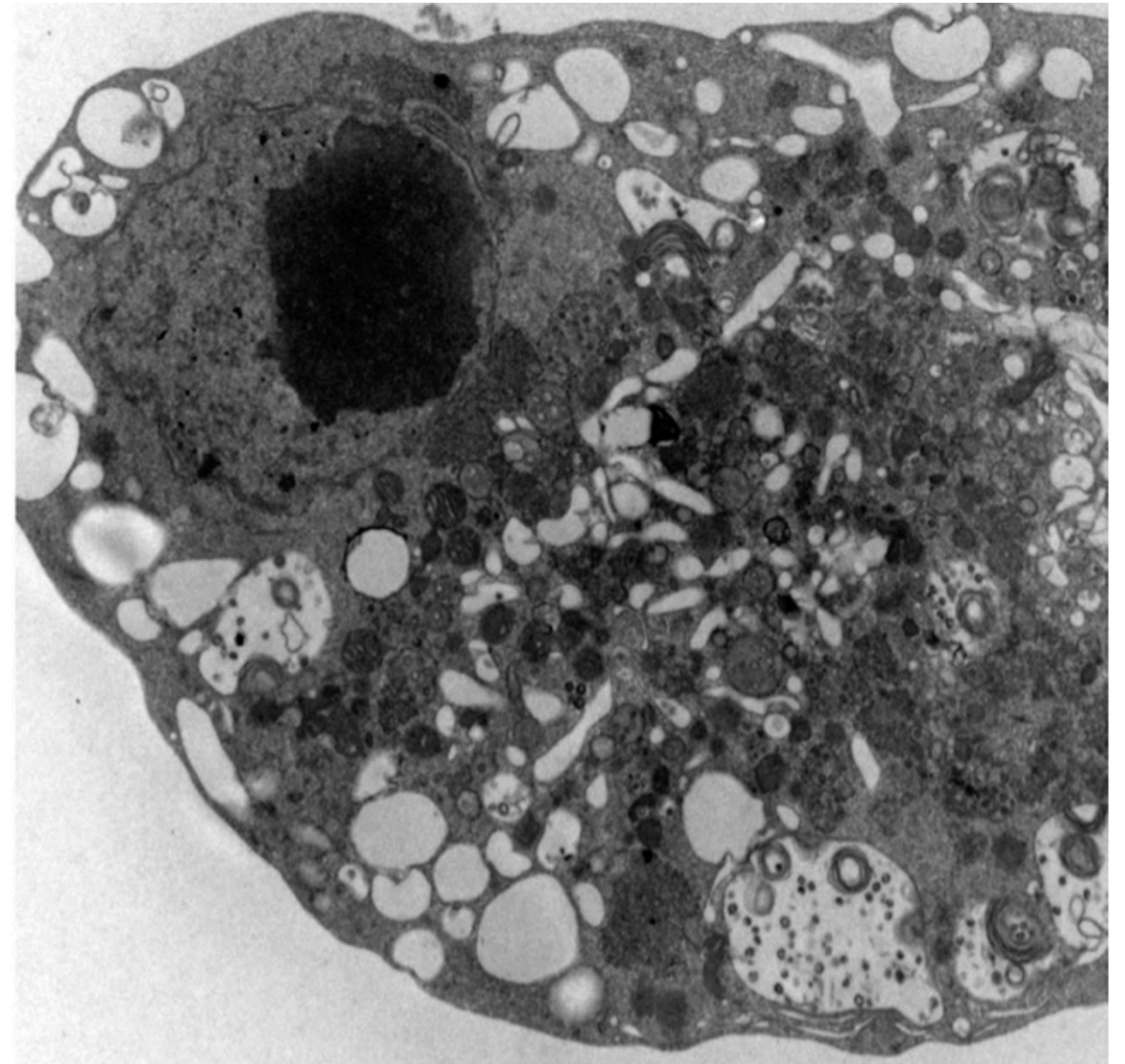
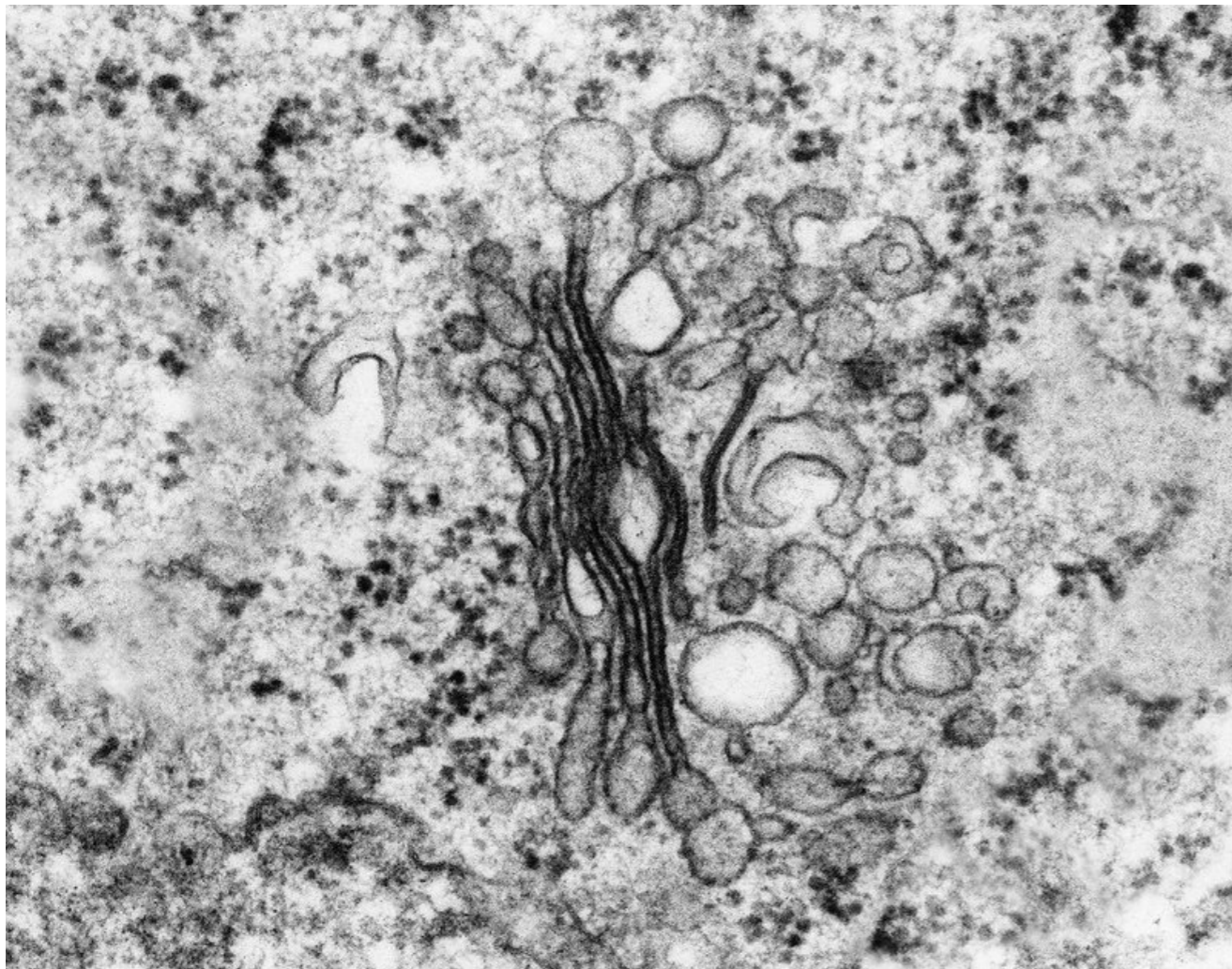
- same as ribosomes on the E.R.
- No membranes, consisting of two protein subunits. one is 30 S, the second 50 S (80S total size )
- synthesize proteins that cells make

Fig. 6-11



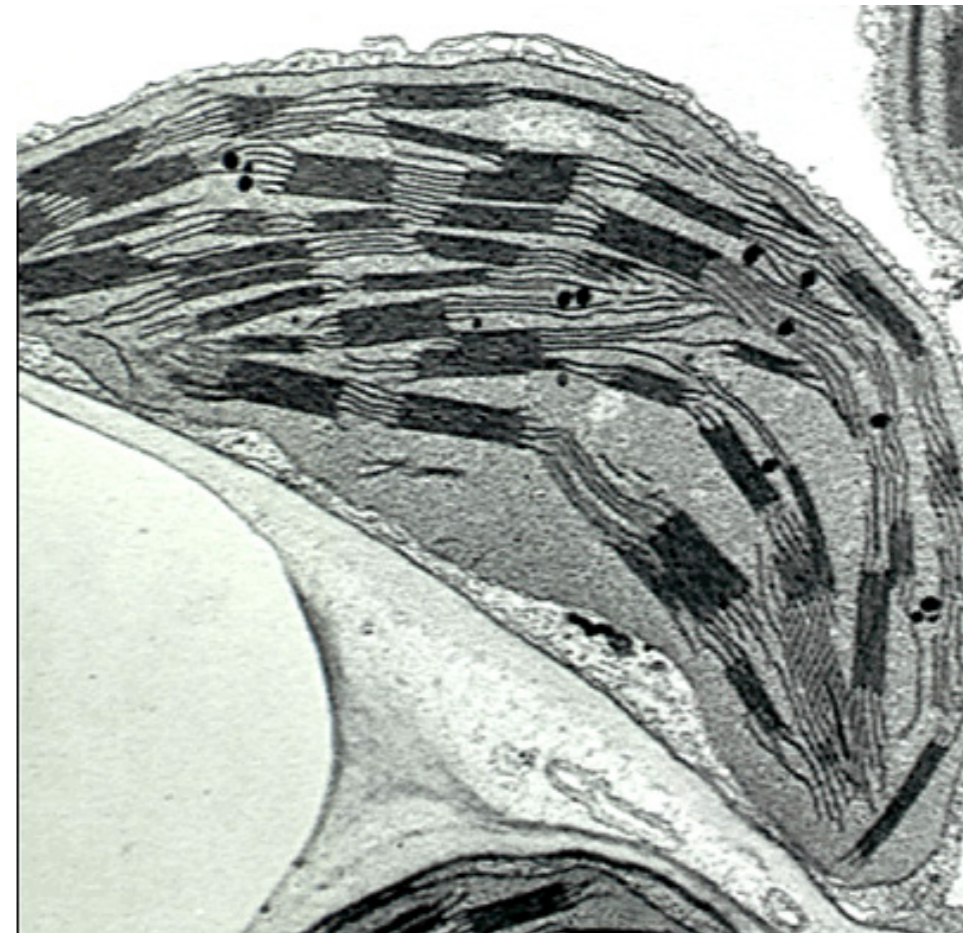
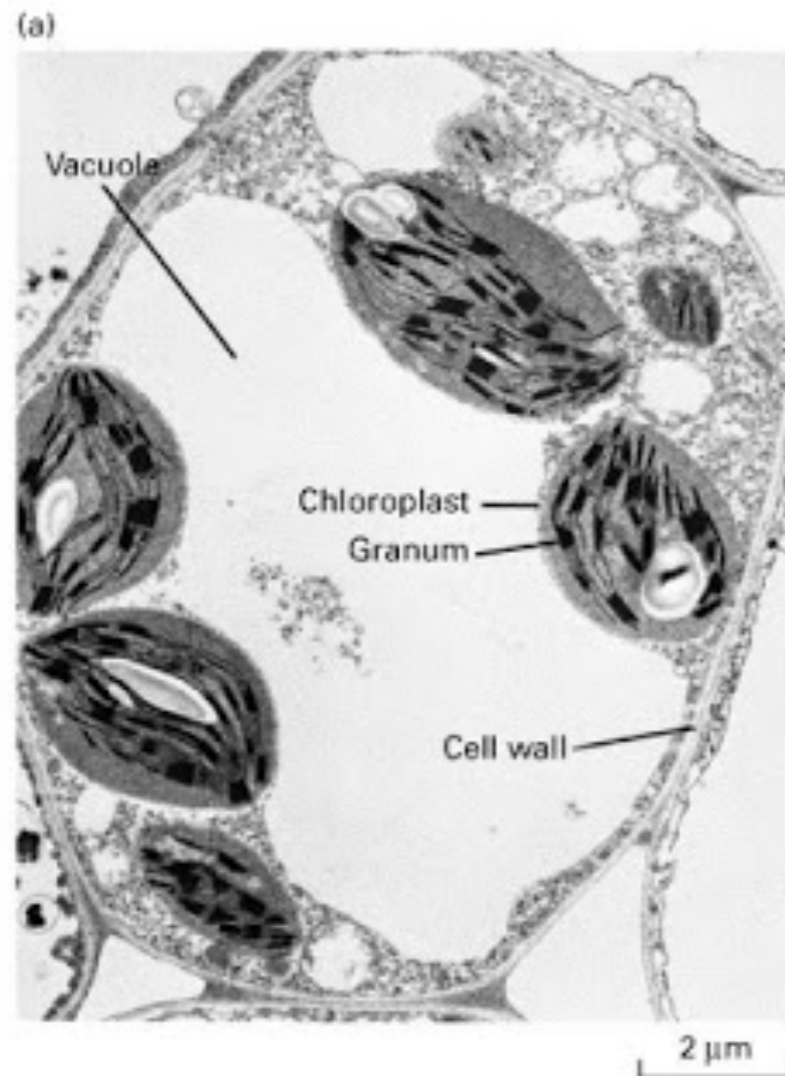
- **Vacuoles and Vesicles**

- Single membrane
- Large in plants, small and animal
- Animals form vacuoles to store food
- Unicellular organisms like *paramecium* use vacuoles to excrete water



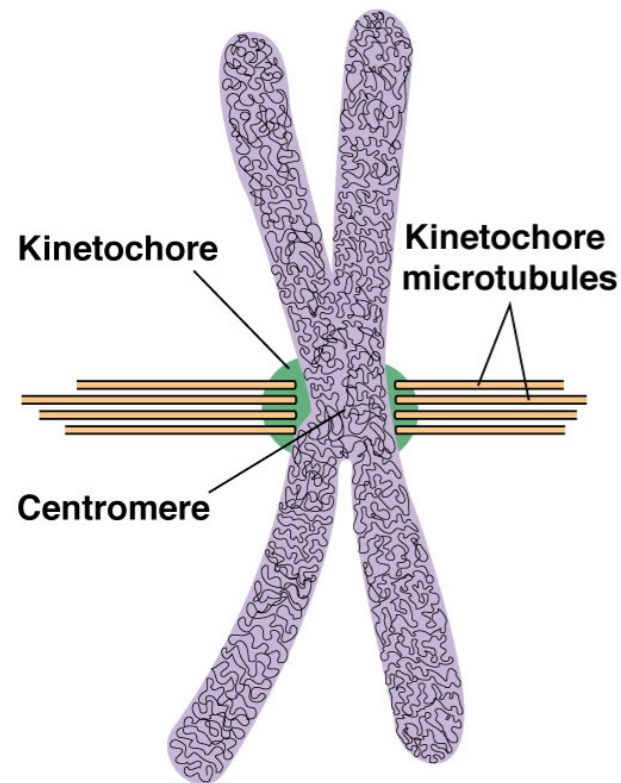
- Chloroplast

- Double membrane bound
- Inside contains flattened stacks of membranes called thylakoids
- Usual oval or spiracle
- Produce glucose from photosynthesis

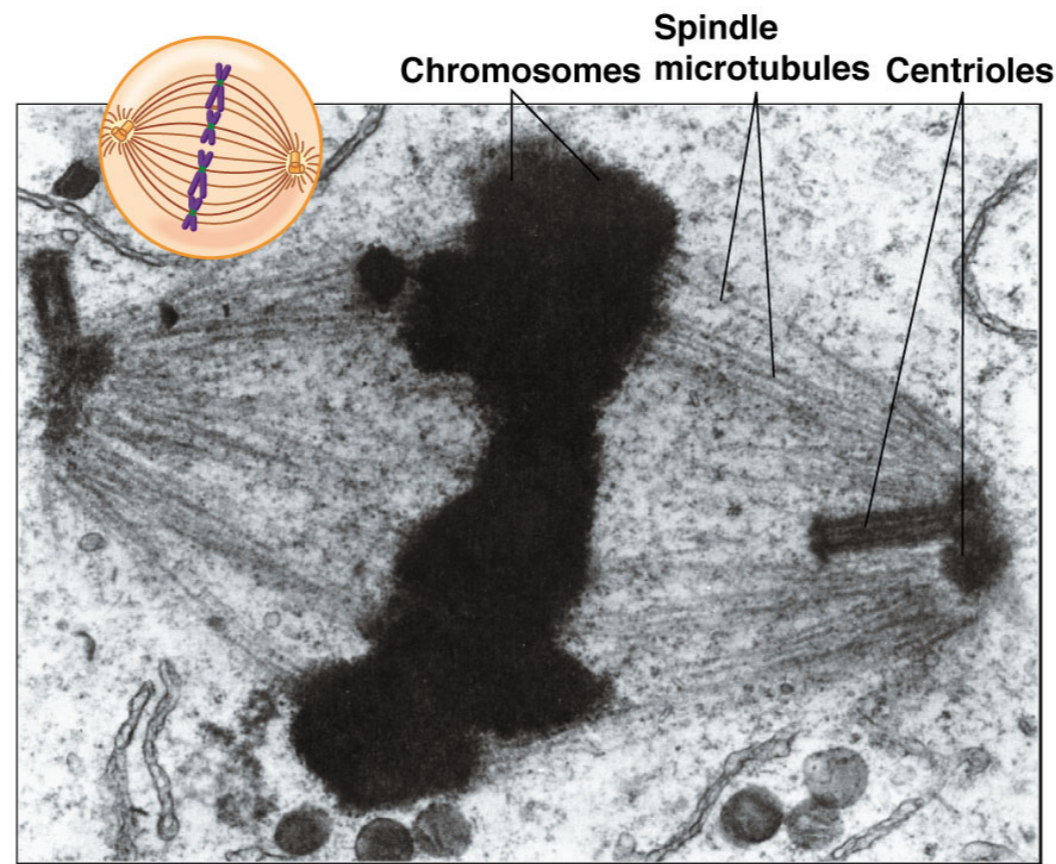


# • Centrioles and Microtubules

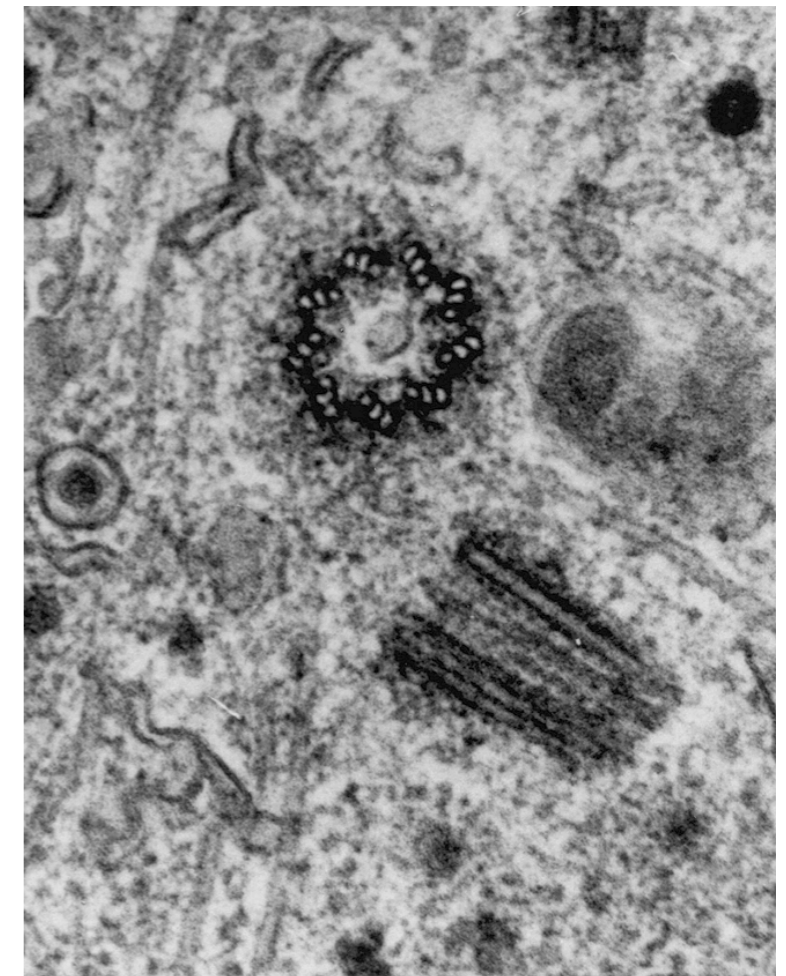
- Cylindrical fibres form microtubules - gives the cell structure
- Move chromosomes
- Centrioles consist of 9 triple microtubules bundles
- Centrioles form the anchor point for microtubules



(a)

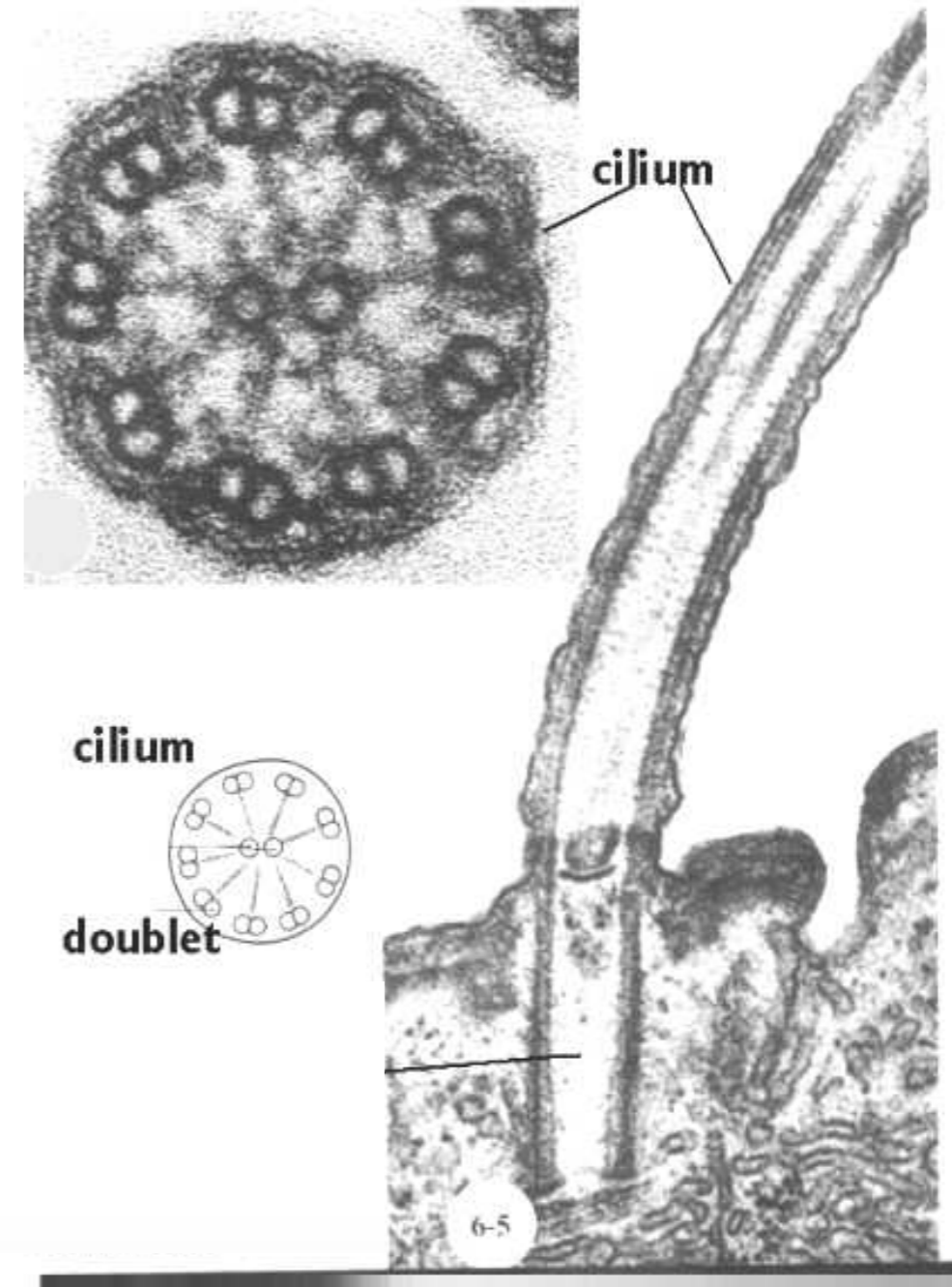
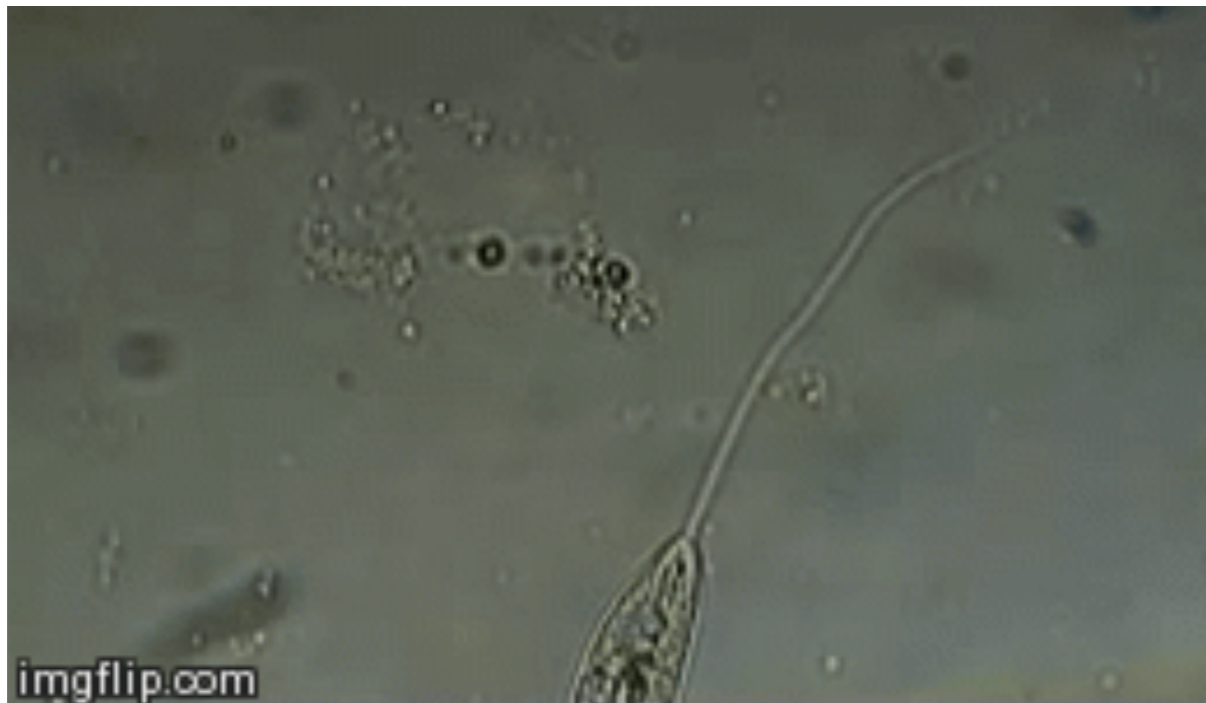


(b)



- **Flagella and Cilia**

- Are whip like structures
- Consists of a ring of nine double microtubules
- Flagella are long cilia short
- 9 double microtubules and 2 central ones



# Eukaryote

The Inner Life of the Cell