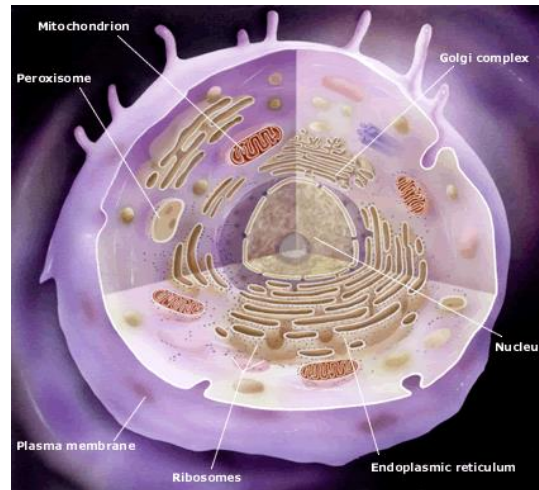
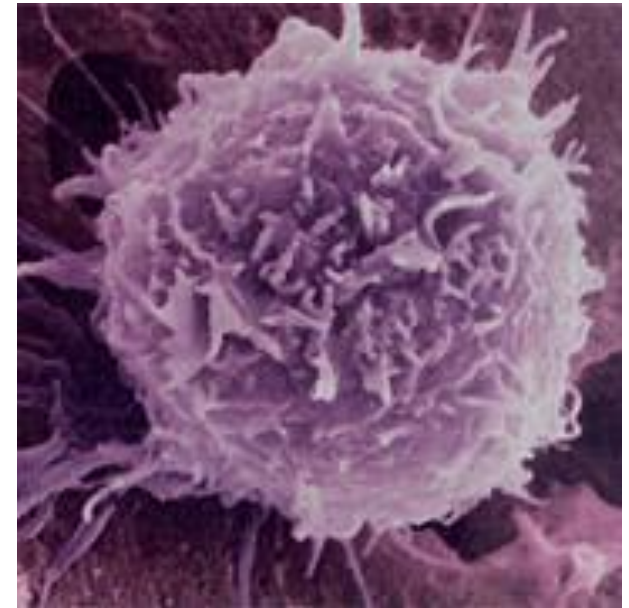
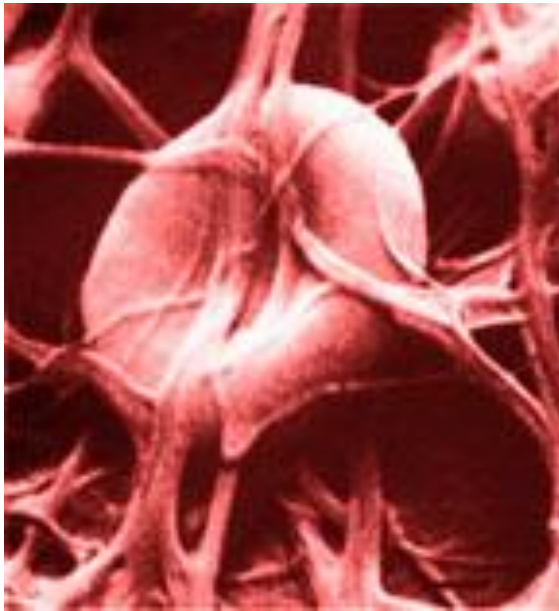


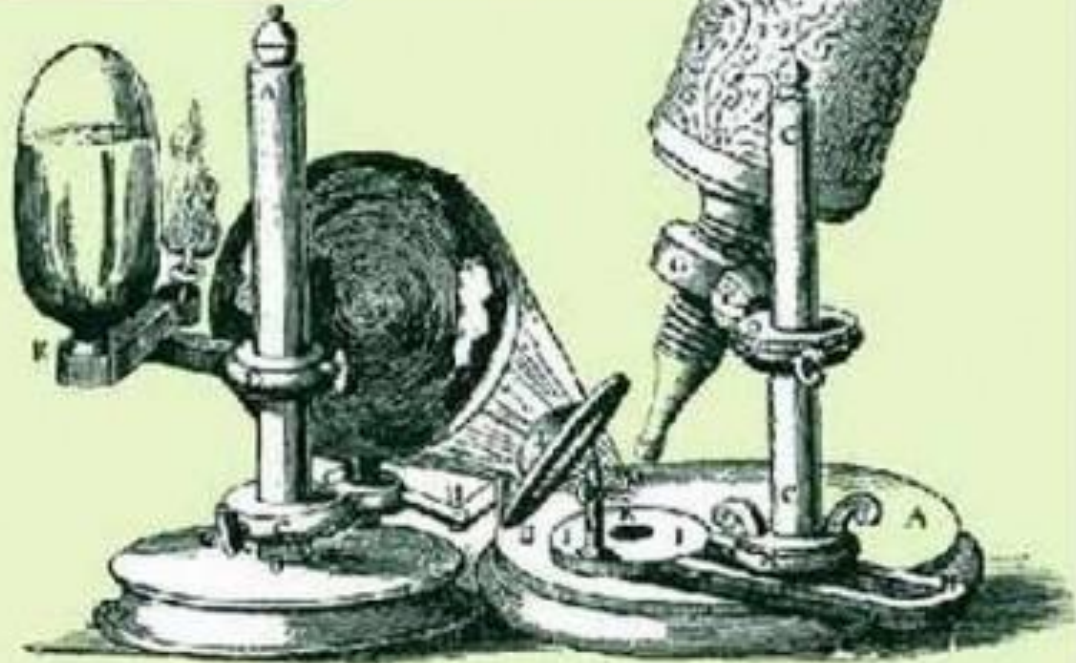
# Cell Structure



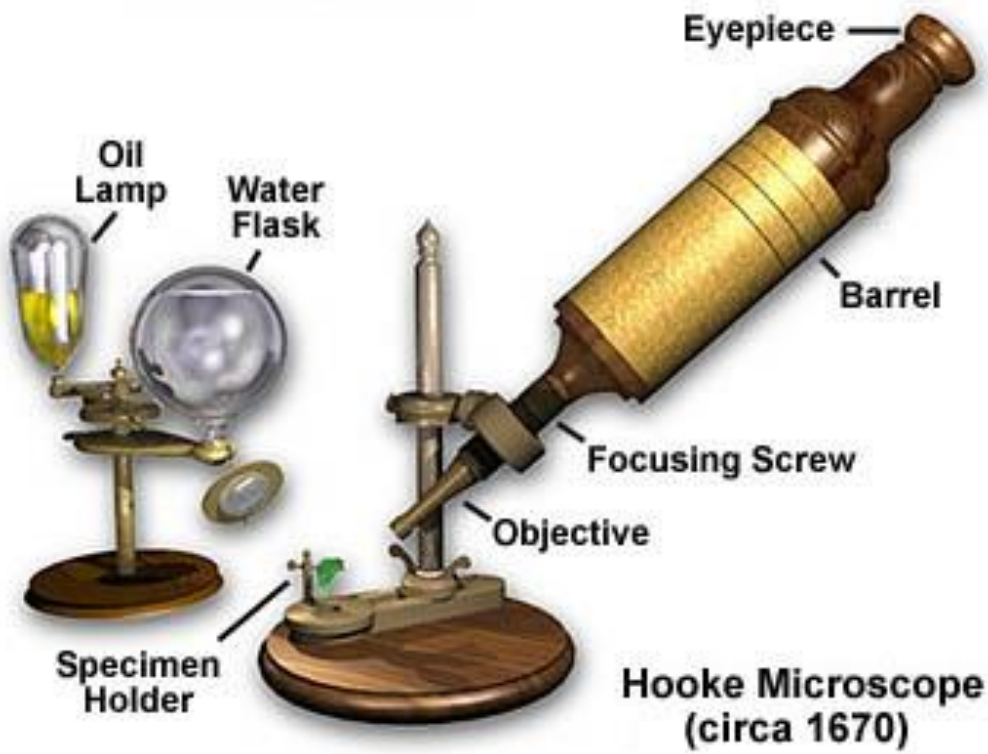
# Discovery of the Cell

Who discovered cells?

- 1665 – Robert Hooke used a compound microscope to examine a piece of cork (20X magnification)
  - He saw little boxes in the cork and called them cells because they looked like the rooms (cells) at the monastery



Robert Hooke (1665)



# Discovery of the Cell

Who developed the microscope?

- 1673 – Anton van Leeuwenhoek was the first person to observe living cells: bacteria, sperm, blood, protists
  - Beneficial because we could finally see microscopic organisms and structure of cells
  - Magnification of 200X

# ANTONY VAN LEEUWENHOEK

1632 - 1723

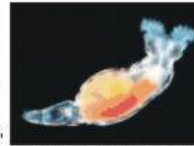


*Microscopy • Microbiology*

- Invented a 270x microscope, a tenfold improvement over earlier models
- Discovered bacteria, protozoa and rotifers sperm and blood cells; observed for 50 years
- No formal scientific training, but elected to the Royal Society
- Refuted spontaneous generation of life



One of Leeuwenhoek's microscopes, approximate actual size (5 cm)



*Philodena*, a rotifer, 220x

*"He often referred with reverence to the wonders God designed in making creatures small and great . . . Leeuwenhoek's life glorified God in many ways, but perhaps most by showing us that there is far more under the sun than we had first suspected."*

– Dan Graves, *Scientists of Faith*



**"It would indeed be a miracle to get these animalcules by chance."**

– Antony van Leeuwenhoek





# Cell Theory

- Who developed the theory?





# Cell Theory

- 1838 – Matthias Schleiden concluded that all plants are made of cells.
- 1839 – Theodor Schwann concluded that all animals are made of cells.
- 1855 – Rudolf Virchow reasoned that cells come only from other cells.

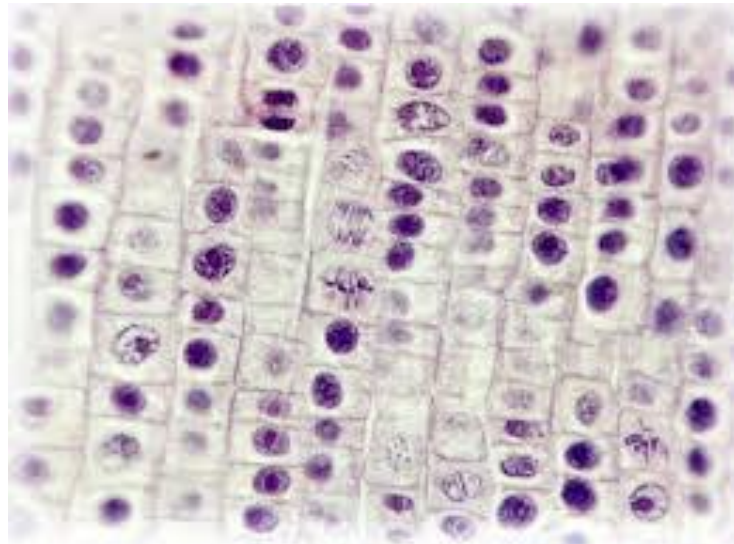
**THIS THEORY  
HAS 3 PARTS**



The  
Cell  
Theory

# Cell Theory

1. All living things are made of cells



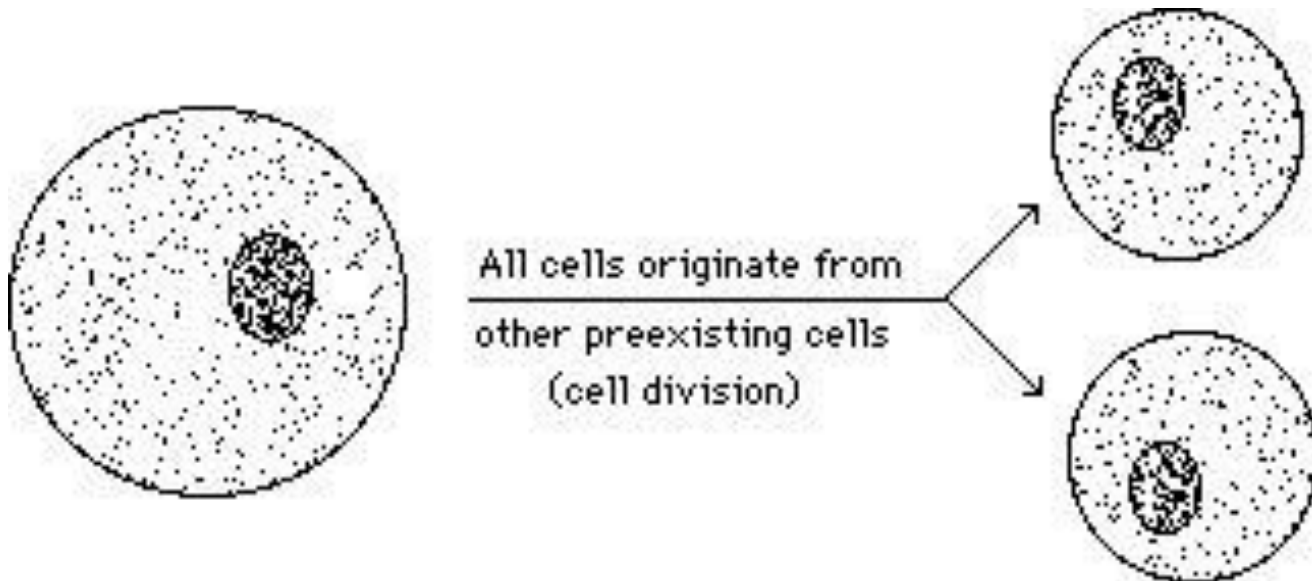
# Cell Theory

2. Cells are the basic units of structure and function in living organisms

(nothing is smaller that is still considered living)

# Cell Theory

## 3. Cells come from other cells

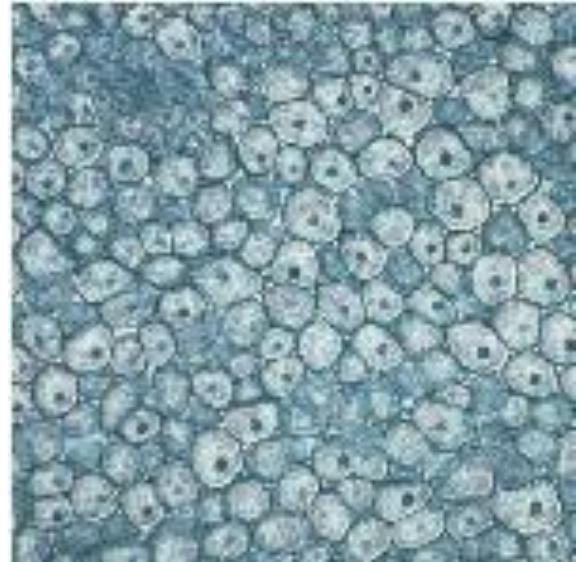


# How do we know cells are alive?

- Reproduce
- Have heredity (DNA)
- Maintains homeostasis
- Grows
- Uses energy
- Responds to its environment
- It is a cell

# The Cell (School Building)

- Cell = highly organized structure contained in a membrane that is the basic unit of structure and function in living things.



# The Cell (School Building)

- Organelle = small structures within a cell with special functions.

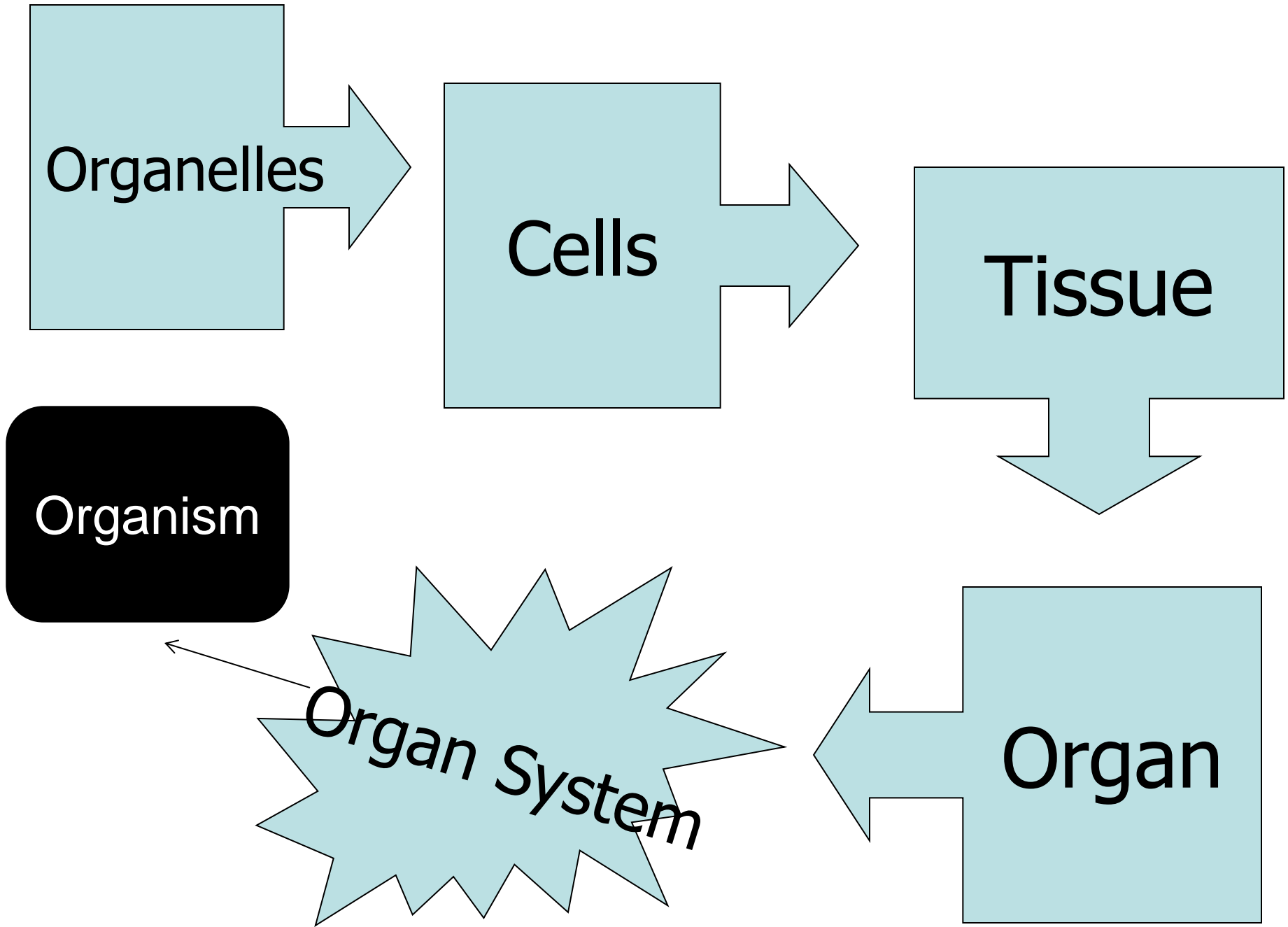


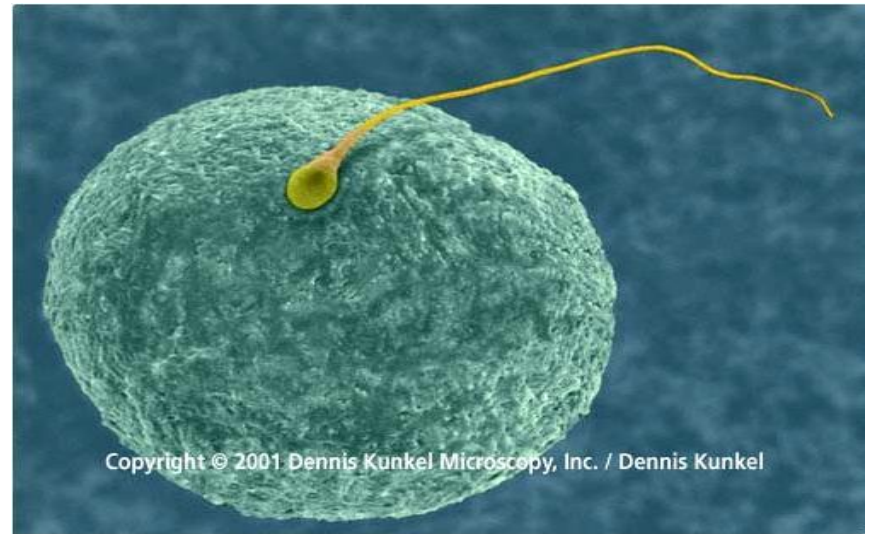
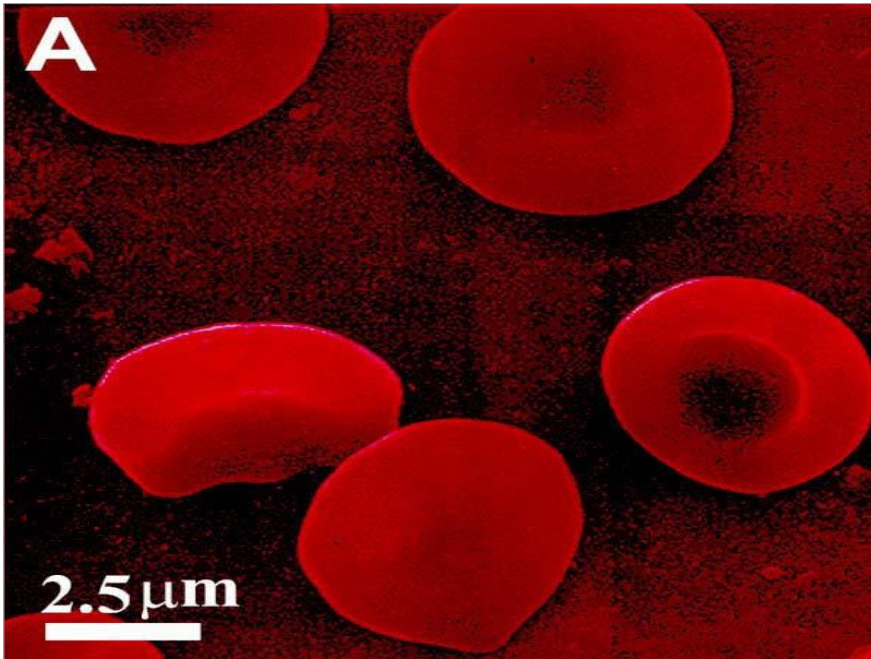
# Why do cells need to be small?

- They will not be able to move enough nutrients into or out the cell to survive
- Cells come in many shapes and sizes
- Cells also have different amounts and types of organelles depending on their function

# Cellular Organization

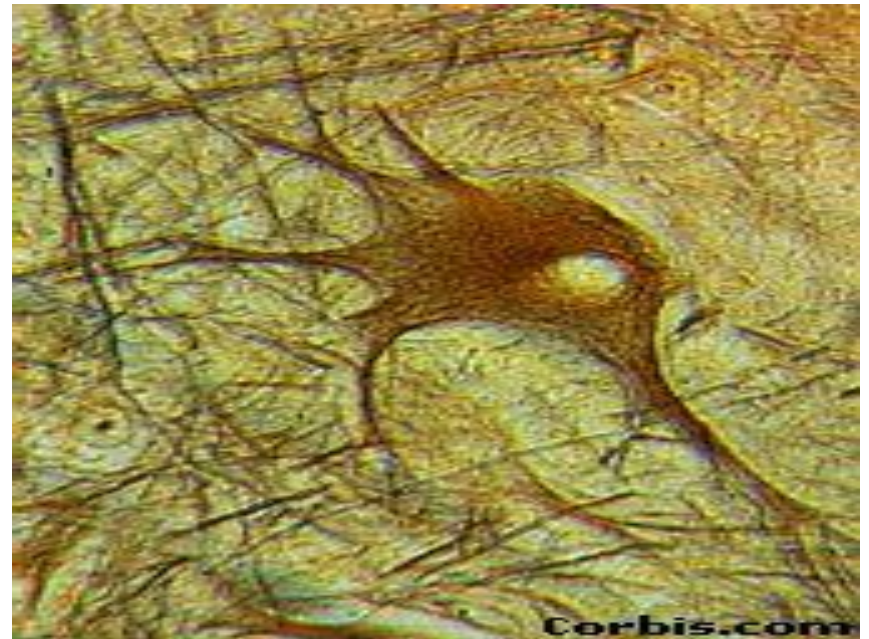
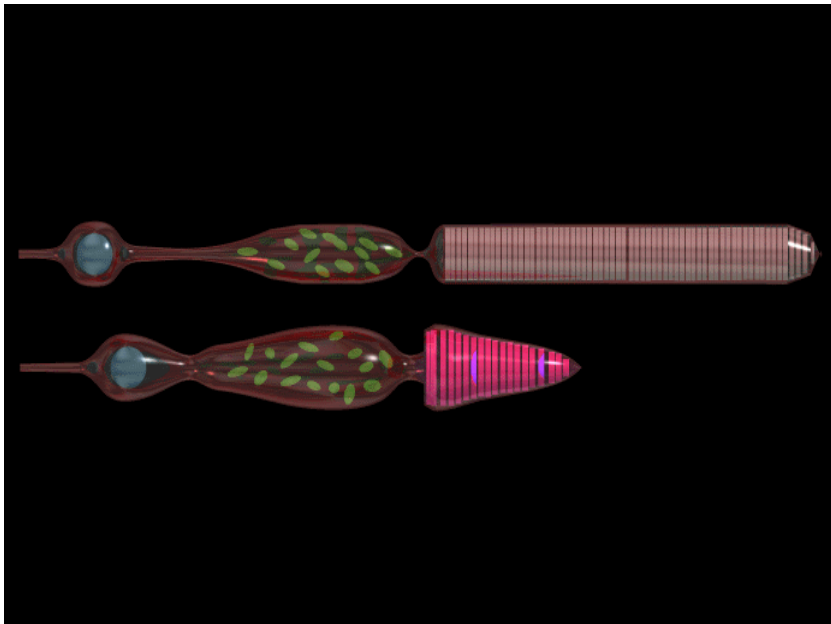
- Cells are composed of many parts, including:
  - Organelles, which are made of
  - Macromolecules (lipids, carbohydrates, proteins, nucleic acids), which are made of
  - Molecules and smaller compounds, which are made of
  - Atoms (carbon, hydrogen, oxygen, nitrogen, and phosphorous)





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**Caption:** Human egg (oocyte) and sperm (spermatozoon).  
**File Name:** 97900A  
**Category:** Medical  
**Type of Image:** SEM  
**Magnification:** egg  $\times 260$ , sperm  $\times 560$  (Based on an image size of 1 inch in the narrow dimension)



Corbis.com

# Types of Cells

- Prokaryotic
  - Structure: no nucleus, no membrane-bound organelles, has ribosomes, unicellular
  - Examples: bacteria

# Types of Cells

- Eukaryotic
  - Structure: nucleus, membrane-bound organelles, unicellular or multicellular
  - Examples: protists, fungi, plants, and animals

# Types of Cells

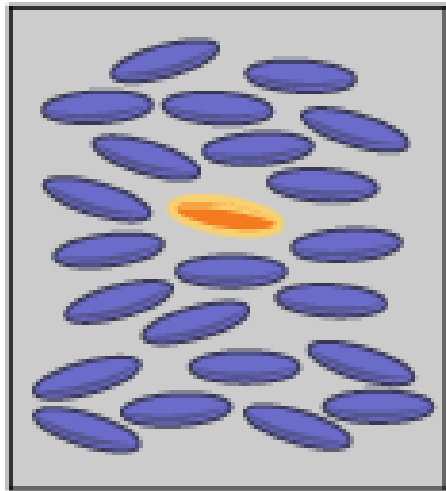
- Plant Cells
  - Have chloroplasts, cell wall, and large vacuole
- Animals Cells
  - Have centrioles

# Prokaryotic Cells

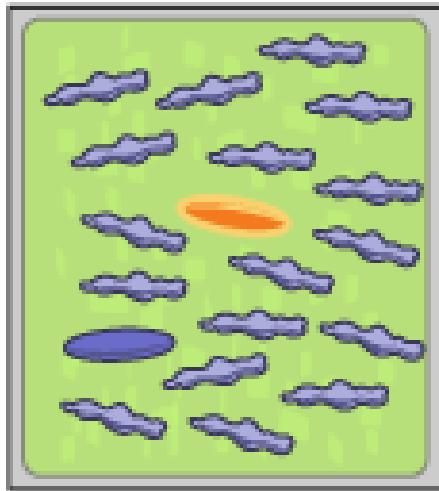
- Antibiotic Resistance
  - Some bacteria cells have started to become resistant to antibiotics
  - The widespread use of the antibiotics are killing off the bacteria without a resistant gene
  - The bacteria that is left have the resistant gene and start to reproduce



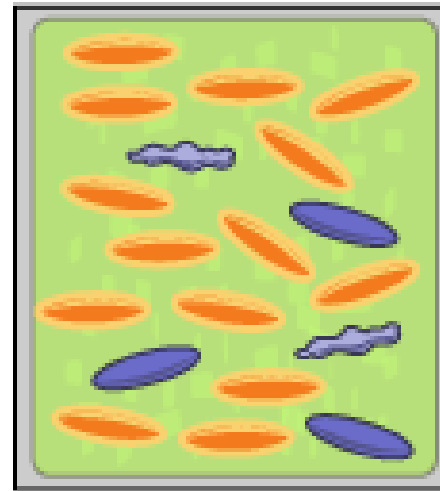
1  
A bunch of bacteria,  
including a resistant  
variety...



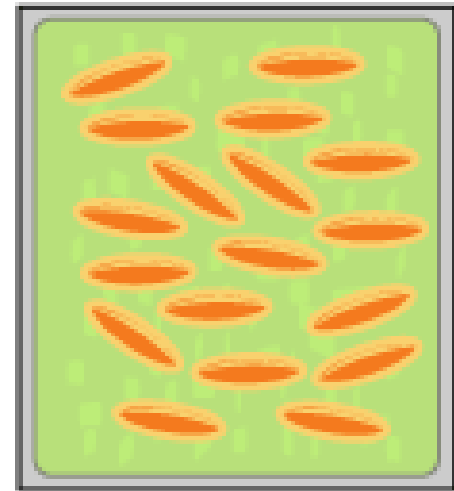
2  
...get bathed in  
antibiotics. Most  
of the normal  
bacteria die.



3  
The resistant  
bacteria multiply  
and become more  
common.



4  
Eventually, the  
entire infection  
evolves into a  
resistant strain.



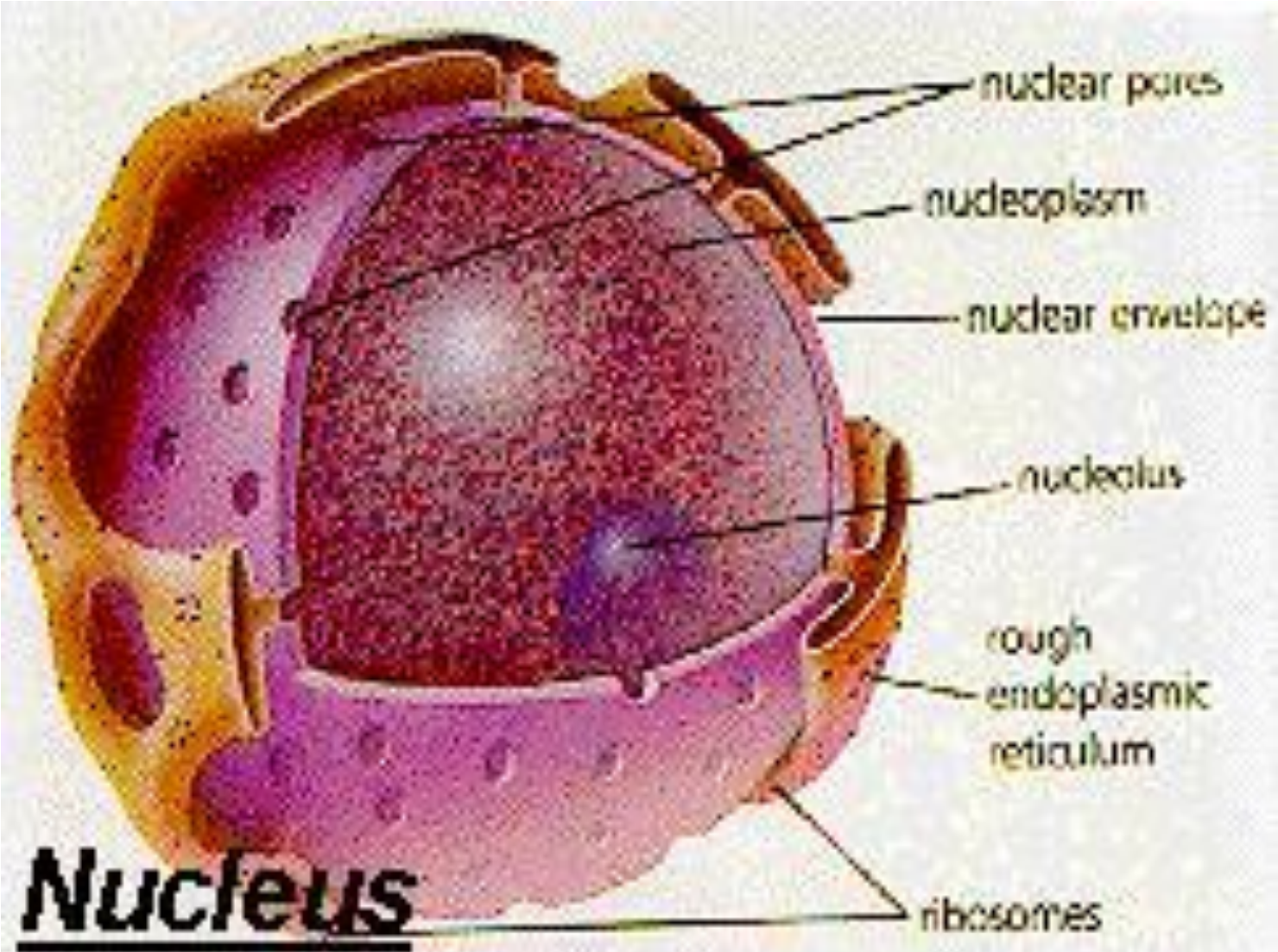
 normal bacterium

 dead bacterium

 resistant bacterium

# Nucleus (principal)

- Function: regulates and controls all the activities within a cell
  - Contains chromosomes (**school rules**) – strands of DNA that do not leave the nucleus (genetic information)



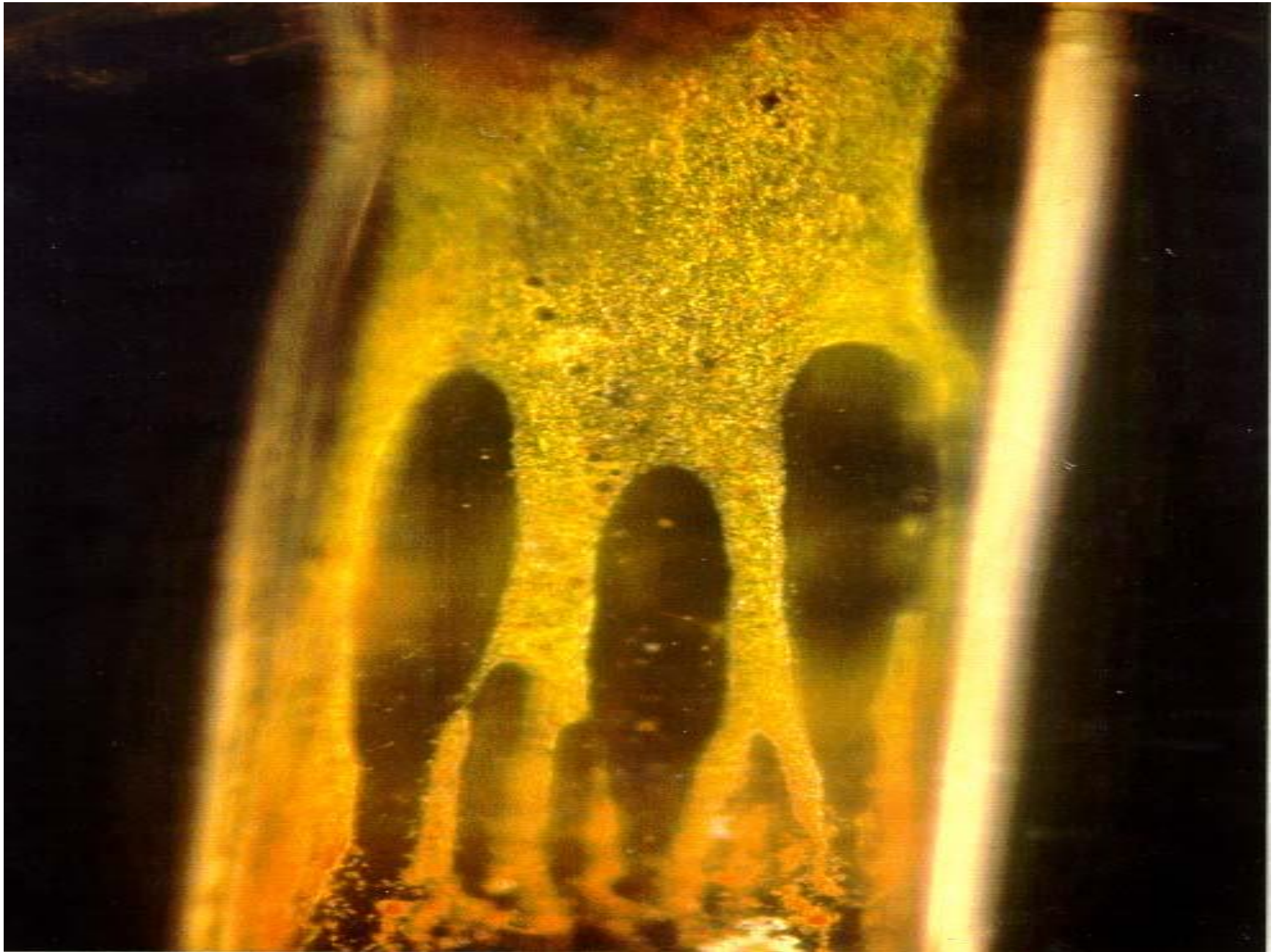
# Nucleolus

- Function: makes ribosomes
  - Located in the nucleus



# Cytoplasm

- Function: fluid that holds organelles in place and site of chemical reactions
  - A gel-like substance within the cell



# Cytoskeleton (studs in walls)

- Function: provides internal support for the cell
  - Long strands of protein located within the cytoplasm

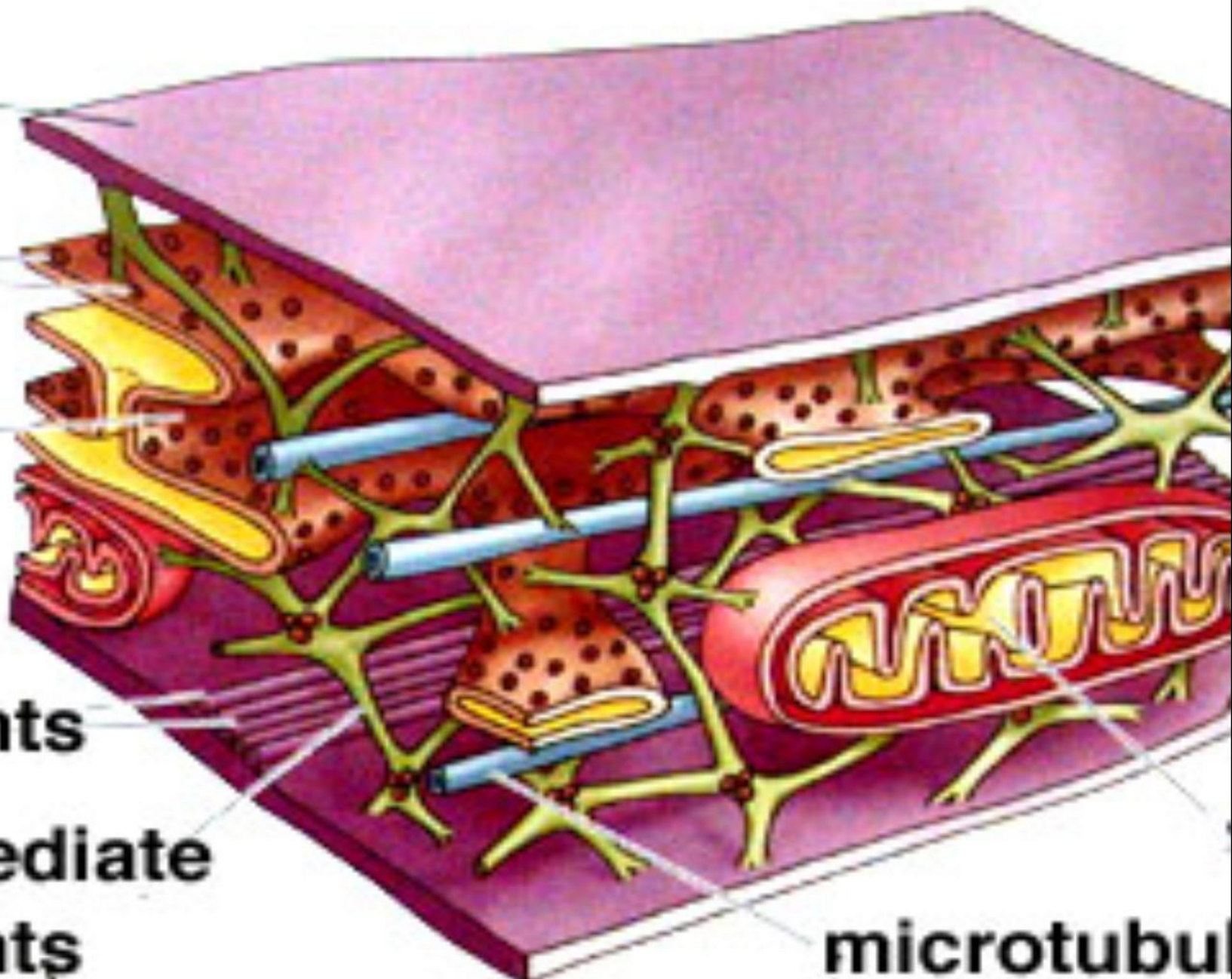
membrane

filaments

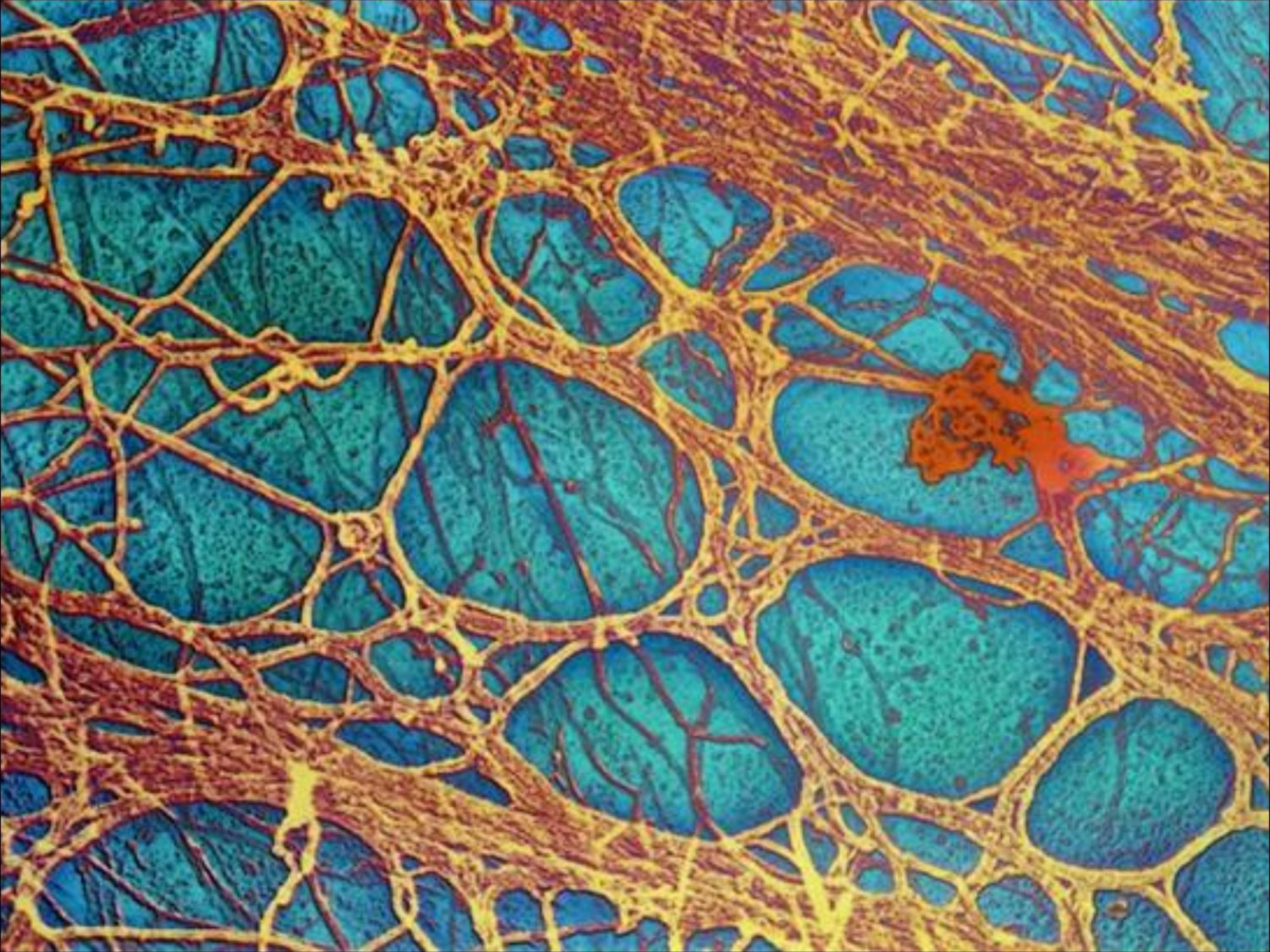
intermediate  
filaments

filaments

microtubul







# Endoplasmic Reticulum (halls)

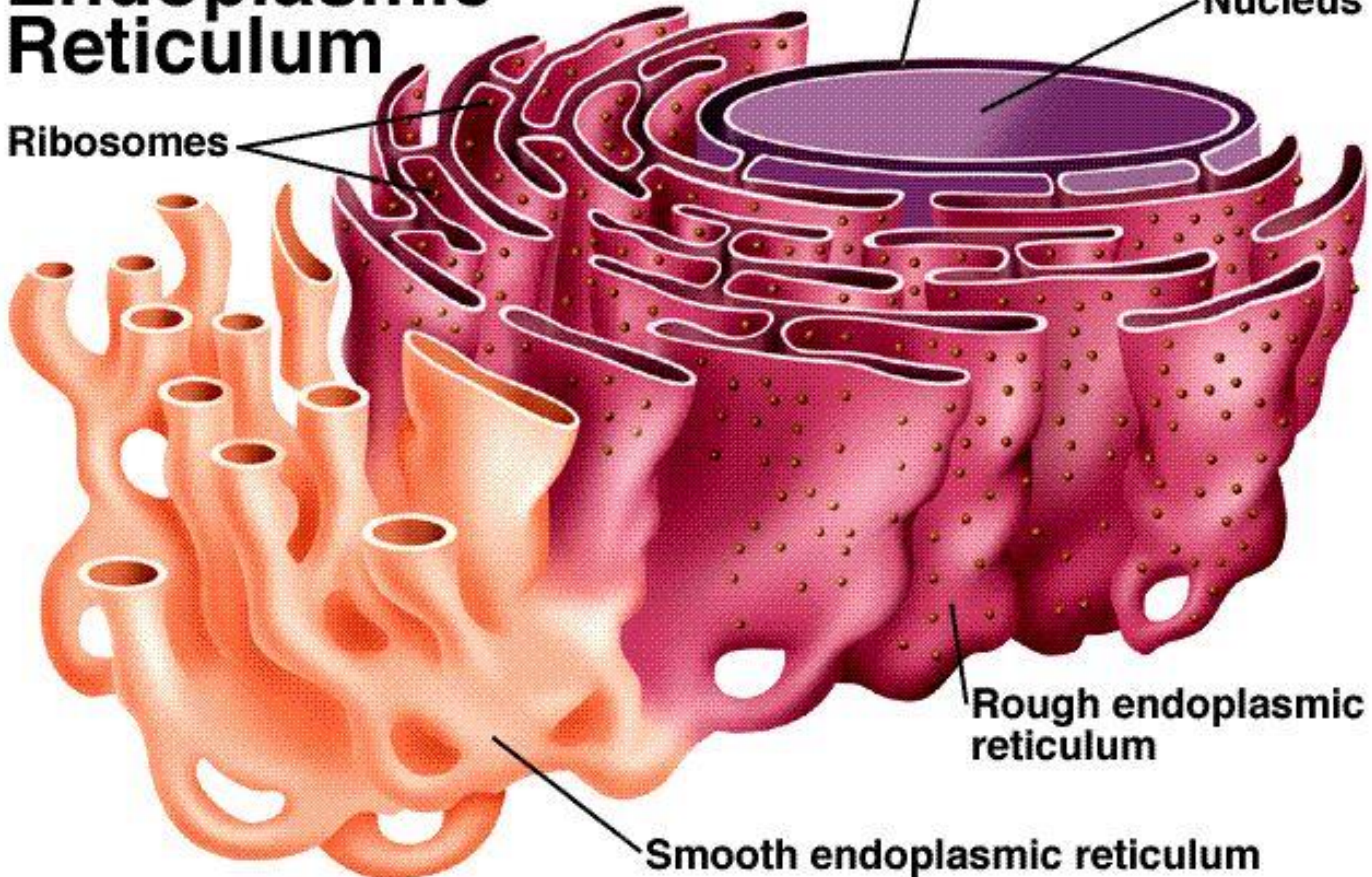
- Function: transports materials around the cell
  - Can be rough (with ribosomes attached) or smooth (without ribosomes attached)

# Three-Dimensional Endoplasmic Reticulum

Ribosomes

Nuclear envelope

Nucleus

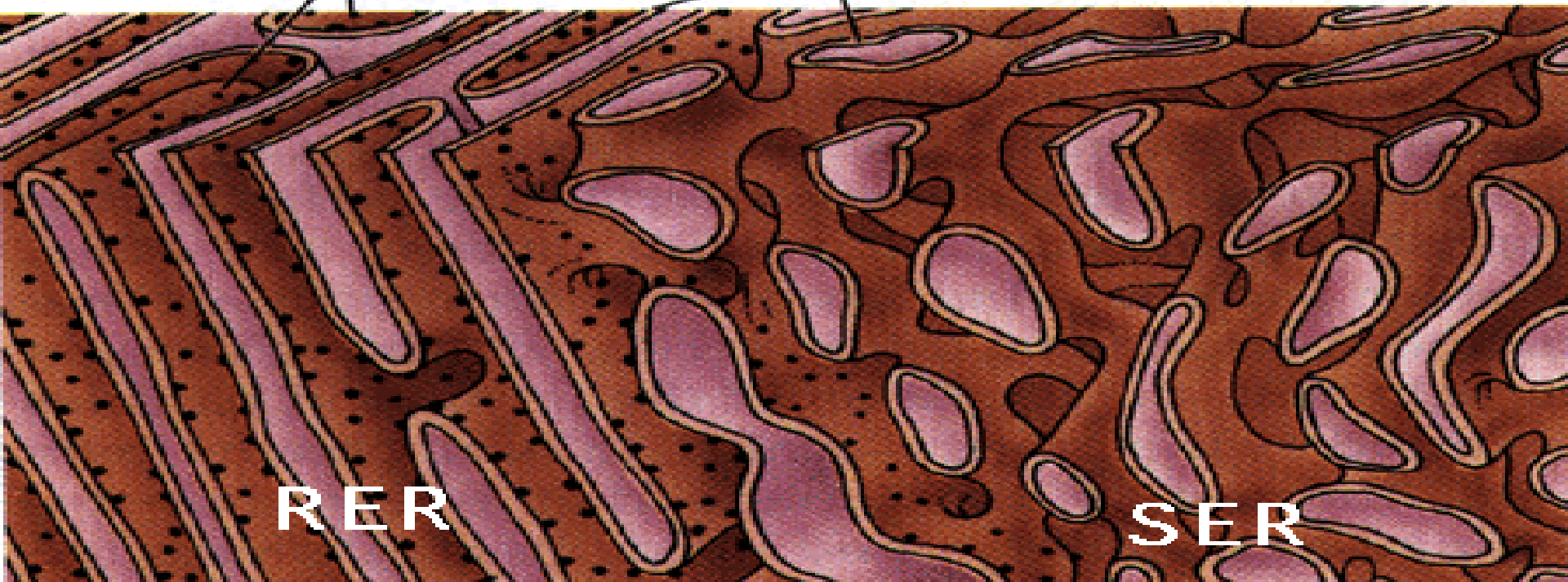


Smooth endoplasmic reticulum



Ribosomes

Membranes

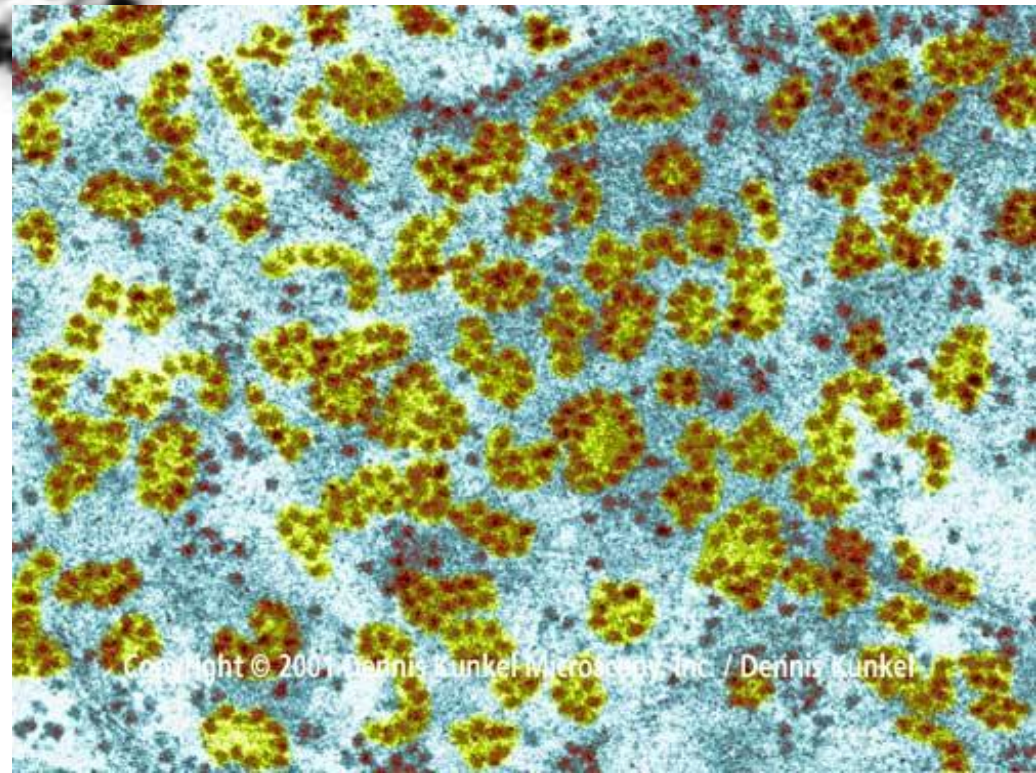
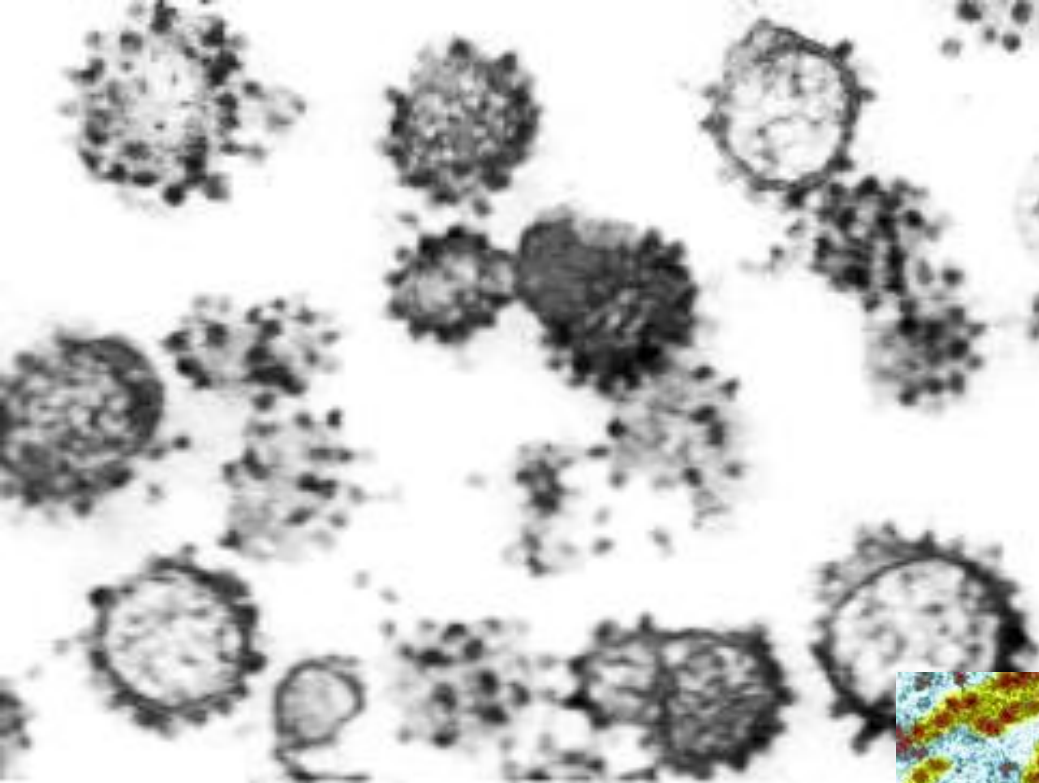


RER

SER

# Ribosomes (students)

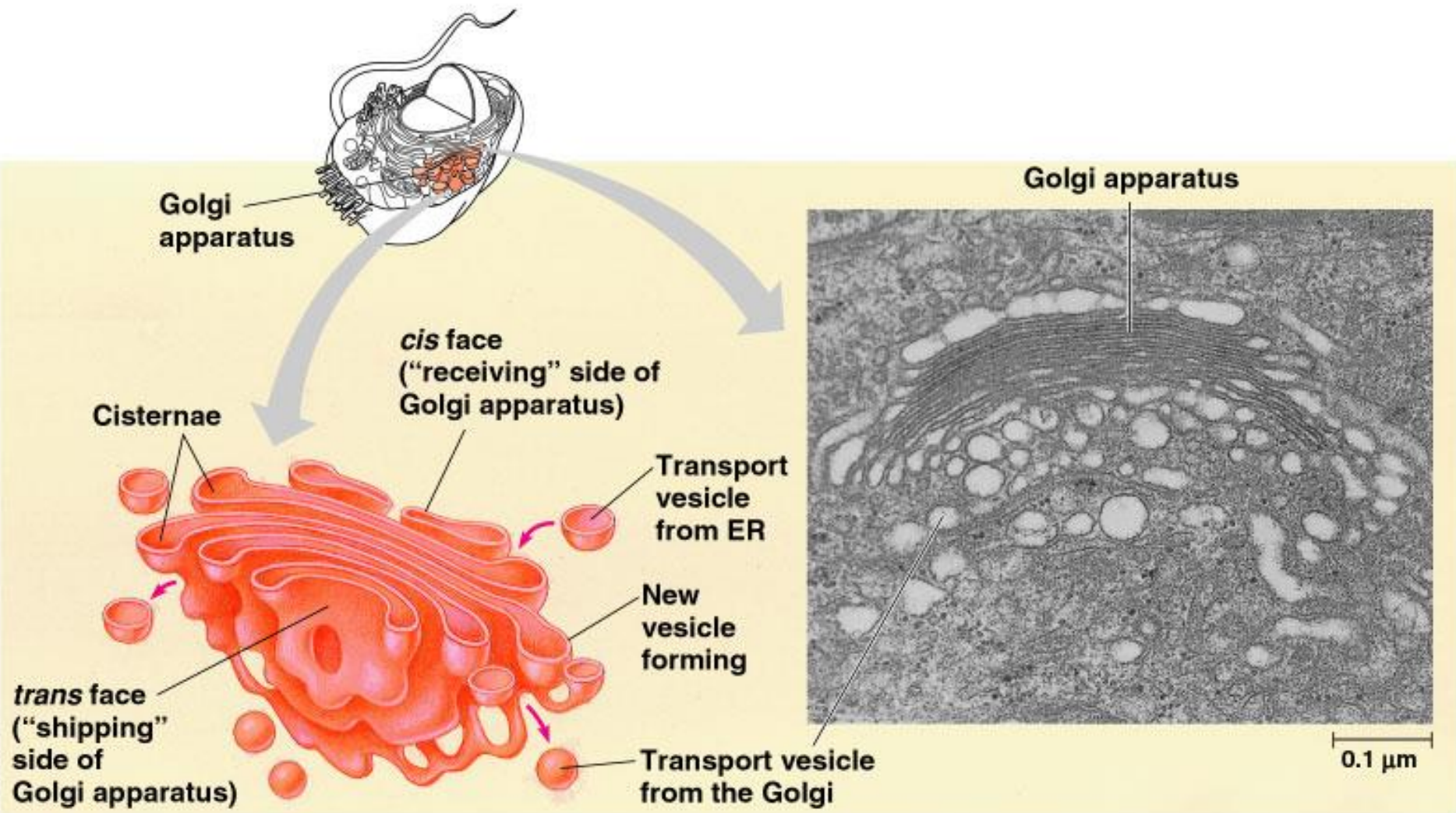
- Function: site of protein synthesis
  - Some float throughout the cytoplasm, some are attached to the ER



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# **Golgi Apparatus (mail room)**

- Function: packages materials; creates vesicles (membrane sacs) that ship materials to other parts of the cell
  - Stacked, flattened membranes

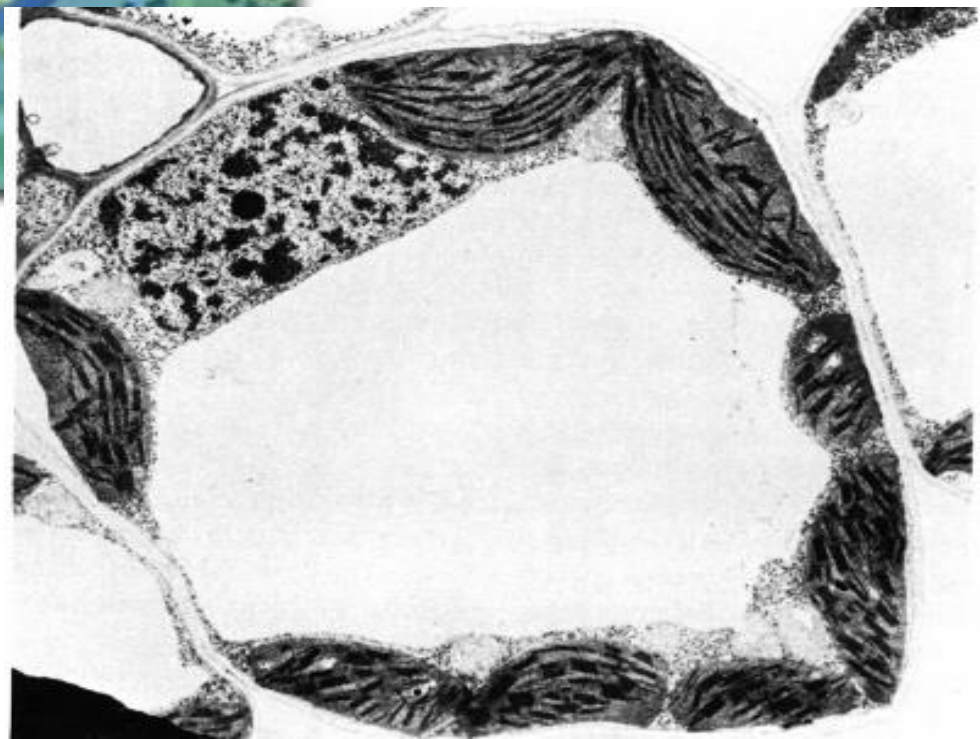
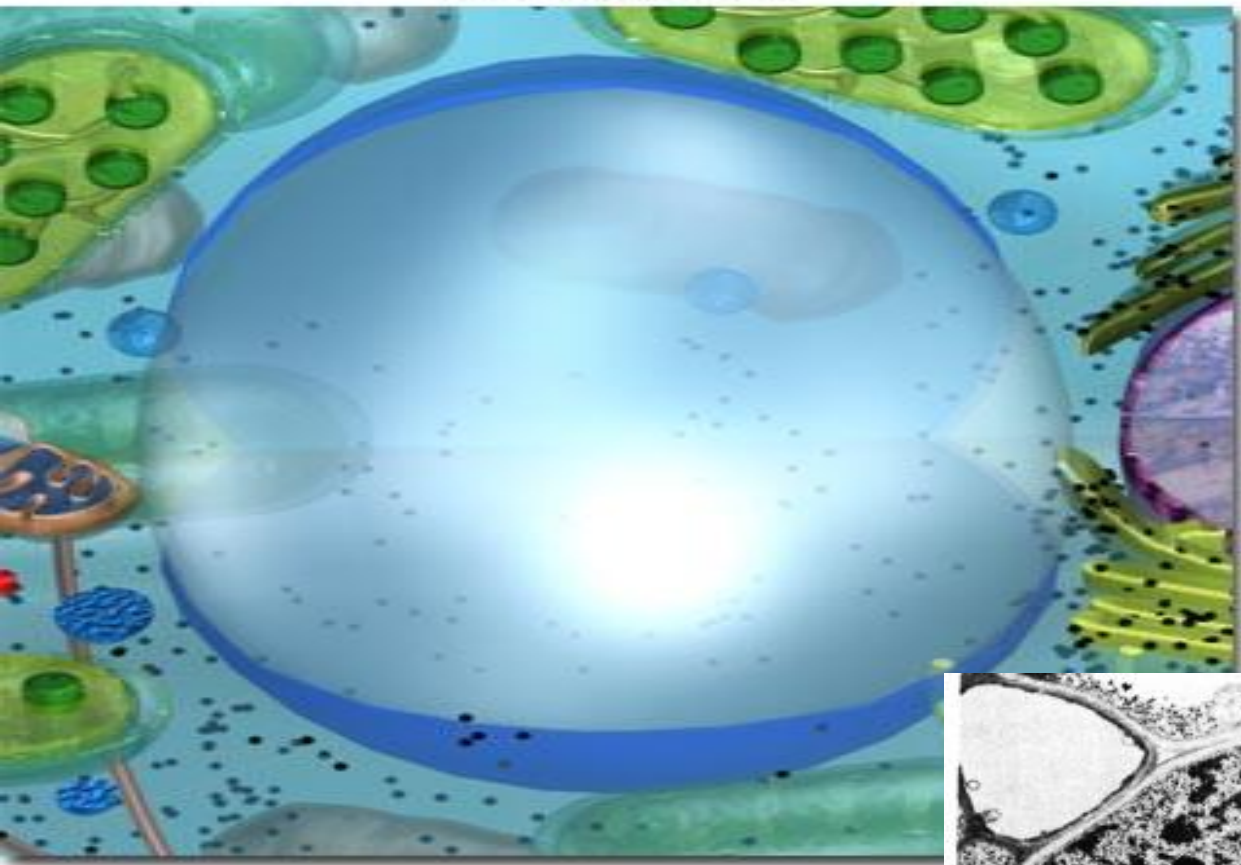




# Vacuoles (lockers)

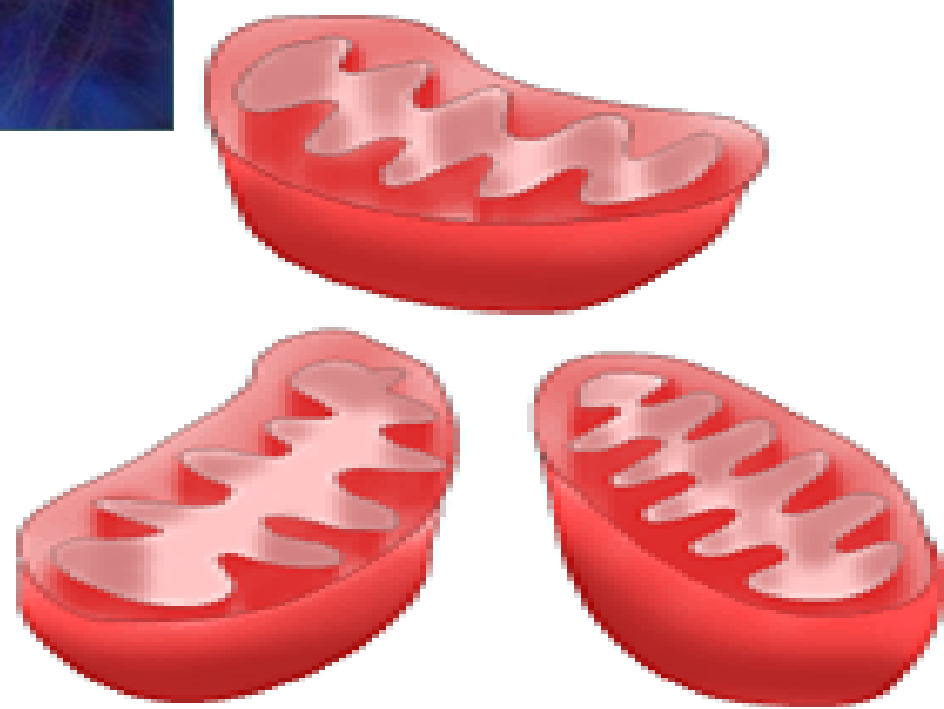
- Function: storage (food, water, pigments, and waste)
  - Plant cells have very large vacuoles

# Plant Vacuole



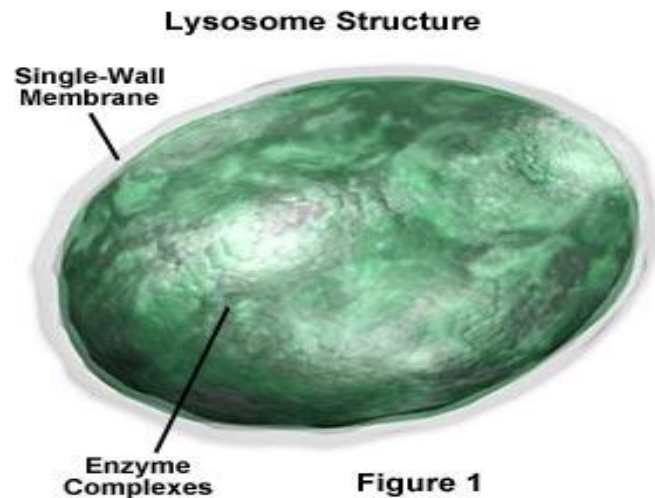
# Mitochondria (generator)

- Function: site of cell respiration to make energy (ATP) for the cell
  - Rod-shaped organelle with a double folded inner membrane



# Lysosomes (custodians)

- Function: breaks down food, waste and worn out organelles
  - Small round organelles that contain digestive chemicals (enzymes)



# Centrioles

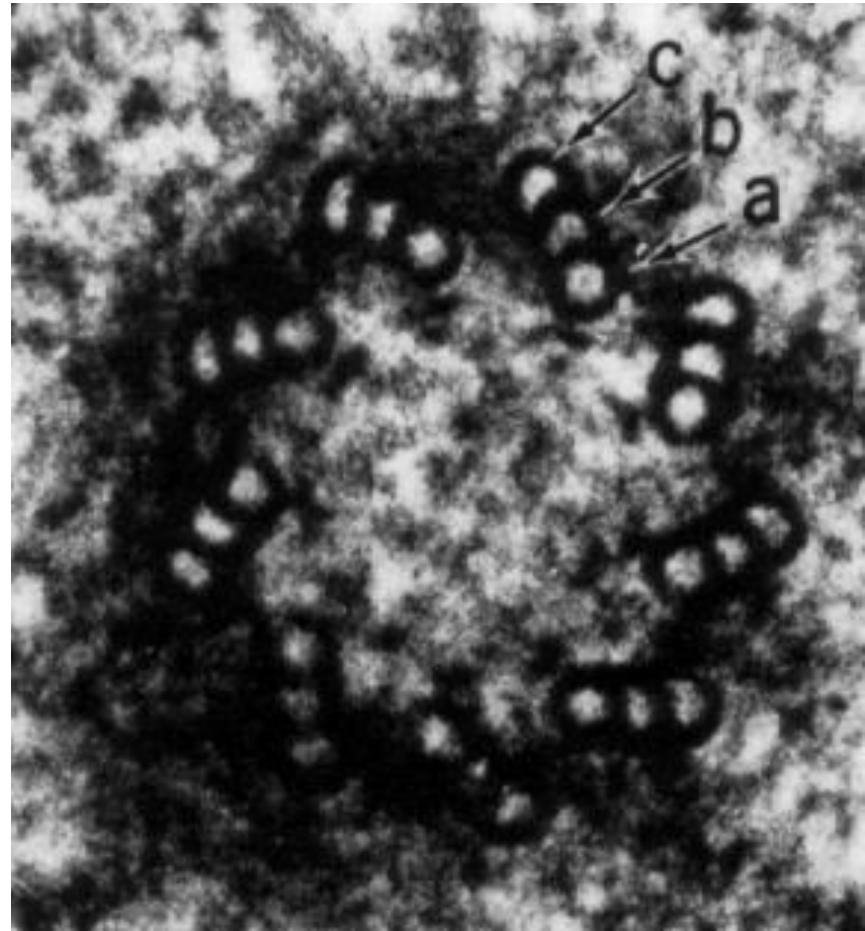
- Function: coordinates the division of the animal cells in Mitosis
  - Only active during cell division
  - Made up of cytoskeleton

# Centriole Structure

Centriole Pair

Microtubule Triplet

Figure 1



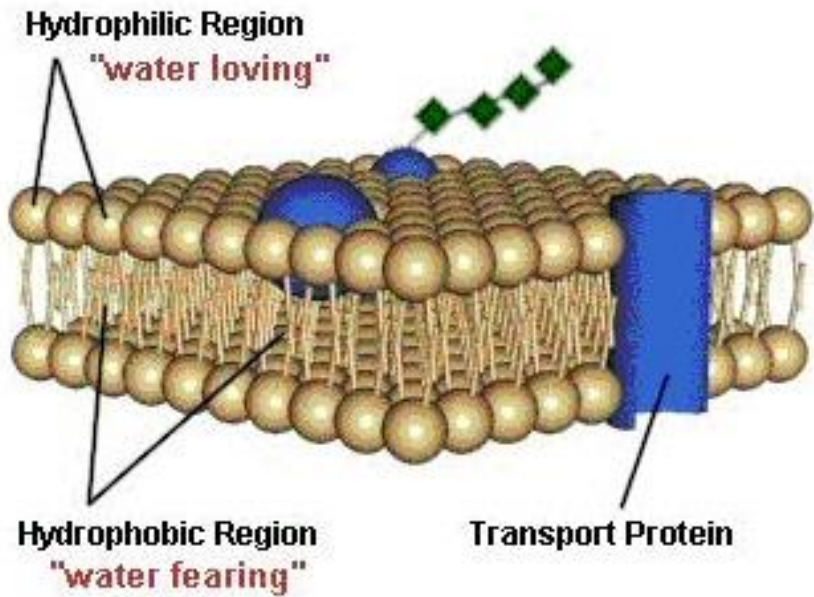
# Cell Membrane

## (outer walls and doors)

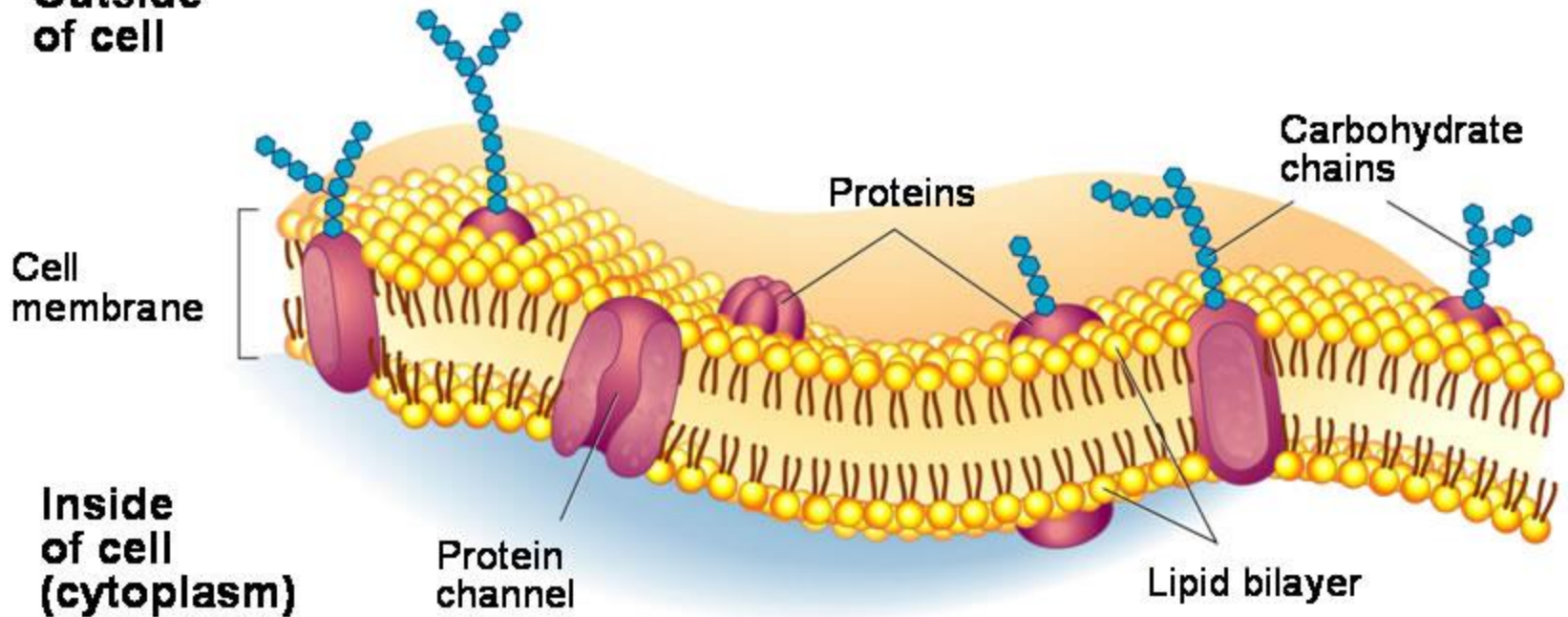
- Function: controls what substances come into and out of the cell
  - Made of a phospholipid bilayer



# Cell Membrane

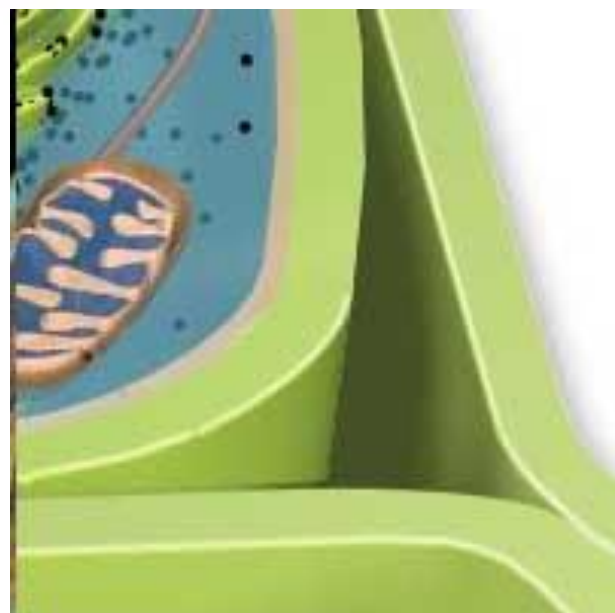
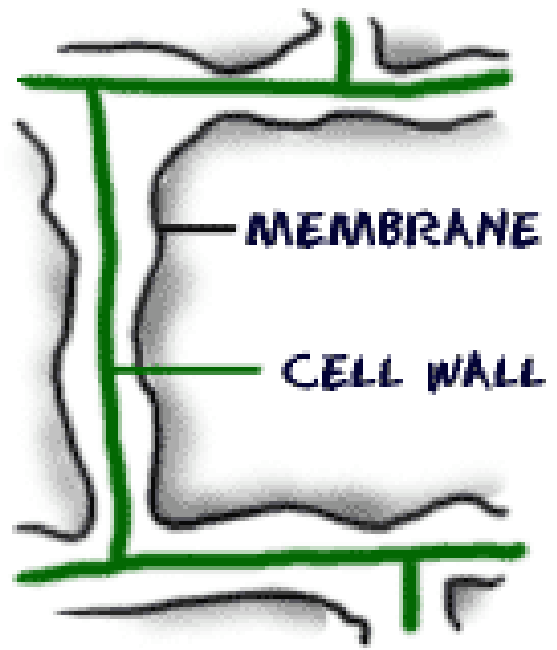
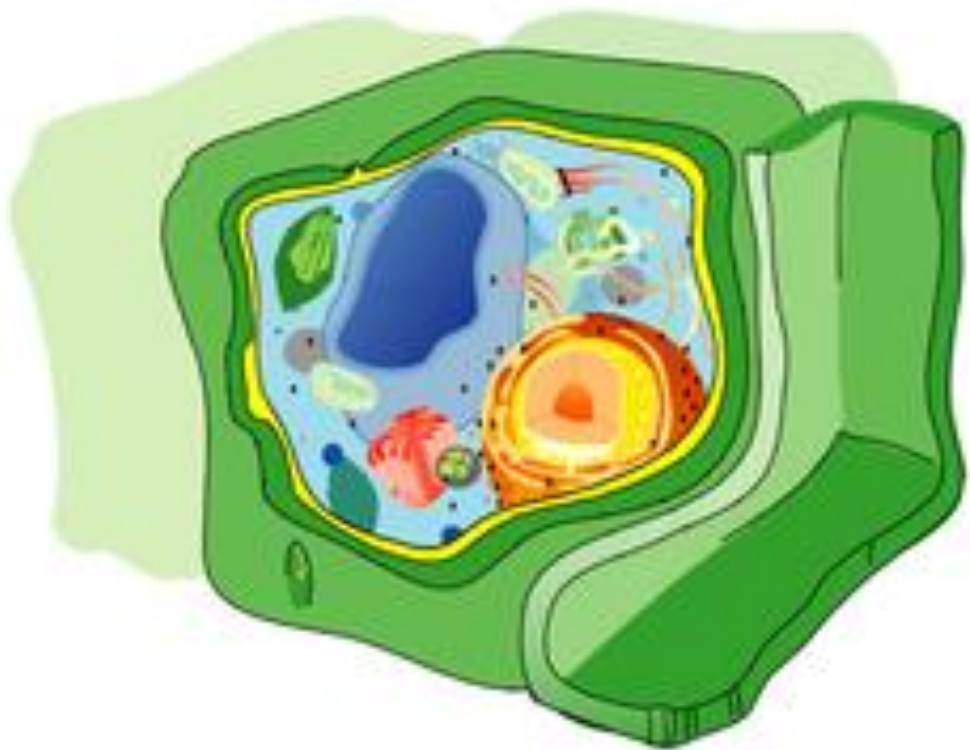


Outside  
of cell



# Cell Wall (outer brick walls)

- Function: protects the cell from the outside and gives it shape
  - Strong, rigid wall
  - *Plants, bacteria, fungi and some protists have Cell Walls*





00:02:08 ELAPSED

# Chloroplast (cafeteria)

- Function: site of photosynthesis which makes glucose which is the cells food
  - Contain chlorophyll – green pigment that captures the sun's light.

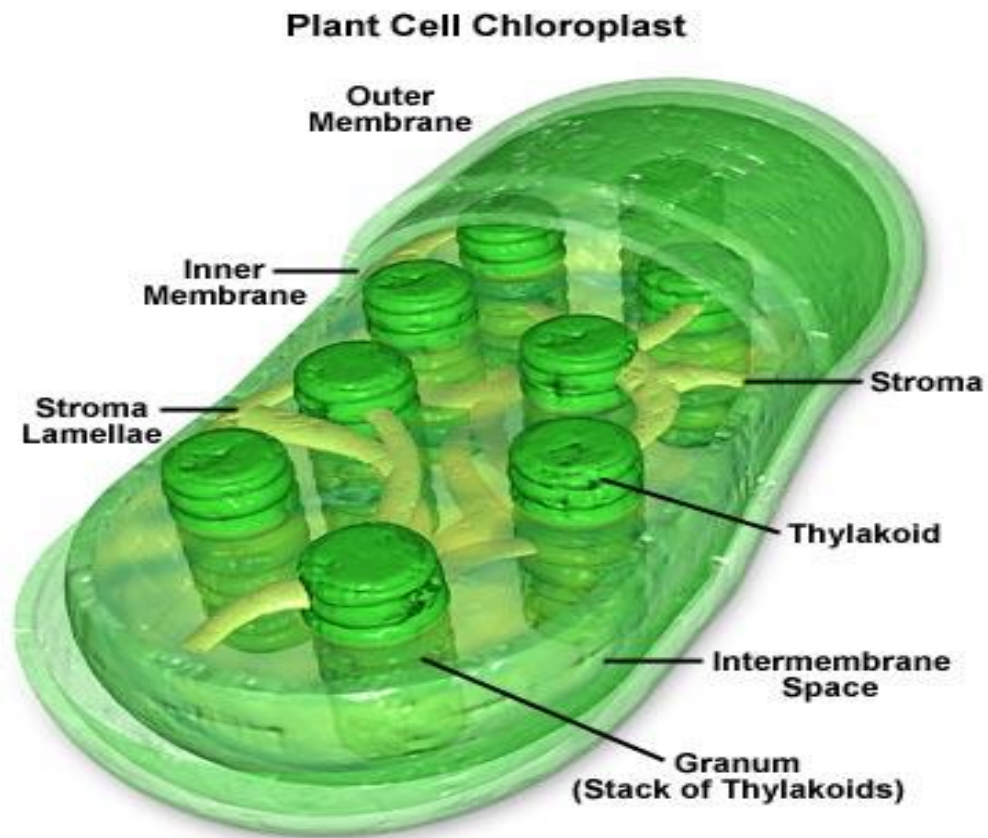


Figure 1

**THE END**