

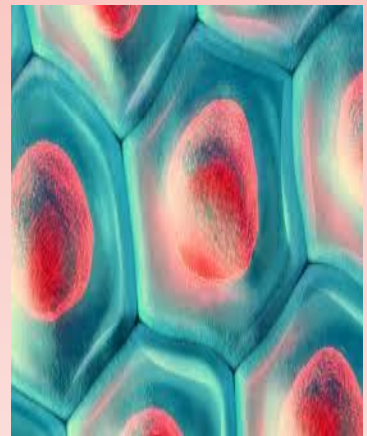
# CELL THEORIES

**DR. ANJALI CHOUDHARY**

**HOD**

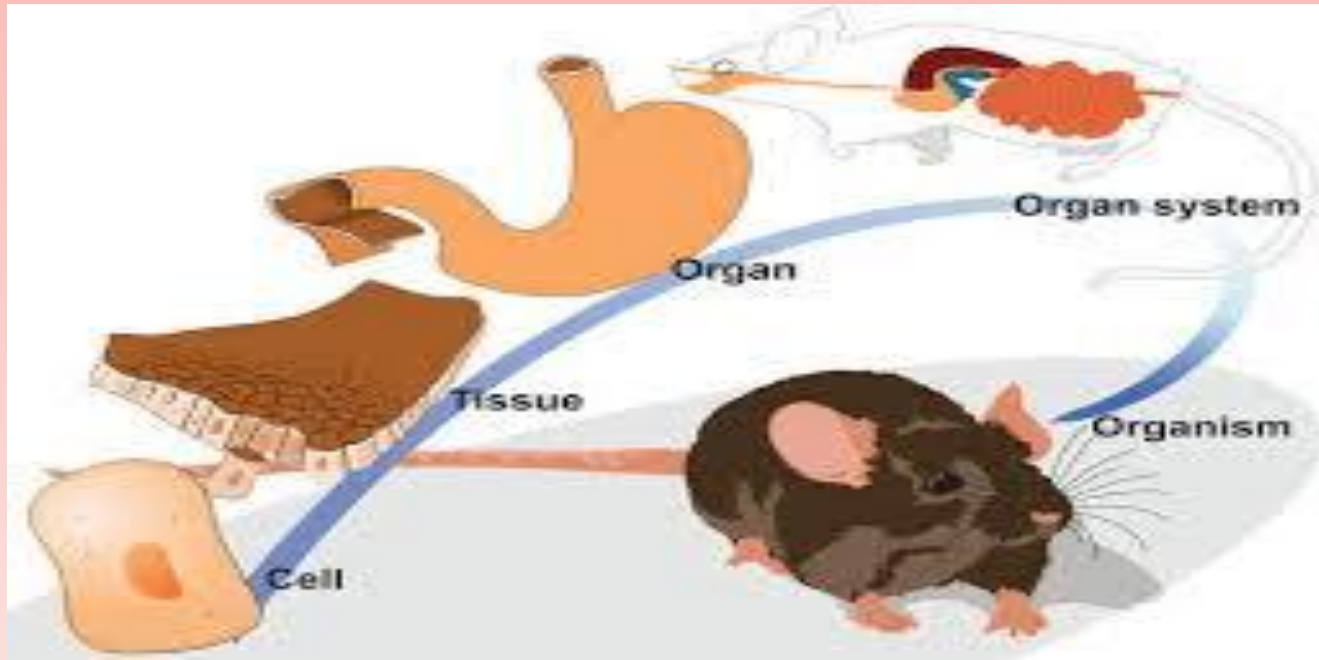
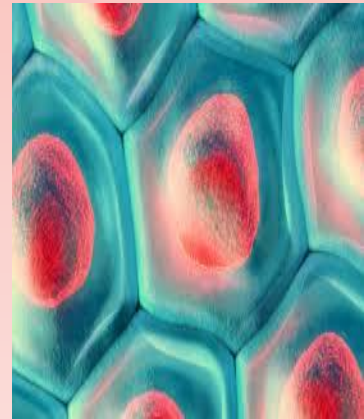
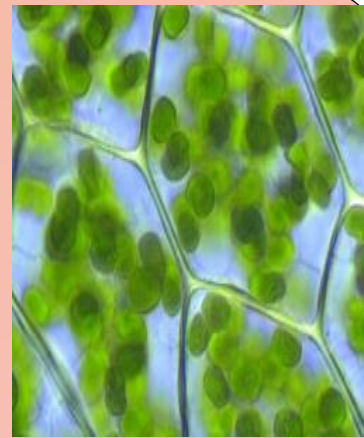
**DEPARTMENT OF BIOTECHNOLOGY**

**CAREER COLLEGE, BHOPAL**



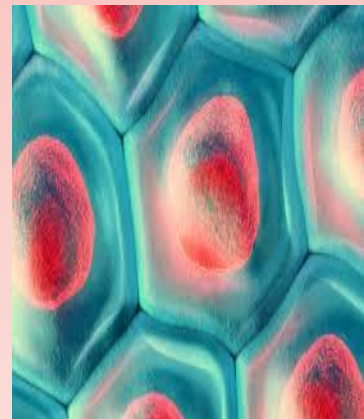
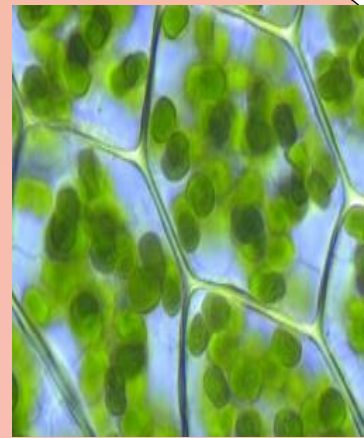
# Cell

- The cell ( *cella*, meaning "small room") is the basic structural, functional, and biological unit of all known organisms.
- Smallest unit of life.
- Cells are often called the "building blocks of life".
- The study of cells is called cell biology, cellular biology, or cytology.



# Cell Discovery

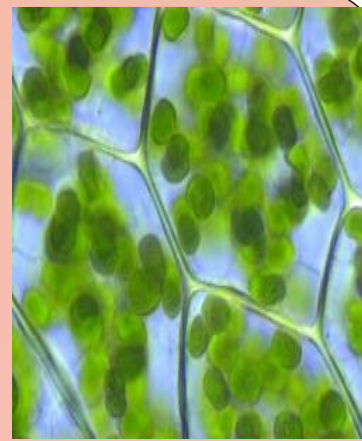
- The scientist who have contributed to the discovery of the cell:
  - **Hans and Zacharias Jansen**
  - **Robert Hooke**
  - **Matthias Schleiden**
  - **Theodor Schwann**
  - **Robert Brown**
  - **Anton Van Leeuwenhoek**
  - **Rudolph Virchow**







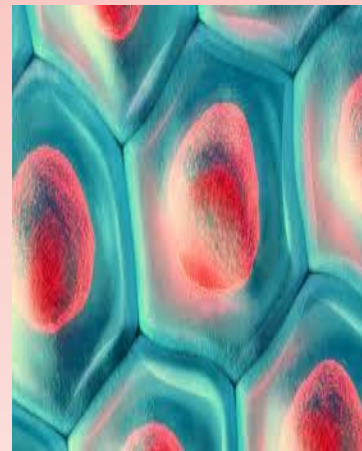
- **Hans and Zacharias Jansen (1595)** credited for the production of first compound microscope



- **Robert Hooke (1665)**  
Coined the term "CELL"  
observed a thin slice of cork (dead plant cells)  
- described what he observed as "little boxes" (cells in Micrographia)



- **Anton van Leeuwenhoek- (1675)**  
"Father of Microbiology"  
He first observed protozoa" - the single-celled organisms and he called them "animalcules".  
Improved the microscope and laid foundation for microbiology.





- **Robert Brown (1831)**

observes that all cells from a variety of backgrounds, seem to contain a dark region near the centre, known as the nucleus.



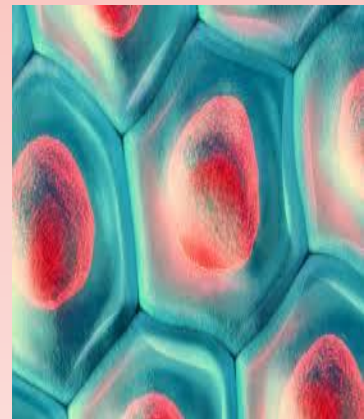
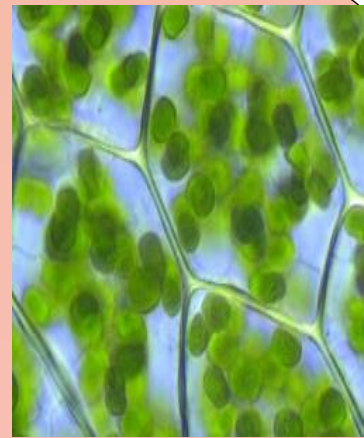
- **Matthias Schleiden (1838)**

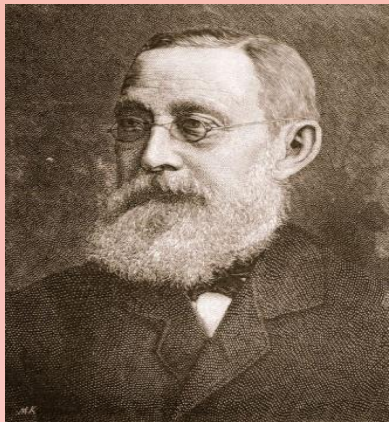
concluded that all plant tissues are composed of cells and that an embryonic plant arose from a single cell. He declared that the cell is the basic building block of all plant matter.



- **Theodor Schwann- (1839 )**

- A German physiologist who, in collaboration with M. J. Schleiden, proposed the **cell theory** (and coined the term)

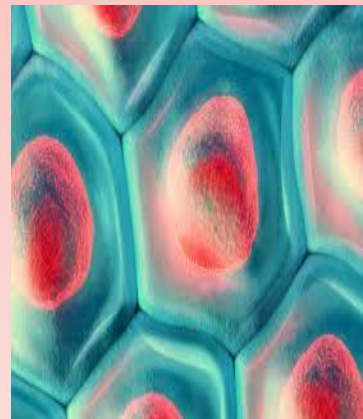
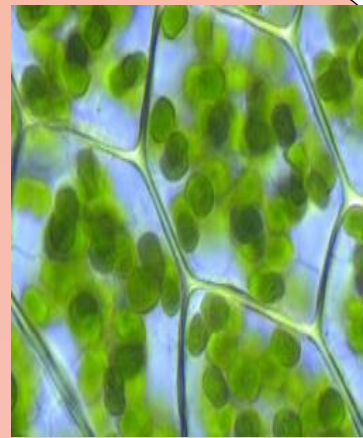




- **Rudolf Virchow (1855)**

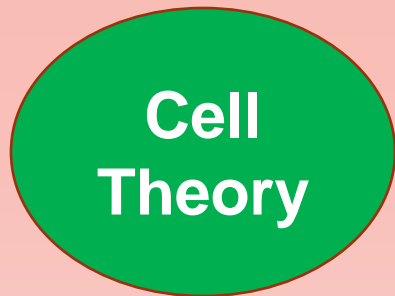
He is known as "the father of modern pathology."

He showed that the origin of cells was the division of pre-existing cells. ↓



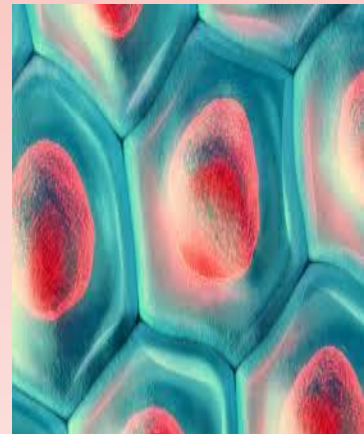
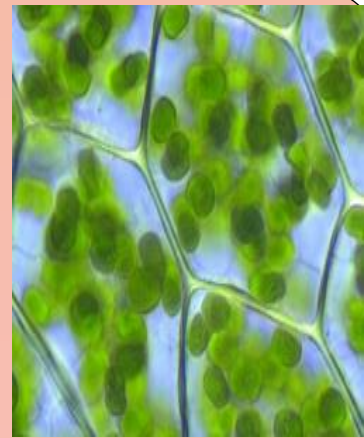


**All living things  
are composed of  
cells**



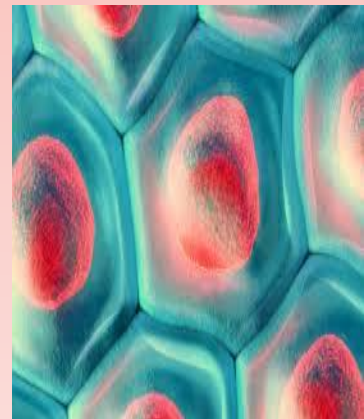
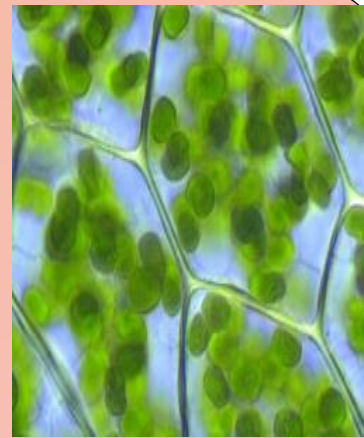
**Cell is the basic  
unit of structure  
and function in  
all living things**

**All cells are  
produced from  
preexisting  
cells**



# Spontaneous Generation

- At first scientists believed that living things came from non living things or organisms can arise from nonliving matter
- This theory was called: spontaneous generation ( **Abiogenesis** ) .
- What part of the cell theory disproves the theory of spontaneous generation: all cells arise from pre-existing cells by cells division





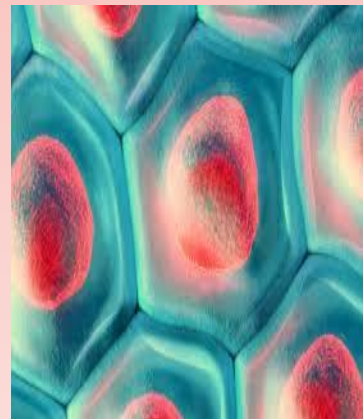
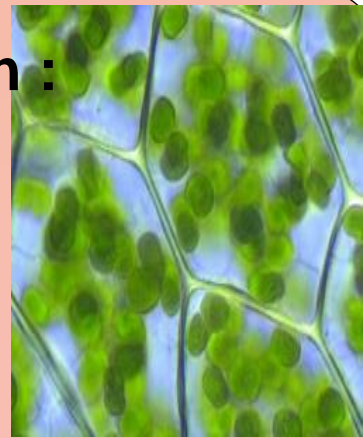
# Experiments on the theory of spontaneous generation :

- **Francesco Redi (1668)** proposed the hypothesis that flies laying eggs on meat were responsible for the appearance of maggots. If flies are prevented from laying their eggs on meat, then no maggots will appear on the meat.

- In mid-1700s— **John Needham** attacked Redi's work. He claimed spontaneous generation could occur under the right conditions. He sealed a bottle of gravy and heated it. Several days later it was full of microorganisms (little animals).

- **Lazzaro Spallanzani** - improved Needham's experiment. They thought that air was needed to generate life because it contained some "life force" or "vital force."

**Louis Pasteur 1864** found a way to settle the argument with his "swan-neck flasks." Replaced abiogenesis theory with a stronger theory called biogenesis which states that all living things can only come from other living things.



# Redi's Experiment on Spontaneous Generation

OBSERVATIONS: Flies land on meat that is left uncovered. Later, maggots appear on the meat.

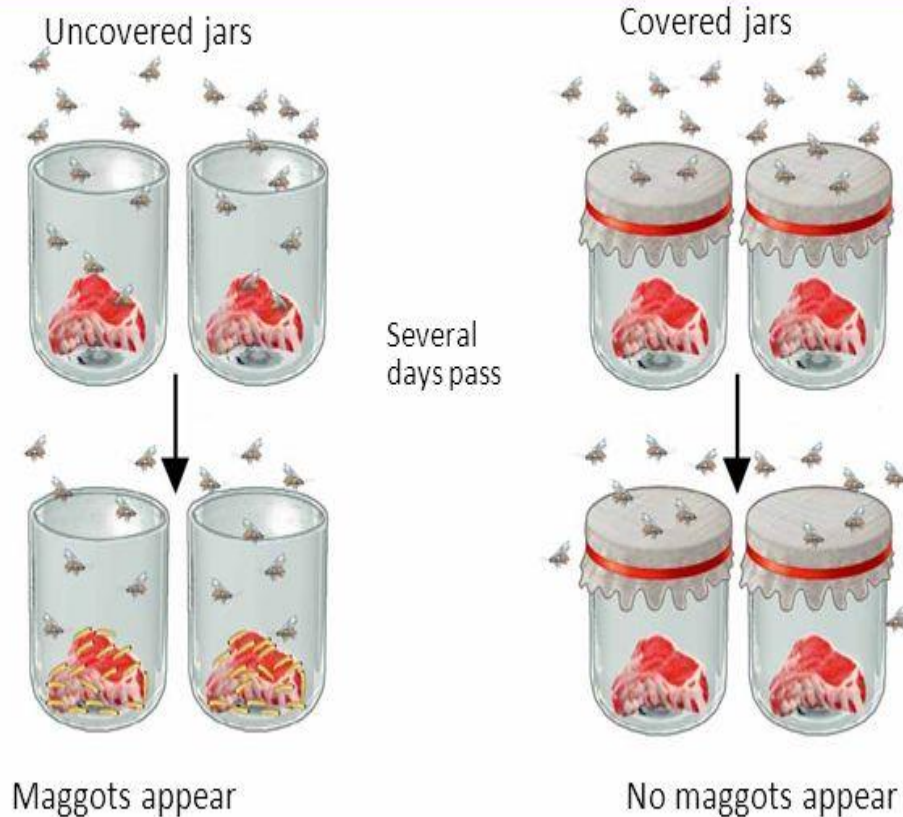
HYPOTHESIS: Flies produce maggots.

## PROCEDURE

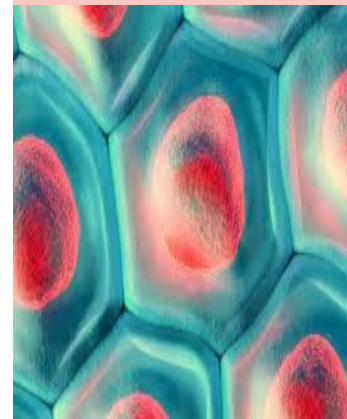
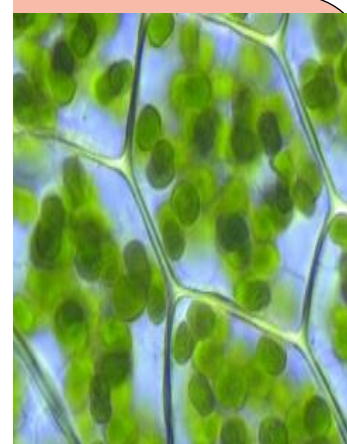
Controlled Variables:  
jars, type of meat,  
location, temperature,  
time

Manipulated Variables:  
gauze covering that  
keeps flies away from  
meat

Responding Variable:  
whether maggots  
appear



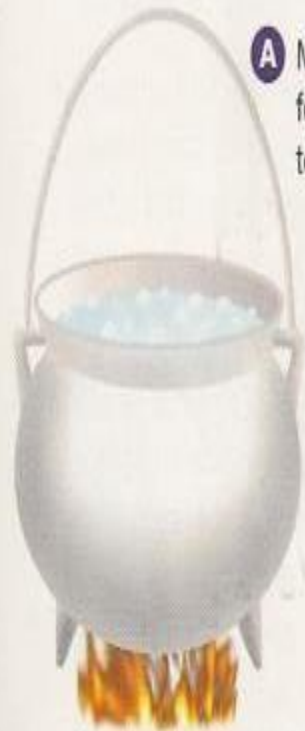
CONCLUSION: Maggots form only when flies come in contact with meat. Spontaneous generation of maggots did not occur.





## John Needham's Experiment

**A** Meat broth is boiled for several minutes to sterilize it.



heated broth



experimental jar



control jar

time



results

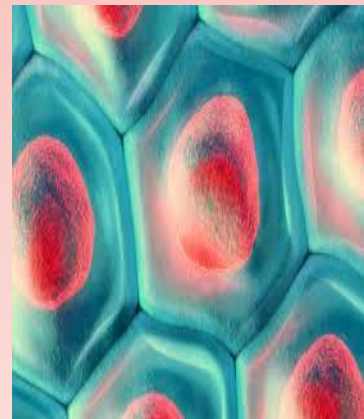
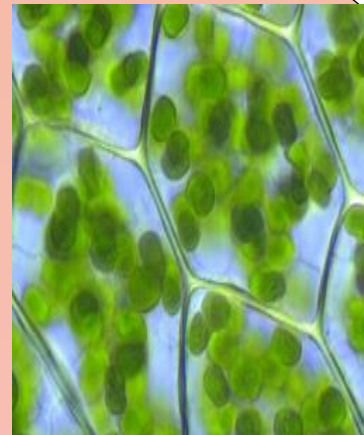


results

**B** Equal amounts of boiled broth are poured into two jars. One jar is sealed. The other jar, the control, is left unsealed.

Needham hypothesized that if life arises only from life, the heated broth would stay clear, indicating no presence of living organisms. If life can arise from non-living matter, the heated broth would become cloudy, indicating the presence

of living organisms. Within days, the heated broth was cloudy. Needham proclaims this as evidence in support of spontaneous generation.





# Spallanzani's Experiment



Gravy is boiled.



Flask is open.



Gravy is teeming with microorganisms.



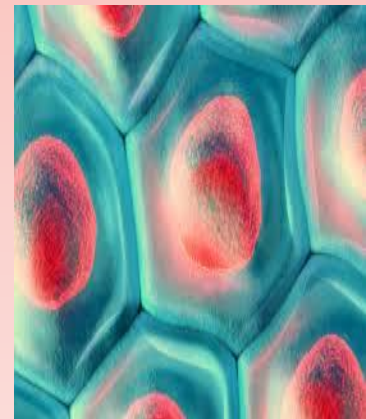
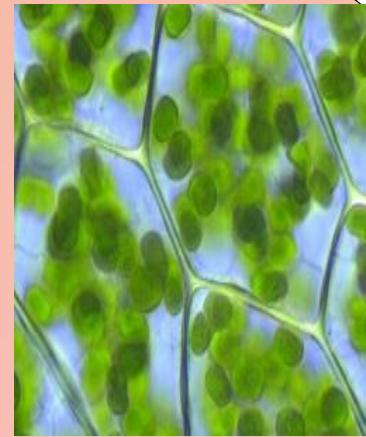
Gravy is boiled.



Flask is sealed.



Gravy is free of microorganisms.



## Louis Pasteur 1859 experiment

broth was boiled in various flasks for one hour to sterilize it and allowed to cool, drawing in fresh air.



open flask allowed air and any bacteria present in the air to enter



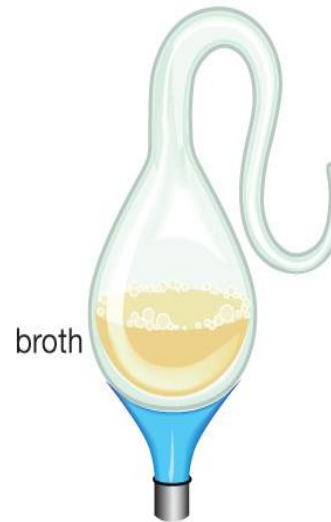
contaminated with bacteria



cotton plug filtered bacteria from the air entering the flask



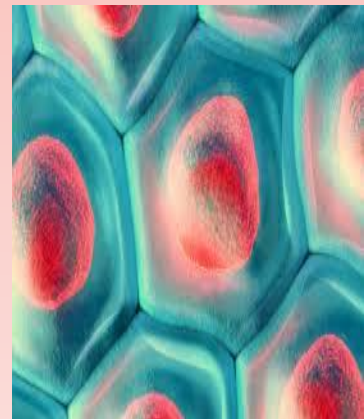
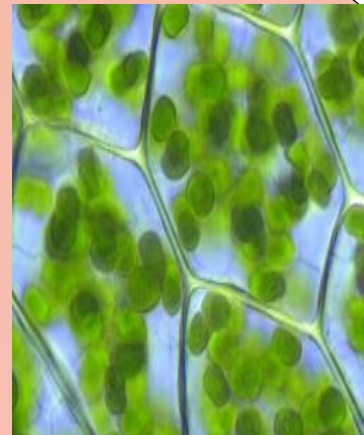
sterile



bacteria were removed from the air entering the flask by settling in the long neck

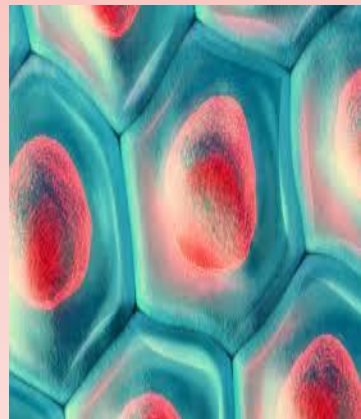


sterile



# Modern Cell Theory

- The cell is the fundamental unit of structure and function in living things.
- All cells come from pre-existing cells by division
- Energy flow (metabolism and biochemistry) occurs in cells
- Cells contain hereditary info (DNA)
- All cells are the same chemically
- All known living things are made of cells ( multicellular and unicellular )
- The activity of an organism depends on the total activity of independent cells

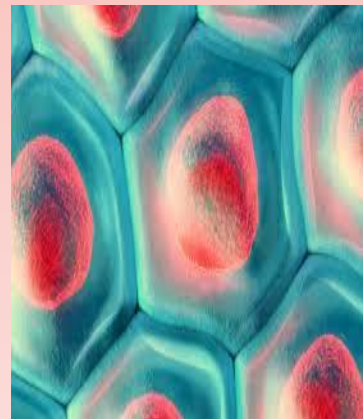
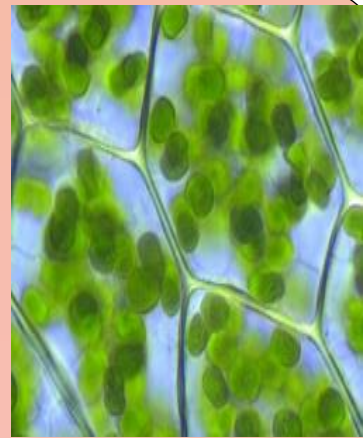


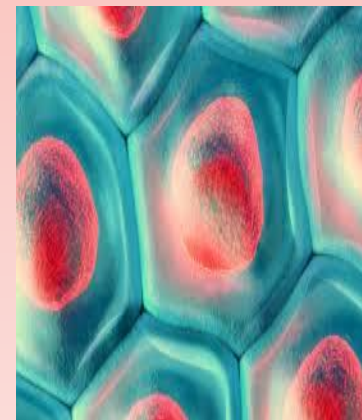
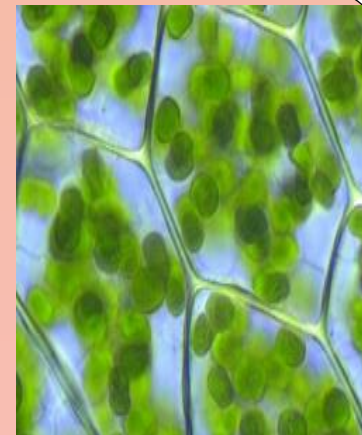
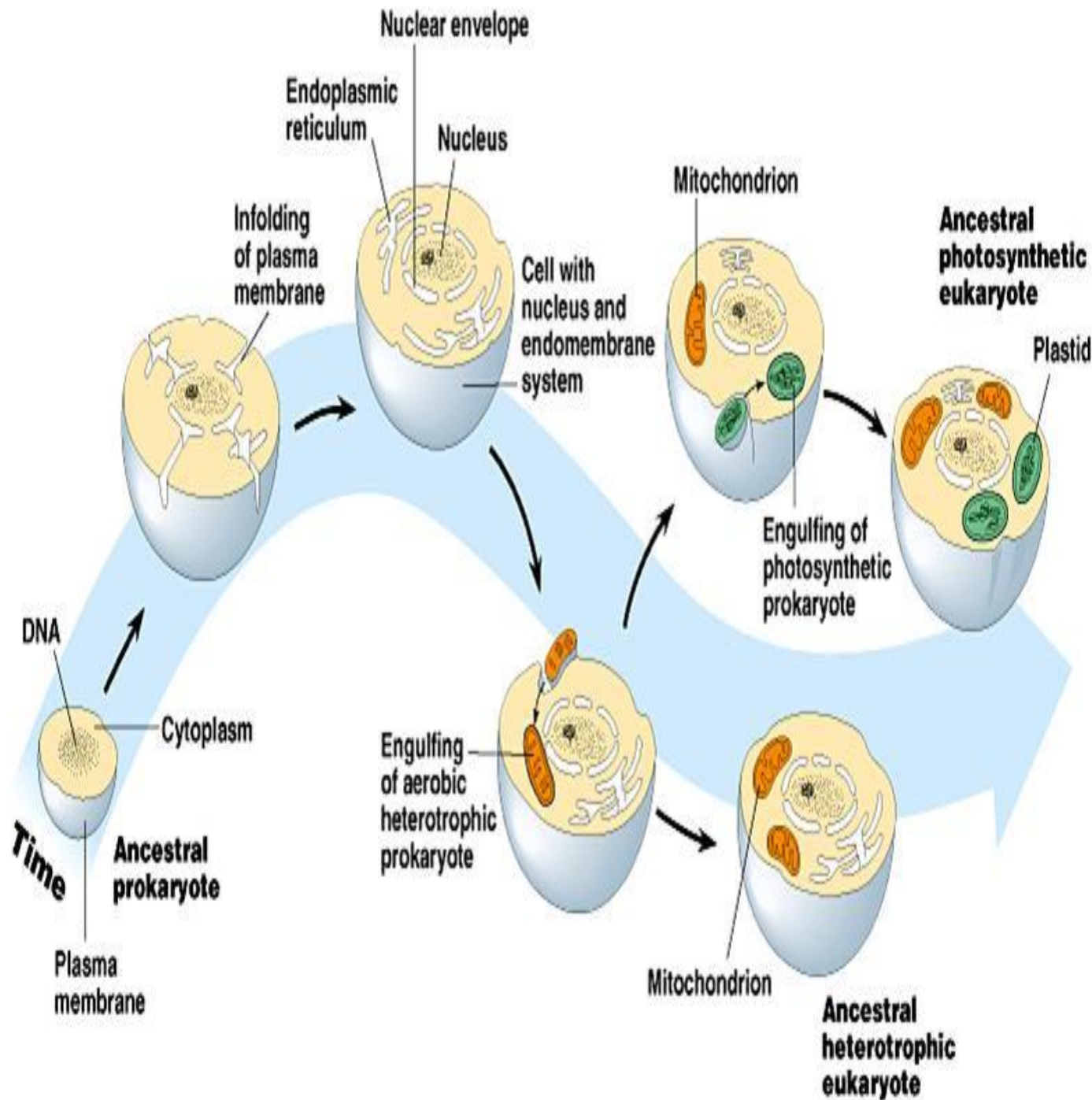


# The Endosymbiotic Theory

***The endosymbiotic theory is the idea that a long time ago, prokaryotic cells engulfed other prokaryotic cells by endocytosis. This resulted in the first eukaryotic cells.***

- First proposed by Lynn Margulis
- Explains the origin of eukaryotic cells
- Explains the origin of certain membrane-bound organelles

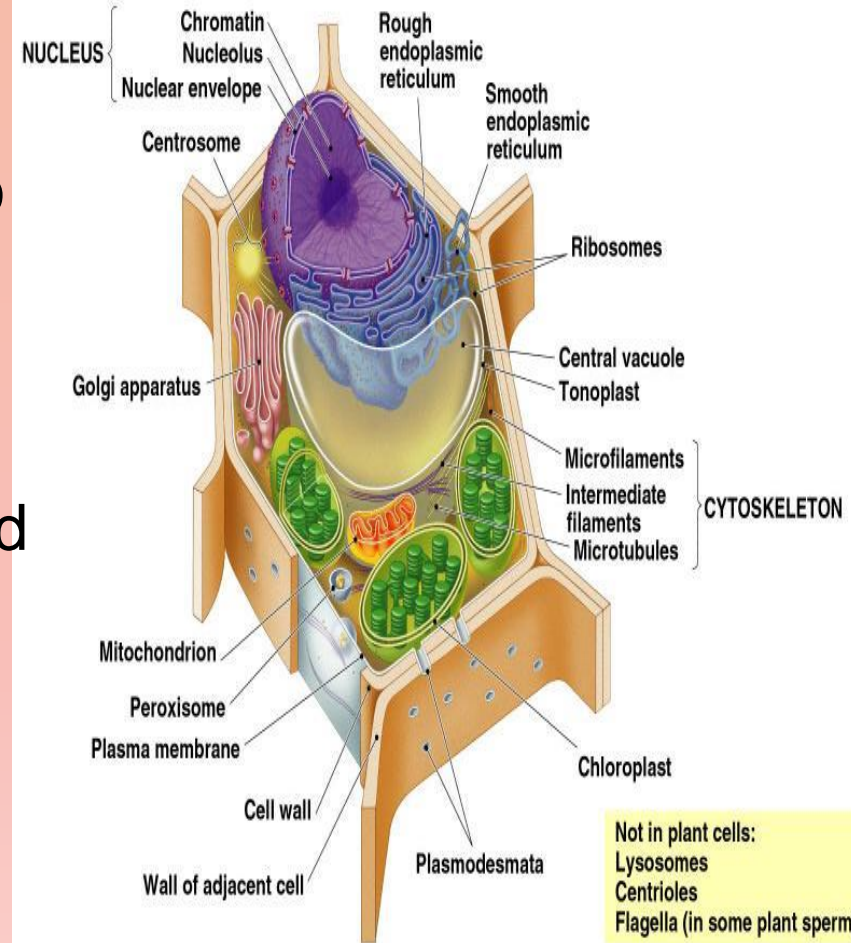
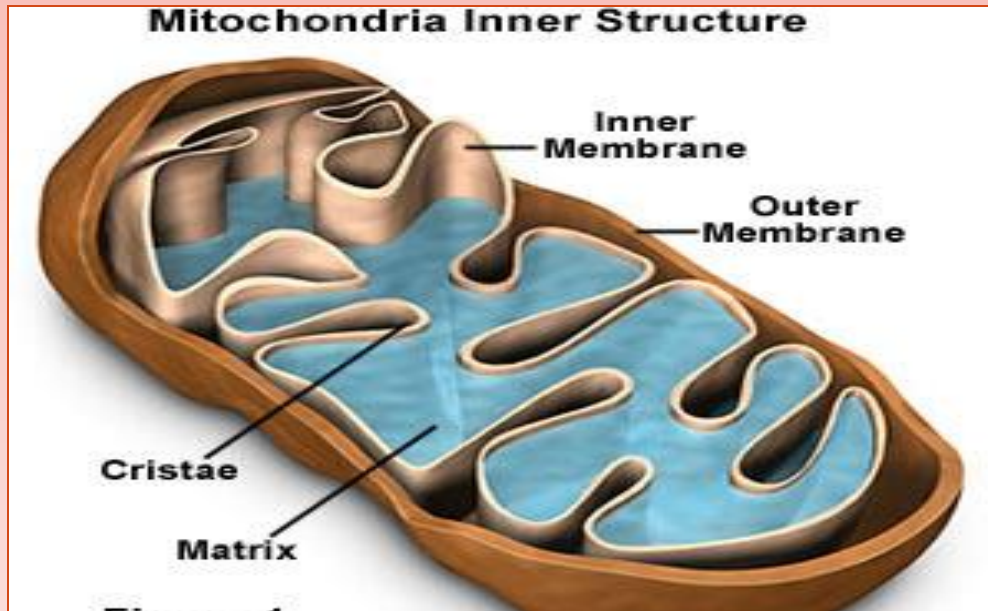




Mitochondria & chloroplasts came from free-living bacteria.

Both have circular DNA similar to bacteria.

- Both have ribosomes similar to bacteria; make proteins.
- Both reproduce themselves, and sizes are similar.





THANK YOU

