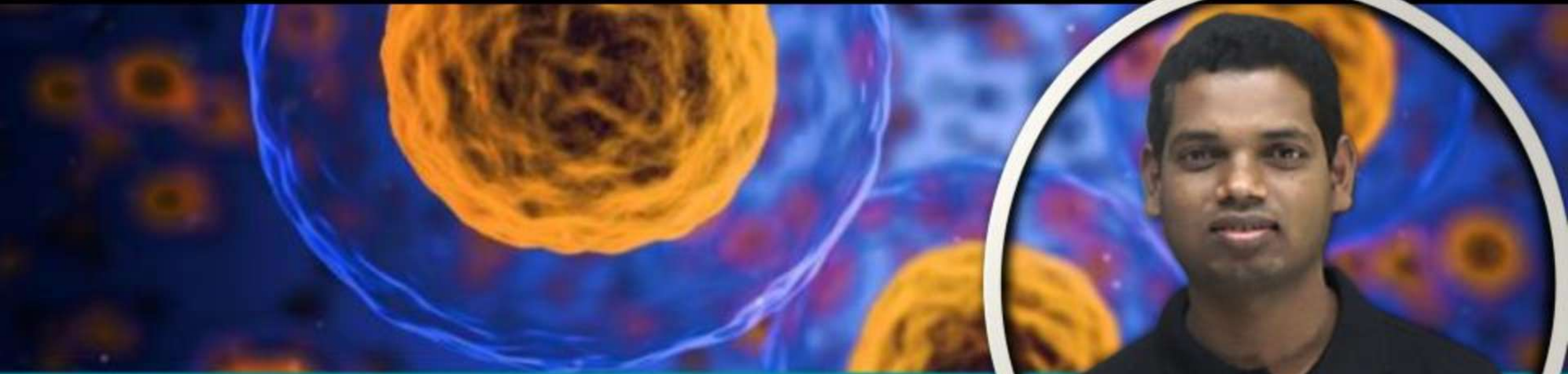


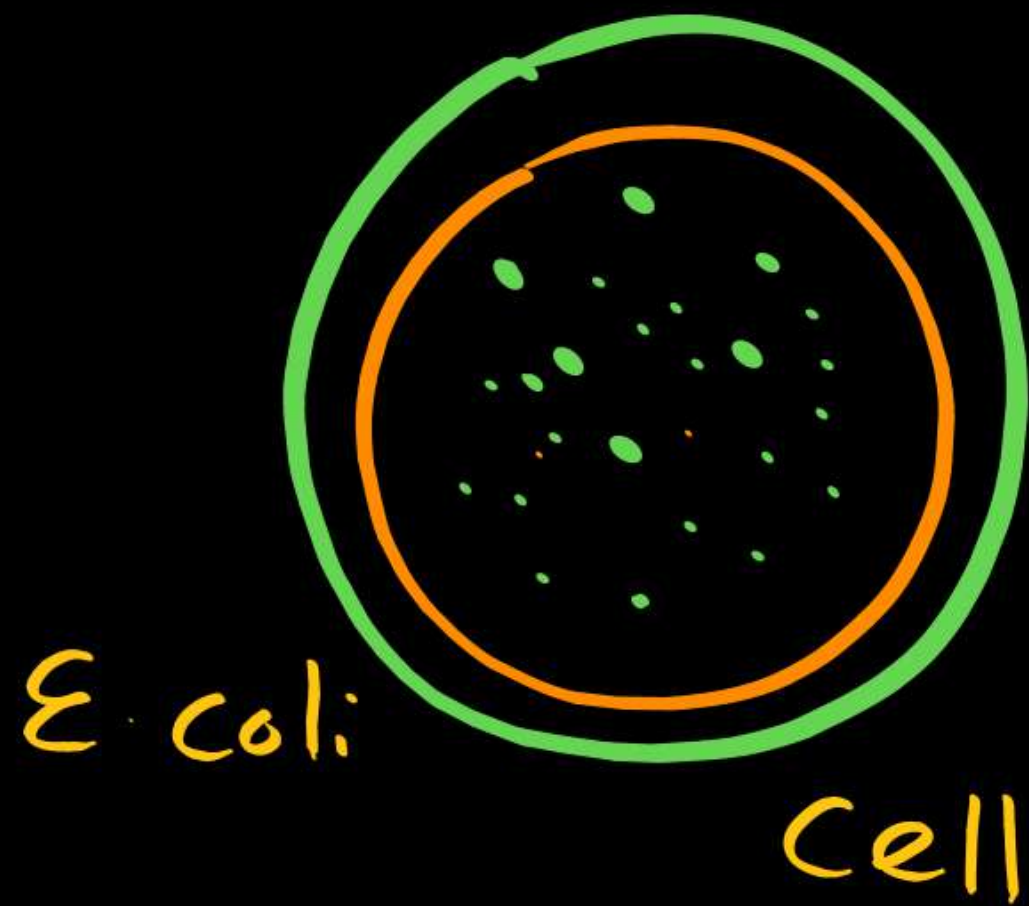


# ARJUNA NEET BATCH



**CELL THE UNIT OF LIFE**

**By : Biswajit Sir**





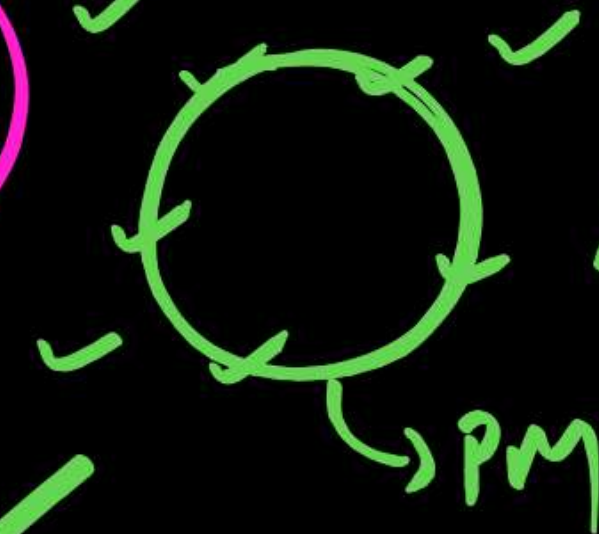
✓ Animal cell → PM → outer delimiting boundary

Nucleus → dense

✓ 70S 80S

✓ Hypothesis, theory

✓ Resolution power



Dhannu → Mannu



LM

0.2  $\mu\text{m}$   
 $10^{-6}$

EM

0.5 nm  
 $10^{-9}$

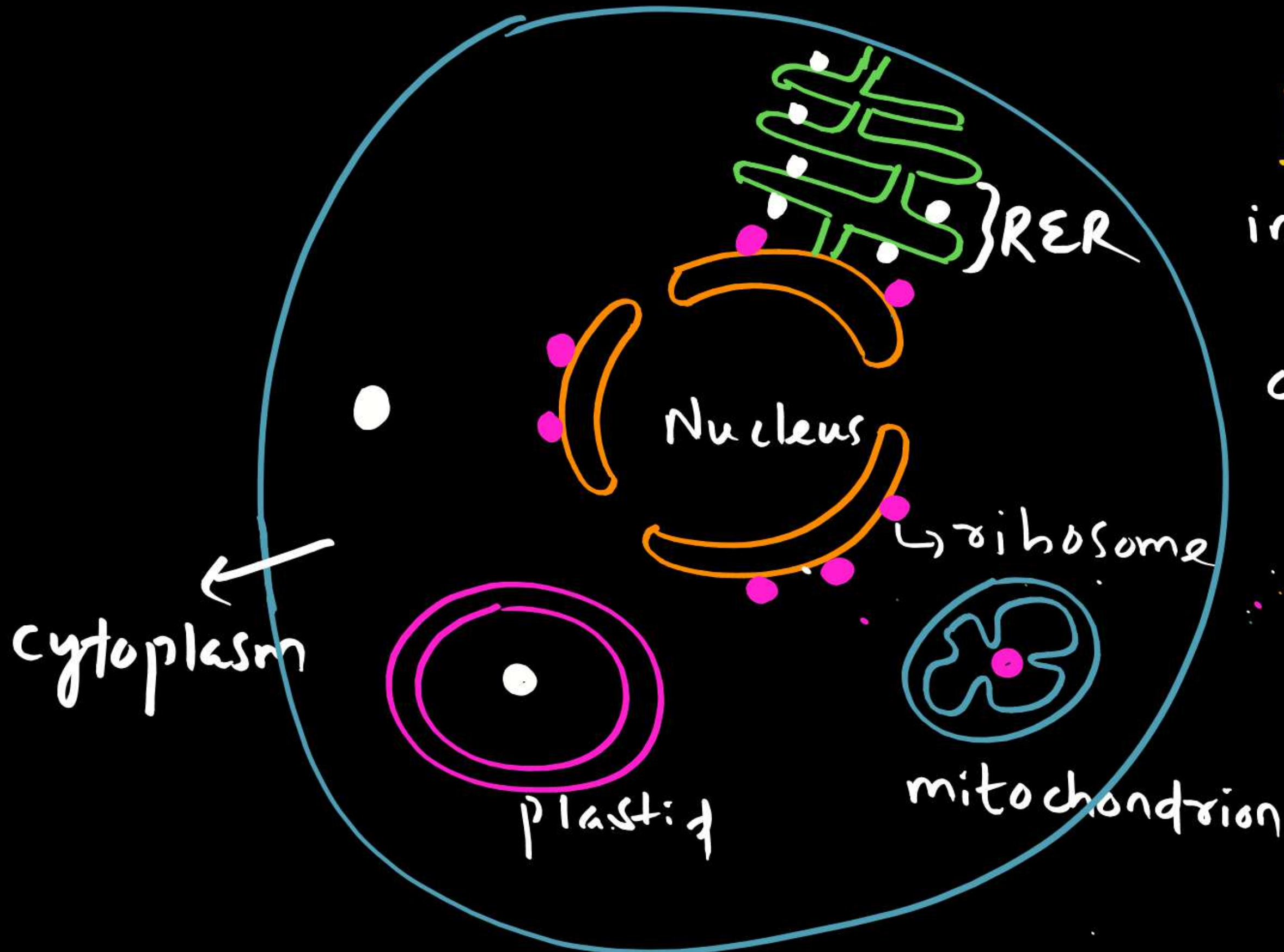
Today cell theory is understood as

→ All organisms are made of cells and cell products.

→ All cells arise from pre-existing cell.

Virus





<sup>EK</sup>  
Ribosome

in → mit., plastid  
cytoplasm  
on → ONM, RER

ER

Eukaryoti cell.

## SIZE OF CELLS

Variable ←

Virus →  $0.02 - 0.2 \mu\text{m}$

Mycoplasma →  $0.3 \mu\text{m}$  (length)

↳ Smallest cell

↳ PPLO →  $0.1 \mu\text{m}$

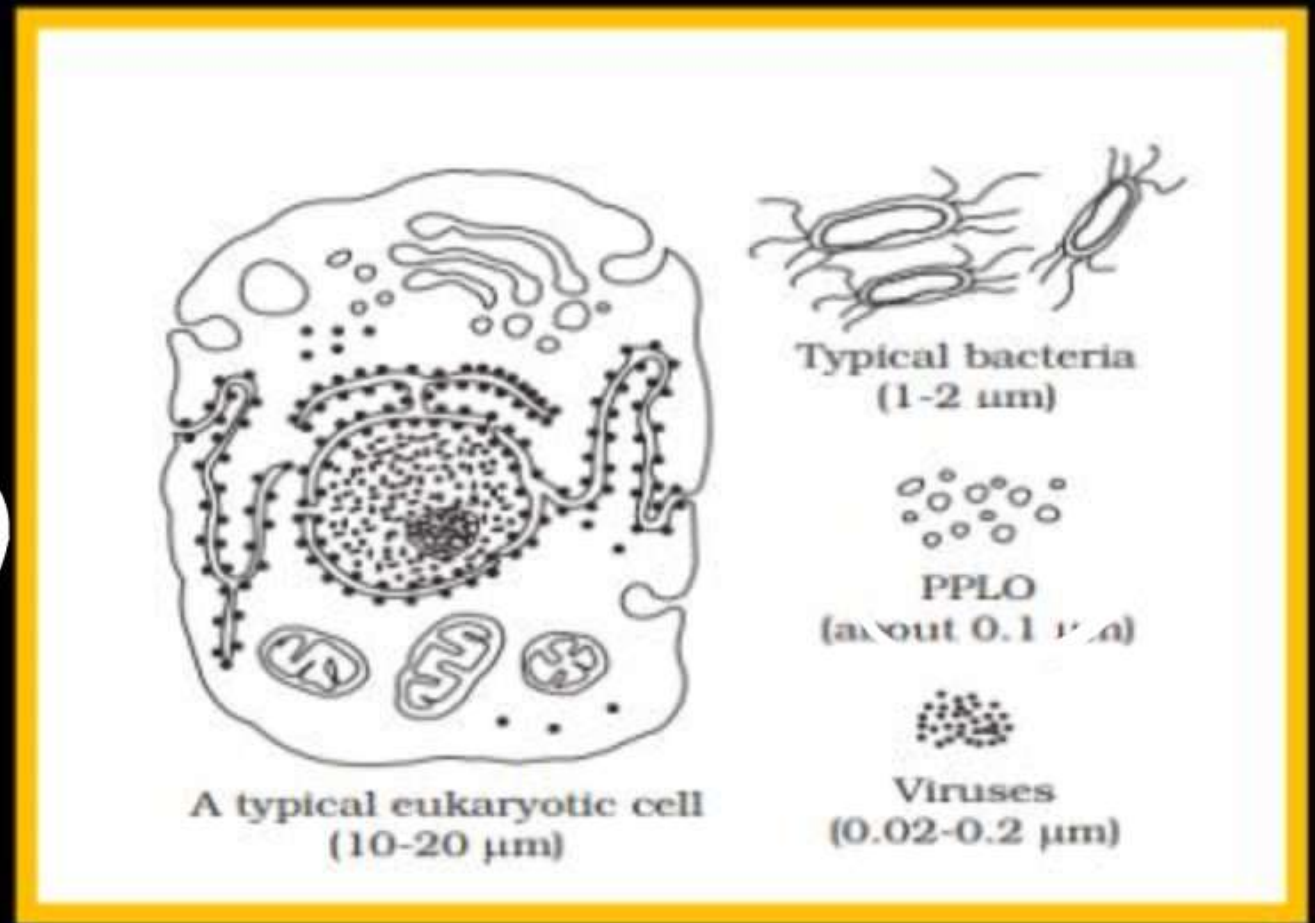
Bacteria could be →  $3 - 5 \mu\text{m}$

Typical PK (Bac) pleuropneumonia like organism

Typical EK →  $1 - 2 \mu\text{m}$

↳  $10 - 20 \mu\text{m}$

Thiomargarita



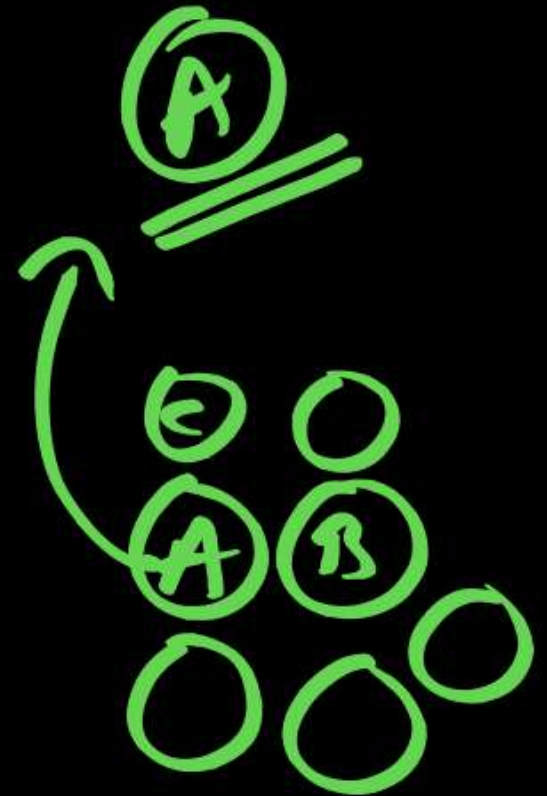


Human RBC  $\rightarrow$   $7.0\text{ }\mu\text{m}$  (diameter)

✓ neuron (nerve cell)  $\rightarrow$  longest cell

Ostrich egg  $\rightarrow$  largest isolated cell

$15\text{ cm} \times 13\text{ cm}$   
(length) (width)





In plants



Sclerenchyma fibre



longest cell in plants.

variable

# SHAPES OF CELLS

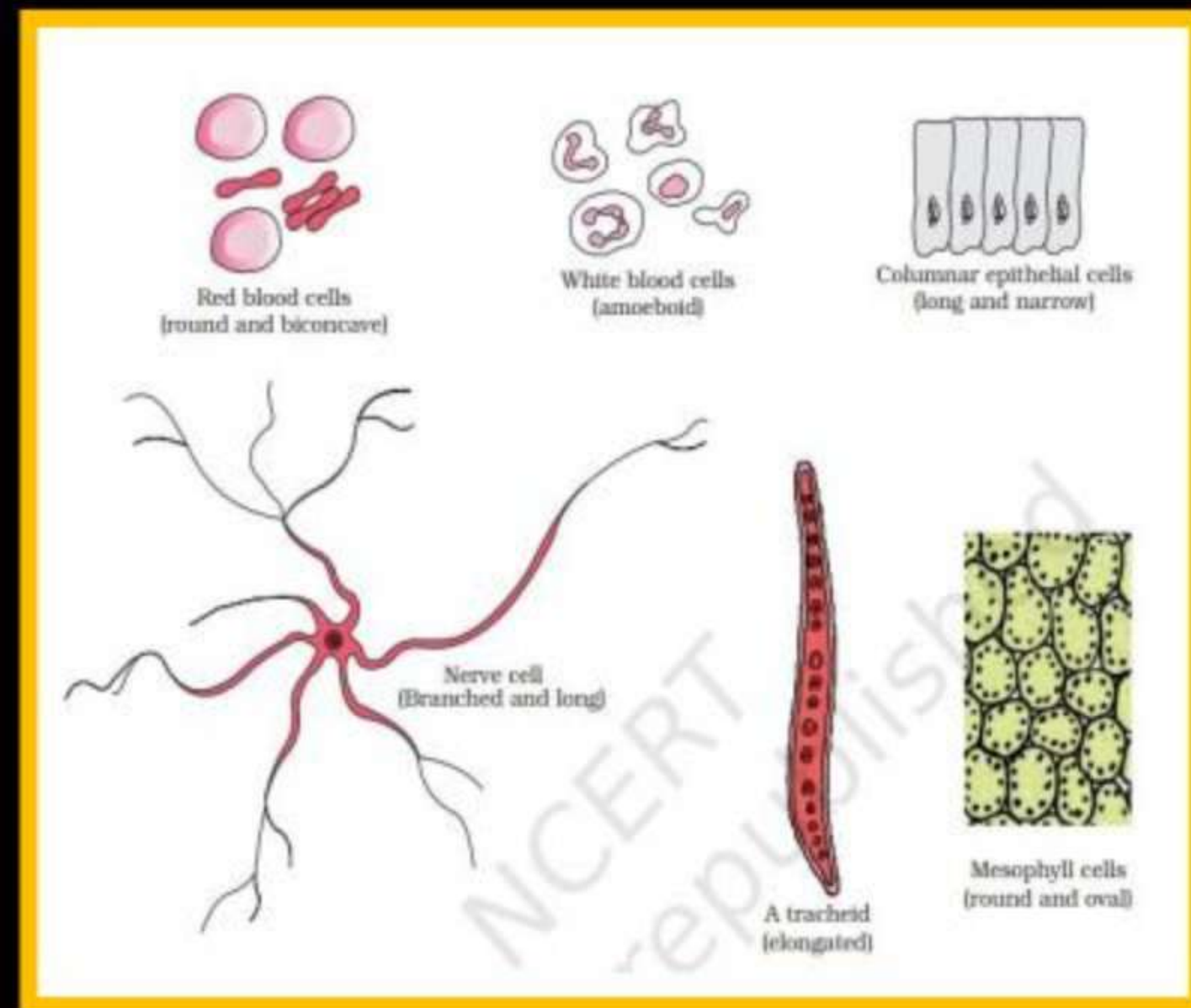


discoid, polygonal, cuboid,  
columnar, thread like, even  
irregular, etc.

RBC → round, biconcave

WBC → Amoeboid

columnar  
epithelial cell → long, narrow





nerve cell → long, branched

✓ Tracheid → elongated

mesophyll cell → round, oval

✓ Shape of cell → may depend on function performed  
by the cell.

Xylem

Variable ← Activities of cells

↳ functions

mesophyll cell → photosynthesis

tracheid → transports  $H_2O$ , minerals.

plasma cell → produces antibodies.

RBC → transports oxygen

very vary





## WHAT IS A CELL?

Unicellular organisms are capable of

- (i) independent existence and
- (ii) performing the essential functions of life.

Anything less than a complete structure of a cell does not ensure independent living. Hence, cell is the fundamental structural and functional unit of all living organisms.

per se



## CELL THEORY



In 1838, Matthias Schleiden, a German botanist, examined a large number of plants and observed that all plants are composed of different kinds of cells which form the tissues of the plant. At about the same time, Theodore Schwann (1839), a British Zoologist, studied different types of animal cells and reported that cells had a thin outer layer which is today known as the 'plasma membrane'. He also concluded, based on his studies on plant tissues, that the presence of cell wall is a unique character of the plant cells. On the basis of this, Schwann proposed the hypothesis that the bodies of animals and plants are composed of cells and products of cells.



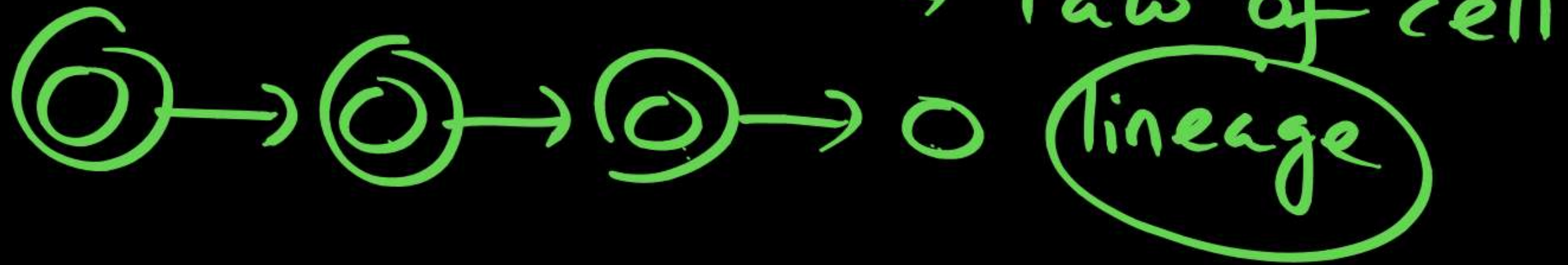




Schleiden and Schwann together formulated the cell theory. This theory however, did not explain as to how new cells were formed. Rudolf Virchow (1855) first explained that cells divided and new cells are formed from pre-existing cells (Omnis cellula-e cellula). He modified the hypothesis of Schleiden and Schwann to give the cell theory a final shape.

Cell theory as understood today is:

- (i) all living organisms are composed of cells and products of cells.
- (ii) all cells arise from pre-existing cells.







## **AN OVERVIEW OF CELL**

**You have earlier observed cells in an onion peel and/or human cheek cells under the microscope. Let us recollect their structure. The onion cell which is a typical plant cell, has a distinct cell wall as its outer boundary and just within it is the cell membrane. The cells of the human cheek have an outer membrane as the delimiting structure of the cell. Inside each cell is a dense membrane bound structure called nucleus. This nucleus contains the chromosomes which in turn contain the genetic material, DNA. Cells that have membrane bound nuclei are called eukaryotic whereas cells that lack a membrane bound nucleus are prokaryotic. In both prokaryotic and eukaryotic cells, a semi-fluid matrix called cytoplasm occupies the volume of the cell.**







The cytoplasm is the main arena of cellular activities in both the plant and animal cells. Various chemical reactions occur in it to keep the cell in the 'living state'.

Besides the nucleus, the eukaryotic cells have other membrane bound **distinct** structures called **organelles** like the endoplasmic reticulum (ER), the Golgi complex, lysosomes, mitochondria, micro bodies and vacuoles. The prokaryotic cells lack such membrane bound organelles. Ribosomes are non-membrane bound organelles found in all cells – both eukaryotic as well as prokaryotic. Within the cell, ribosomes are found not only in the cytoplasm but also within the two organelles – chloroplasts (in plants) and mitochondria and on rough ER. Animal cells contain another non-membrane bound organelle called centrosome which helps in cell division.





**Cells differ greatly in size, shape and activities. For example, Mycoplasmas, the smallest cells, are only  $0.3\text{ }\mu\text{m}$  in length while bacteria could be 3 to  $5\text{ }\mu\text{m}$ . The largest isolated single cell is the egg of an ostrich. Among multicellular organisms, human red blood cells are about  $7.0\text{ }\mu\text{m}$  in diameter. Nerve cells are some of the longest cells. Cells also vary greatly in their shape. They may be disc-like, polygonal, columnar, cuboid, thread like, or even irregular. The shape of the cell may vary with the function they perform.**





# EUKARYOTIC CELL



→ includes → all protists, fungi, plants, animals

→ Nucleus

↳ membrane bound  
well defined  
well organised

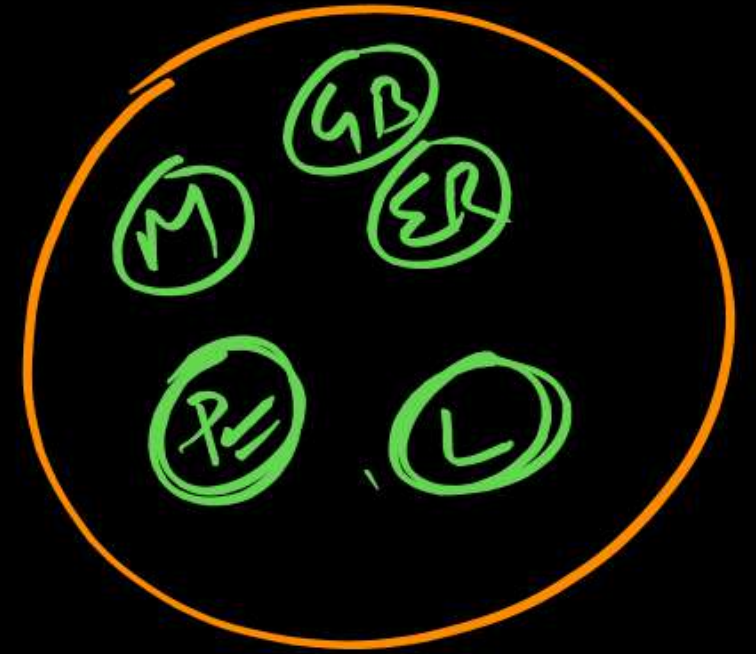
chromosomes ← genetic material  
organised (ds DNA)



EK cell

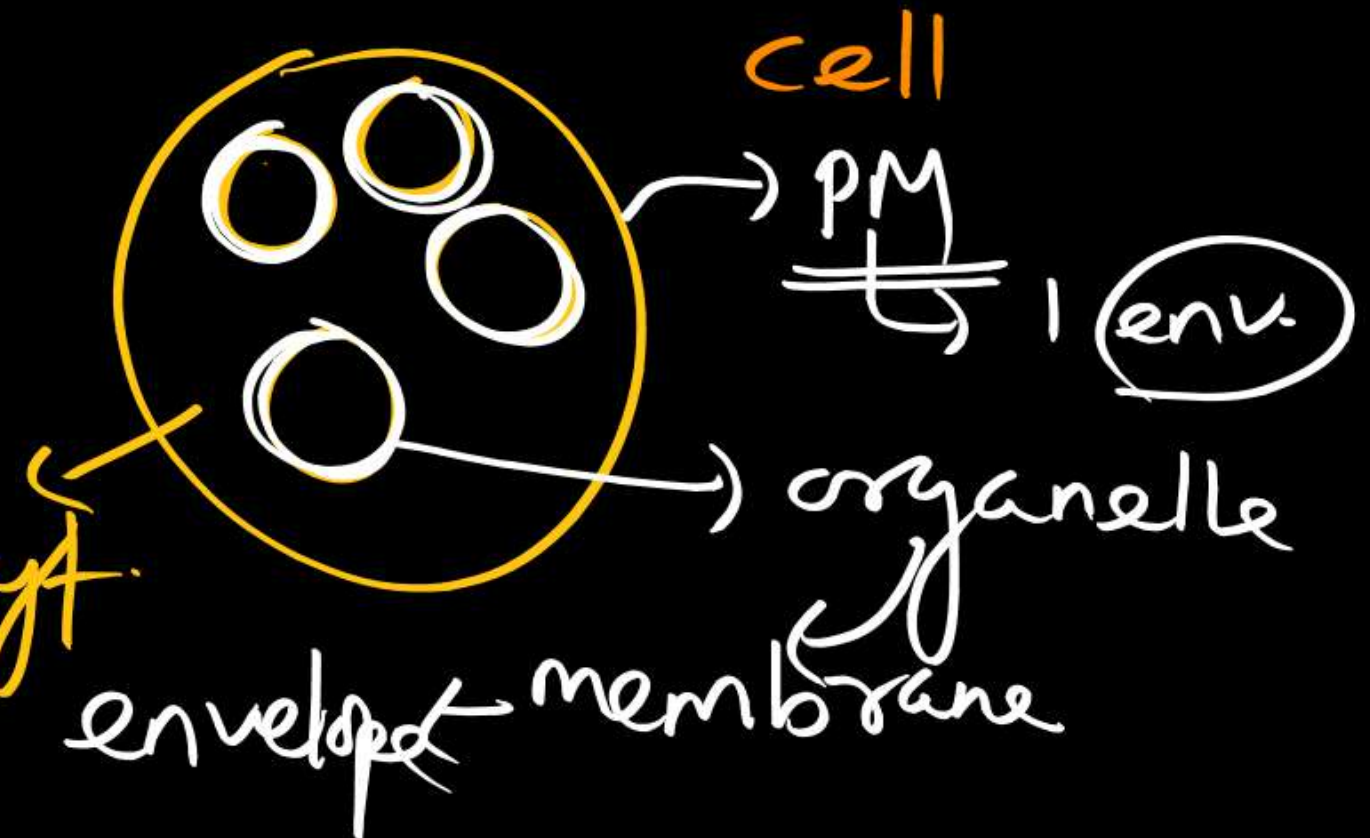
membrane bound organelles

↓ Results



→ EK cells show extensive  
compartmentalisation  
of cytoplasm

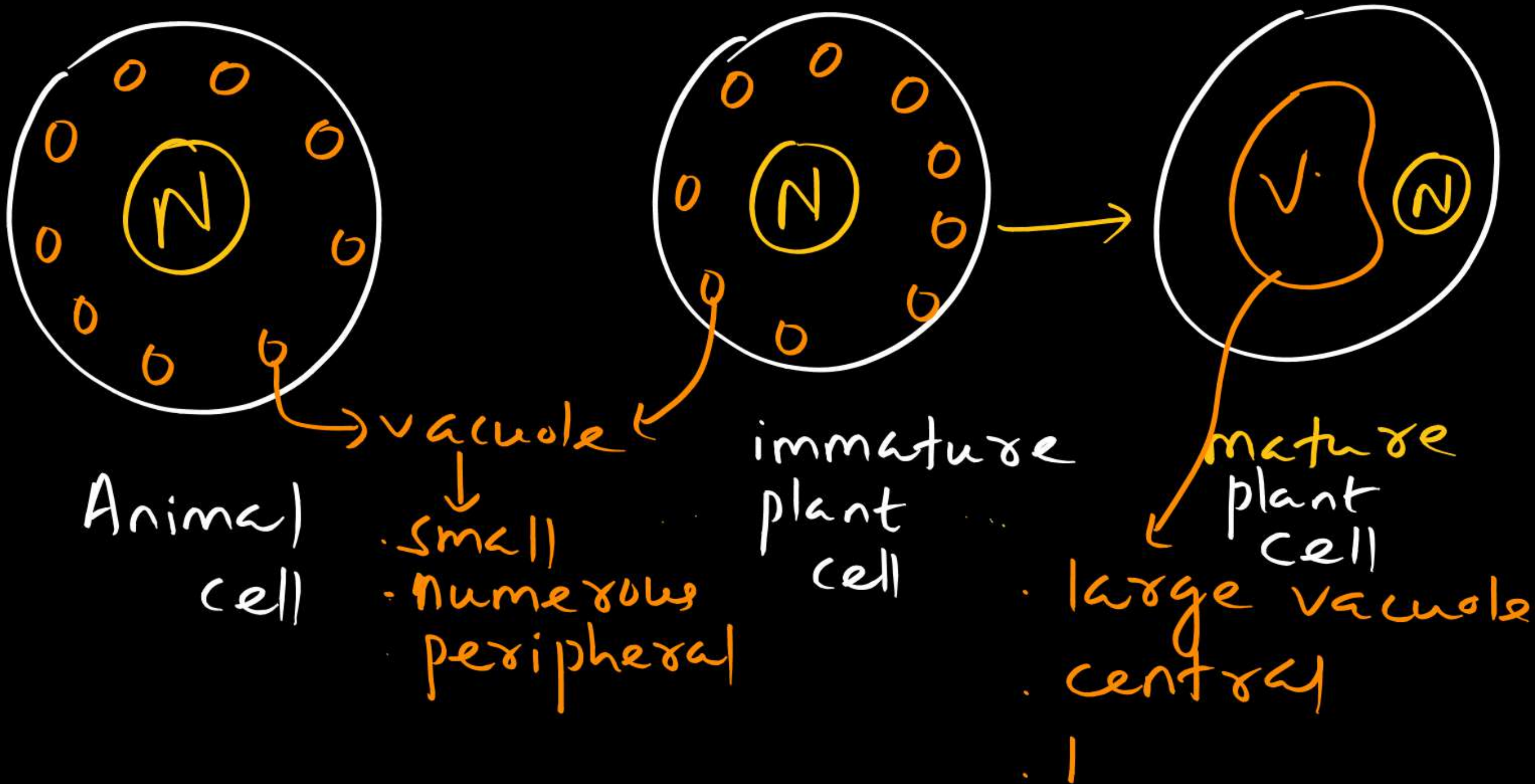
→ double envelope system <sup>cyt.</sup>





All EK cells  $\rightarrow$  nonidentical

	<u>plant cell</u>	<u>Animal cell</u>
cell wall	+	-
plastid	+	-
✓ large central vacuole	+	-
Centrosome (2 centriole)	- (most of plant cells)	+





## ✓ EK cells

→ varieties of  
Structures

✓ cytoskeleton  
→ microtubule  
→ microfilament  
→ intermediate  
filament

locomotory

↳ Cilia

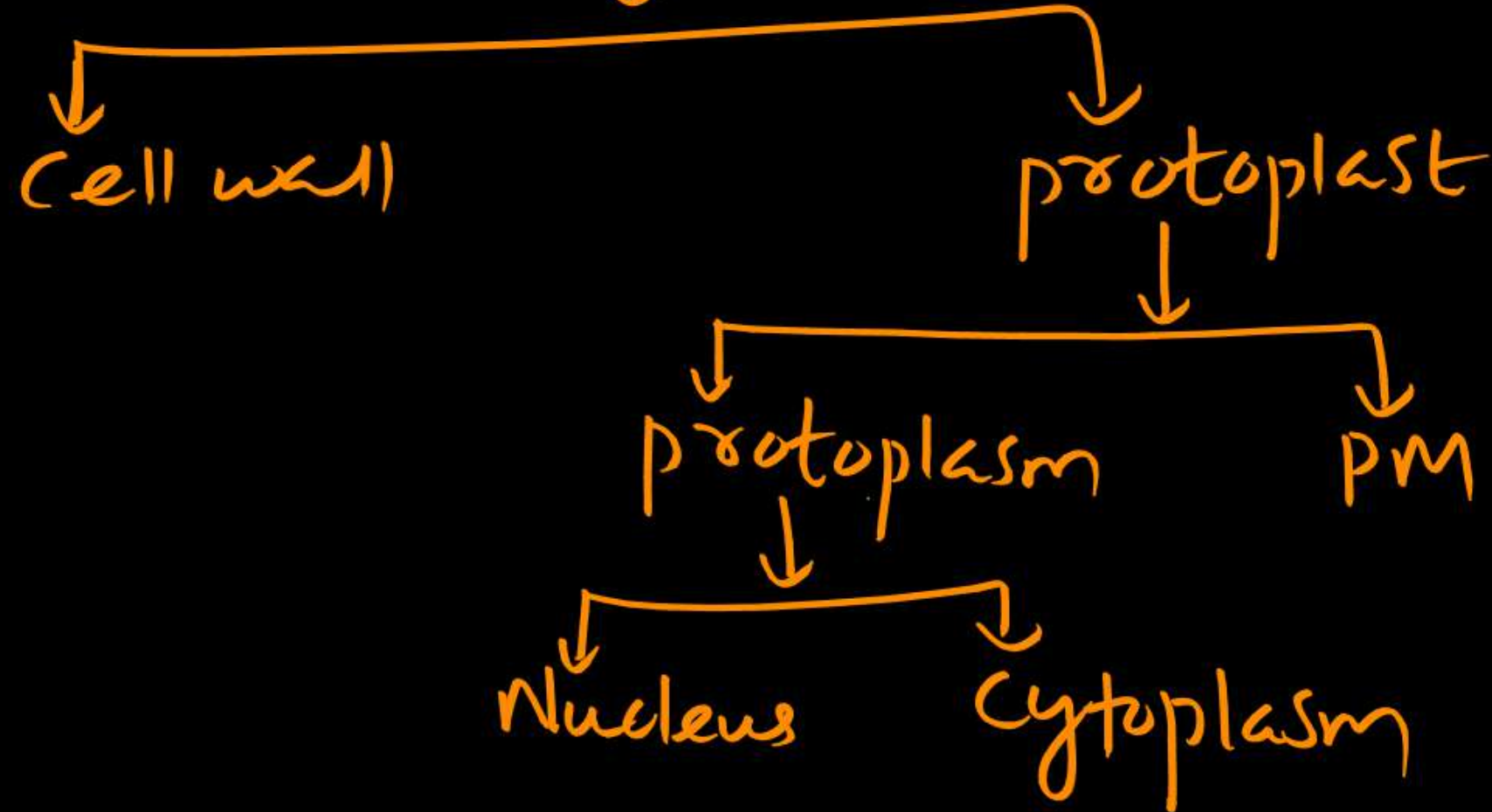
flagella

Pseudopodia

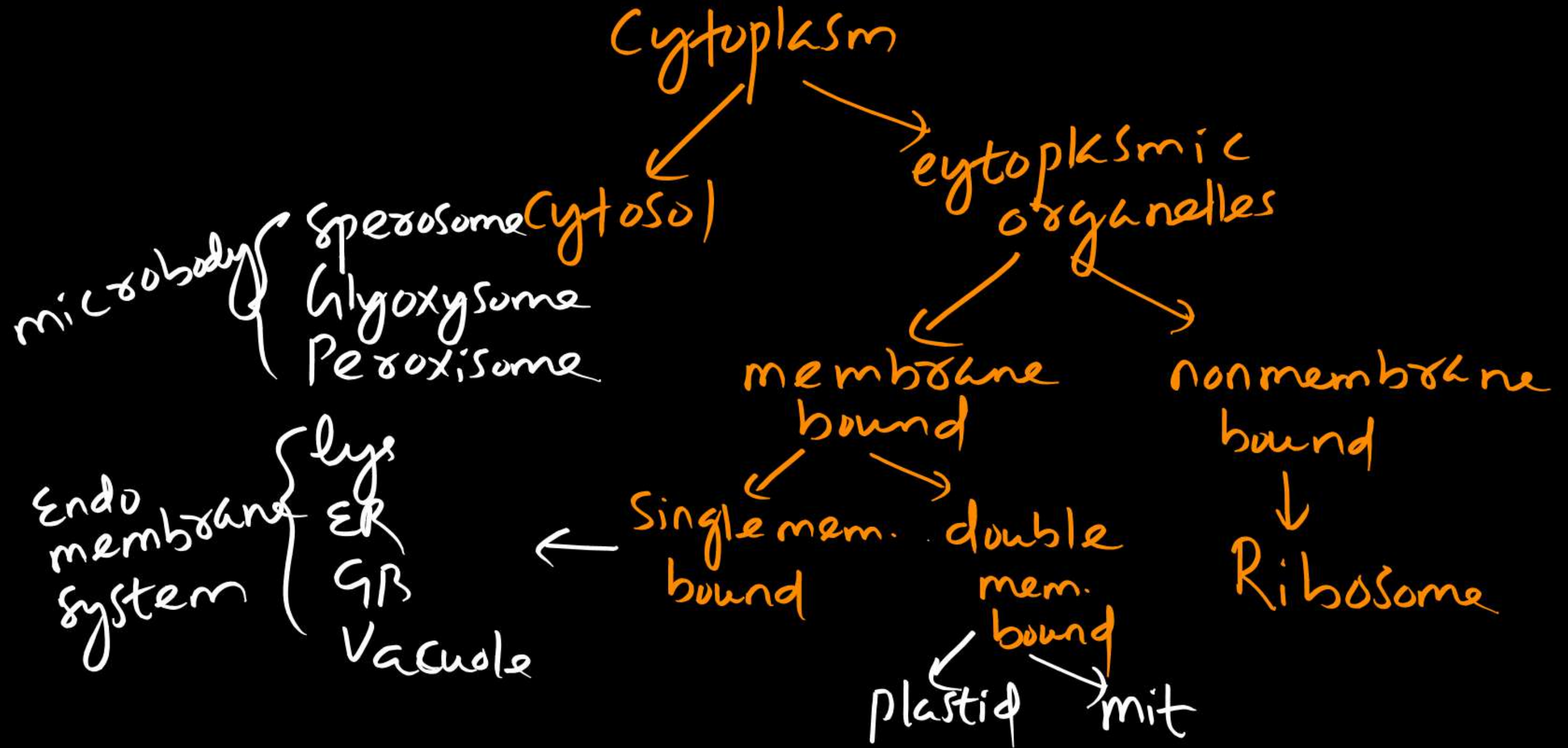
# VARIOUS COMPONENTS OF EUKARYOTIC CELL



Typical plant cell









*Thank You बच्चों*

