VIRAAT BATCH

CDS-2 , 2023

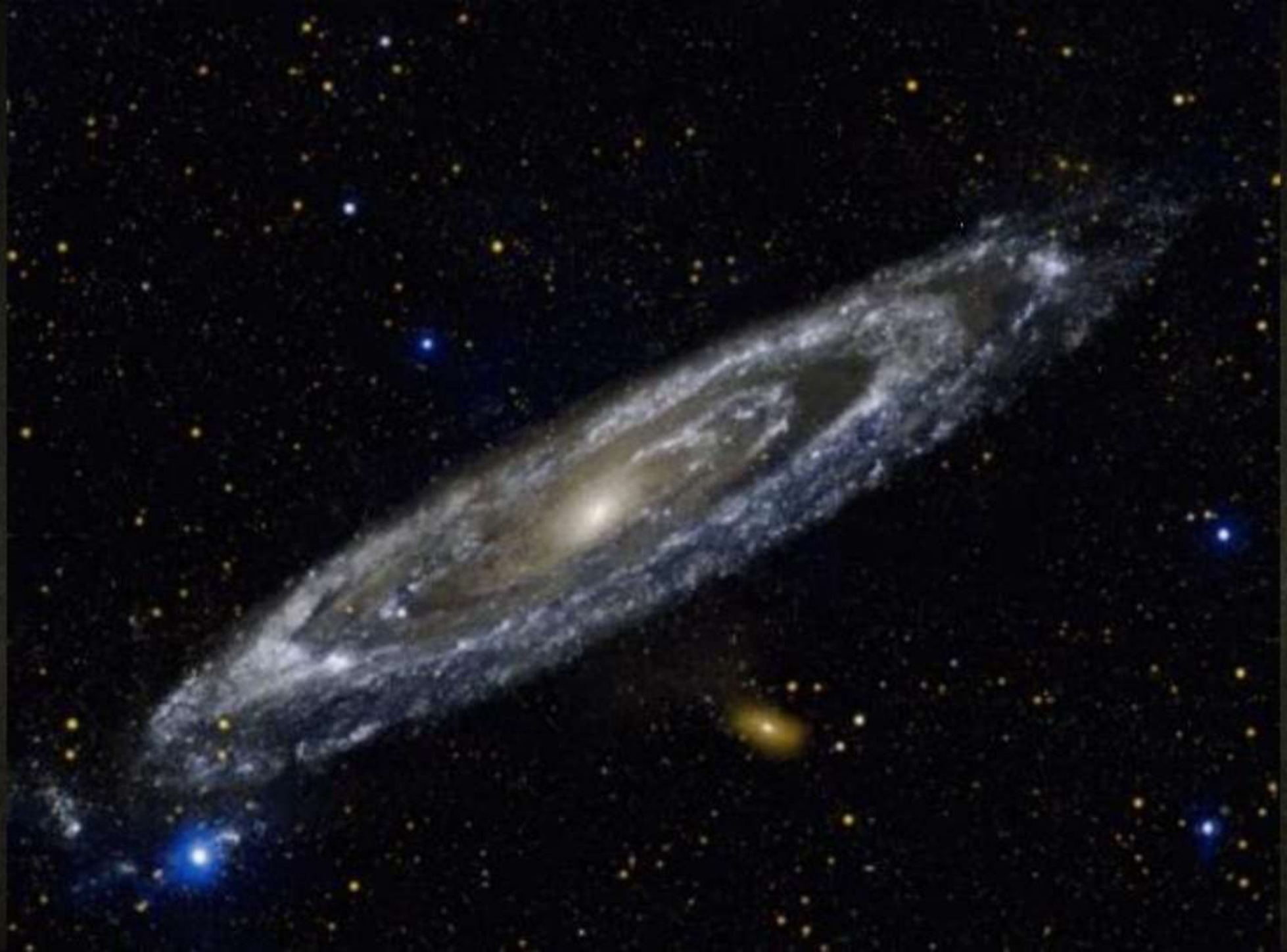
- Biology
- Cell (Part - 1)

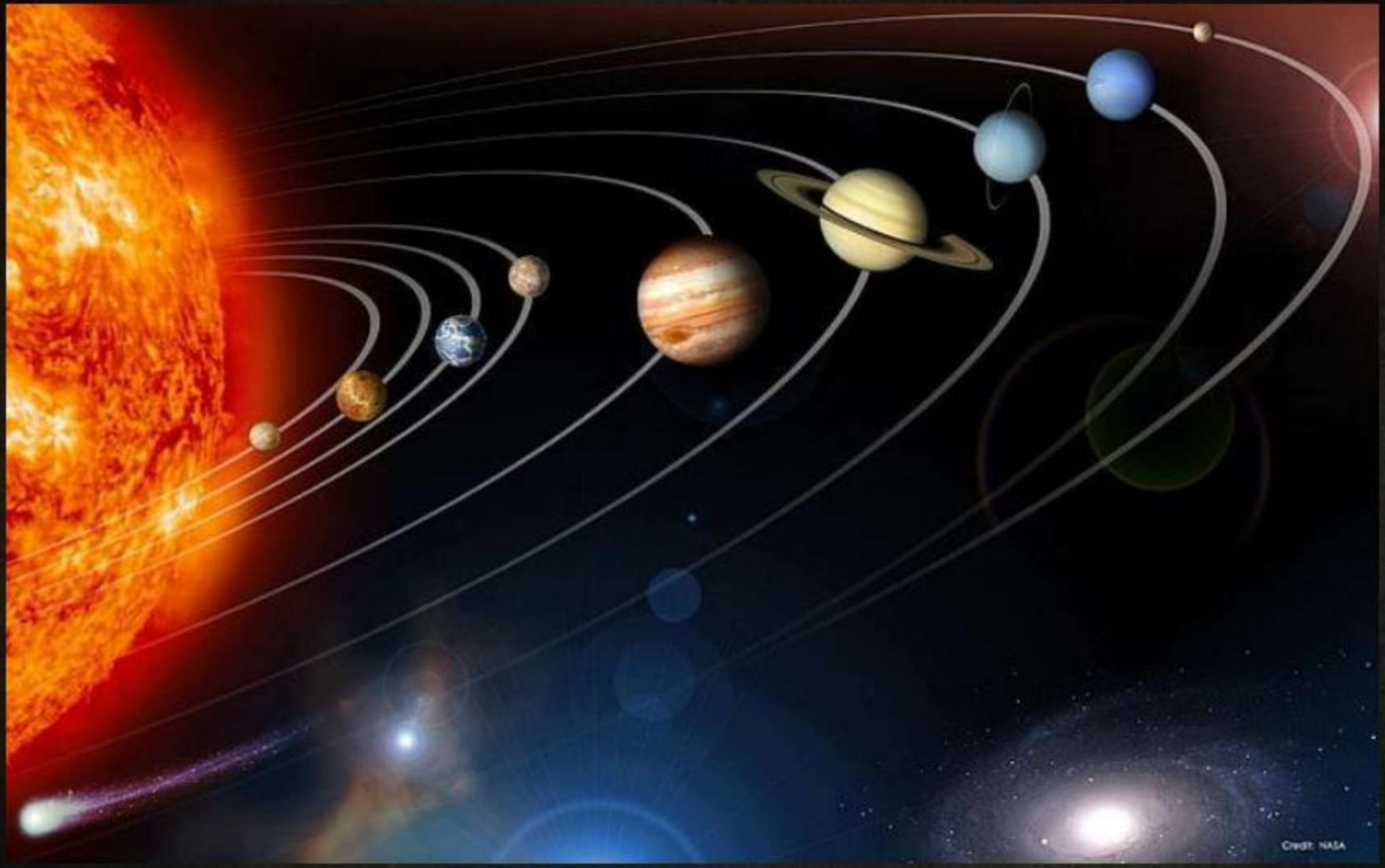
Lecture No.- 01

By- Dr. Soumya ma'am

TODAY'S TARGETS

1. Cell
2.
3.
4.



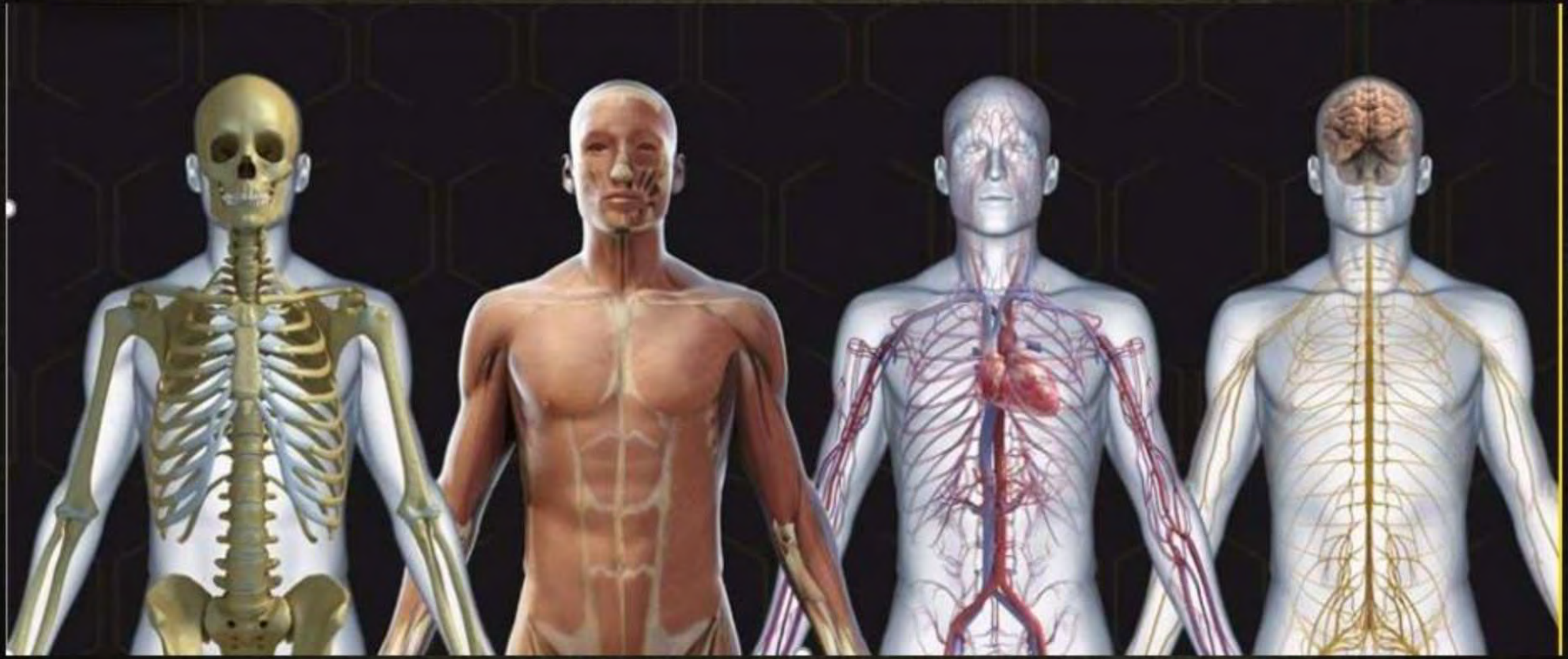

Credit: NASA

10 Major Systems responsible for body functions

- SKELETAL
- MUSCULAR
- CARDIOVASCULAR
- NERVOUS
- ENDOCRINE

- LYMPHATIC
- RESPIRATORY
- DIGESTIVE
- URINARY
- REPRODUCTIVE

Infrastructure systems



Skeletal system

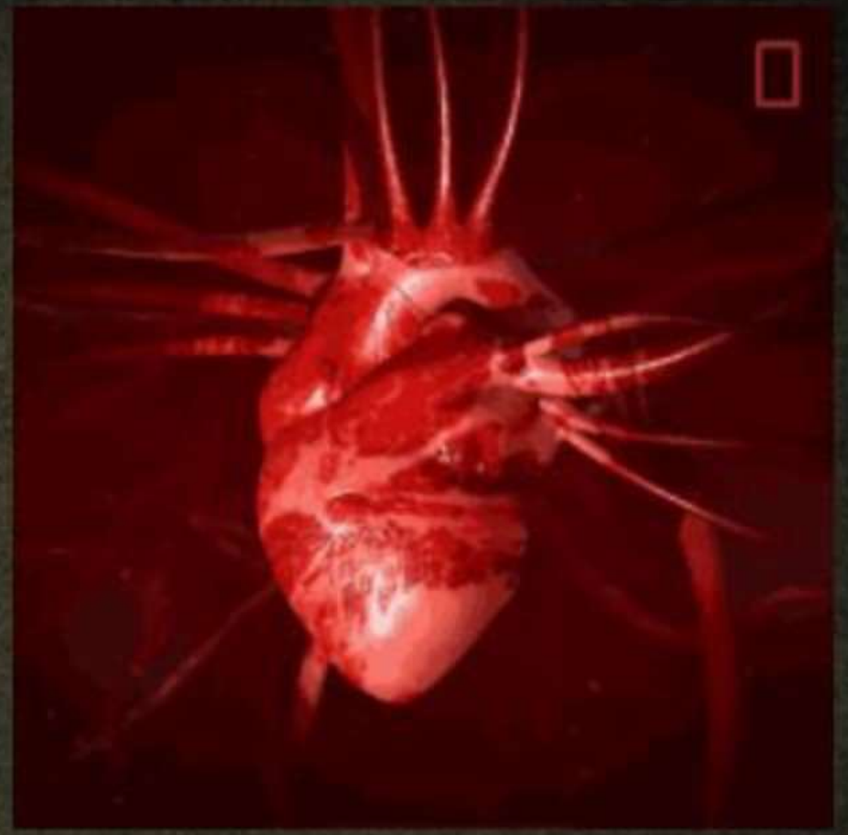
- OVER 200 BONES
- Hold the body together
- Give it shape
- Protects tissues and organs
- Anchor points for muscular system

Muscular system

- Found throughout the body and facilitate movement

Cardiovascular system

- A pipeline that includes the heart, blood vessels and blood.
- Also known as the circulatory system.

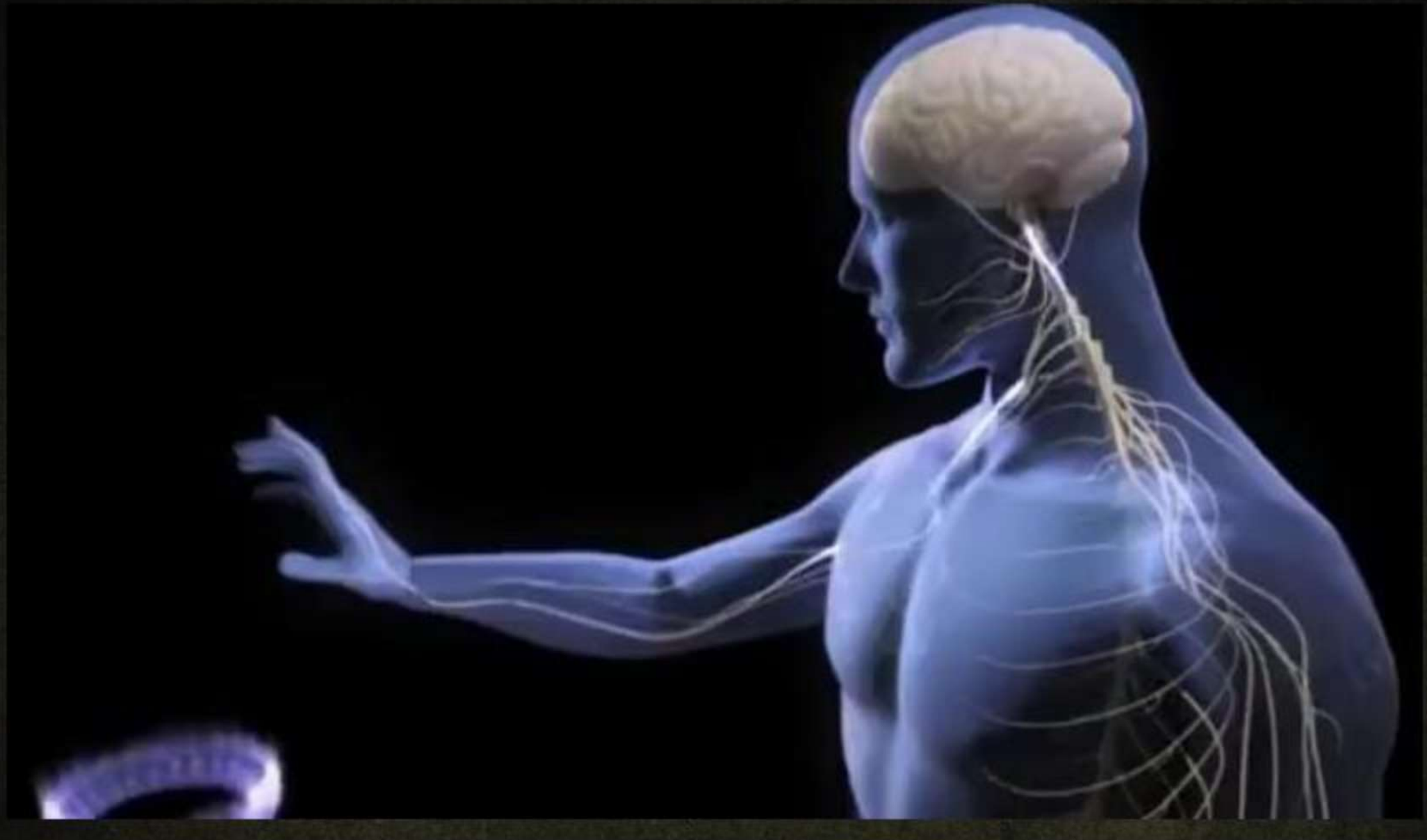


Delivers – Oxygen
WBCs
Hormones and
Nutrients throughout the body

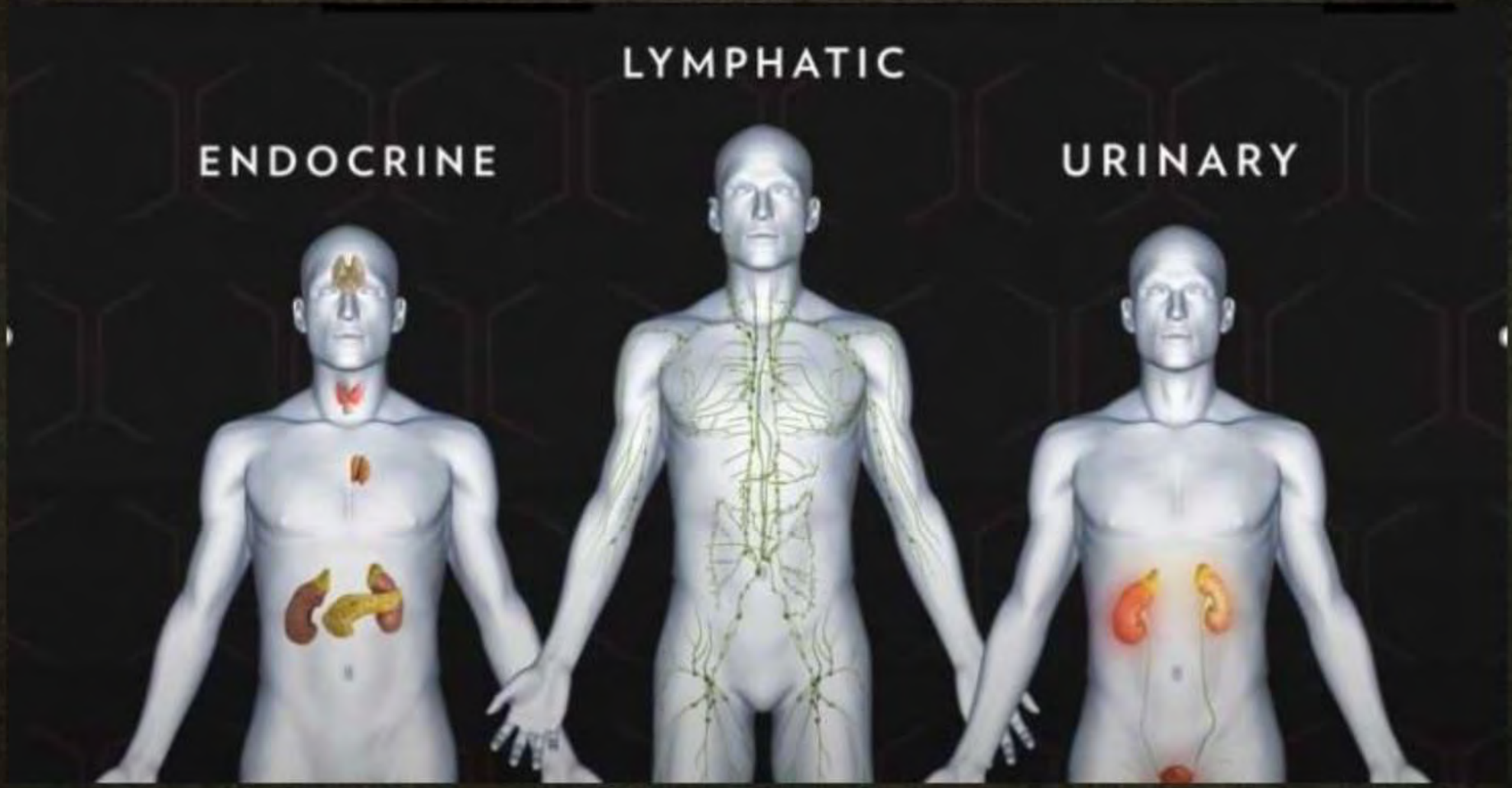
Nervous system

- Communication system of the nerve cells that the body uses to transmit information and coordinate body functions.

- Brain
- Spinal cord
- Cranial nerves
- Spinal nerves

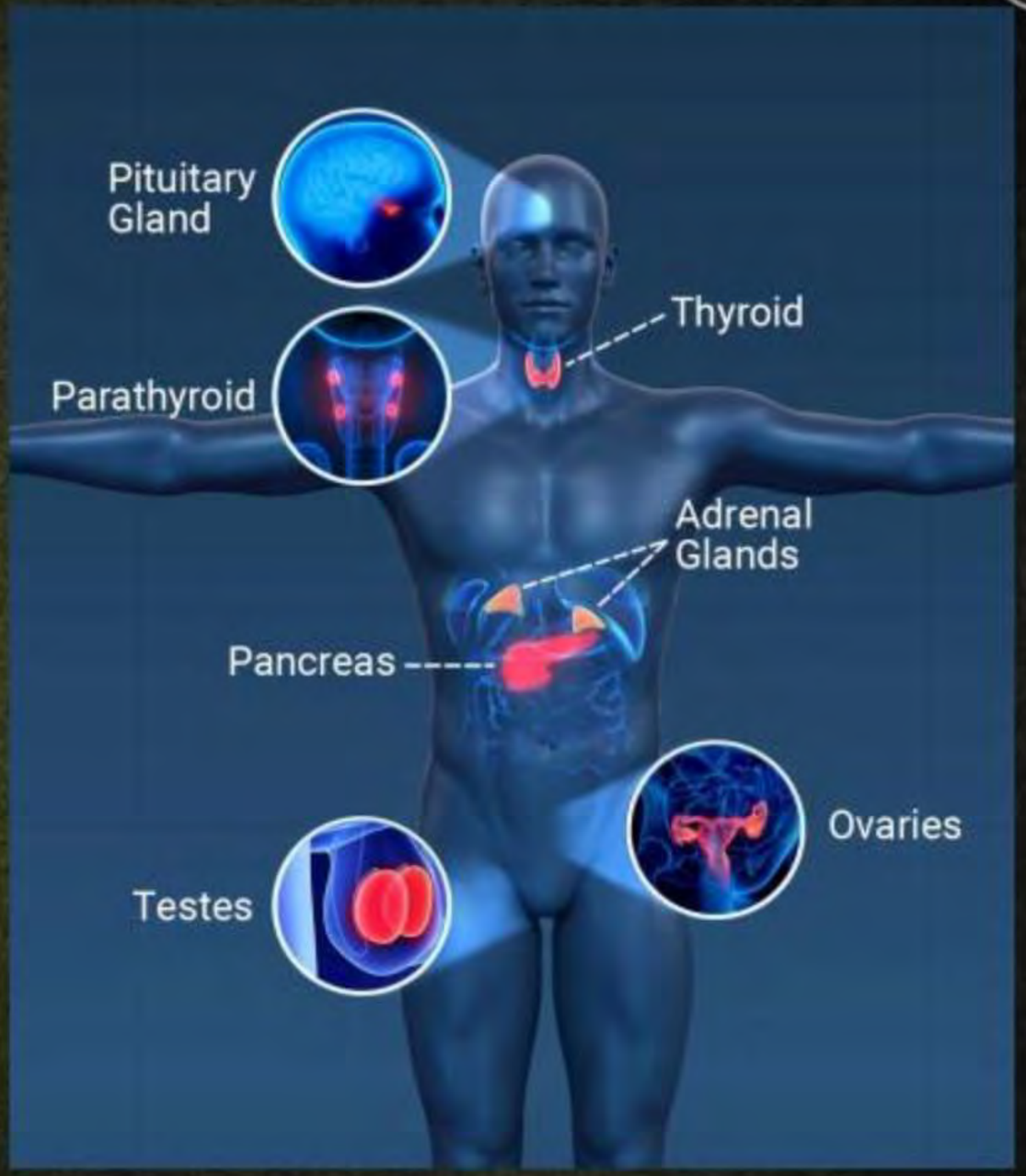


Regulatory systems- Regulate the body environment



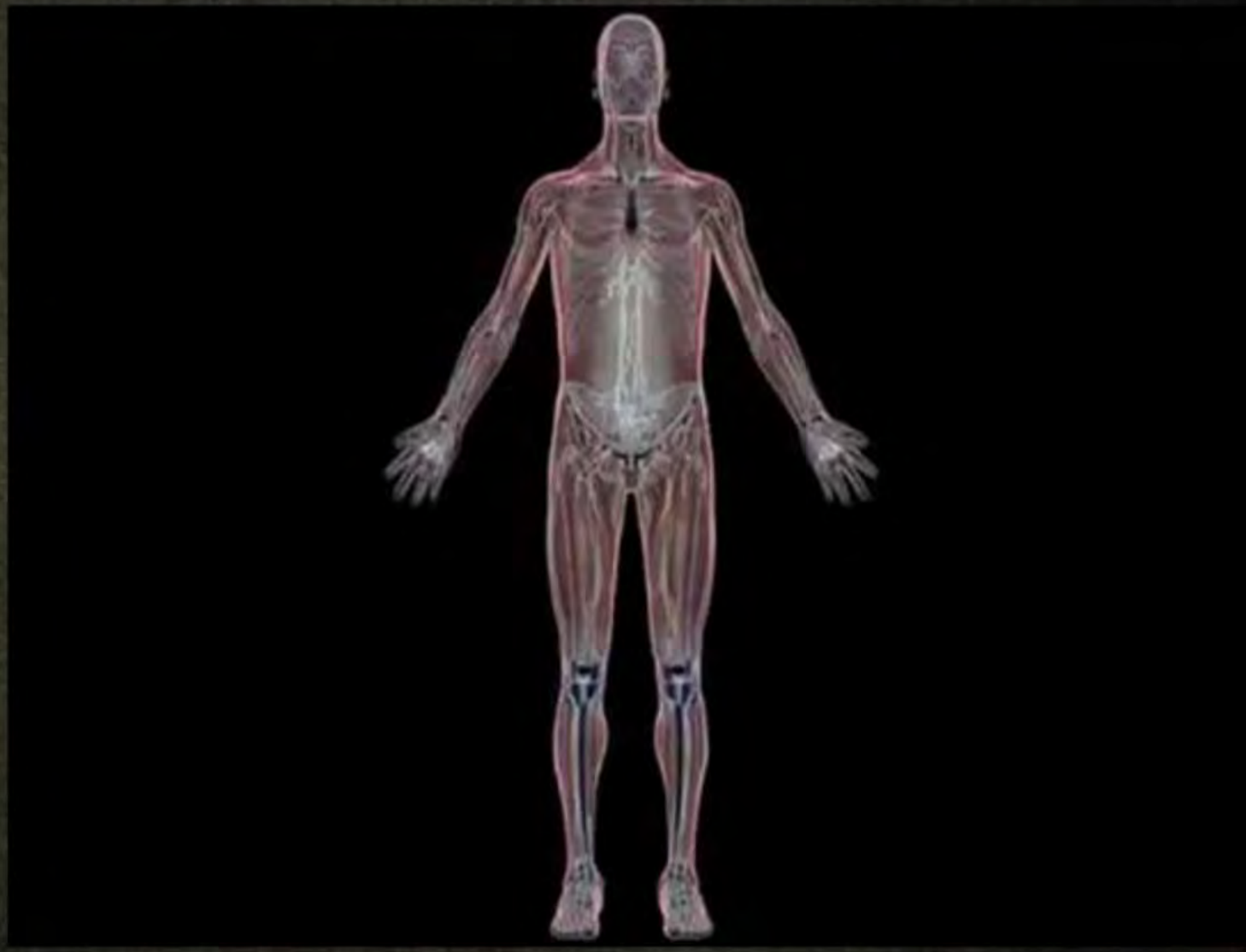
Endocrine system

- Series of glands that use the information carried by the nervous system to help regulate the bodys processes .
- Due to the neural connection, endocrine glands are aware of the amount of hormones and the other chemicals they need to produce.
- Chemicals distributed throughout the body by cardiovascular system.



Lymphatic system

- A collection of lymph nodes and vessels.
- Help regulate the body's defences.
- Aka the immune system
- Uses neural system to transmit information about the affected areas of the body and then sends out healing agents like WBCs via the blood stream.

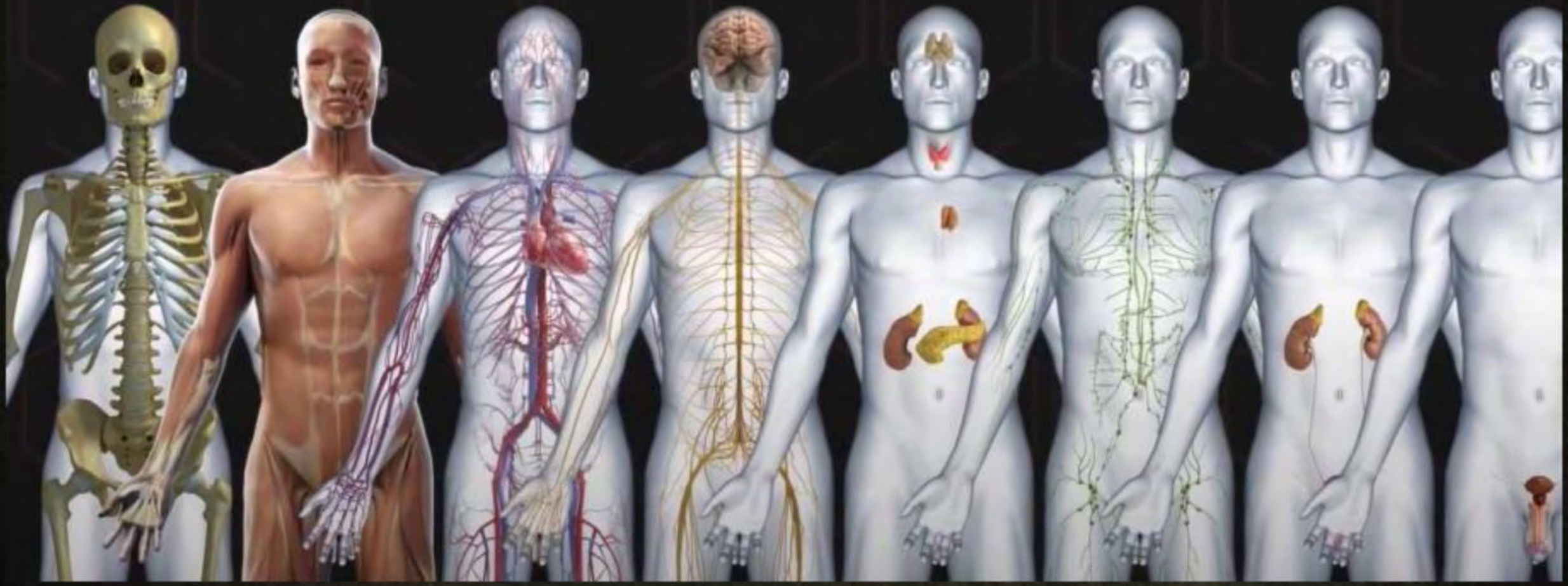


Urinary system

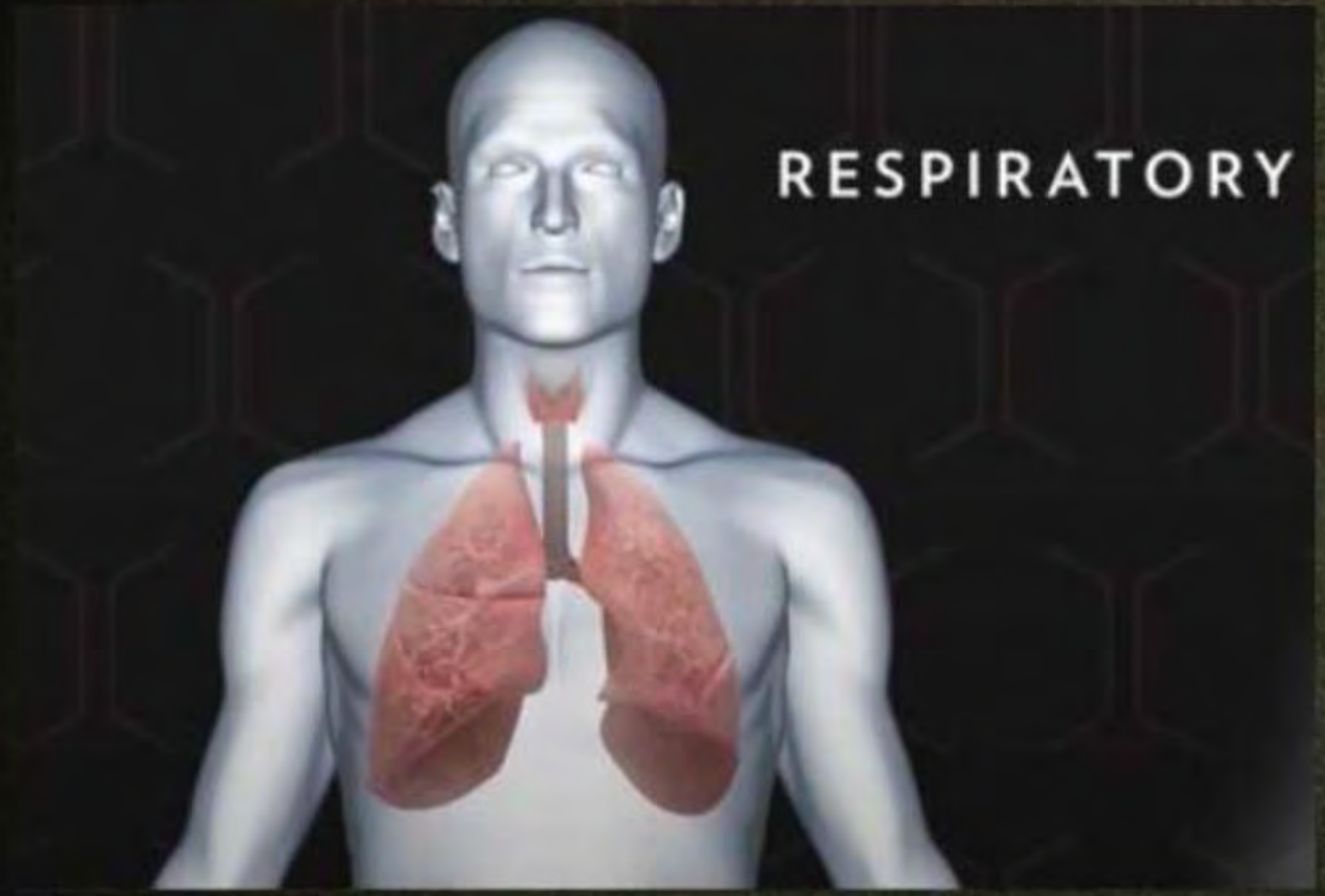
- Kidneys
- Ureters
- Urinary bladder
- Urethra

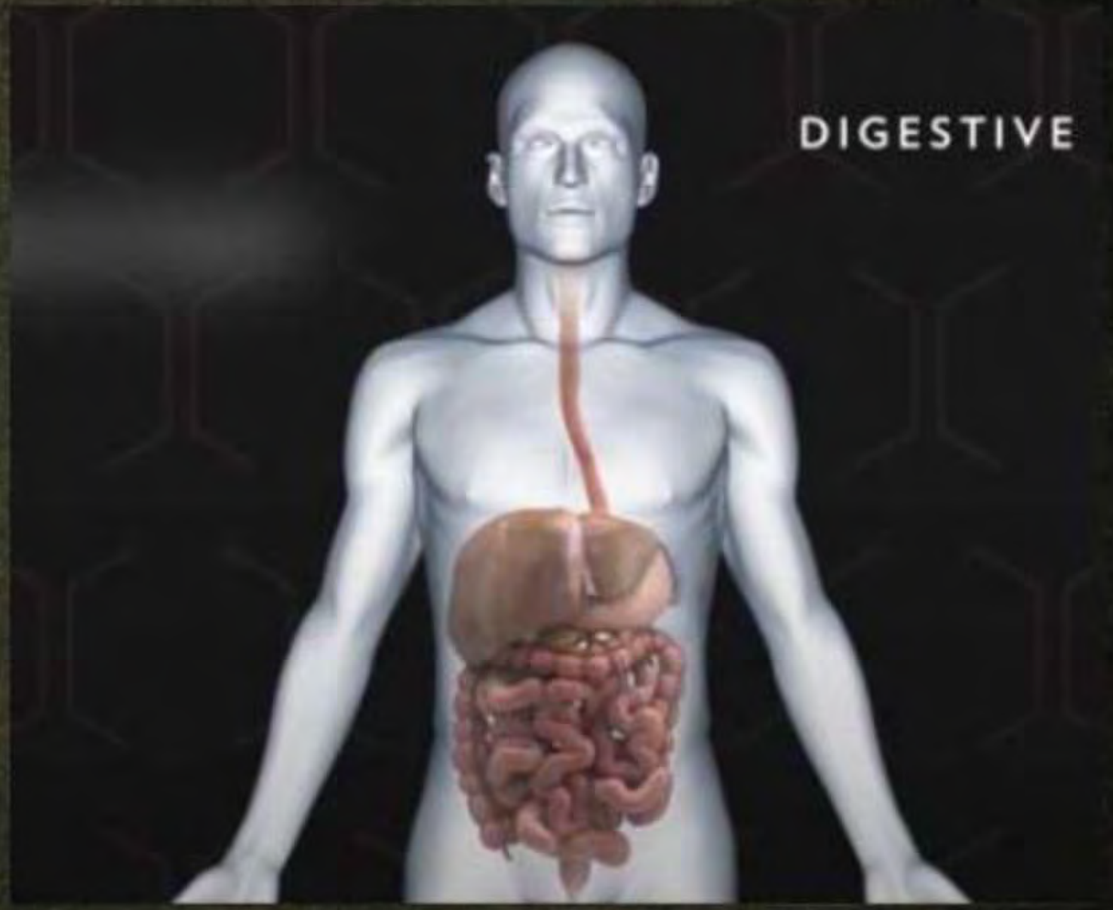
- Maintains the body's electrolyte levels and filters wastes from the blood.
- This waste is sent through the blood vessels into the kidneys and then expelled as urine.

REQUIRE ENERGY TO FUNCTION

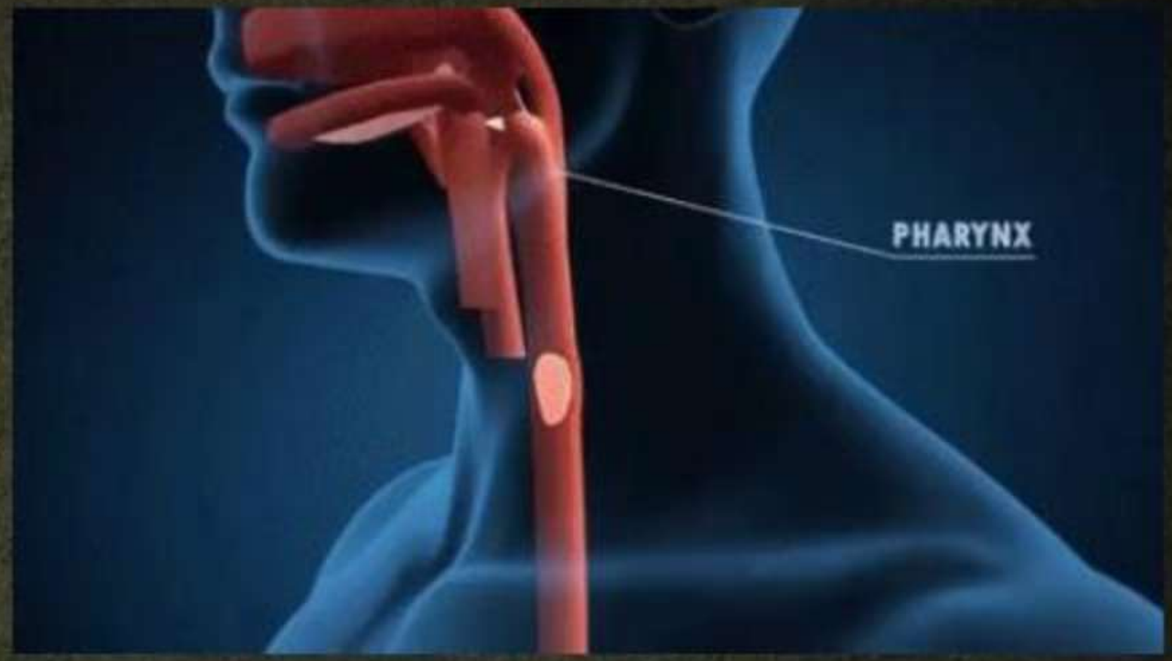


Energy systems





Digestive system

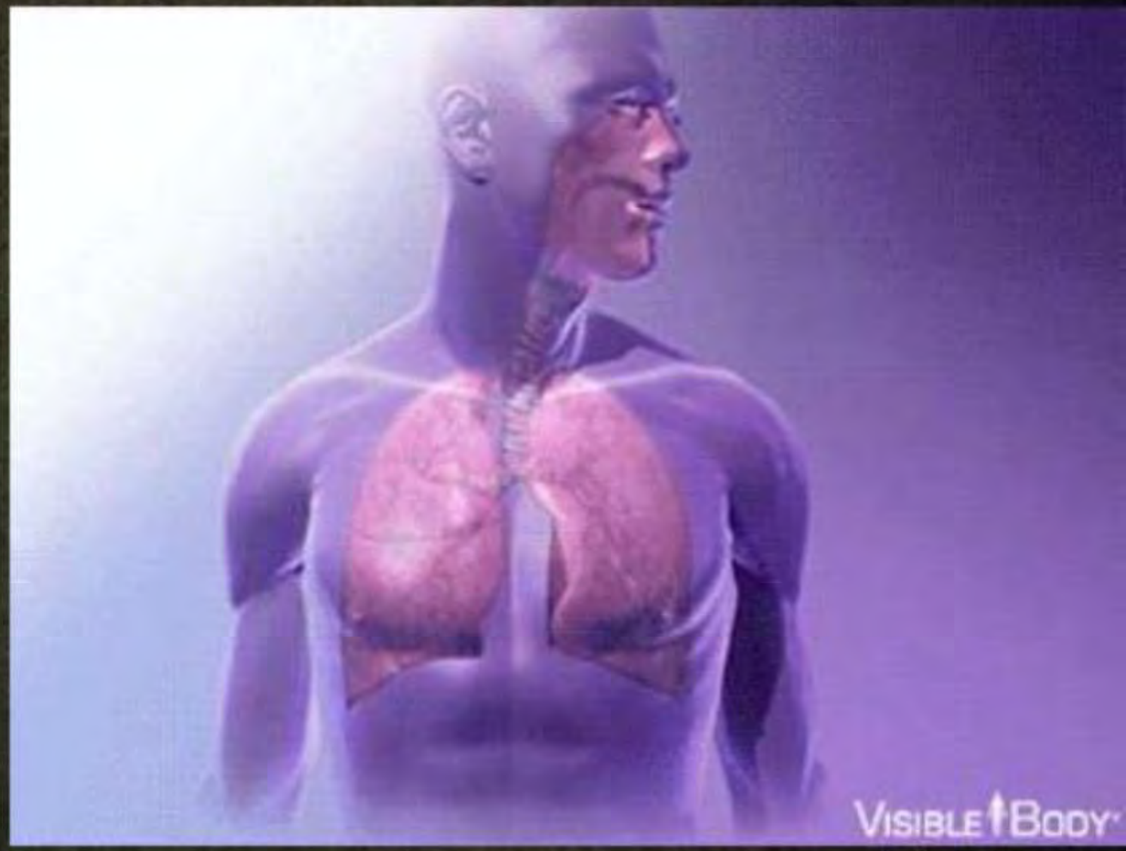


Breakdown of food into such small particles which can be absorbed by the blood.

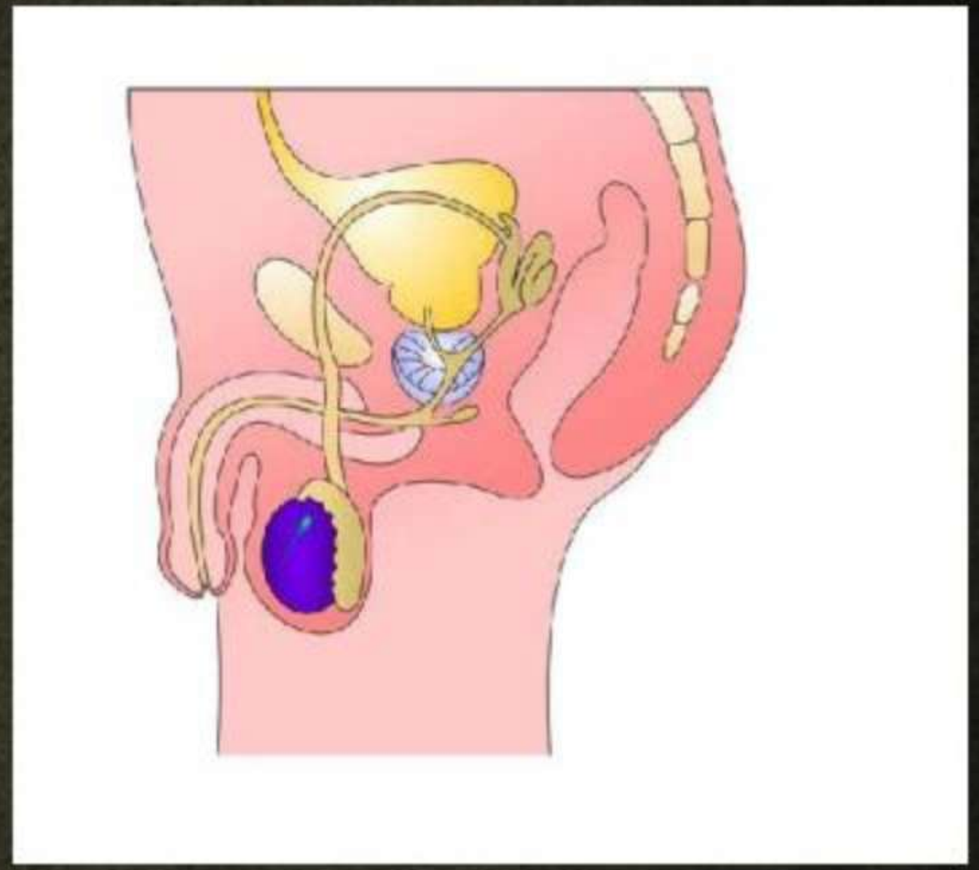
Respiratory System

- Group of passageways and organs that extracts life giving oxygen from the air we breathe.
- The lungs extract oxygen for the body to use and then expel CO2 byproduct.

- Oxygen is used at the cellular level to convert food to energy.



Reproductive System



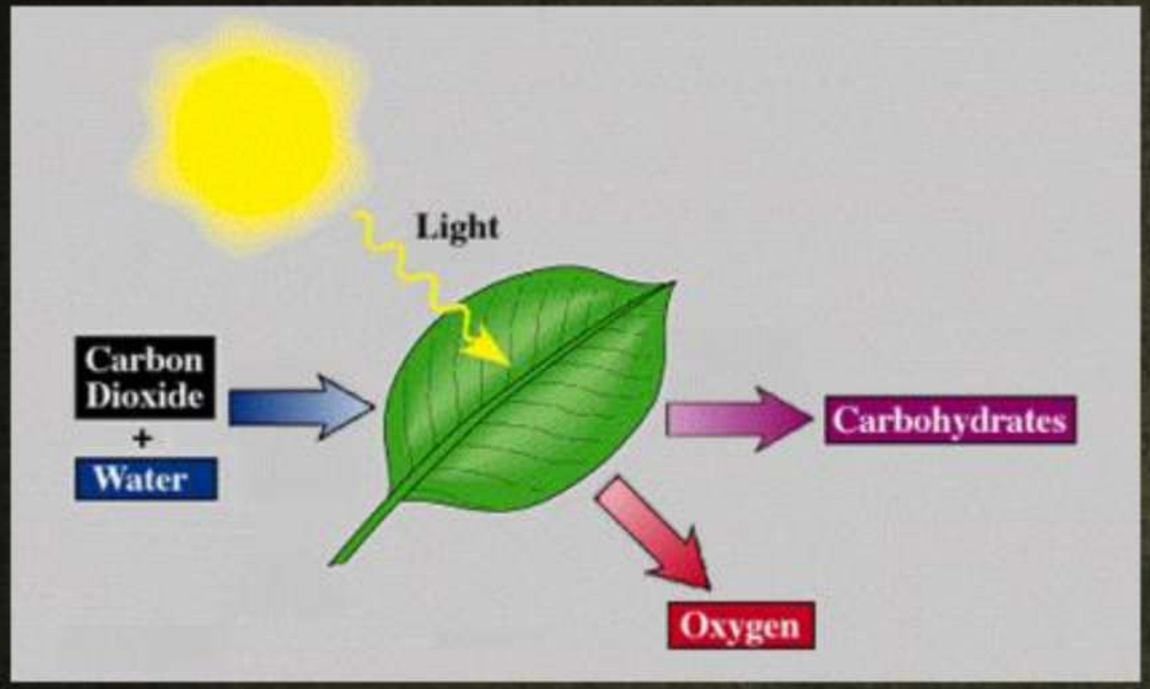
- Responsible for creating life!

Organ systems in plants

Vascular plants have two distinct organ systems: a **shoot system**, and a **root system**.

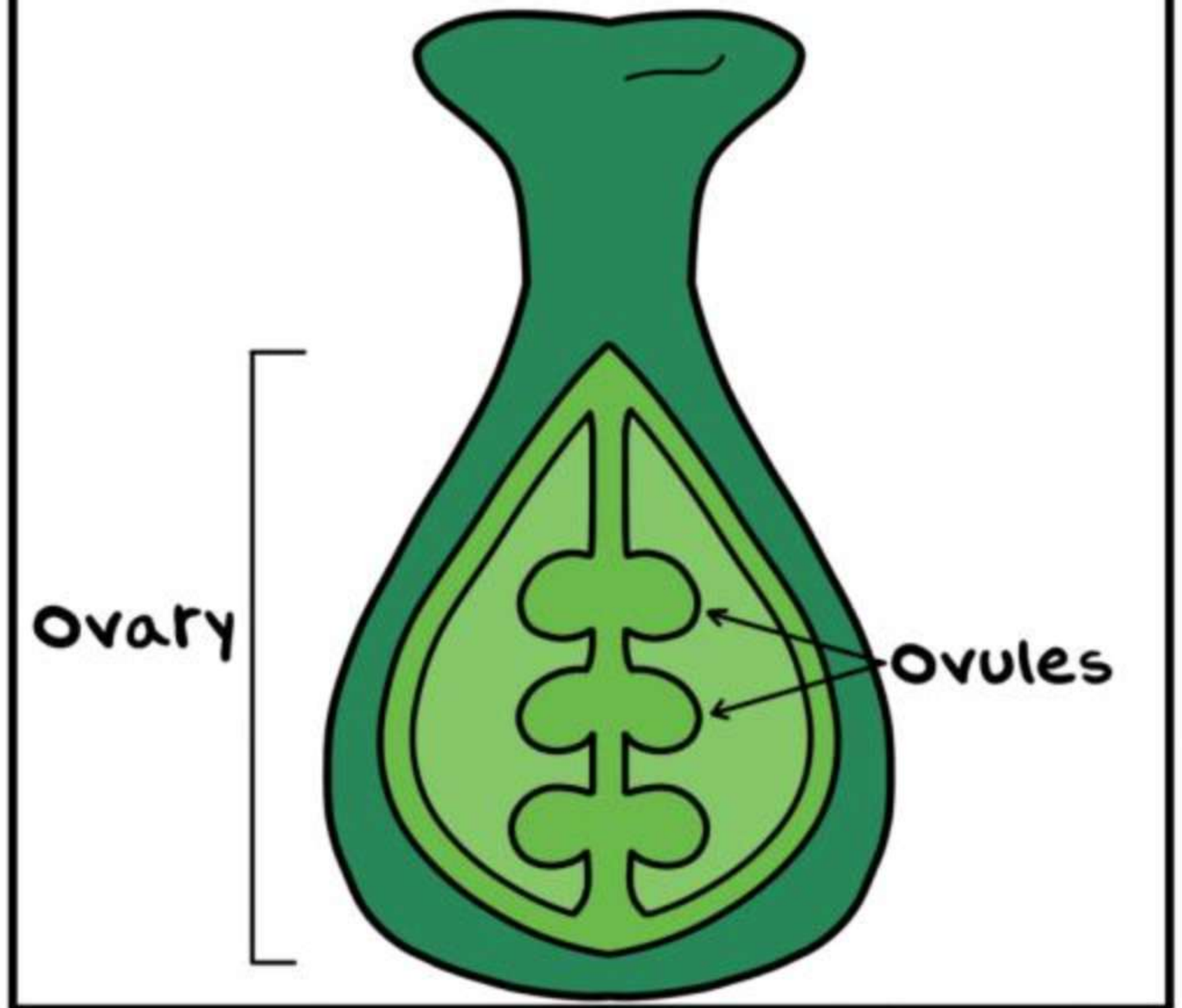
Shoot system

The shoot system consists stems, leaves, and the reproductive parts of the plant (flowers and fruits). The shoot system generally grows above ground, where it absorbs the light needed for photosynthesis.


Light
Carbon Dioxide
+
Water
Carbohydrates
Oxygen


make a gif.com

Angiosperm Reproduction



Root System

The root system, which supports the plants and absorbs water and minerals, is usually underground.

What is a cell?

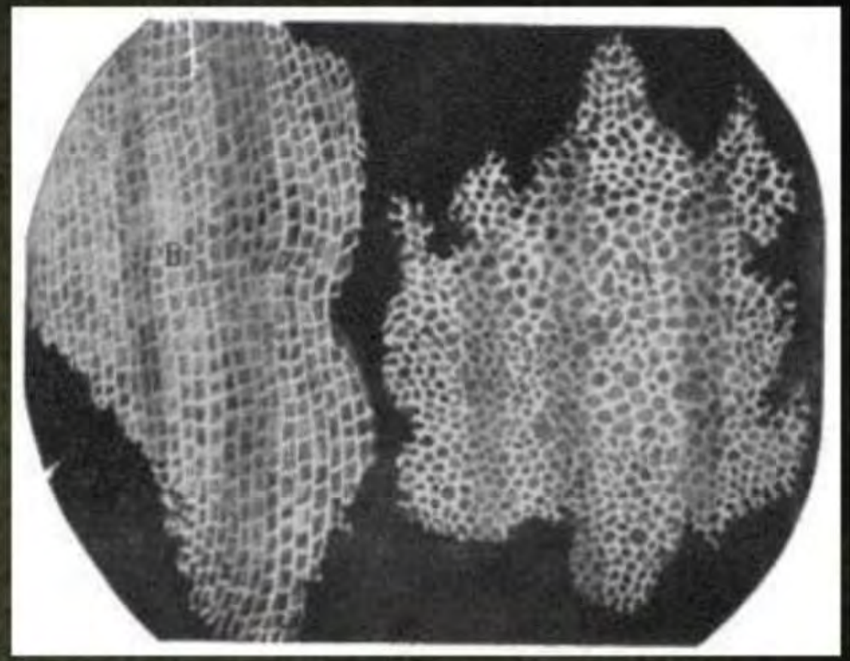
Cell → Tissue → Organ → Organ system → Organism

कोशिका

Discovery of Cell

- In 1665, Robert Hooke published *Micrographia*. ★★

dead ! मरा हुआ



- While looking at cork, Hooke observed box-shaped structures, which he called "cells" as they reminded him of the cells, or rooms, in monasteries.

- The term "cells" was first coined by him.

MAGNIFYING GLASSES.

WITH

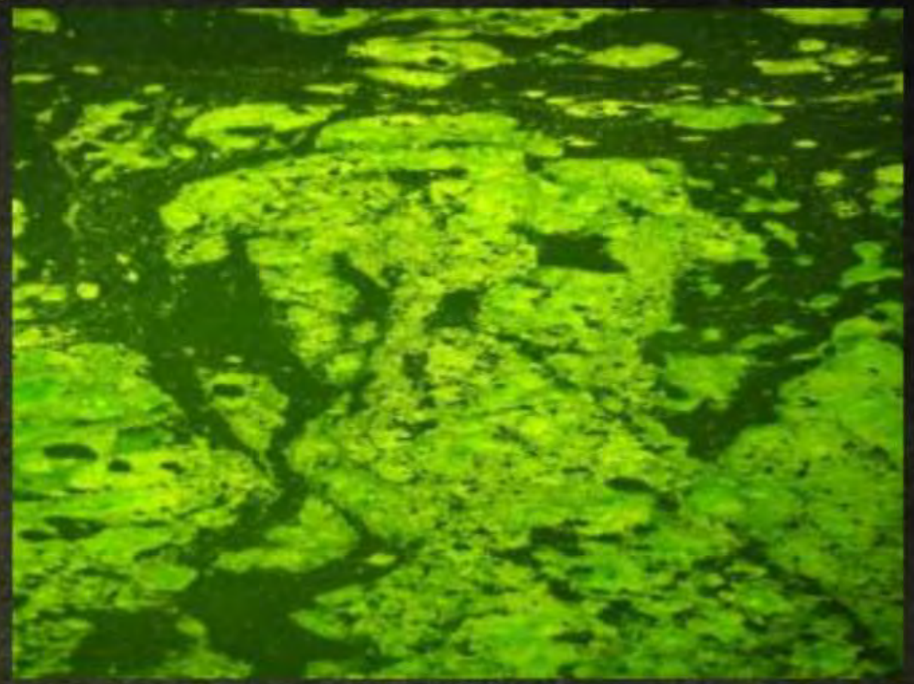
OBSERVATIONS and INQUIRIES thereupon.

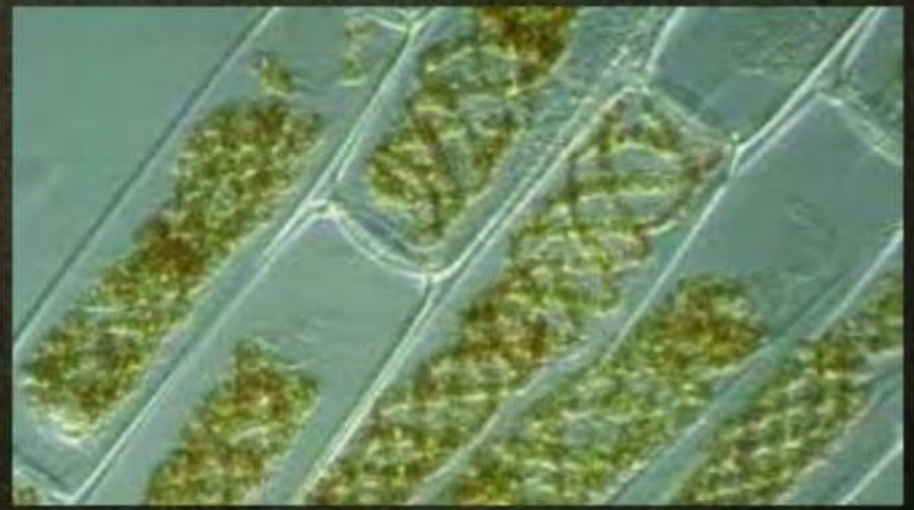
By *R. HOOKE*, Fellow of the ROYAL SOCIETY.

Non possis oculo quantum contendere Lincus,
Non tamen idcirco contemnas Lippus inungi. Horat. Ep. lib. 1.

Discovery of LIVING cell

Anton Van Leeuwenhoek was the first person to see and describe a living cell. He was the scientist who first discovered free-living algae Spirogyra cells in pond water in 1674.





The cell theory

Matthias Schleiden

all plants are made of cells

Theodore Schwann

all animals are made of cells

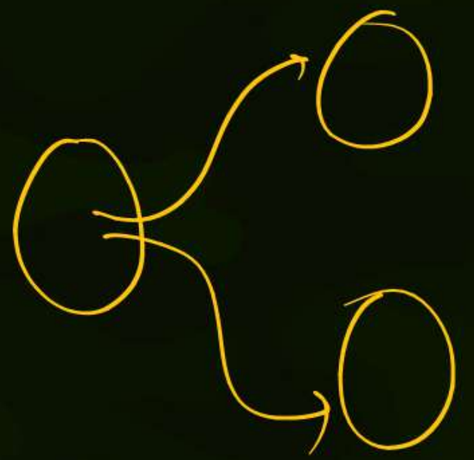
1839

Modification in cell theory

1855

Matthias Schleiden	Theodore Schwann	Rudolf Virchow
		
all plants are made of cells	all animals are made of cells	all cells came from pre-existing cells

Cell Theory



Omnis cellula-e-cellulae

↓

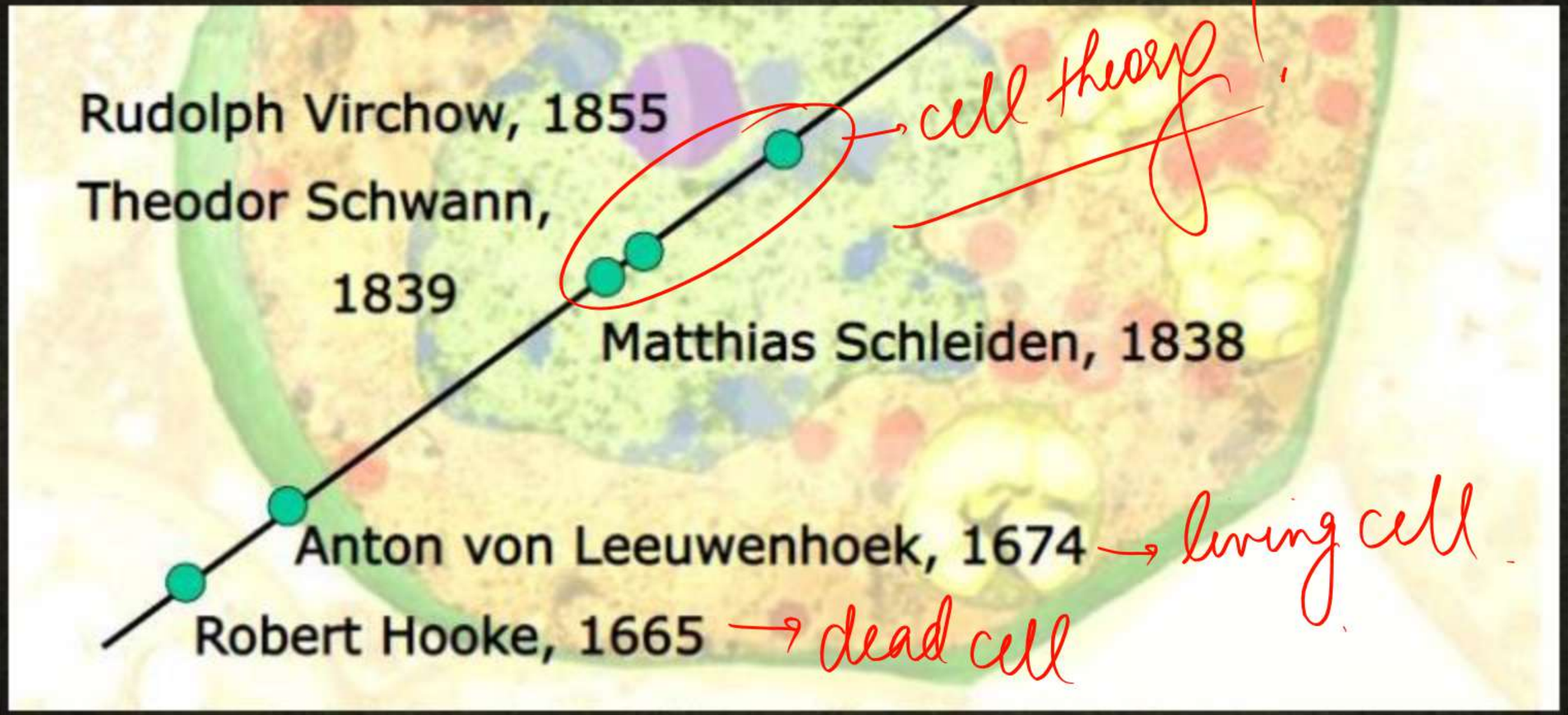
New cells arise from pre-existing cells.

↙

Rudolf Virchow

1855

Time chart

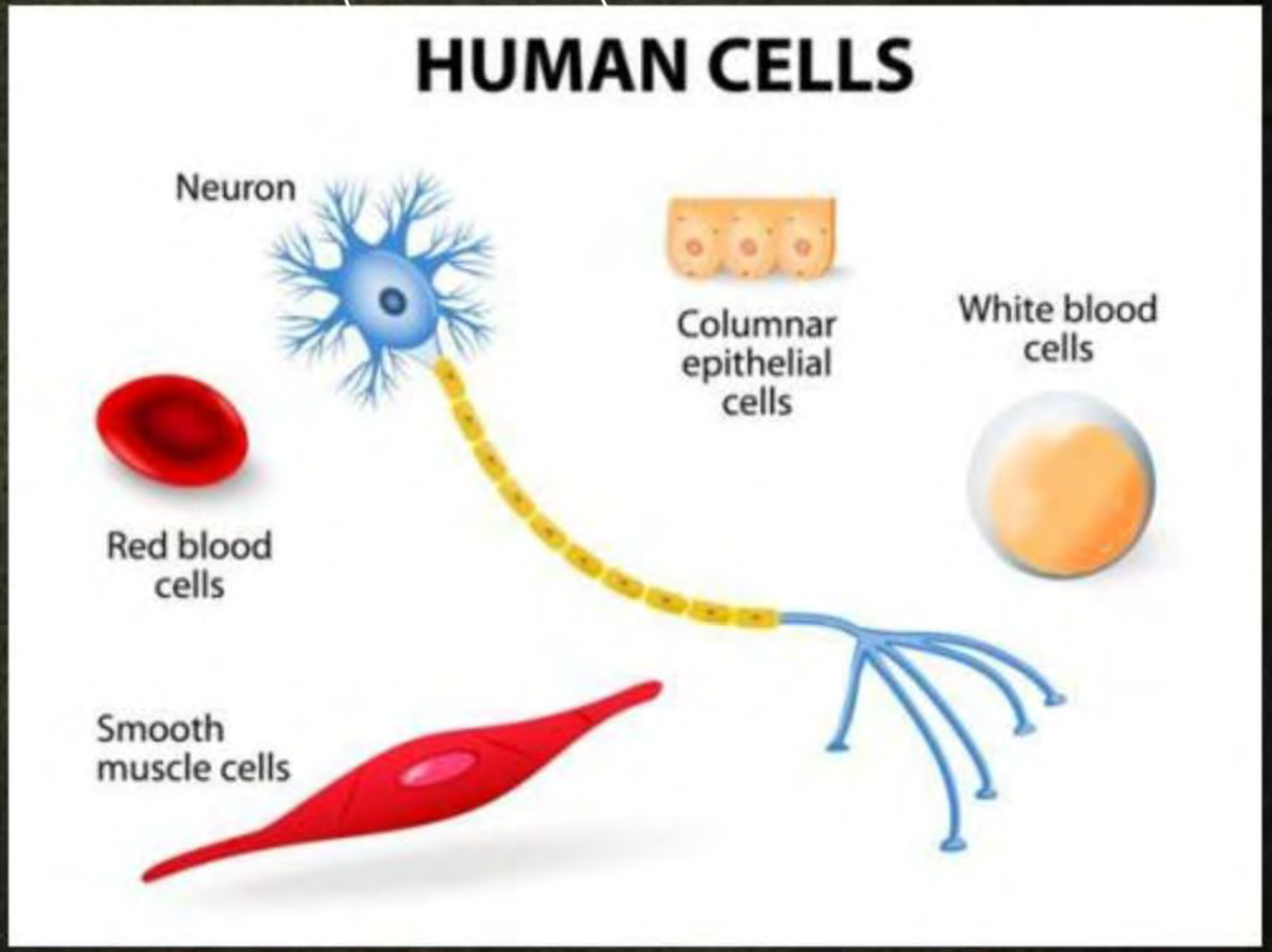

Rudolph Virchow, 1855
Theodor Schwann,
1839
Matthias Schleiden, 1838
Anton von Leeuwenhoek, 1674
Robert Hooke, 1665
cell theory !
living cell
dead cell

Types of cells

* Shape & size depend upon function !

nerve cell

function !



Tremendous variation in sizes

Smallest → Mycoplasma

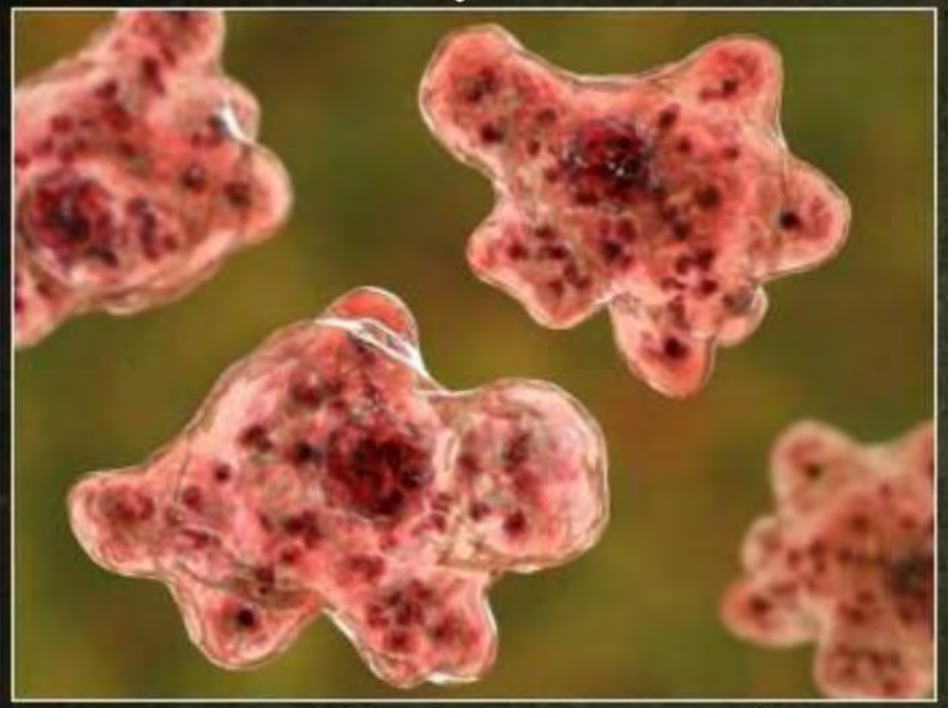
Ostrich egg

Smallest

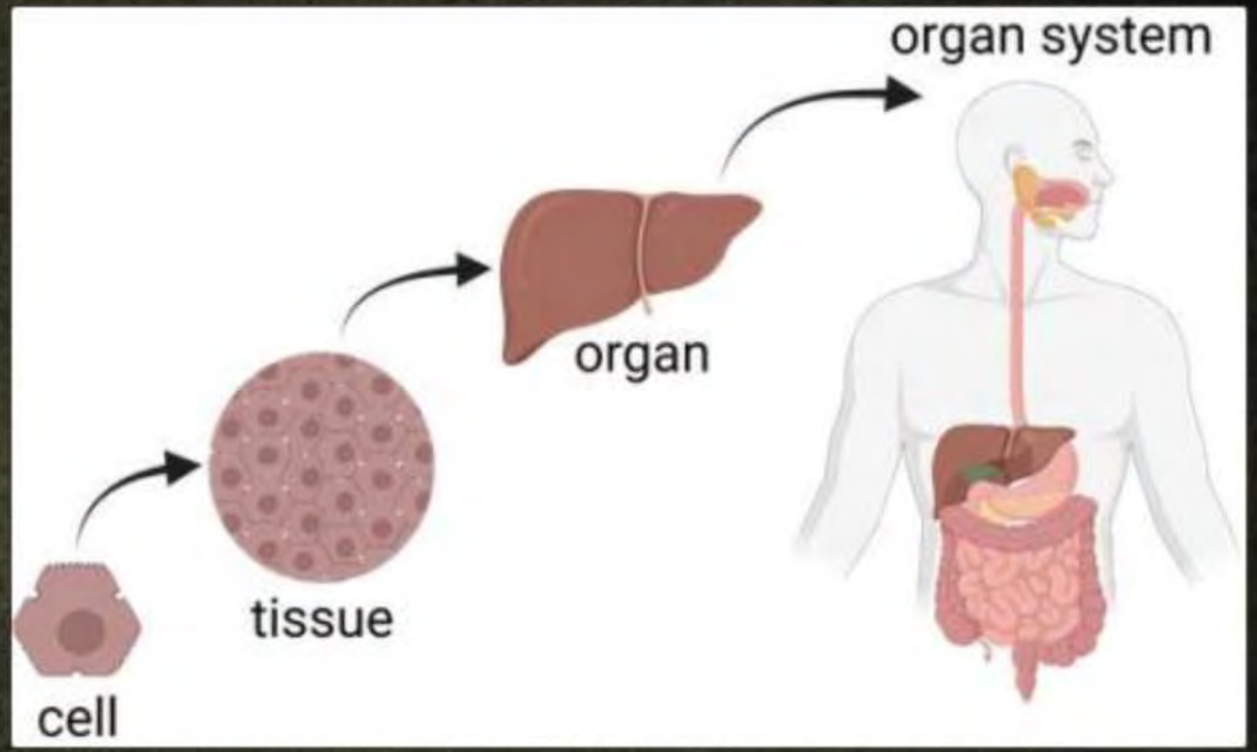
Cell → structural & functional unit of organism

Types of organisms

amoeba



Unicellular



multicellular organism

Division of labour

Basic components of the cell

Cell membrane
Plasma membrane
कमरे की दीवार

cytoplasm

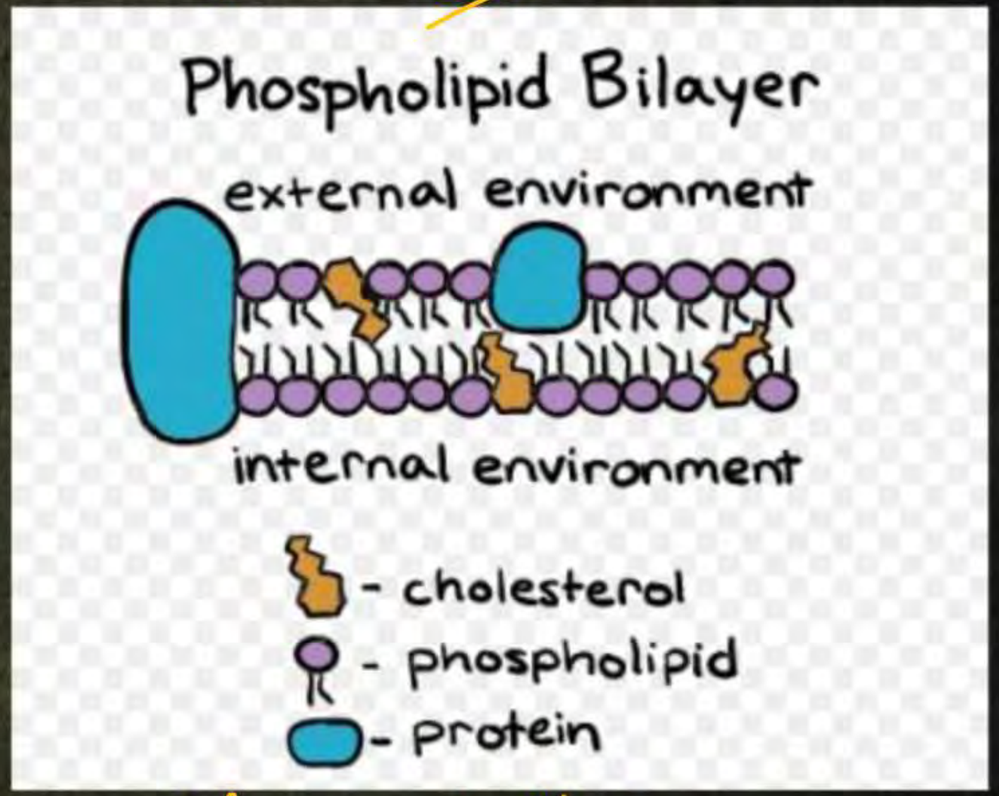
nucleus
manager sahab !

Cell membrane

- Outermost covering of the cell that separates the contents of the cell from its external environment.
  - Universal membrane
  - Selectively permeable

  Made of lipids, proteins and Carbohydrates.
- Major lipids are phospholipids which are present in form of bilayer. Polar head is outside and hydrophobic portion is towards inside to protect it from aqueous environment.
- In addition to phospholipids membrane also contains cholesterol.
- The ratio of protein and lipid varies considerably in different cell types. In human beings, the membrane of the erythrocyte has approximately 52 per cent protein and 40 per cent lipids.

Erythrocytes / RBCs



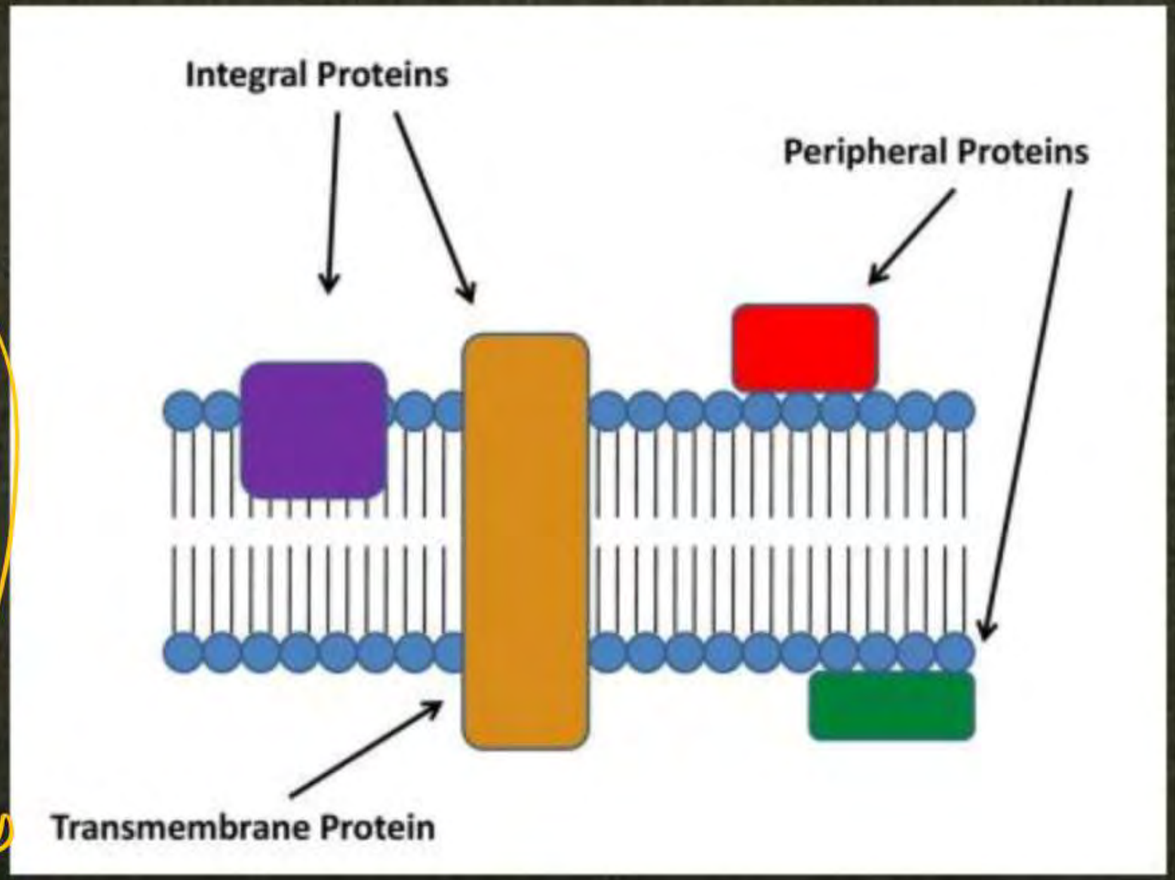
52% protein 40% lipid


Cholesterol
lipids
carbohydrates
proteins
phospholipids

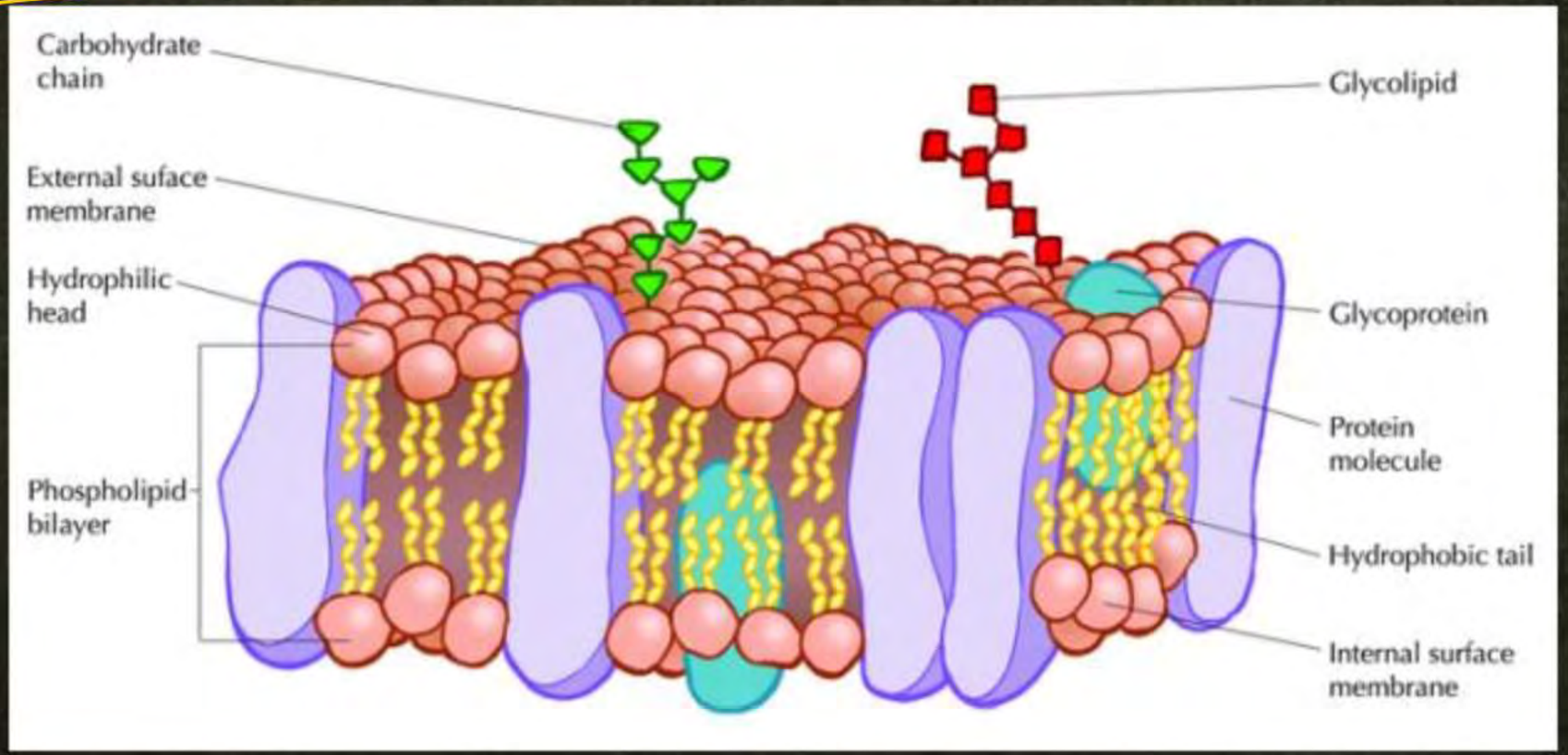
- Depending on the ease of extraction, membrane proteins can be classified as integral and peripheral. Peripheral proteins lie on the surface of membrane while the integral proteins are partially or totally buried in the membrane.

Integral

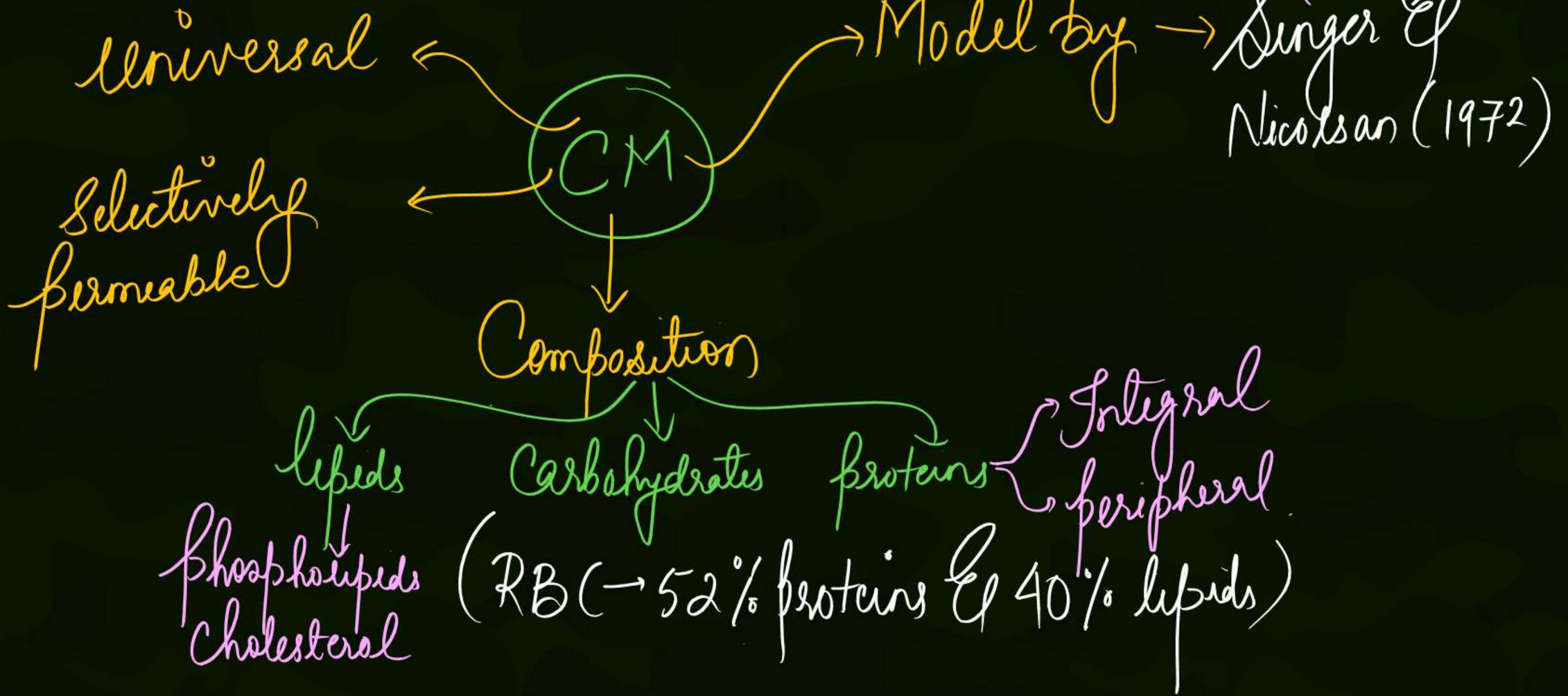
peripheral



- An improved model by Singer and Nicolson (1972) widely accepted as fluid mosaic model .
- According to this, the quasi-fluid nature of lipid enables lateral movement of proteins within the overall bilayer.
- The fluid nature of the membrane is also important from the point of view of functions like cell growth, formation of intercellular junctions, secretion, endocytosis, cell division etc.



mind map → cell membrane



Diffusion

विसरण

- Transfer from high concentration to low concentration.
- Carbon dioxide is cellular waste and requires to be excreted out by the cell.
- Cell intakes oxygen for functions.

high conc → low conc

Osmosis

परासरण

- A special kind of diffusion.
- Movement of water from high concentration to low concentration.
- Three kinds of medium – hypotonic, hypertonic and isotonic.
- Cell swells in hypotonic medium.
- Cell shrinks in hypertonic medium.
- Remains of the same size in isotonic medium.

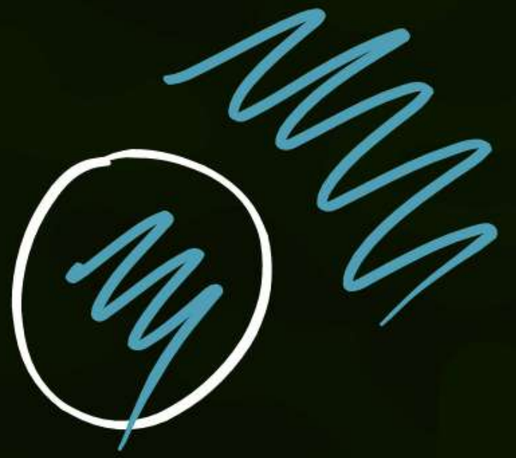
Hypotonic

swell

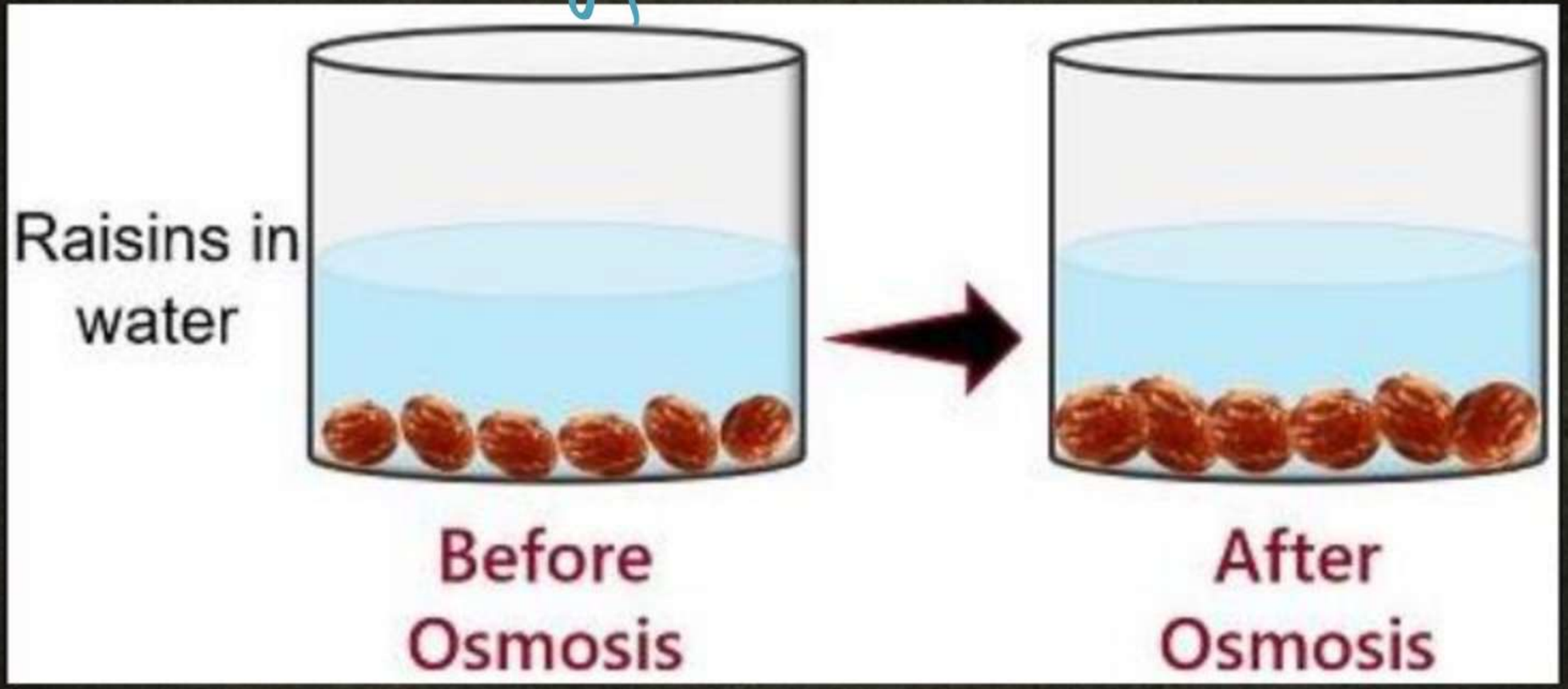
Hypertonic

shrink

isotonic

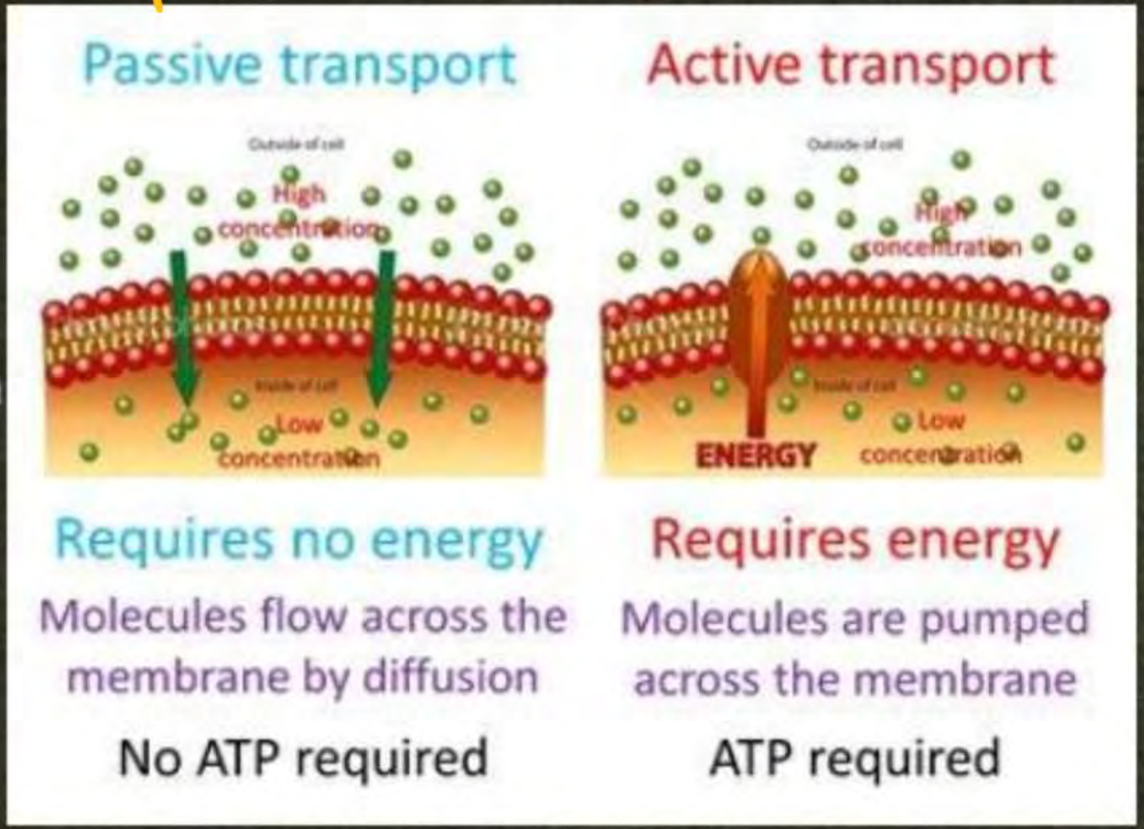


Hypotonic



Neutral solutes may move across the membrane by the process of simple diffusion along the concentration gradient, i.e., from higher concentration to the lower. Water may also move across this membrane from higher to lower concentration. Movement of water by diffusion is called osmosis

passive active

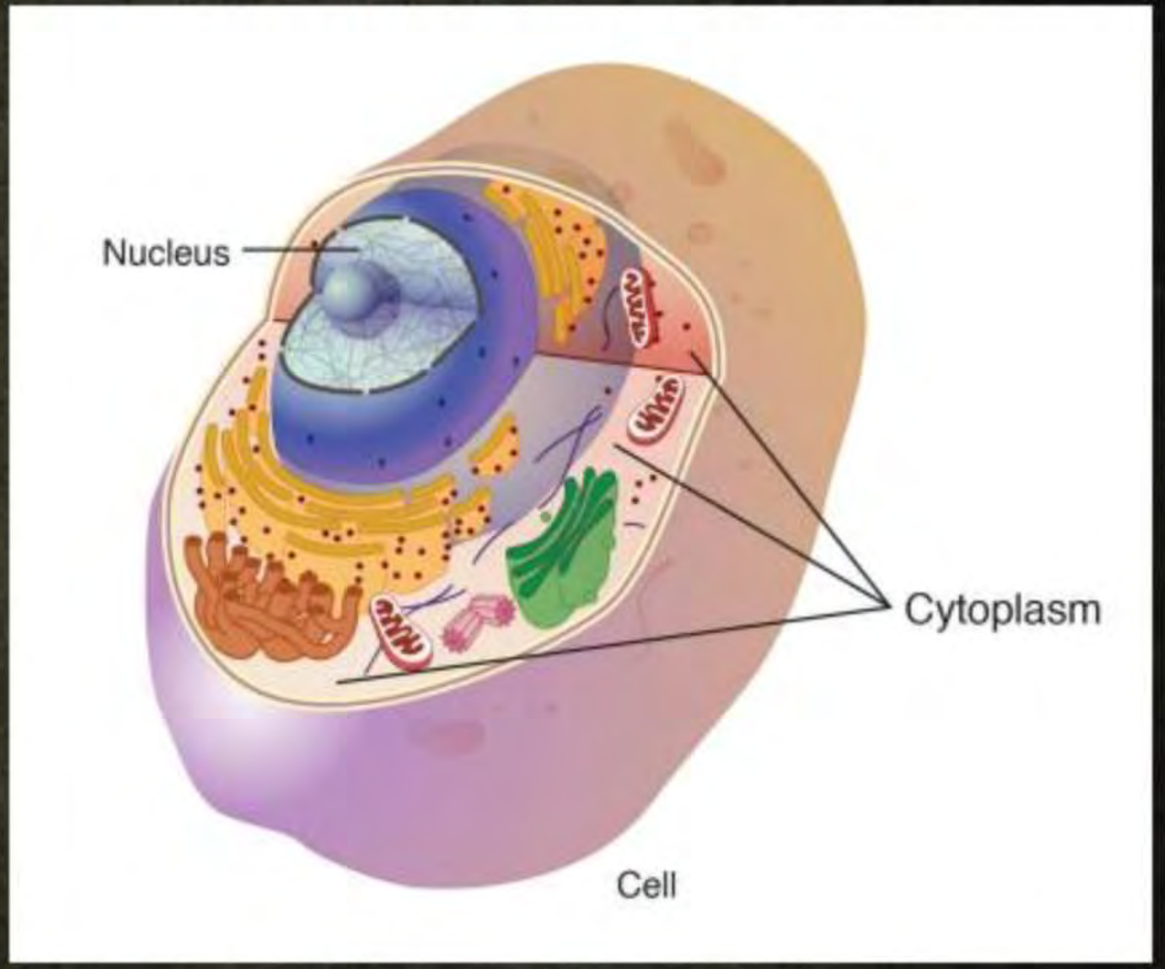


As the polar molecules cannot pass through the nonpolar lipid bilayer, they require a carrier protein of the membrane to facilitate their transport across the membrane. A few ions or molecules are transported across the membrane against their concentration gradient, i.e., from lower to the higher concentration.

Cytoplasm

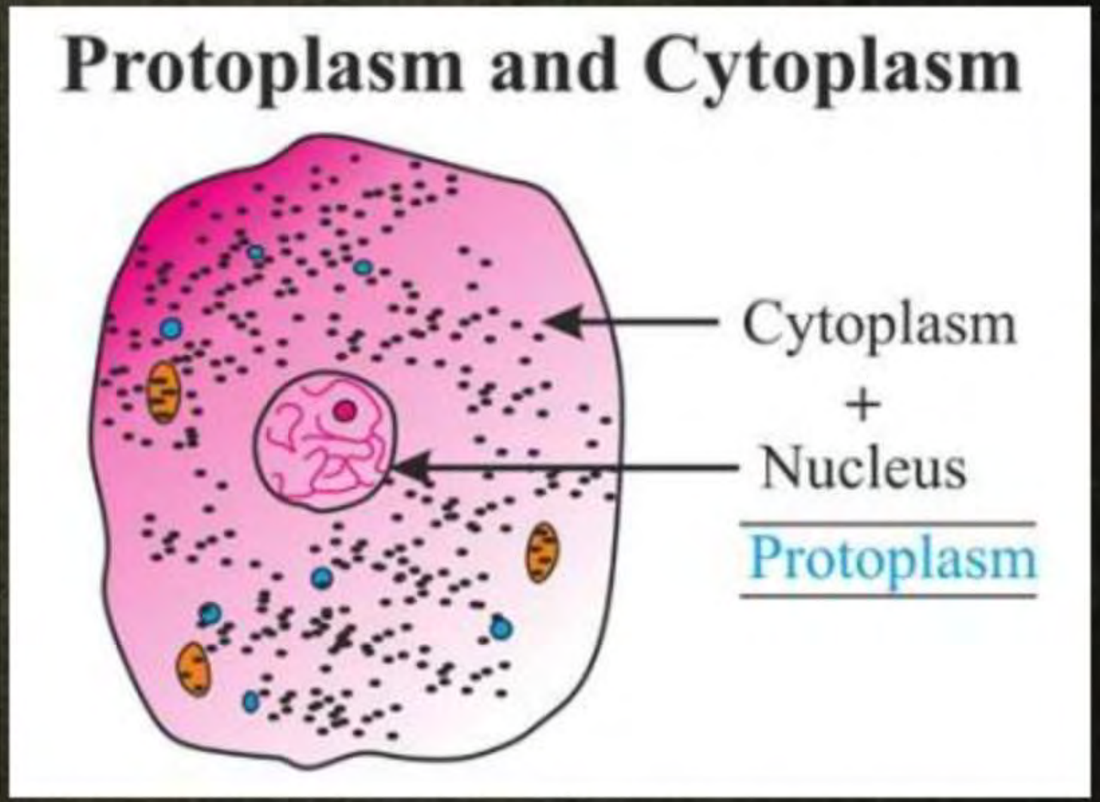
कोशिका द्रव्य

- Cytoplasm is the gelatinous liquid that fills the inside of a cell. It is composed of water, salts, and various organic molecules. Some intracellular organelles, such the nucleus and mitochondria, are enclosed by membranes that separate them from the cytoplasm.
- Cytoplasm's a funny term. So what does "cyto" mean? "Cyto" means "cell", "plasm" means "stuff", so it's "cell stuff".



Protoplasm

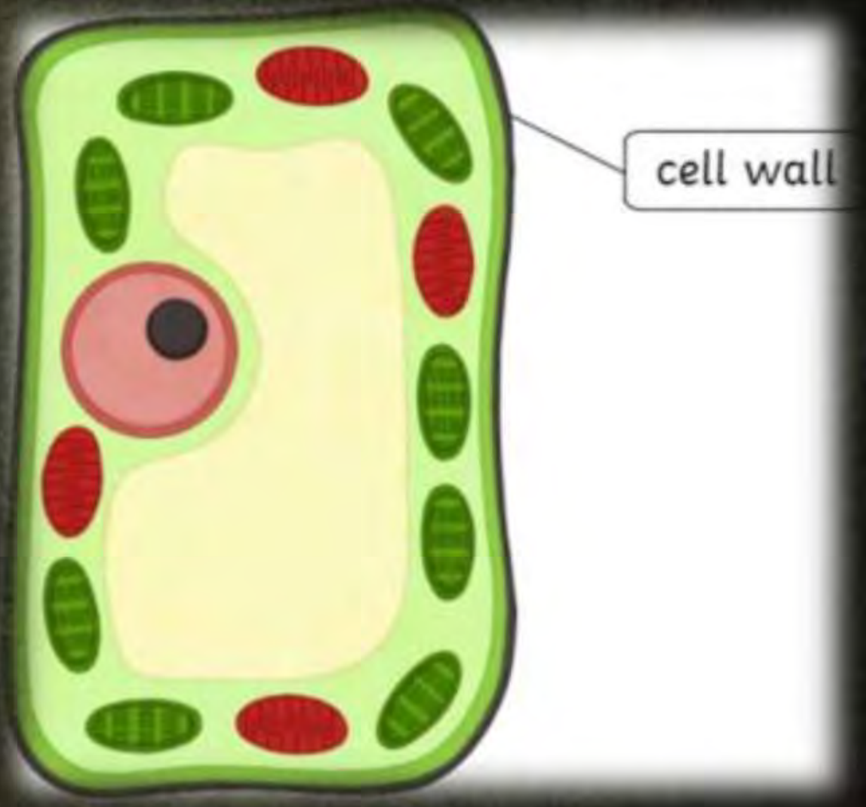
- The living substance of cells that is surrounded by the plasma membrane is known as protoplasm
- (Greek: protos = first, plasma = form).
- J.E. Purkinje coined the term protoplasm.



Protoplasm =
Cytoplasm + nucleus

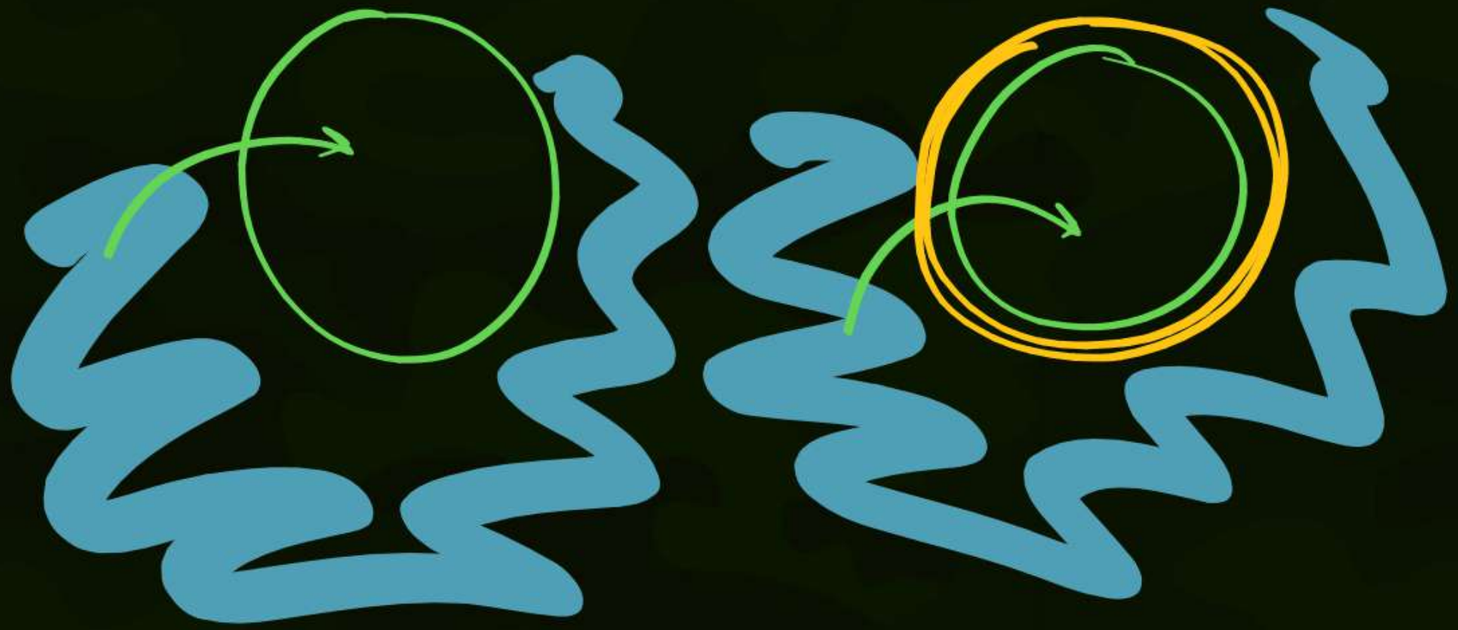
Cell wall

- A rigid structure
- Forms an outer covering for the plasma membrane of fungi and plants.
- Cell wall not only gives shape to the cell and protects the cell from mechanical damage and infection, it also helps in cell-to-cell interaction and provides barrier to undesirable macromolecules.
- Algae have cell wall, made of cellulose, galactans, mannans and minerals like calcium carbonate.
- In plants it consists of cellulose, hemicellulose, pectins and proteins.
- Fungi- chtin
- Bacteria- peptidoglycans
- Helps protect the cell in hypotonic external medium.



Vishal

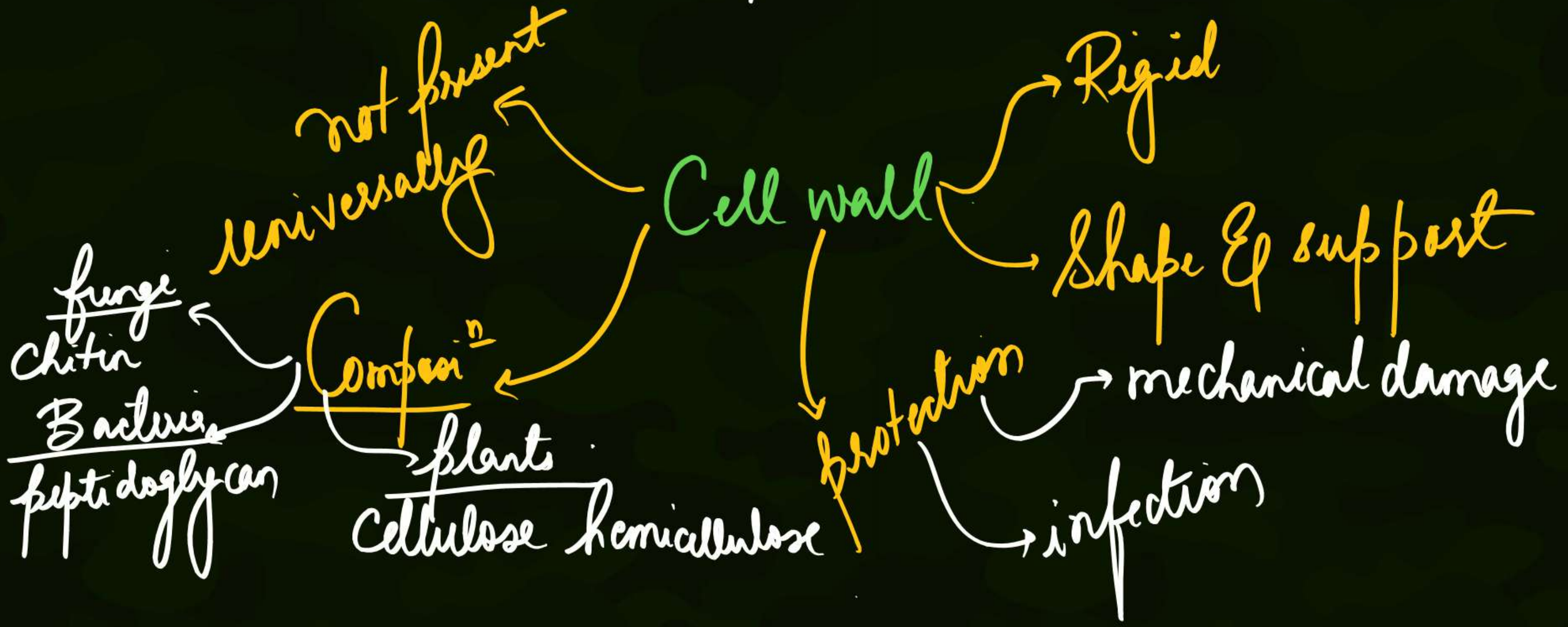
Plant



Cell wall

- plants → cellulose & hemicellulose
- bacteria → peptidoglycan
- fungi → Chitin

mind map - cell wall

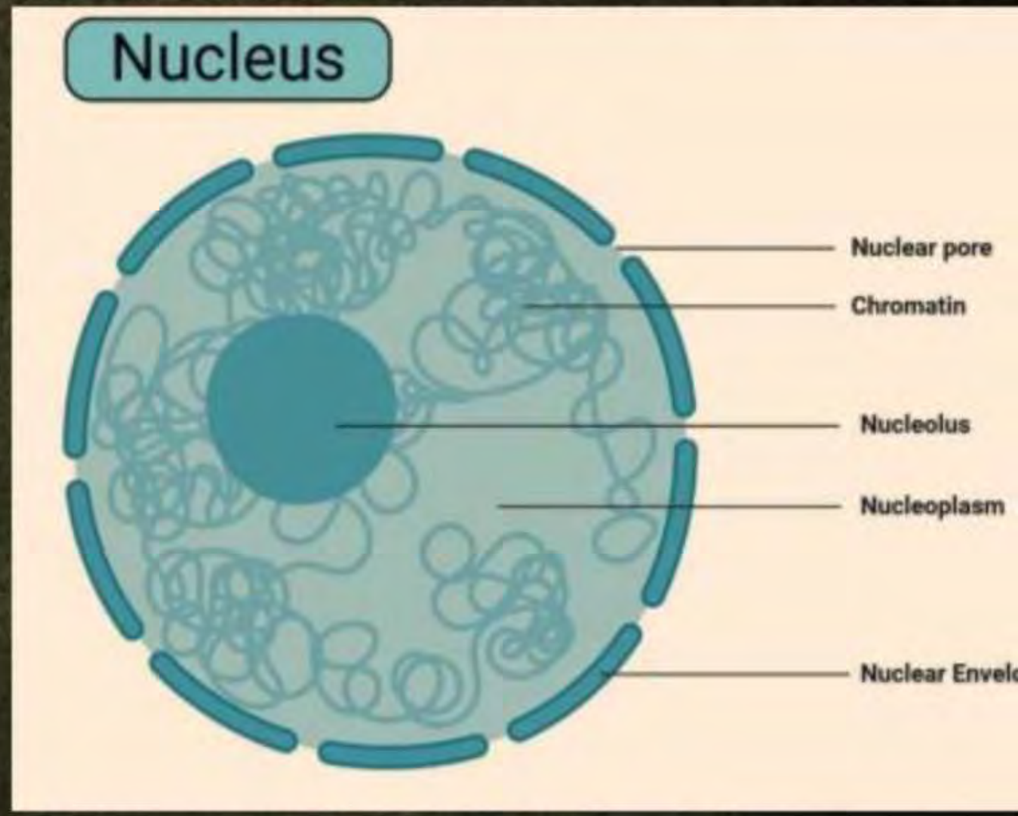


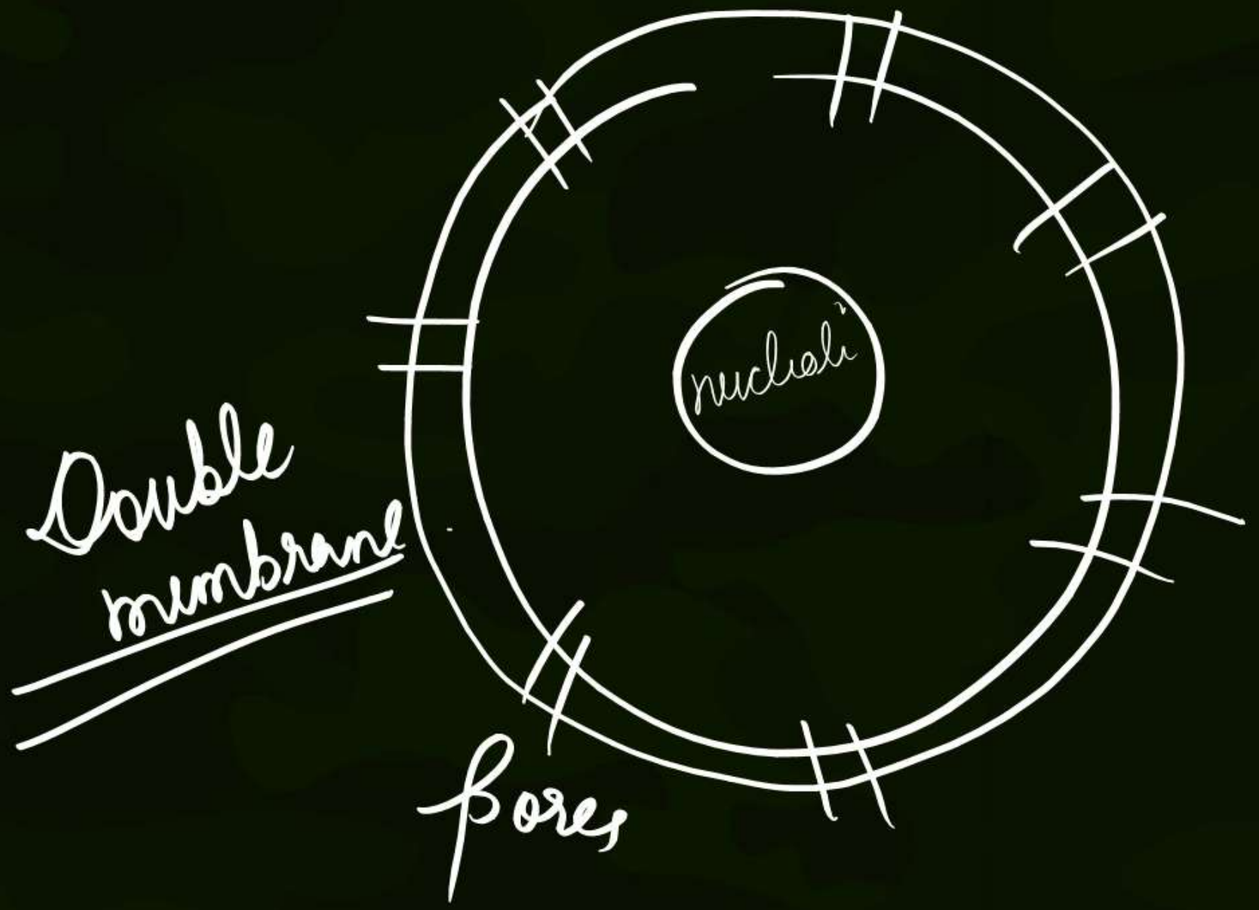
Nucleus

manager sahab !!

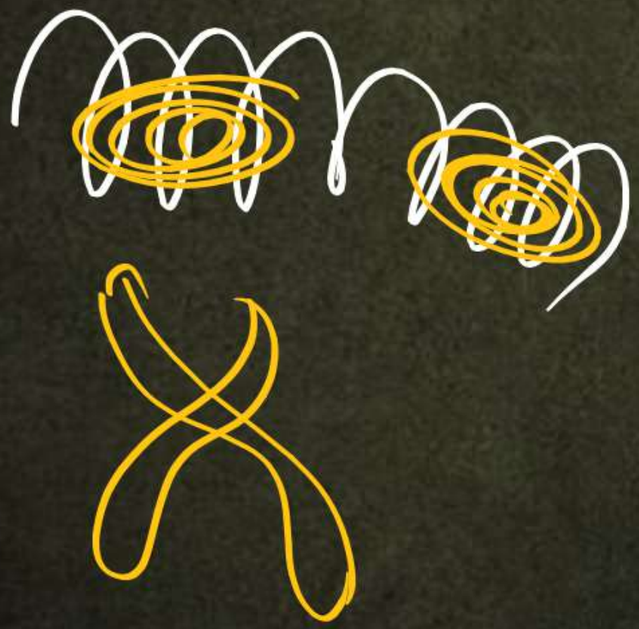
- Nucleus as a cell organelle was first described by Robert Brown as early as 1831.
- Later the material of the nucleus stained by the basic dyes was given the name chromatin by Flemming.

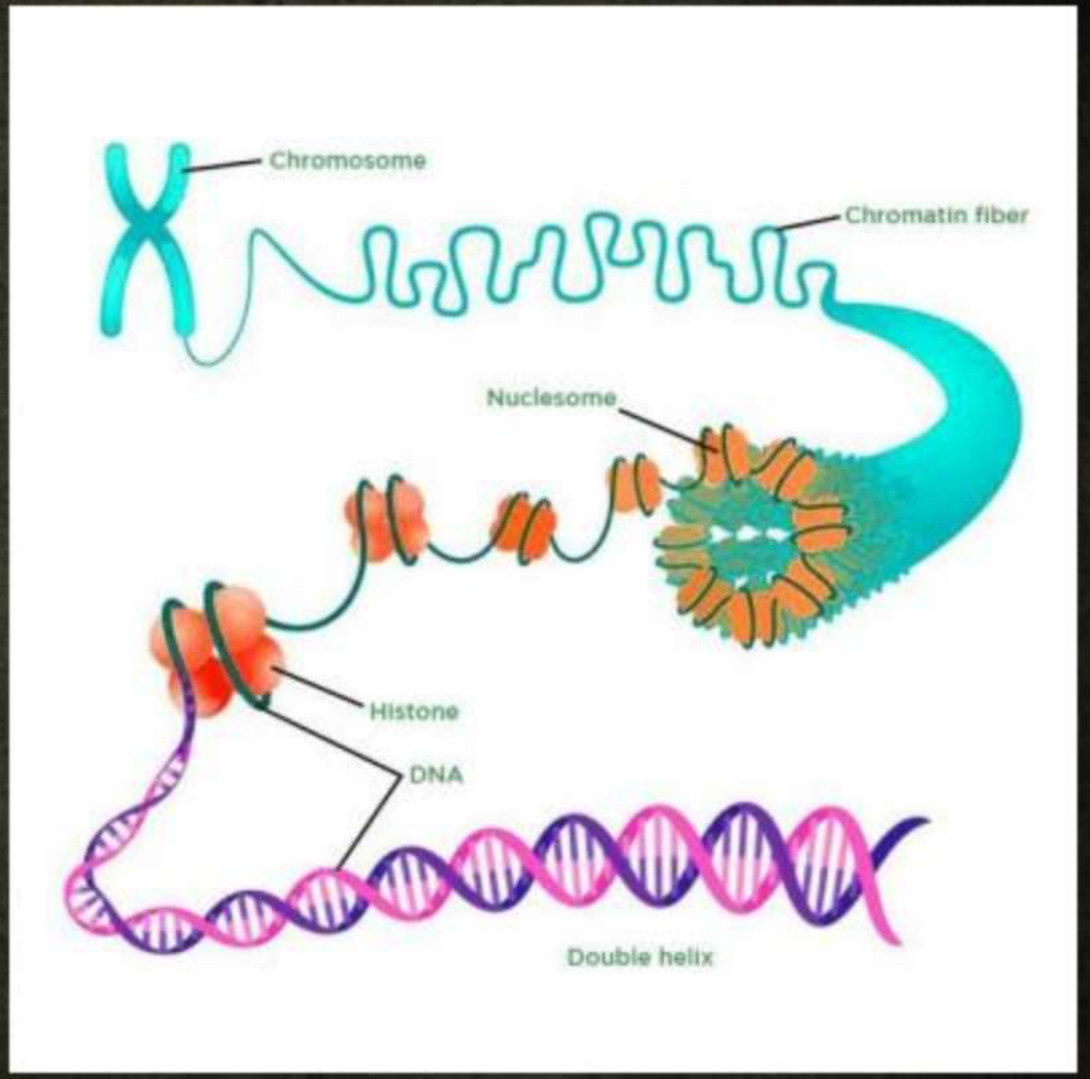
- Nucleus of a cell when it is not dividing has highly extended and elaborate nucleoprotein fibres called chromatin, nuclear matrix and one or more spherical bodies called nucleoli (sing.: nucleolus)
- Nuclear envelope, which consists of two parallel membranes with a space between (10 to 50 nm) called the perinuclear space, forms a barrier between the materials present inside the nucleus and that of the cytoplasm.

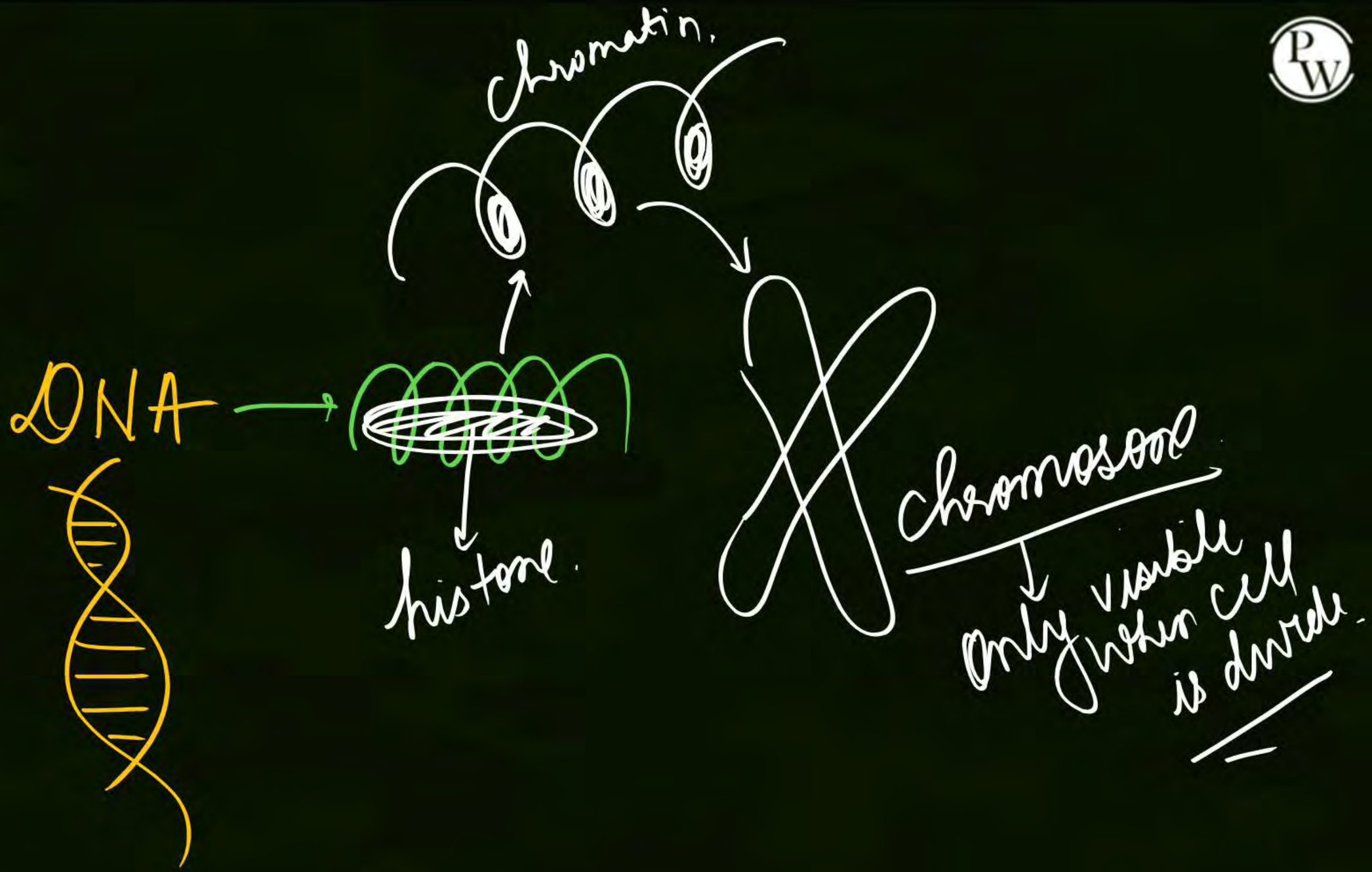


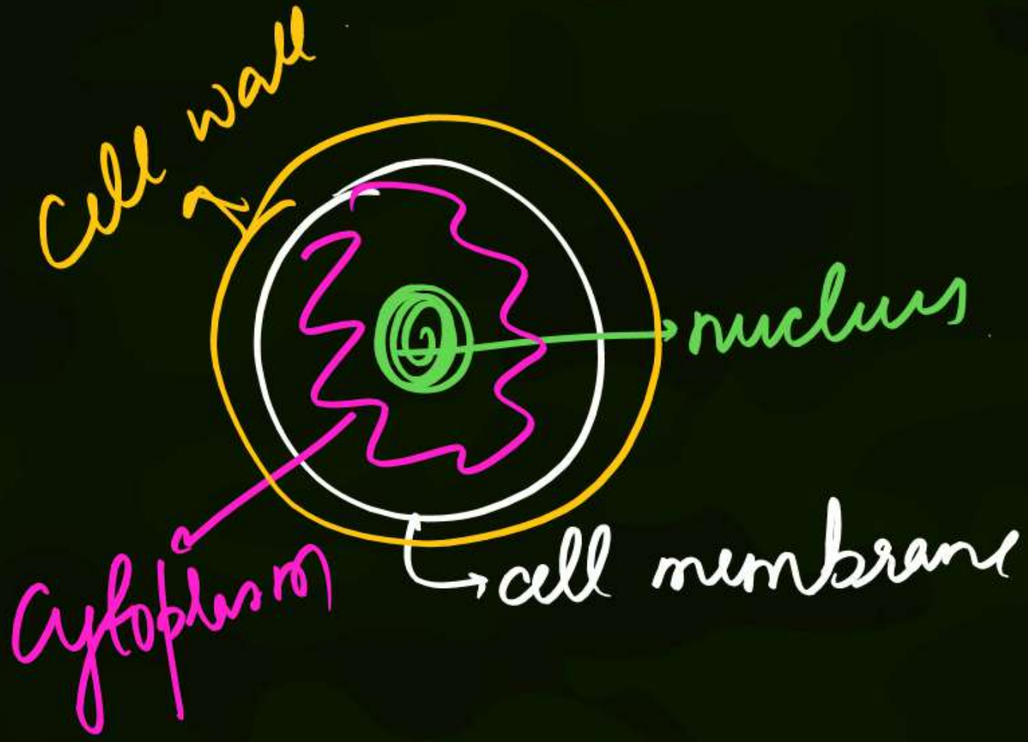

Double membrane
nucleoli
pores

Chromatin material, chromosome, DNA and genes






chromatin.
DNA
histone.
chromosome
Only visible
when cell
is divide.


cell wall
nucleus
cytoplasm
cell membrane

Question

The living content of cell is called protoplasm. It is composed of :

PYQ

A Cytoplasm only

B Cytoplasm and nucleoplasm

C Nucleoplasm only

D Cytoplasm, nucleoplasm and other organelles

Question

Which one of the following statements is correct about the cell membrane?

PYQ

A. It is made up of cellulose

B. It is a permeable structure for all substances

C. It is flexible and enables the cells to engulf many materials

D. It does not allow diffusion of gases like oxygen and carbon dioxide

Question

Which one of the following is a feature of membrane?

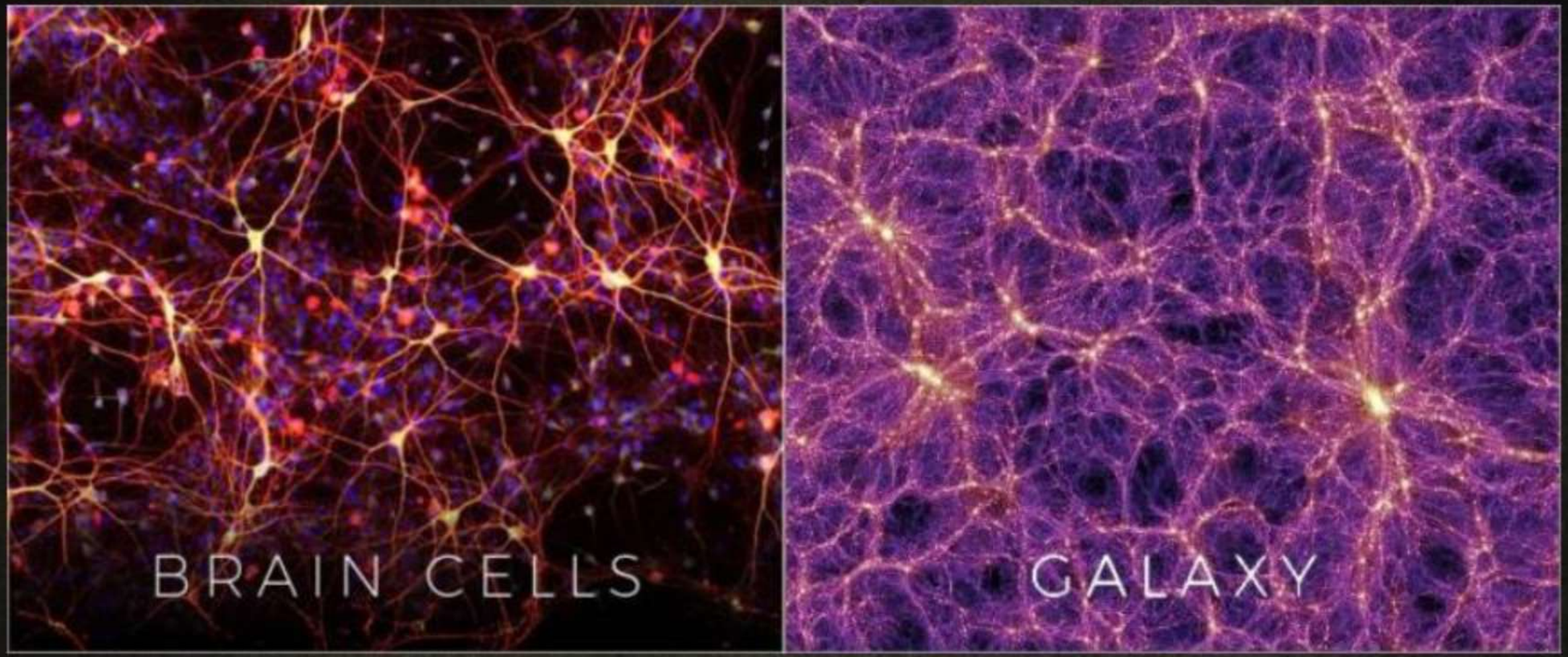
PYQ

A Bilayer of proteins molecule in which lipids and cholesterol are embedded

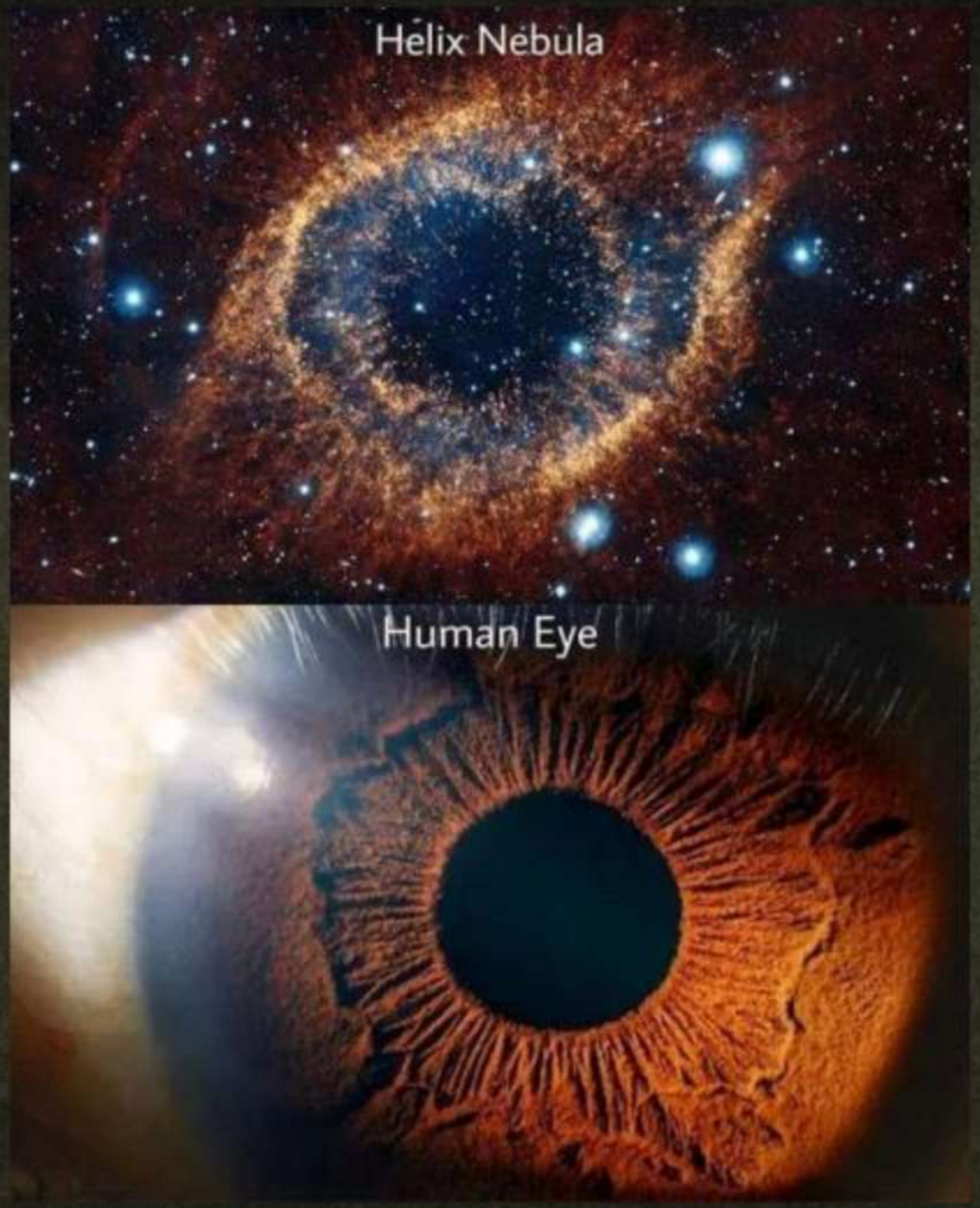
B Bilayer of phospholipids molecule in which proteins and cholesterol are embedded

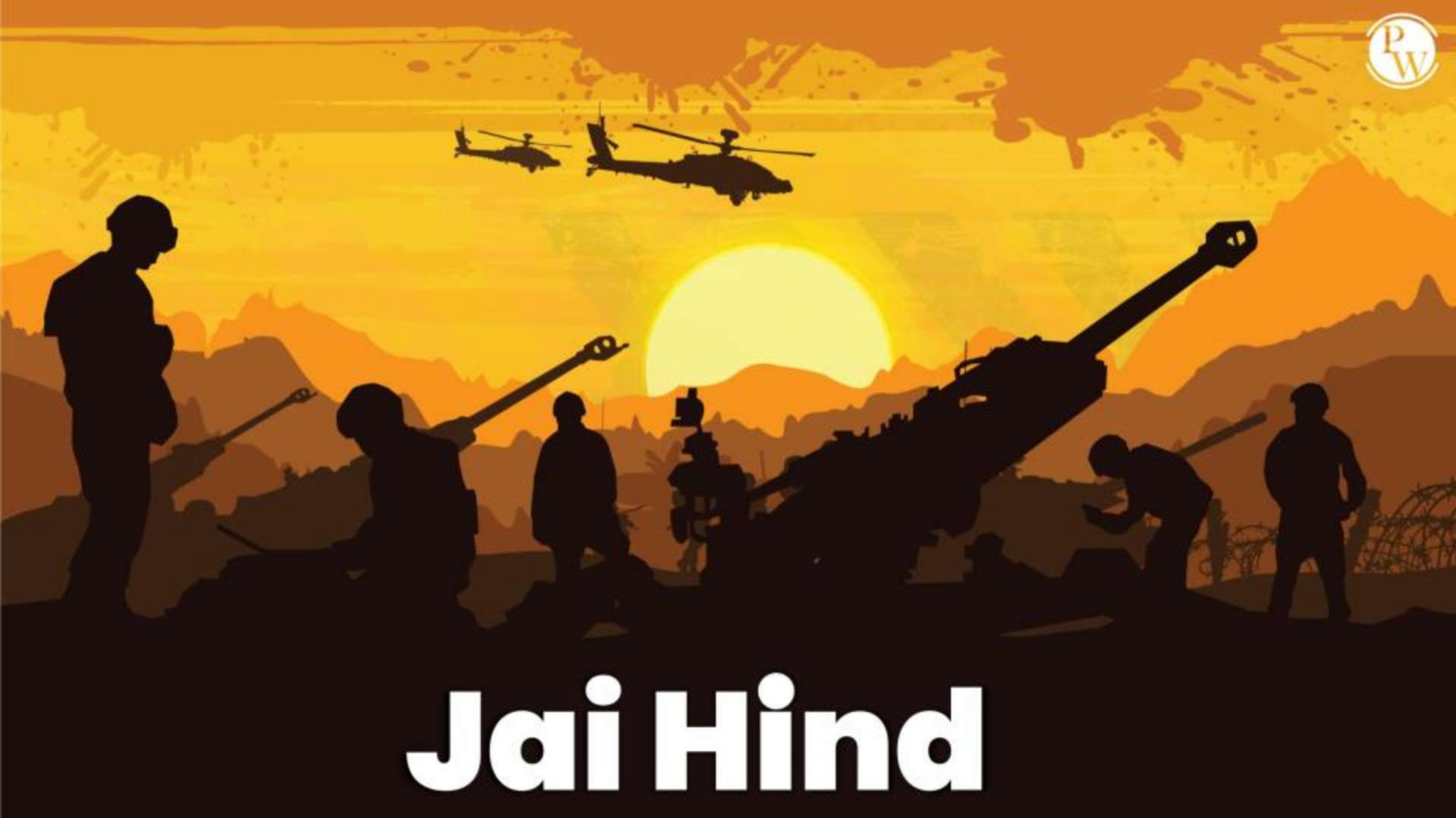
C Bilayer of neutral lipid in which proteins and cholesterol are embedded

D Bilayer of neutral lipids lacking cholesterol and proteins


BRAIN CELLS
GALAXY


Death of a star
Birth of a cell


Helix Nebula
Human Eye


Jai Hind