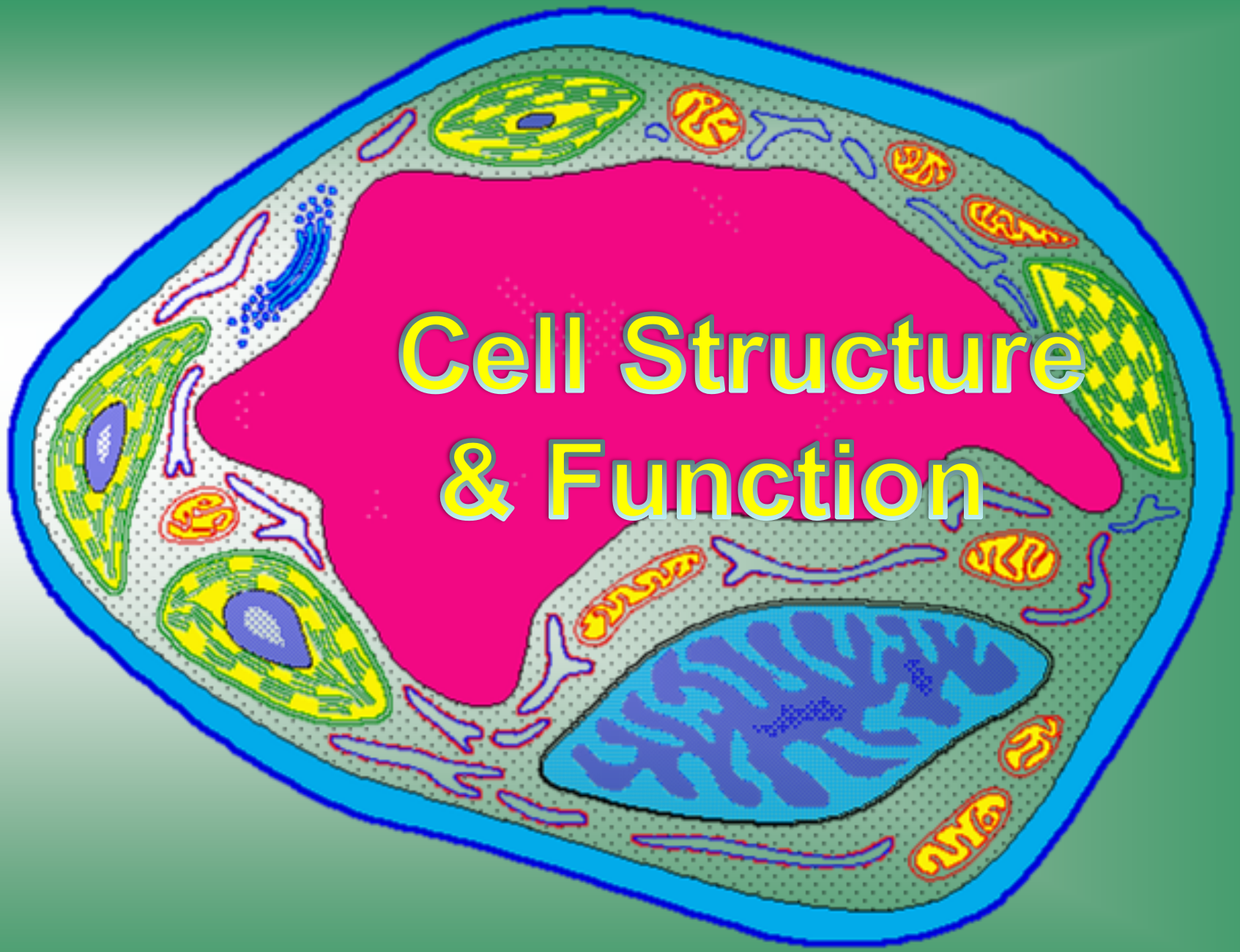
DEPARTMENT OF PHYSICAL EDUCATION

Subject:- Anatomy, Physiology and Health Education

Class:- B.P. Ed. Semester- I

Presented By:- Dr. Mahesh Singh Dhapola



Cell Theory

- All living things are made up of cells.
- Cells are the smallest working units of all living things.
- All cells come from preexisting cells through cell division.

Definition of Cell:- A cell is the smallest unit that is capable of performing life functions.

OR

Cell is the structural and functional unit of life.

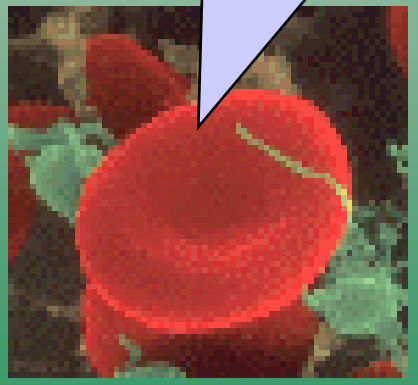
Examples of Cells

Amoeba Proteus

Plant Stem

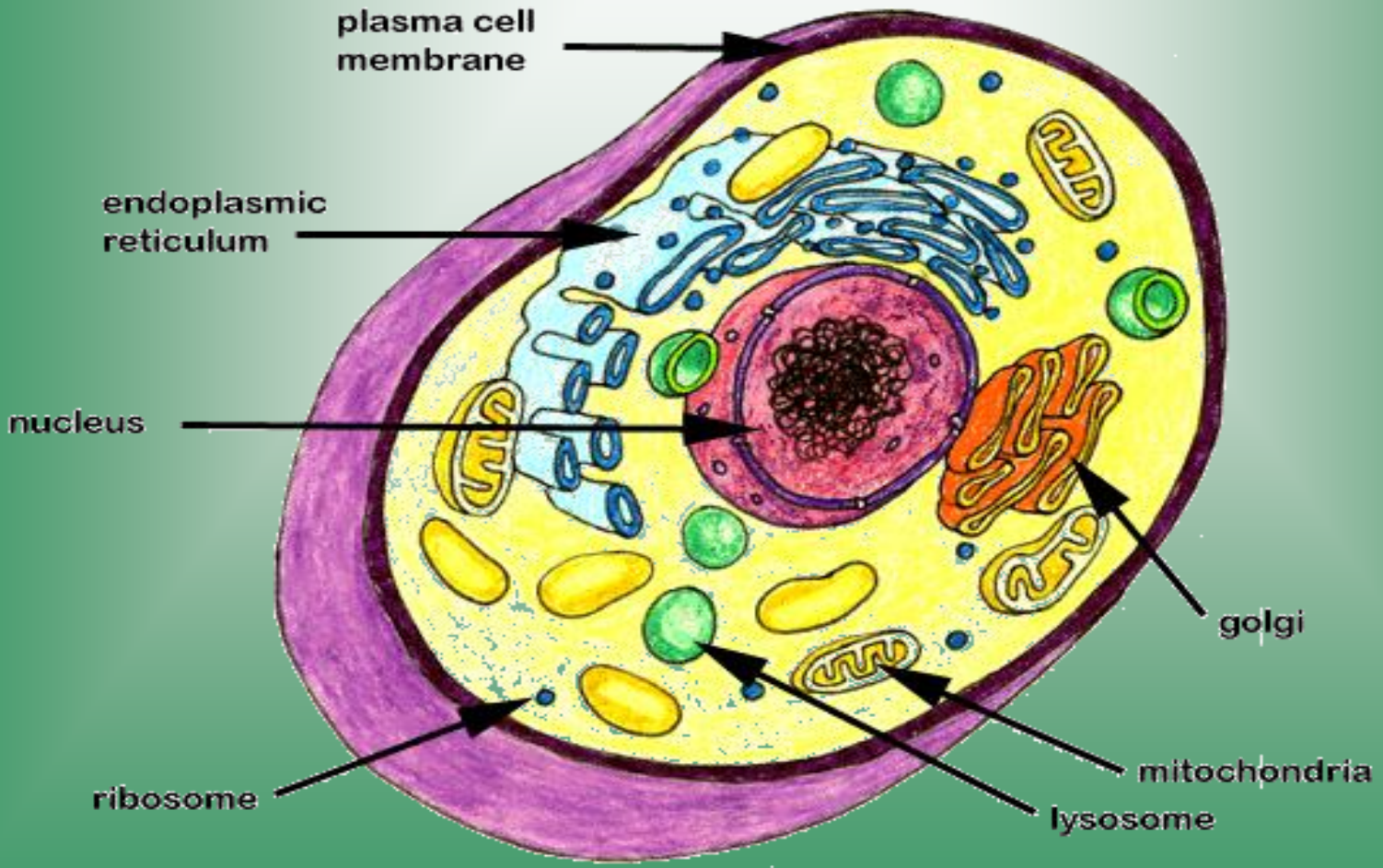
Bacteria

Nerve Cell



Red Blood Cell

“Typical” Animal Cell



Cell Parts and Functions

Nucleolus (Nucleoli)

Makes ribosomes

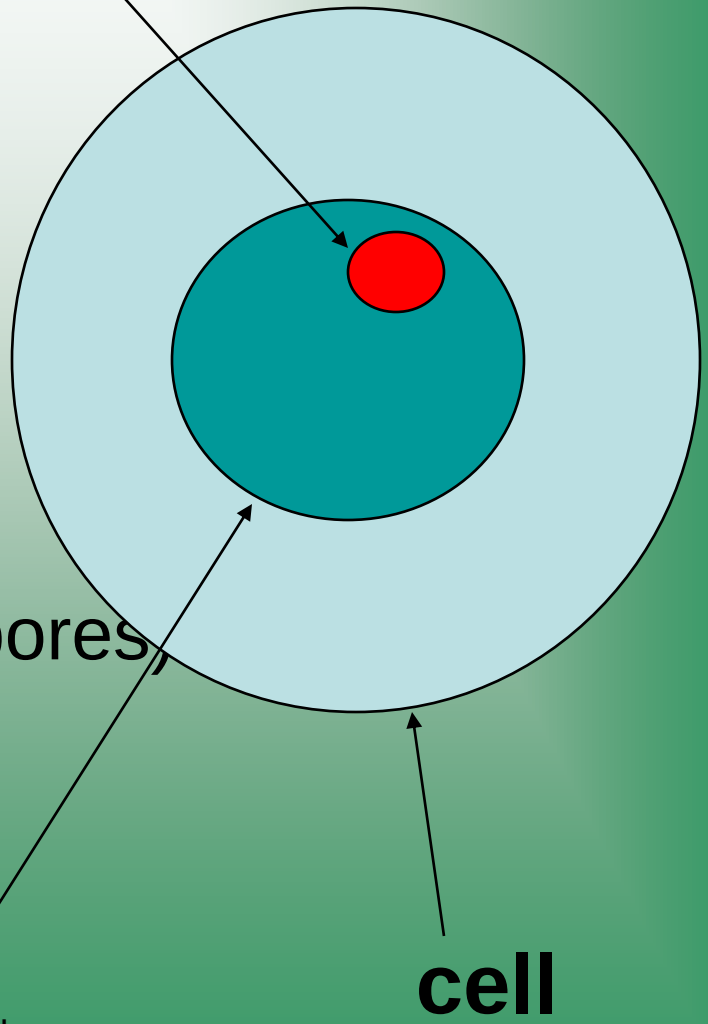
Location: inside the nucleus (dark spot)

Nuclear Membrane

Protects nucleus

Lets things in/out of nucleus (pores)

Location: around nucleus



Cell Parts

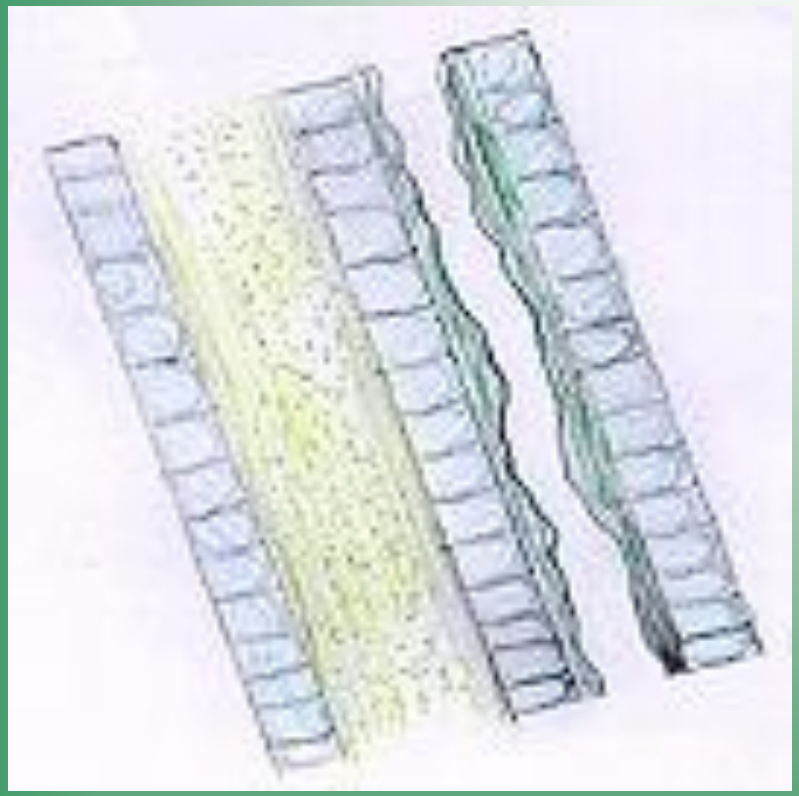
Organelles

Surrounding the Cell

Cell Membrane

- Outer membrane of cell that controls movement in and out of the cell
- Double layer

Cell Wall



- Most commonly found in plant cells & bacteria
- Supports & protects cells

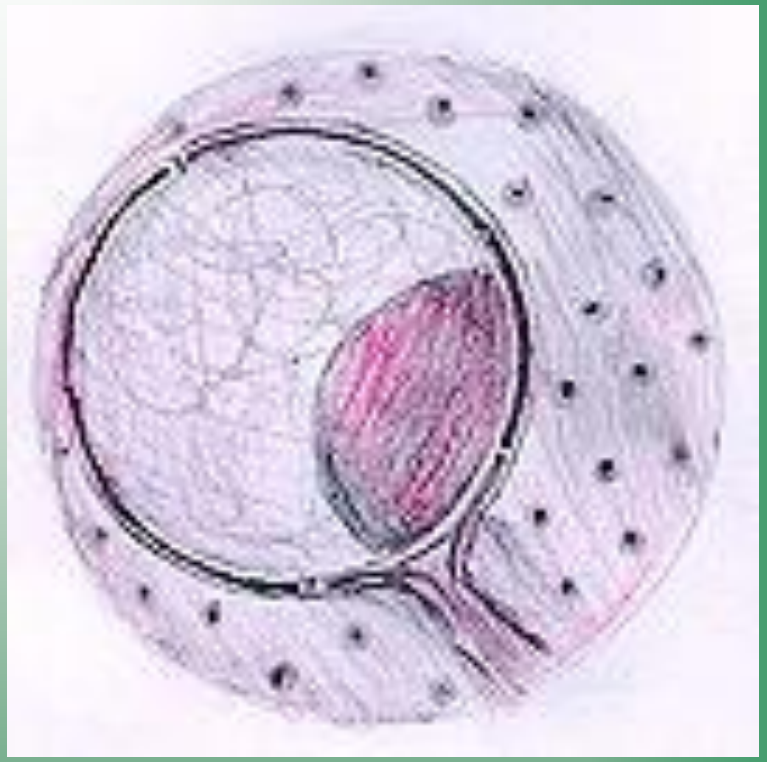
Inside the Cell

Inside the Cell Nucleus

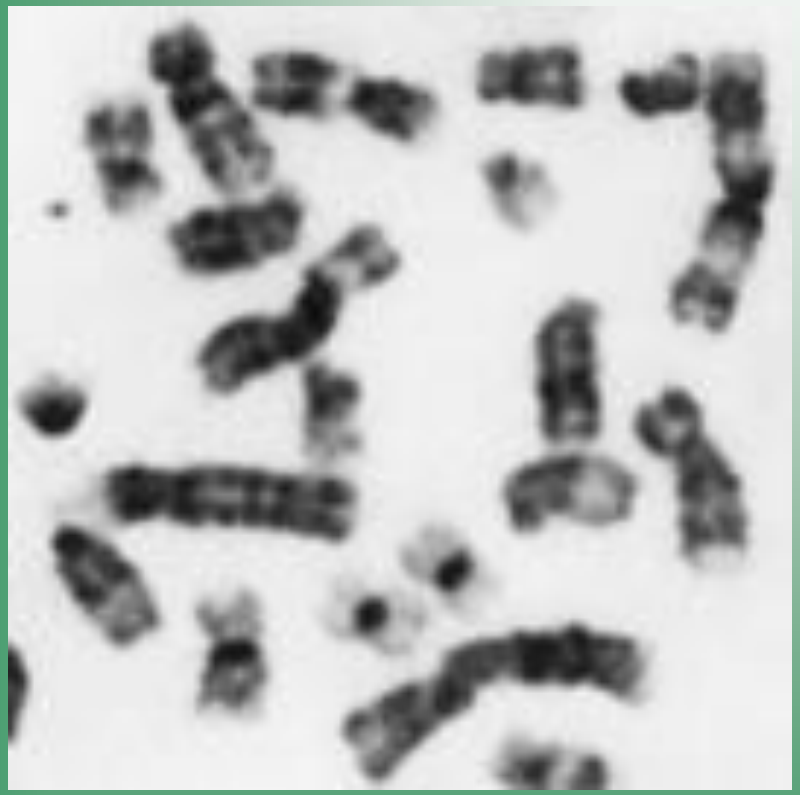
- Largest structiure almost in the center of a cell, bounded by nuclear membrane. Directs cell activities
- Separated from cytoplasm by nuclear membrane
- Contains genetic material – DNA
- Contains nucleolus and chromatin

Nuclear Membrane

- Surrounds nucleus
- Made of three layers contains lipids and proteins.
- Openings allow material to enter and leave nucleus
- It measures 70A* Approx.



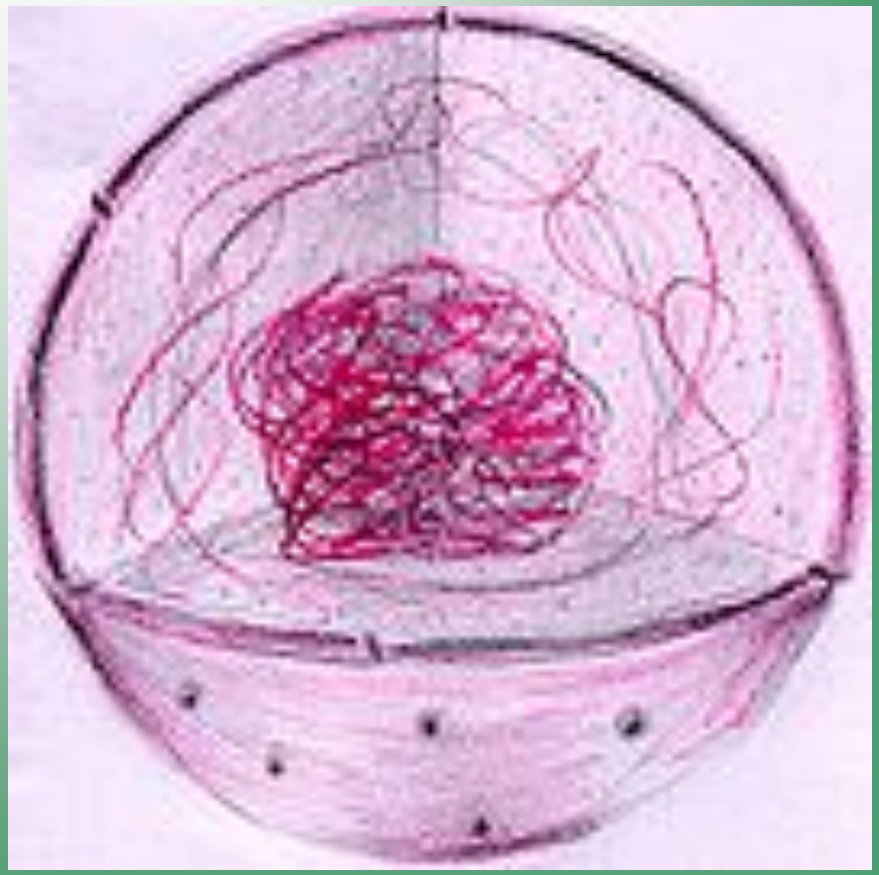
Chromosomes



- In nucleus
- Made of DNA
- Contain instructions for traits & characteristics

Nucleolus

- Inside nucleus
- Contains RNA to build proteins



Cytoplasm

- Gel-like mixture
- Lying between the cell membrane and nucleus.
- It contains cell organells like endoplasmic reticulum, golgi apparatus, mitochondriya, lysosomes and centrosome.
- Surrounded by cell membrane

Endoplasmic Reticulum

- Moves materials around in cell.
- Most extensive cell organelle. It is of two types i.e. Granular & Agranular
- Consists of two membranes separated by a space
- Smooth type: lacks ribosomes
- Rough type (pictured): ribosomes embedded in surface

Ribosomes

- Each cell contains thousands
- Make proteins
- Found on ribosomes & floating throughout the cell

Mitochondria

- Produces energy through chemical reactions – breaking down fats & carbohydrates
- Controls level of water and other materials in cell
- Recycles and decomposes proteins, fats, and carbohydrates
- Also known as “Power house of the Cell”

Golgi Bodies (Apparatus)

- Cup shaped structured.
- Lies between the nucleus and apex of the cell
- Concerned with concentration of proteins prior to their secretion
- Move materials within the cell
- Move materials out of the cell

Lysosome

- Transports undigested material to cell membrane for removal
- Contain variety of hydrolytic enzymes.
- Small spherical or oval bodies surrounded by a single membrane
- It break down bacteria and cell debris engulfed by the cell

Cell Parts and Functions

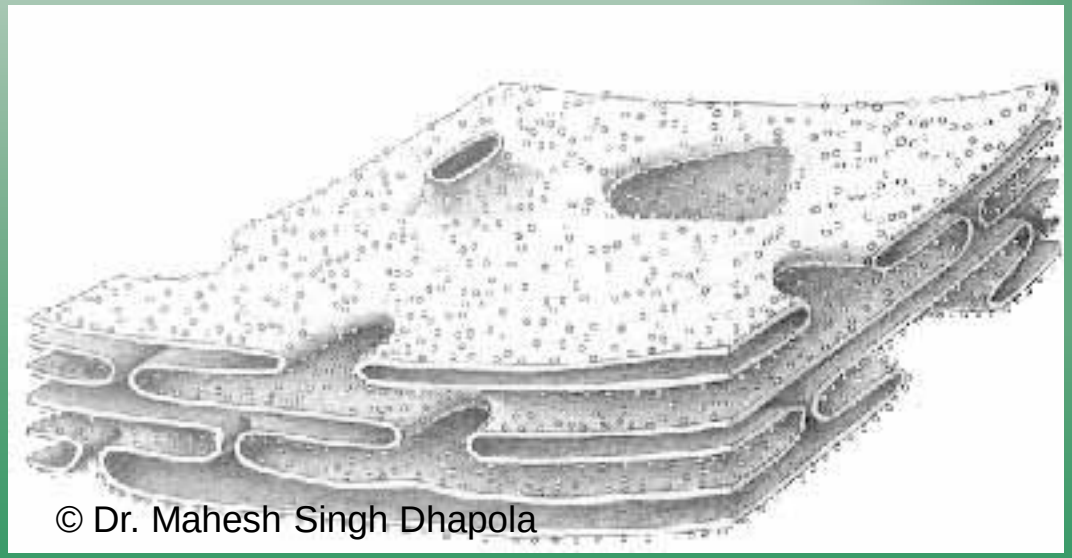
Endoplasmic Reticulum (E.R.)

Transports materials and sends messages to all parts of the cell

Two types: smooth and rough (has ribosomes)

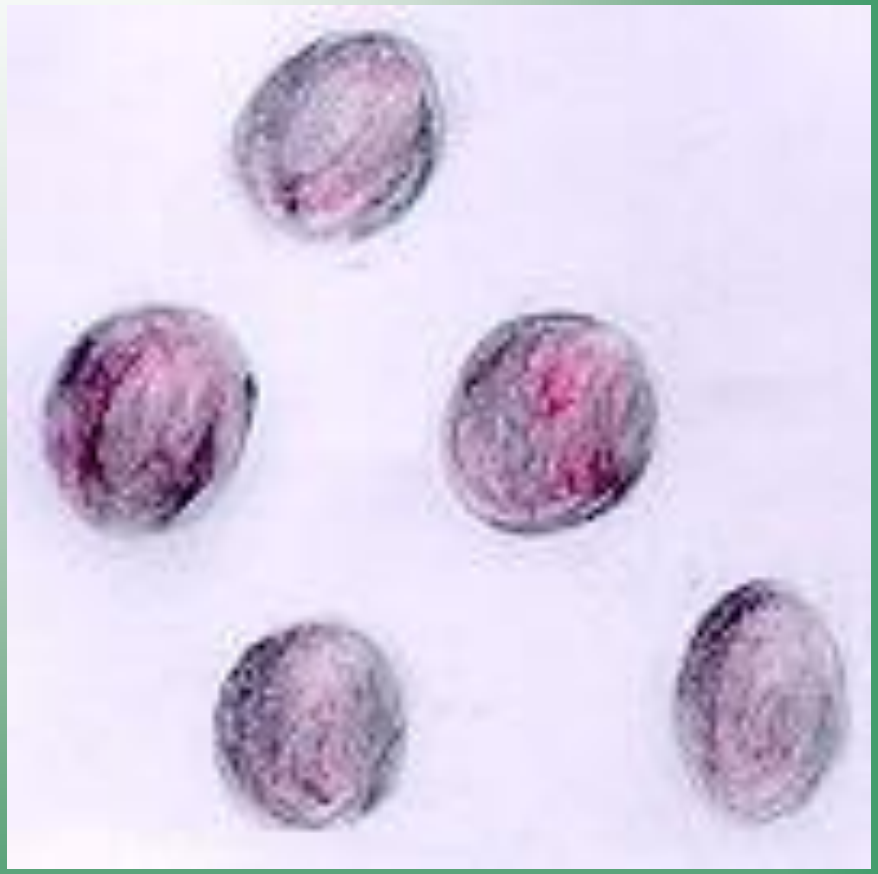
Location: attaches from cell membrane to nuclear membrane

Rough E.R.



Vacuoles

- Membrane-bound sacs for storage, digestion, and waste removal
- Contains water solution
- Help plants maintain shape



Functions of Cell

1. Ingestion and Assimilation
2. Growth and Repair
3. Metabolism
4. Respiration
5. Excretion
6. Irritability and Contractility
7. Reproduction

Tissue Types in the Human

A group of cells having the same origin, similar shape and specific or common generalised function is known as tissue.

- Epithelial
  - primarily used for protection
- Connective
  - primarily used for support
- Nerve
  - primarily used for control
- Muscle
  - primarily used for movement

Epithelial Tissue

- Consists almost entirely of cells, little extracellular material
- One side always exposed to:
  - body exterior
  - organ cavity
- Cells have high regeneration potential *
- Cells are avascular * …. (Perfusion)
- Some epithelial cells rest on a “Basement Membrane”
  - Basement Membrane
    - nonliving adhesive substance secreted by epithelial cells (Similar to Scotch® tape)
    - composed of connective tissue (collagen and glycoproteins)

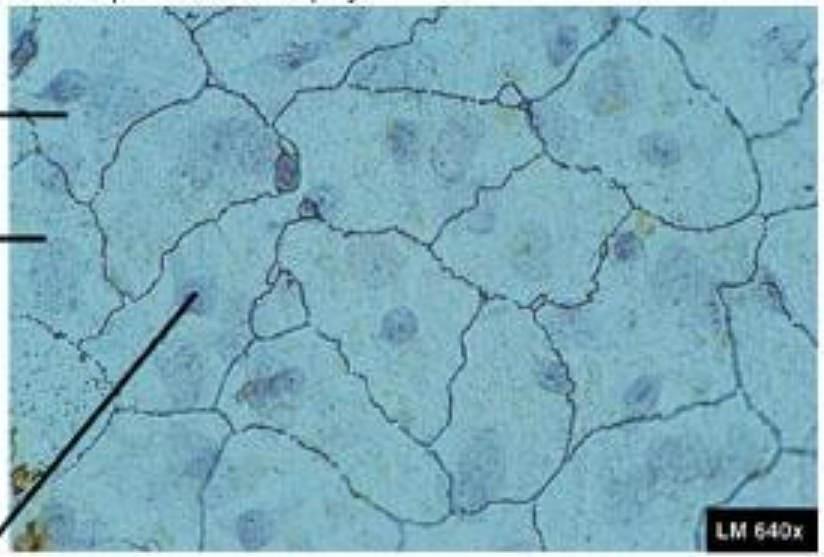
Adjectives Describing Epithelial Tissue

- Squamous (meaning “scale”) - flat cells
- Cuboidal - cells as tall as they are wide
- Columnar - tall and column shaped
  - Simple - having a single layer of cells
  - Stratified - having multiple or stacked layers
  - Transitional - dome shaped surface cells

- <u>Examples</u>
  - SIMPLE SQUAMOUS EPITHELIUM
    - permeable - used for filtration and exchange
    - examples: capillaries, alveoli, kidney glomeruli
  - STRATEFIED SQUAMOUS EPITHELIUM
    - used for protection - basil cells may be cuboidal
    - examples: skin, inside of mouth

Free surface

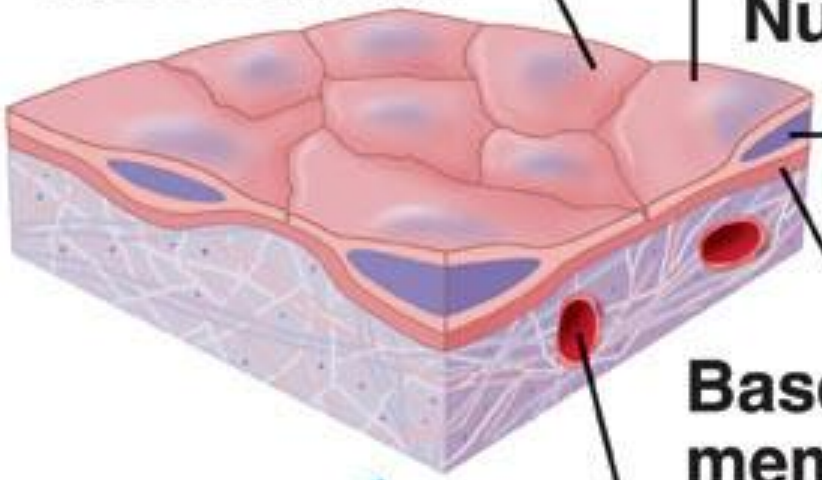
Epithelial cells with little extracellular materials between the cells



Surface view

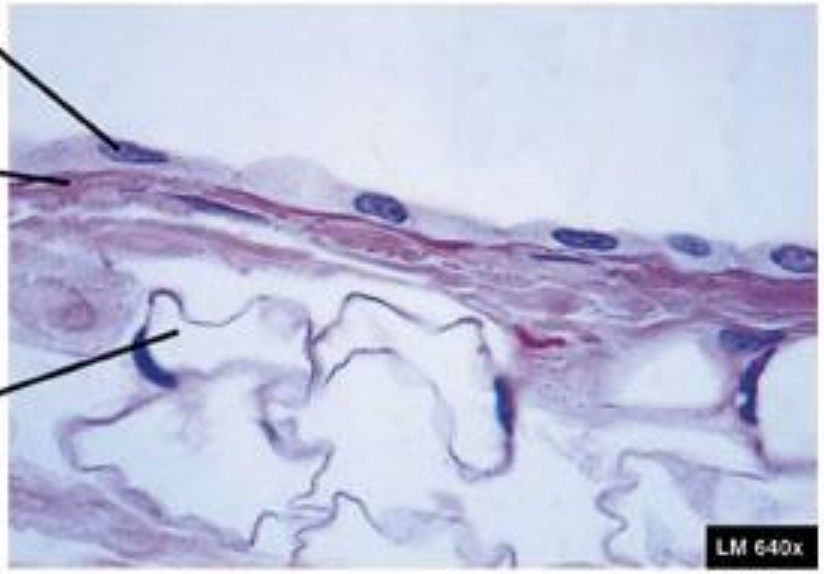
Free surface

Nucleus

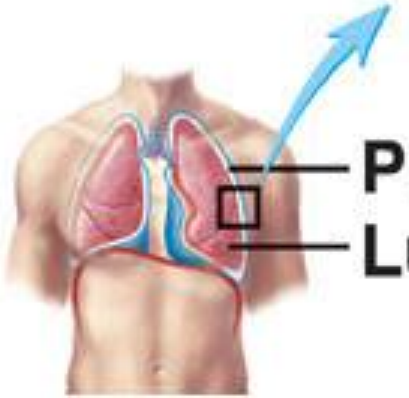


Basement membrane

Capillary

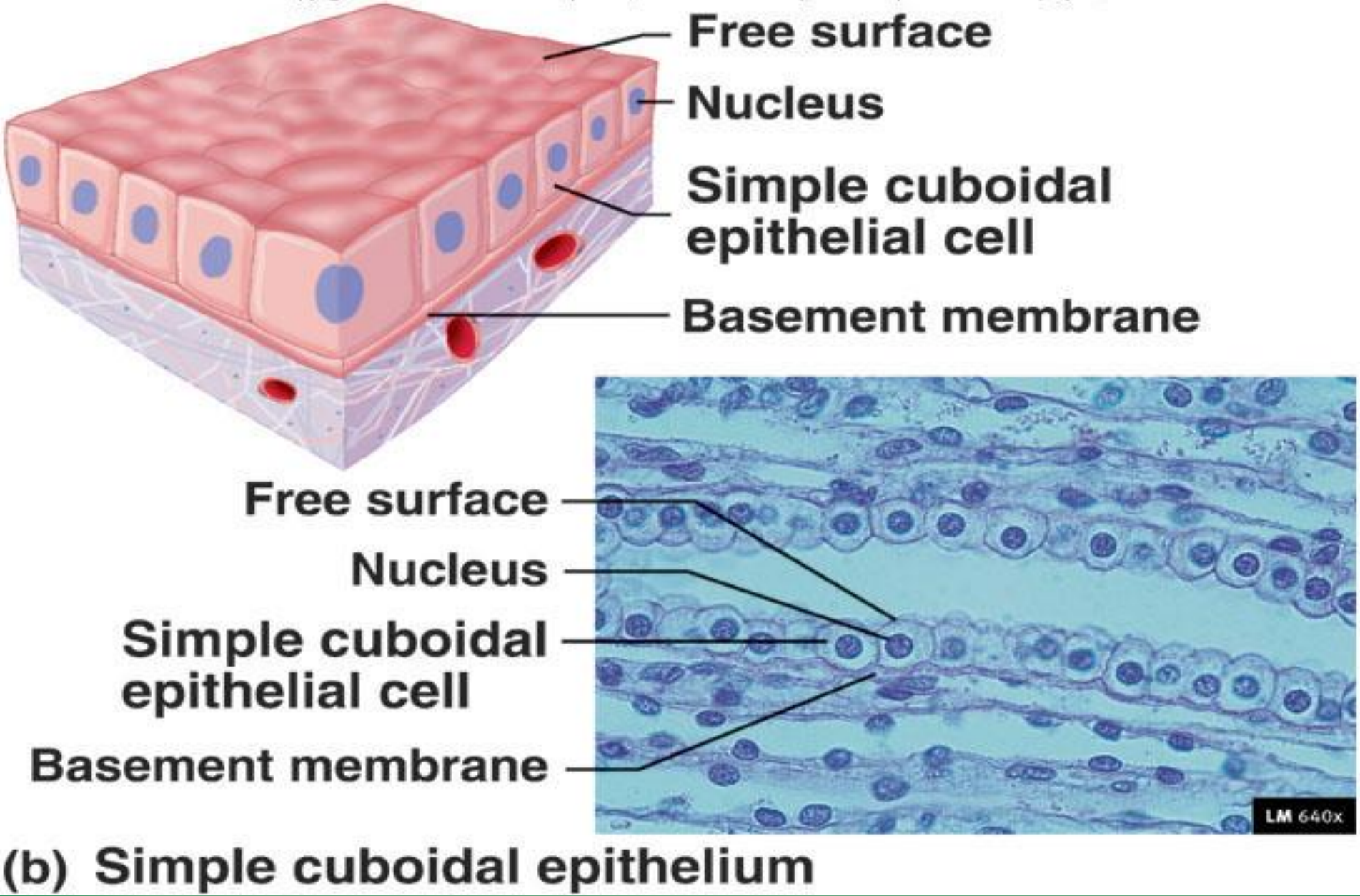


Cross-sectional view



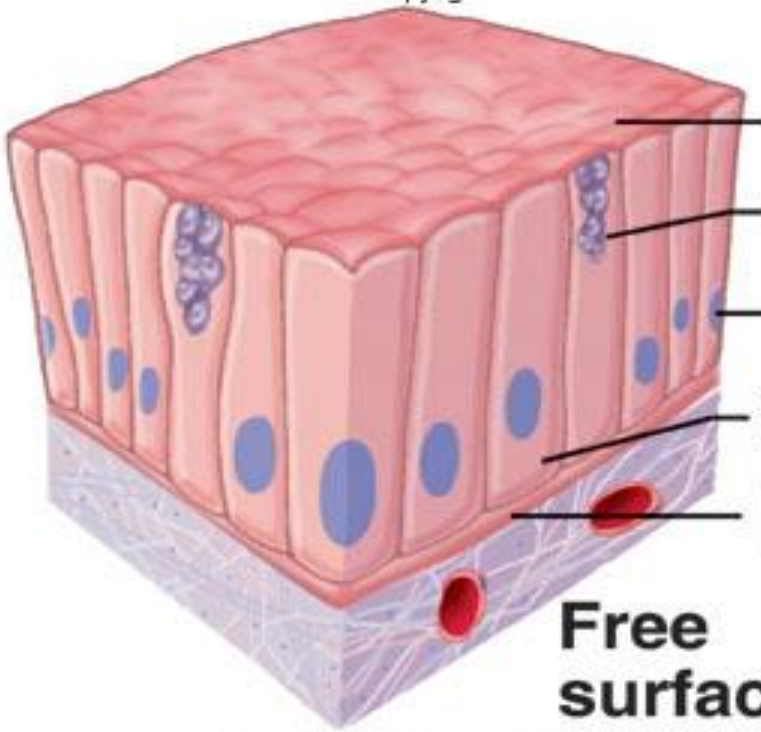
Pleura

Lung



(b) Simple cuboidal epithelium

Kidney tubules, glands, lining of terminal bronchioles, etc.



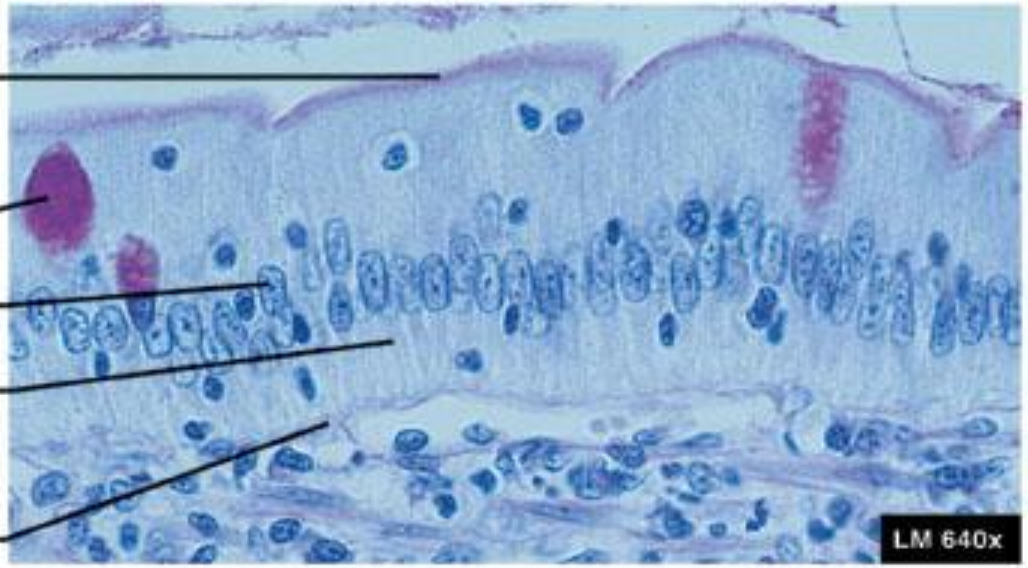
Free surface

Goblet cell containing mucus

Nucleus

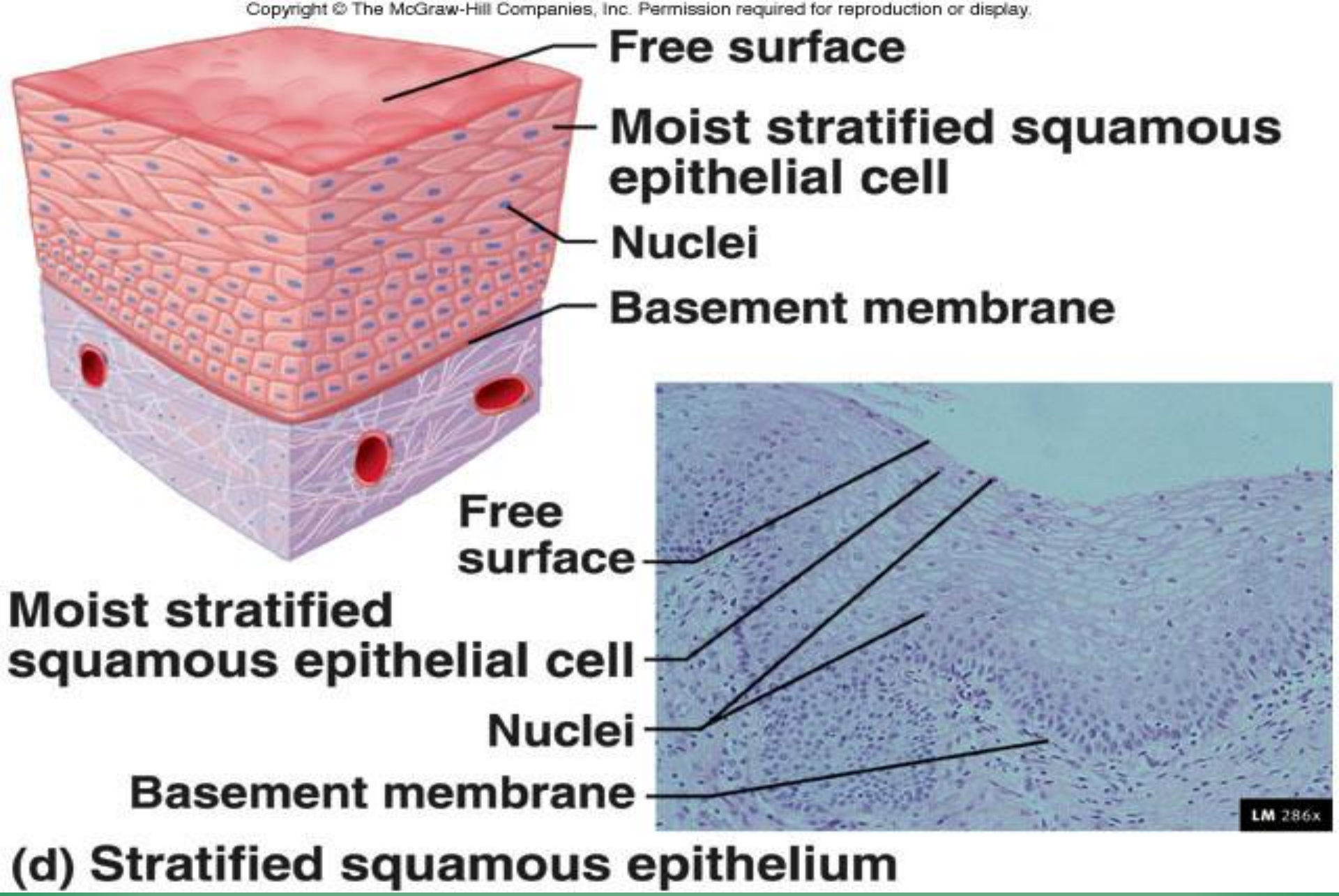
Simple columnar epithelial cell

Basement membrane



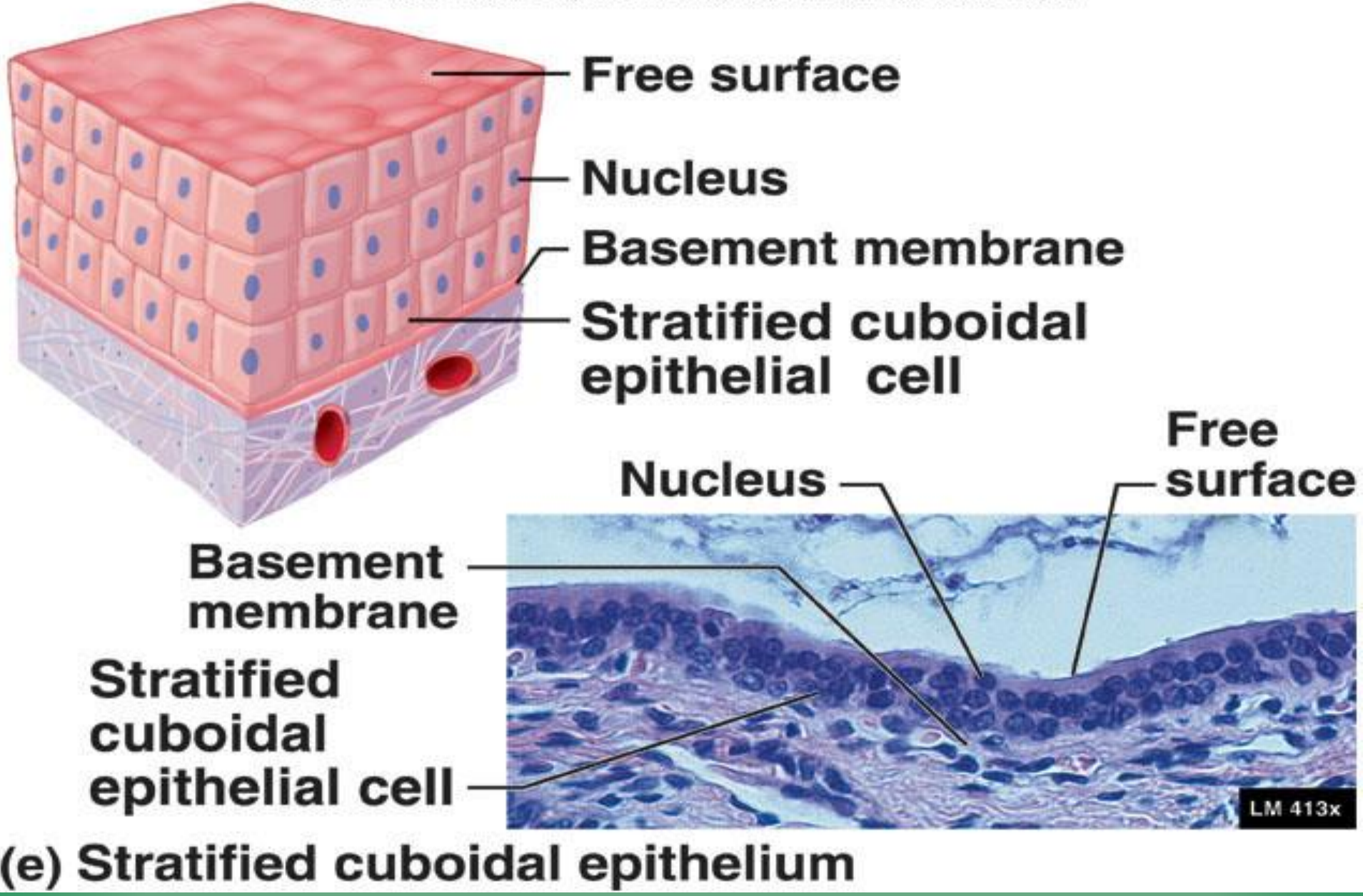
(c) Simple columnar epithelium

Glands, bronchioles, stomach, intestines, bile ducts, etc.



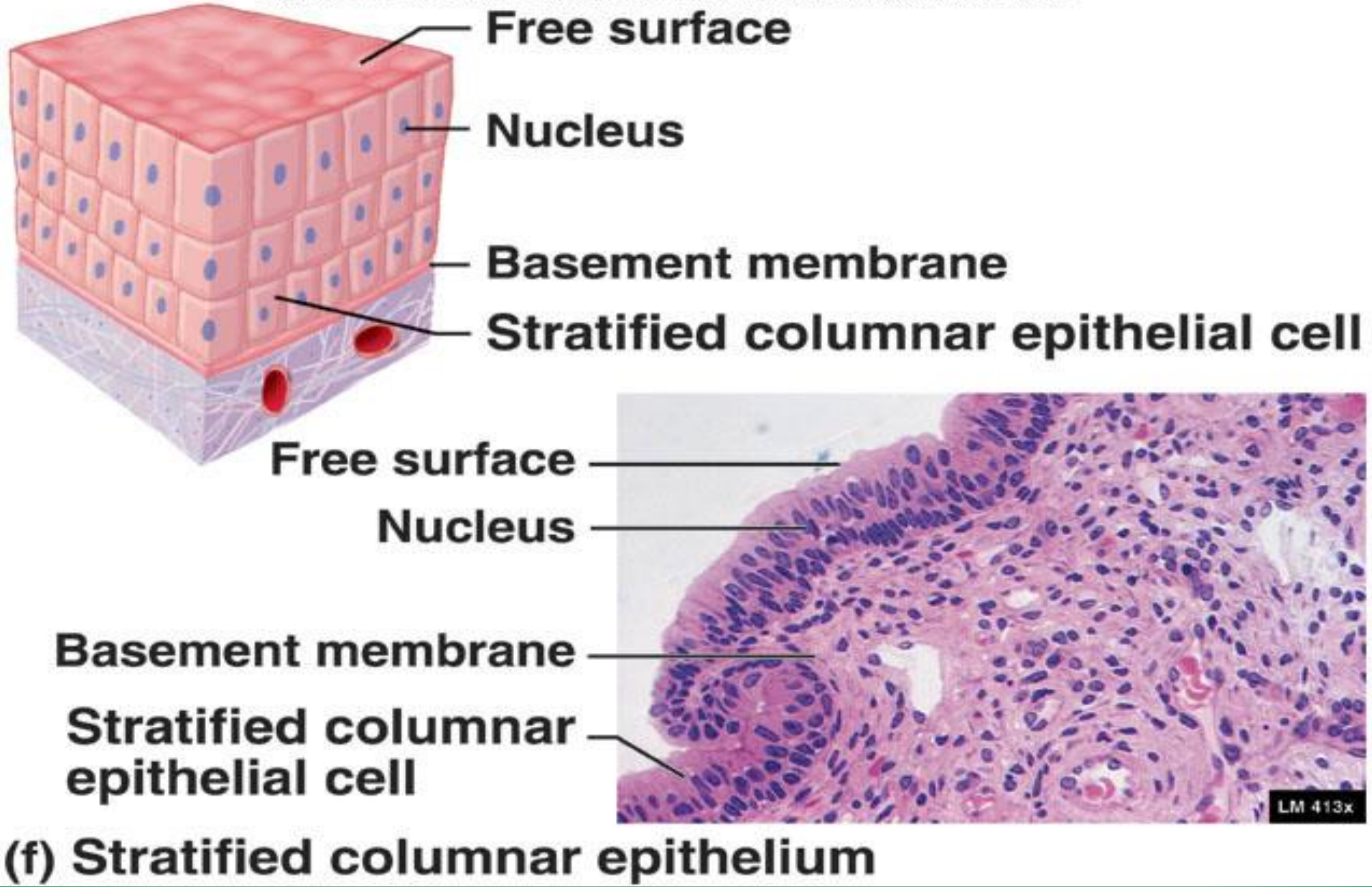
(d) Stratified squamous epithelium

Mouth, throat, esophagus, urethra, skin (keratinized)



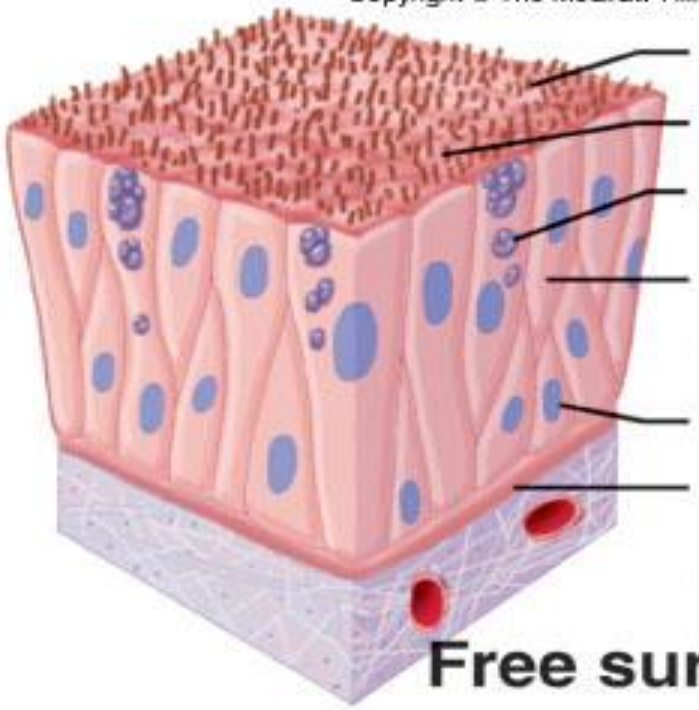
(e) Stratified cuboidal epithelium

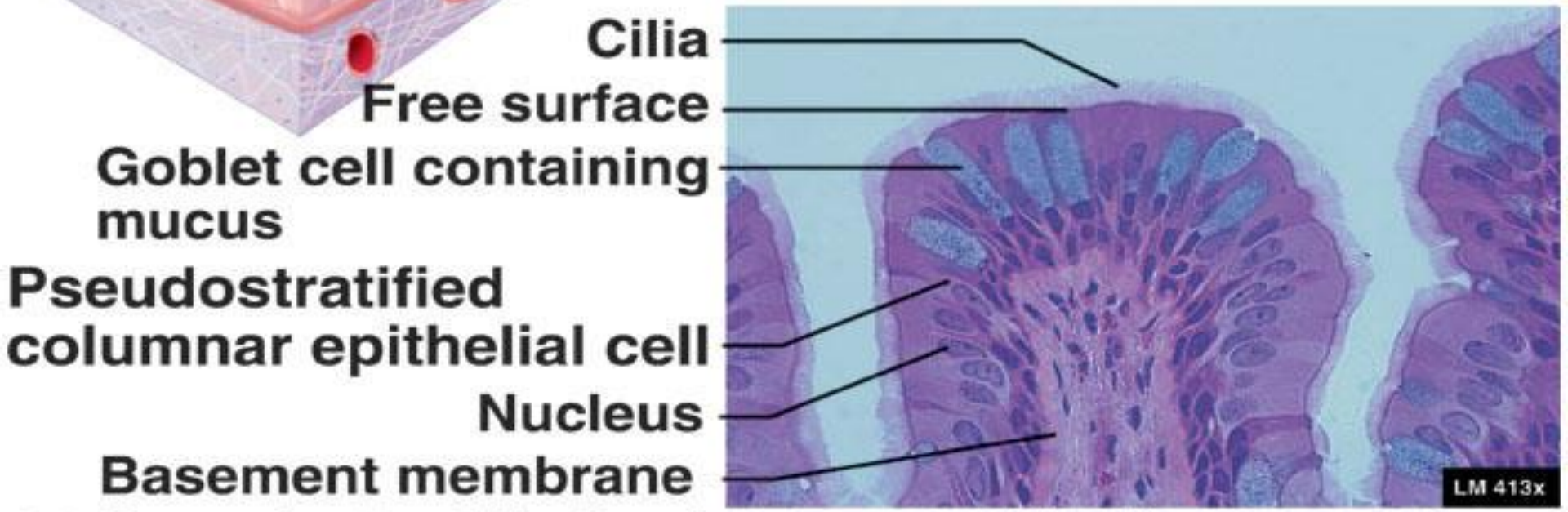
Sweat gland ducts, salivary gland ducts, etc.



(f) Stratified columnar epithelium

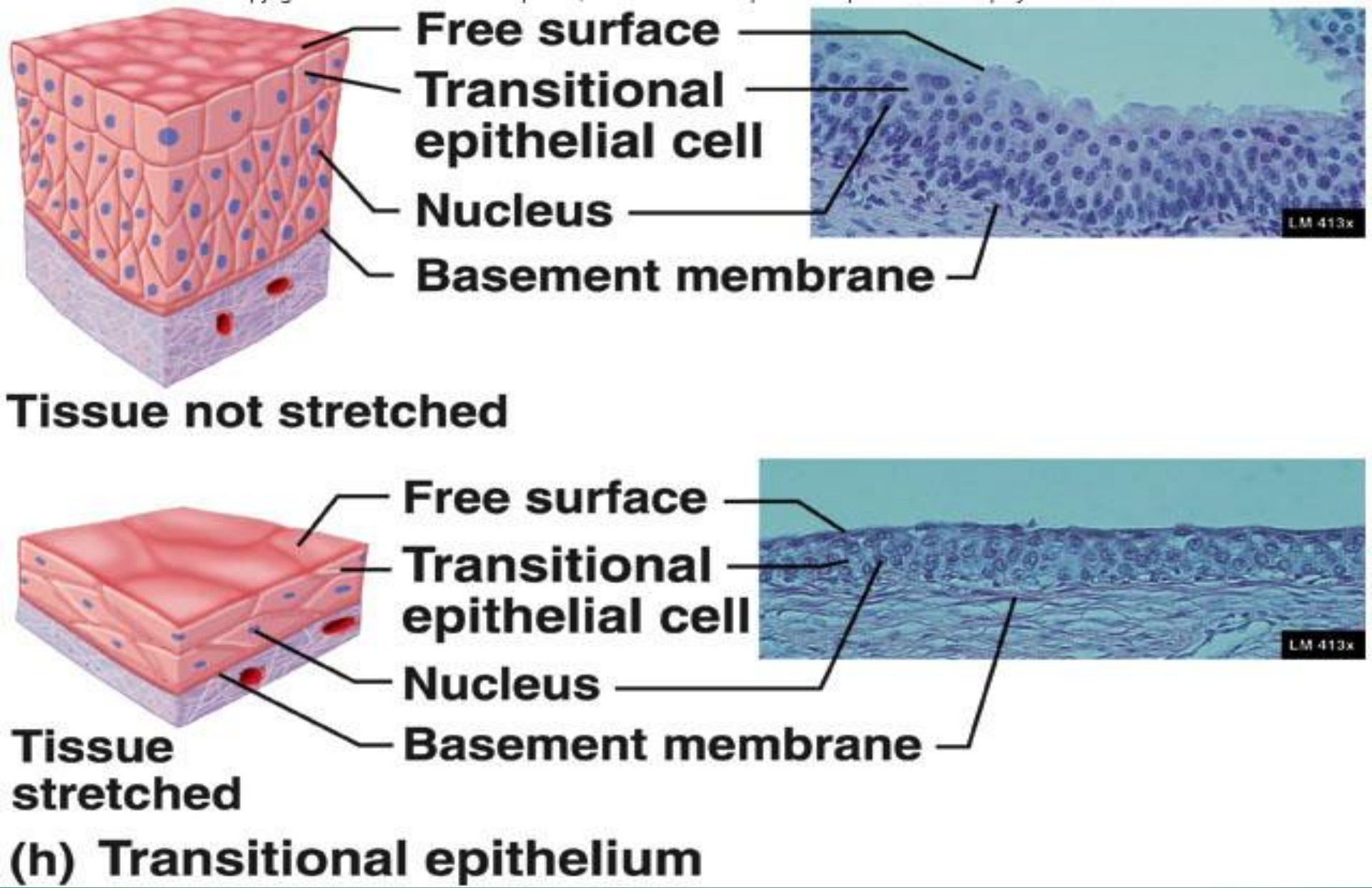
Mammary gland ducts, larynx, urethra (males)





(g) Pseudostratified columnar epithelium

Lines nasal cavity & sinuses, auditory tubes, trachea, bronchi



Bladder lining, ureters, and superior urethra

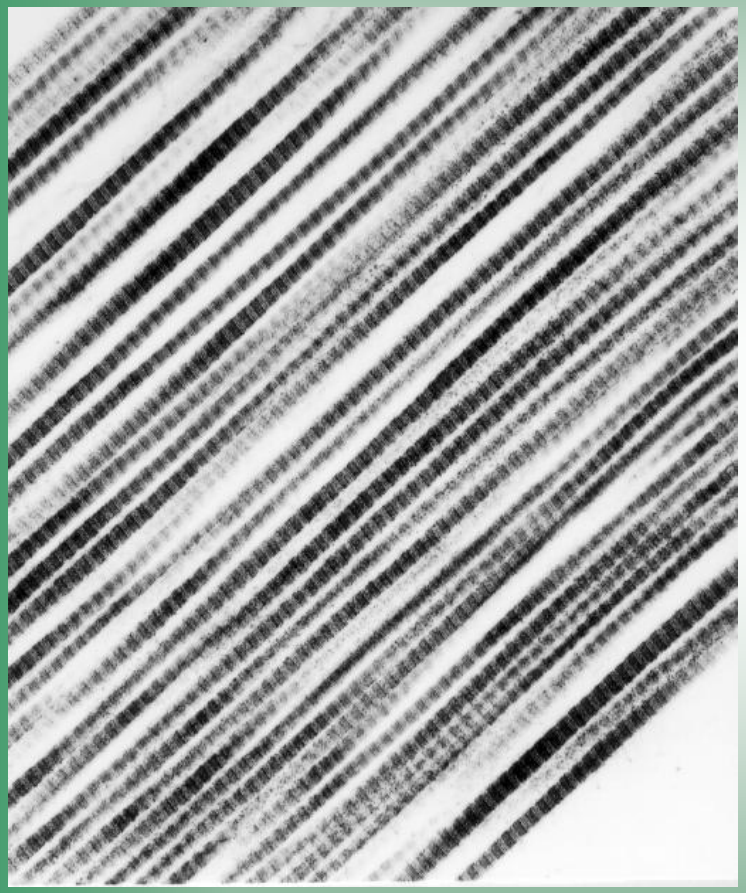
[A] Epithelium Tissue:-

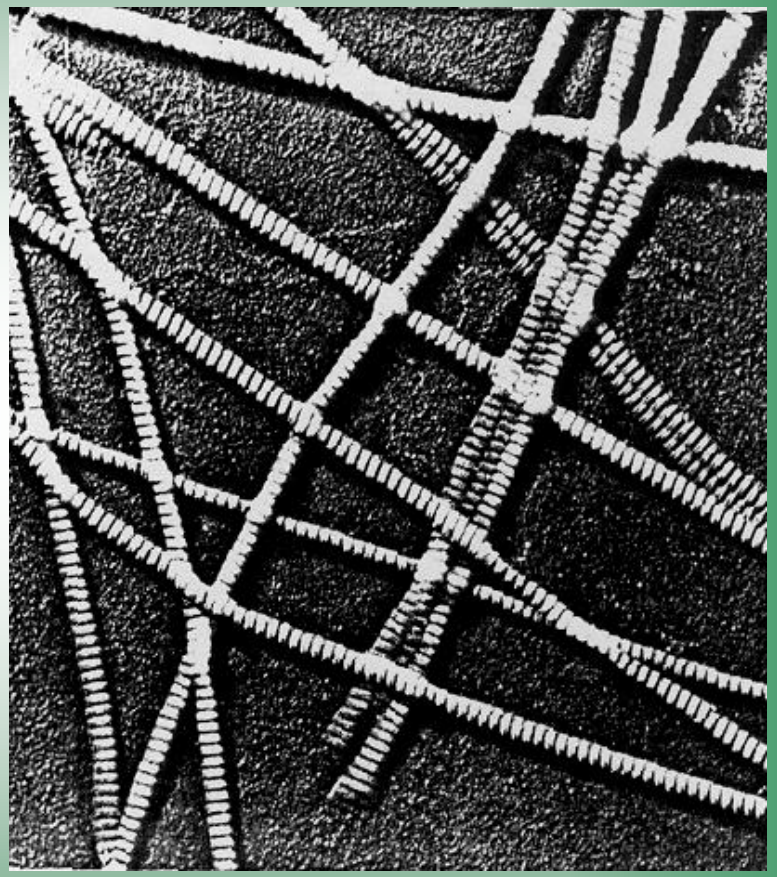
1. Simple Epithelial Tissue (Single Layered)
   i. Squamous
   ii. Cuboidal
   iii. Columnar
   iv. Ciliated
   v. Glandular
2. Stratified Epithelium Tissue:- (More than one layer)
   i. Stratified Squamous Epithelium
   ii. Stratified Cuboidal Epithelium
   iii. Stratified Columnar Epithelium

[B] CONNECTIVE TISSUE

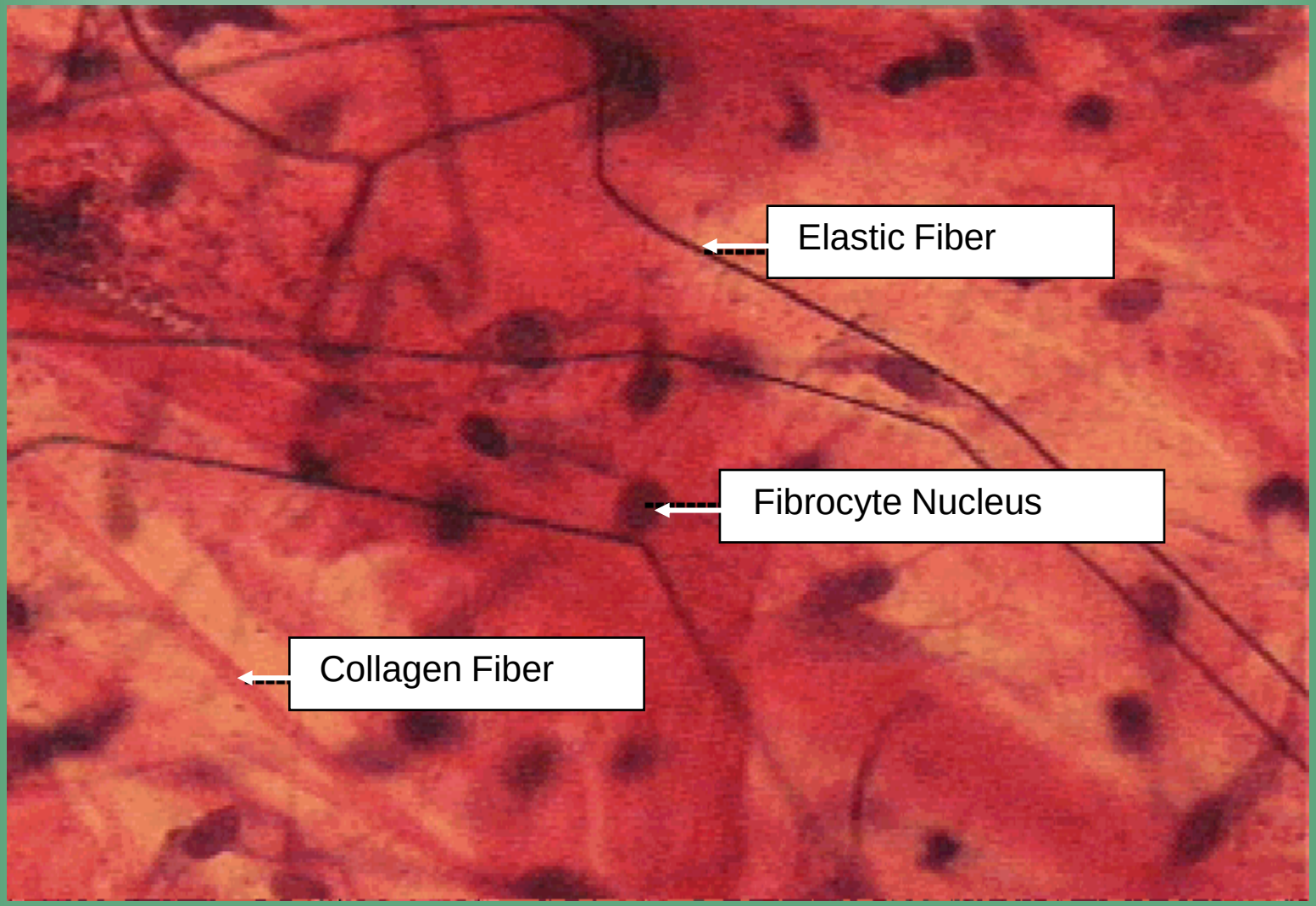
1. Areolar Tissue
2. Adipose Tissue
3. White Fibrous Tissue
4. Tendon
5. Ligament
6. Blood
7. Bone i. Compact ii. Spongy
8. Cartilage

Collagen Fibers





Areolar Tissue

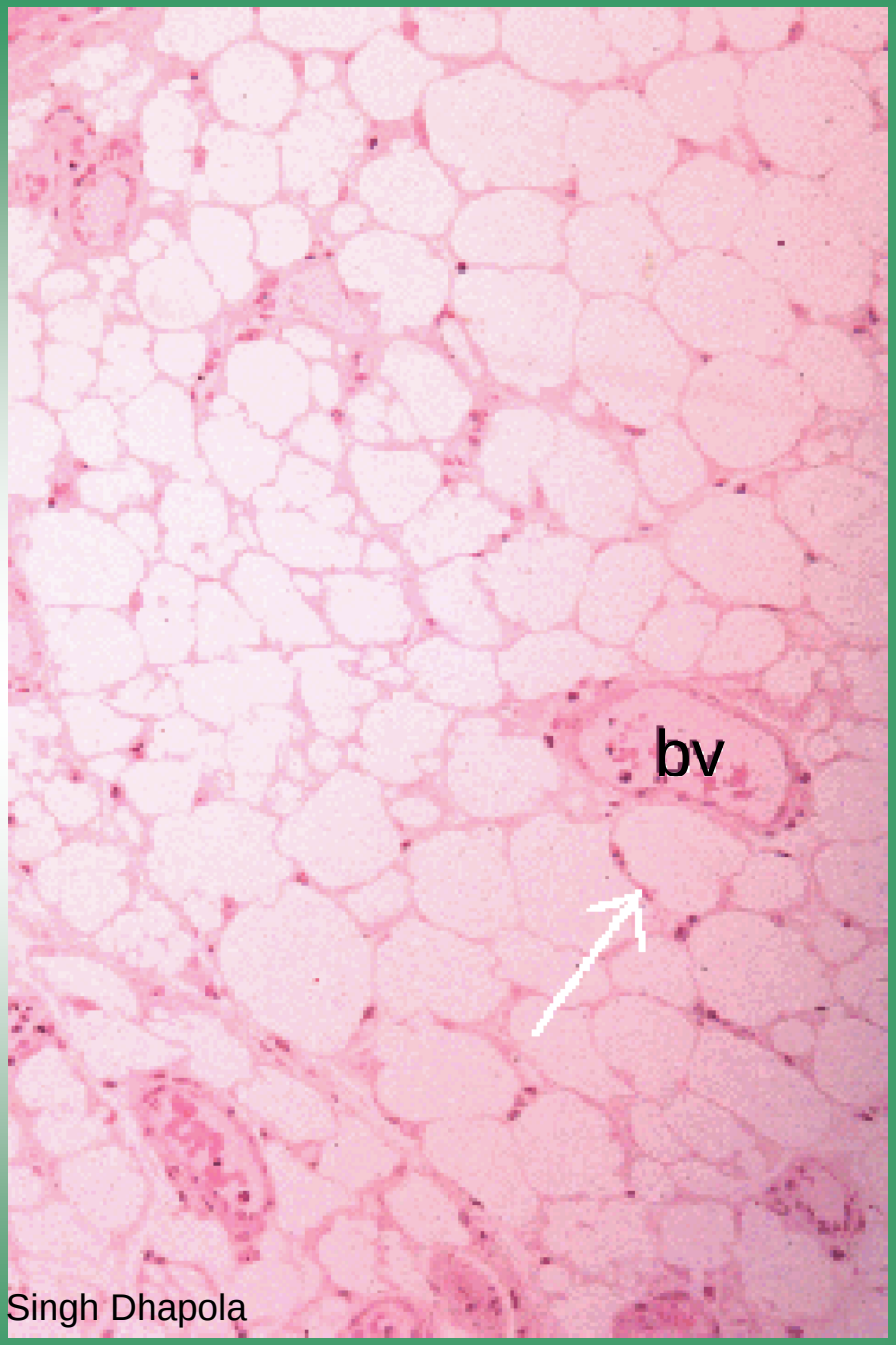


Adipose Tissue

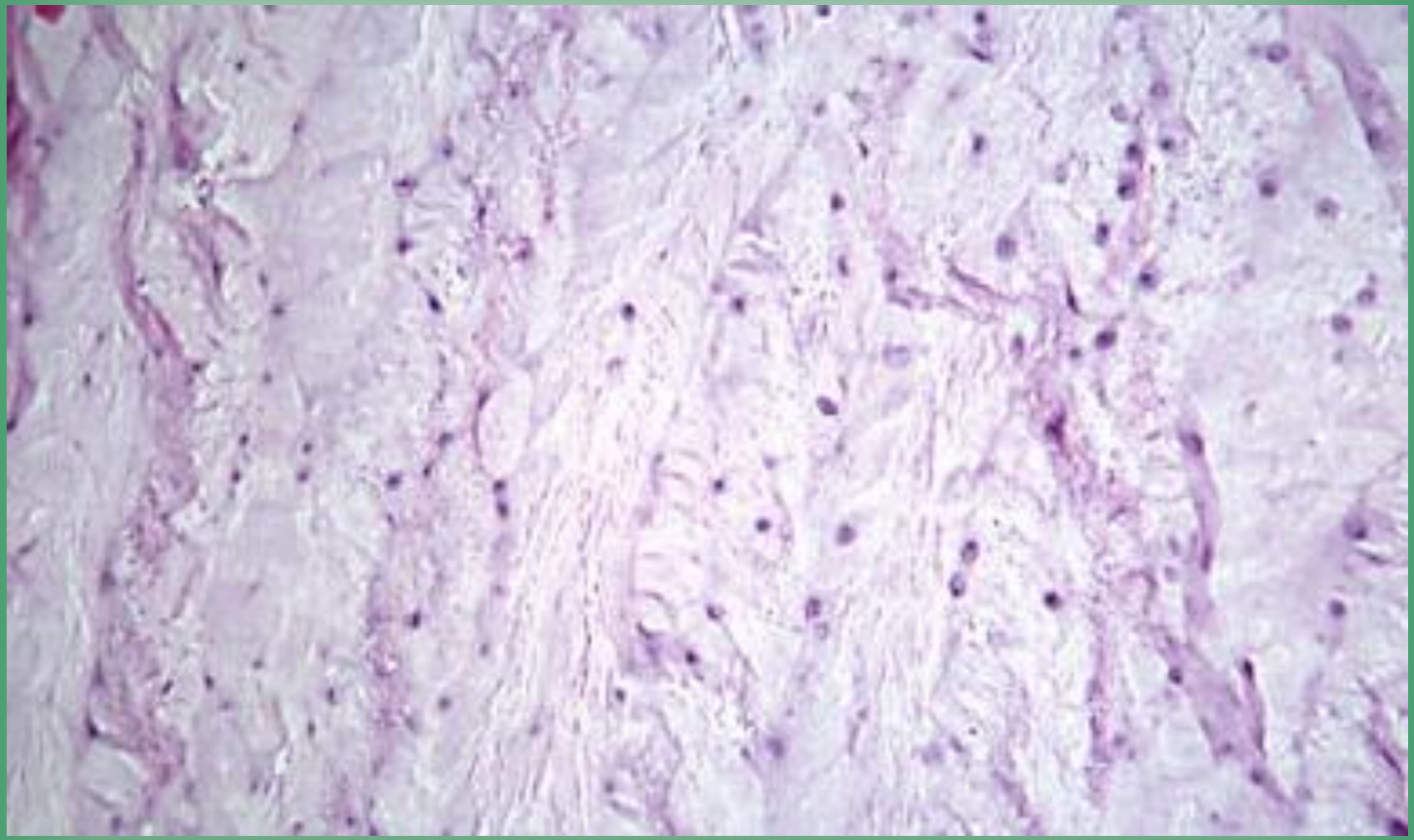
200 X

(bv = blood vessel)

(arrow: adipocyte nucleus)

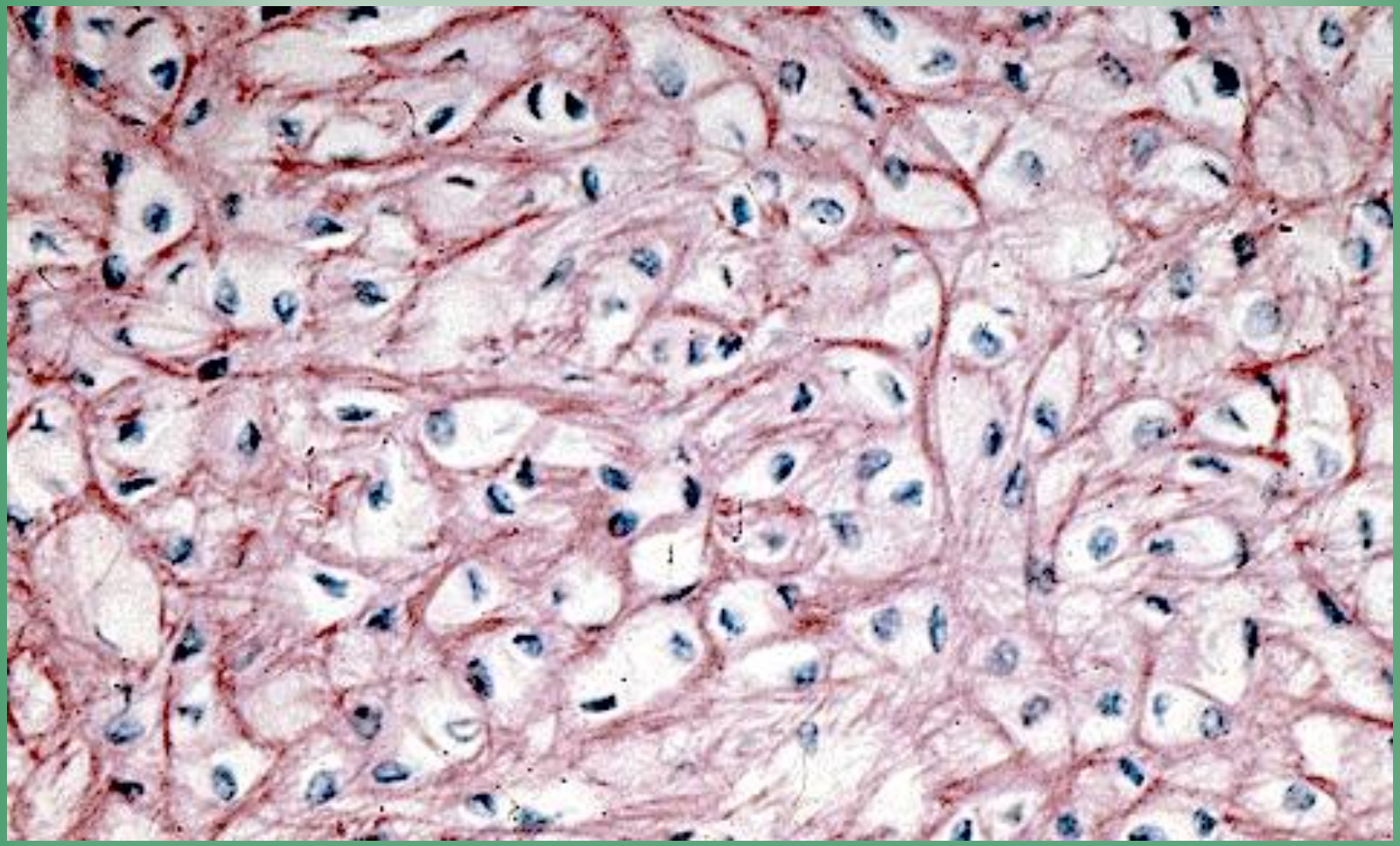


Fibrocartilage

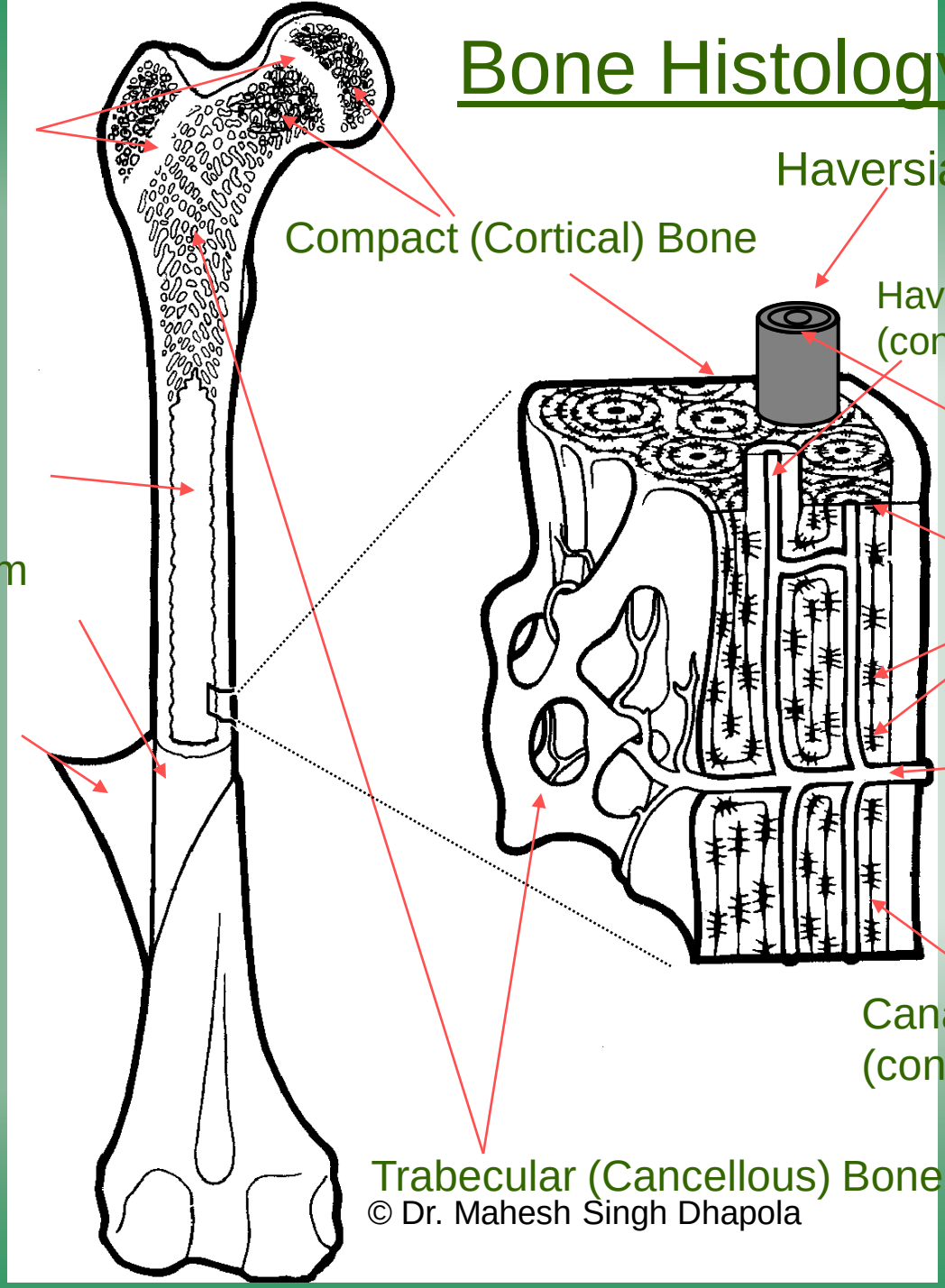


Elastic Cartilage

(note numerous chondrocytes and elastic fibers)



Bone Histology



Cartilage Tissue is further classified into:-

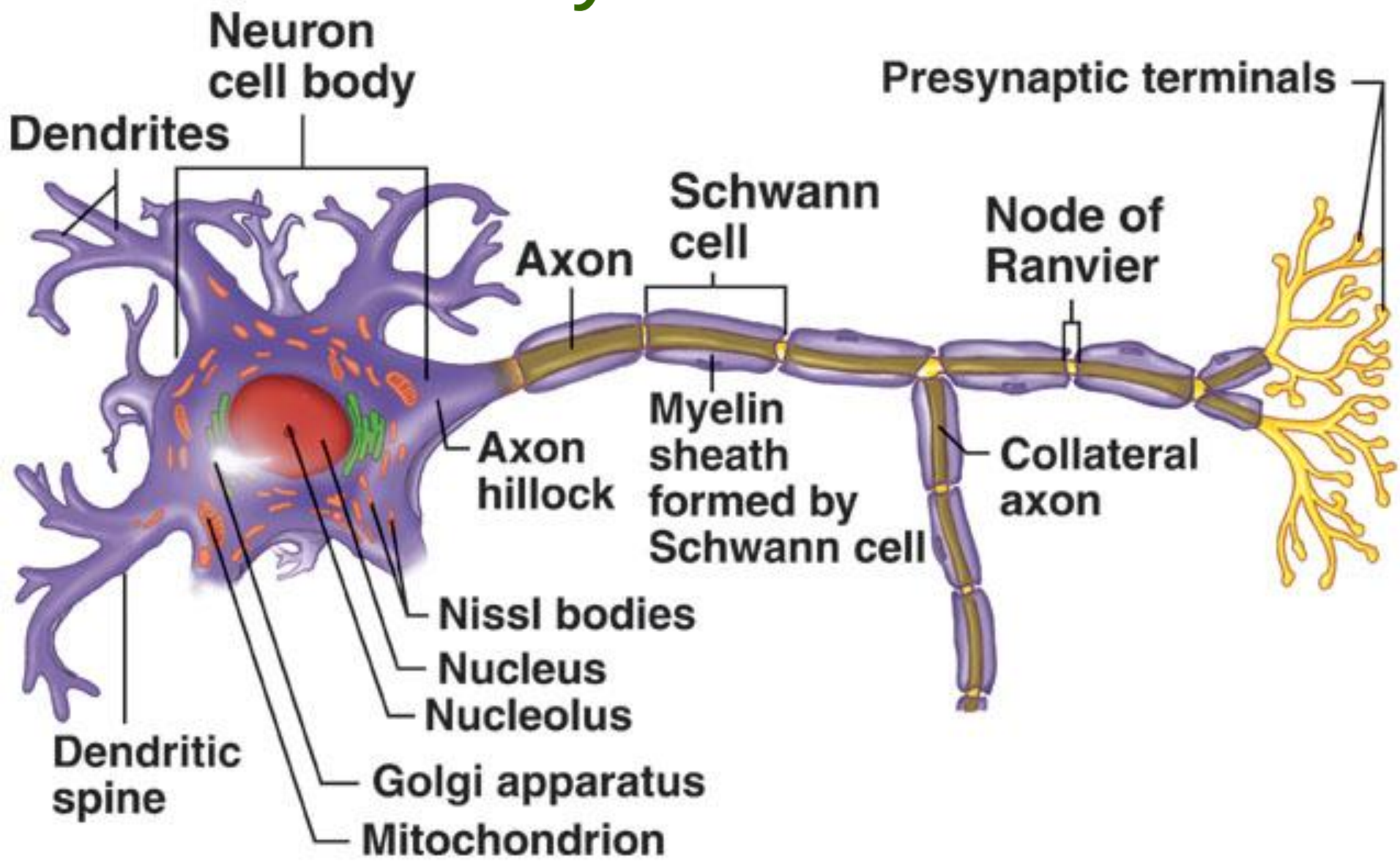
i. Hyaline Cartilage (Collagen fibres)
ii. White Fibrous Cartilage
iii. Elastic Cartilage

[C] MUSCULAR TISSUE:- This tissue is specialized for contraction, and by means of this movement is performed. It is composed of cylindrical fibers which correspond to the other tissues. Three are three types of Muscles:-

1. Striped (Striated, Skeletal or Voluntary)
2. Unstriped (Unstriated, Smooth or Involuntary)
3. Cardiac Muscles (Only found in the heart)

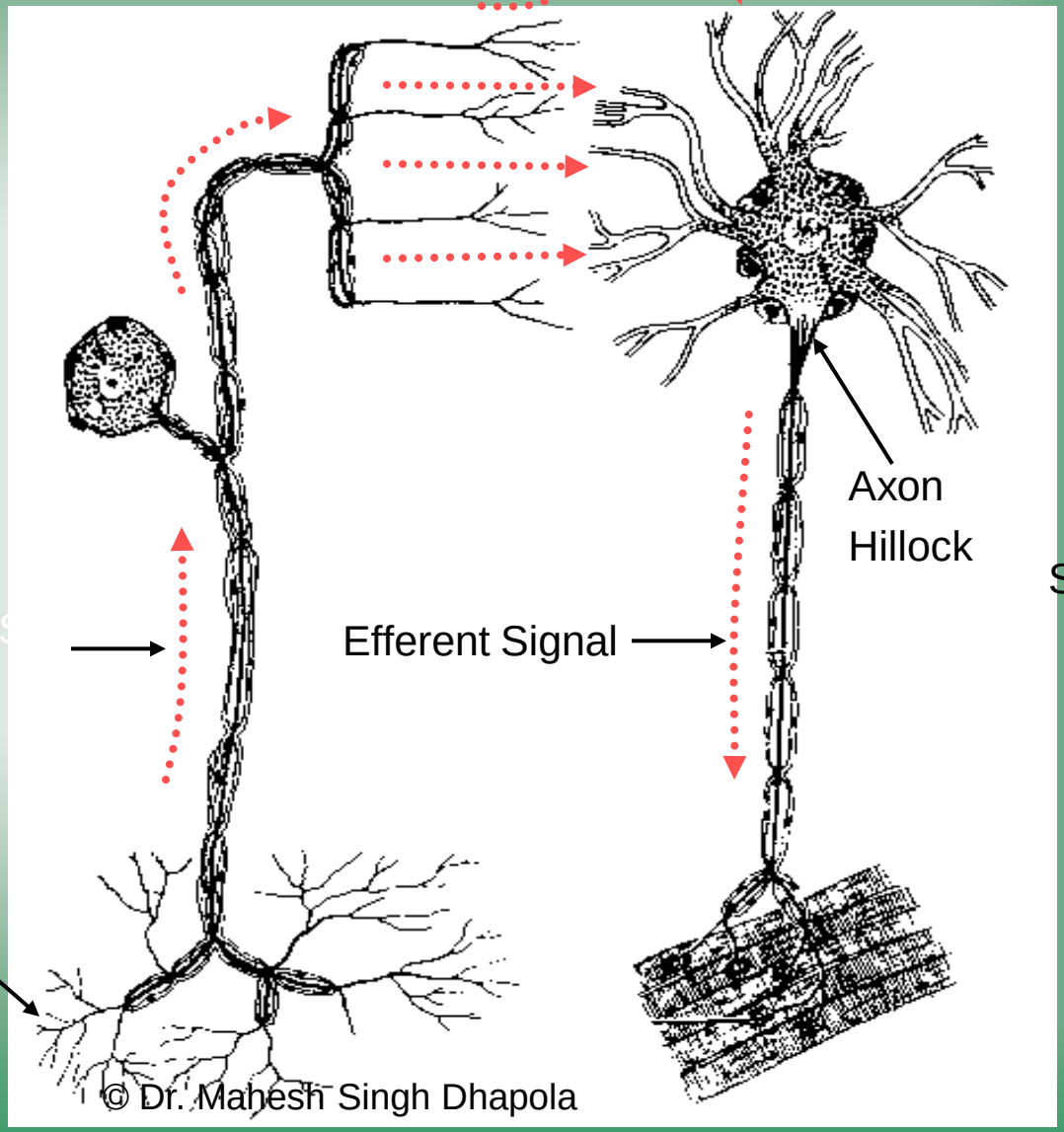
[D] NERVOUS TISSUE:- The nervous tissue consist of three kinds of matter i.e. grey matter forming the nerve cells, white matter, forming the nerve fibers and neuroglia, a special kind of supporting cell, found only in the nervous system, which holds together and support nerve cells and fibers. Each nerve cell with its processes is called a neuron.

Anatomy of Nerve



Higher Neural Processing Centers

Sensory - Motor Structure & Signal transmission



ESSENTIAL PROPERTIES OF LIFE

1. Presence of protoplasm
2. Excitation and Irritability
3. Contractility and Conductivity
4. Respiration
5. Assimilation and Digestion
6. Metabolism
7. Growth and Development
8. Excretion and Secretion
9. Reproduction