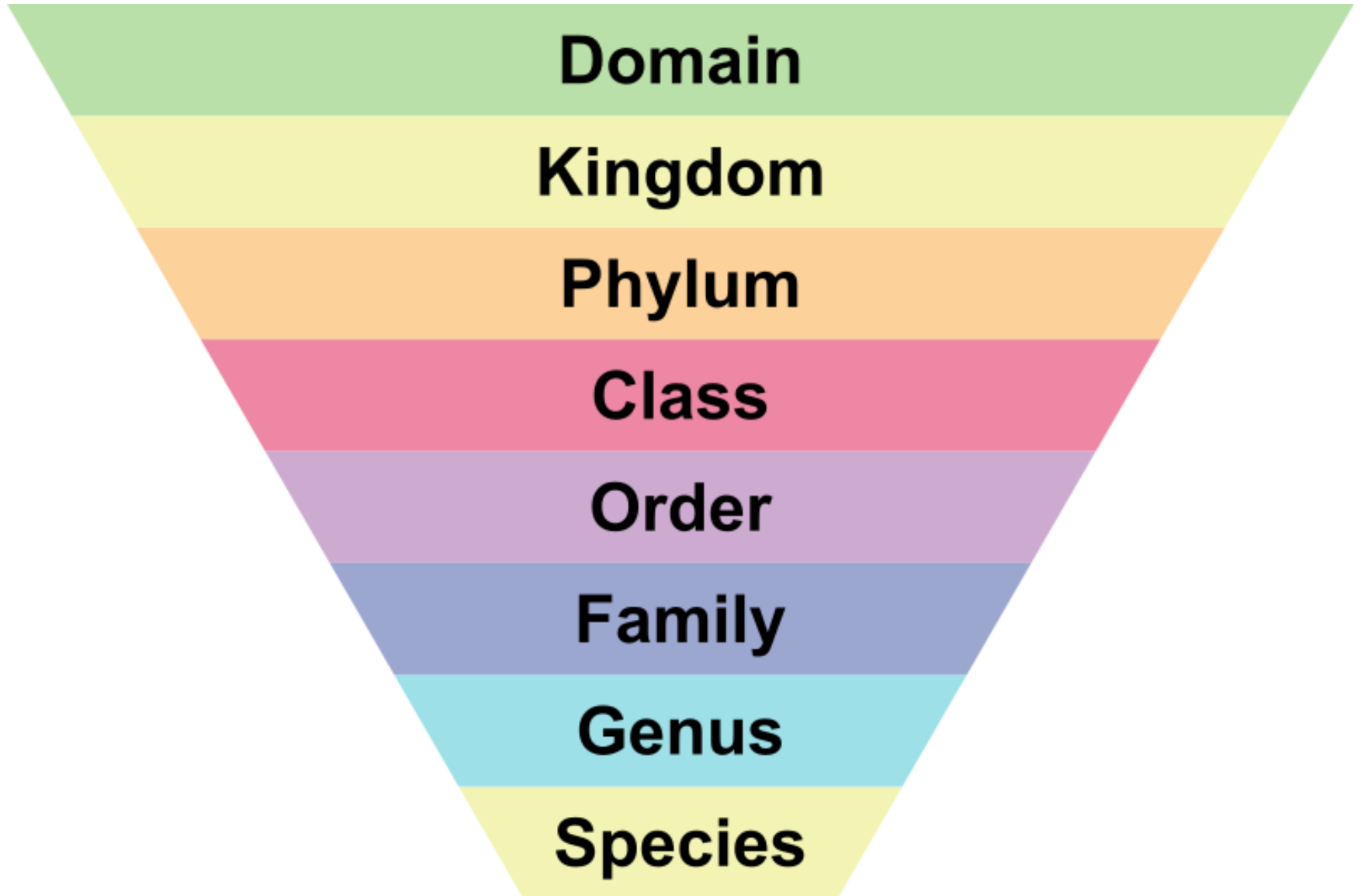


How organisms are classified?



Vertebrate Zoology

Biol245



What we will learn in this lab !!

- Introduces the students to the **diversity of life** among vertebrates, **their form**, **function** and evolution.
- Provides a basic overview of the major **vertebrate classes**, their features and major organ systems.
- Examining comparative vertebrate anatomy from an evolutionary perspective (What changes are occurring as we progress through the **simplest** to the more **complex classes**).
- Study the **adaptations** between organism and the countless environmental conditions.

- From 488 to 542 million years ago multicellular organisms began to explode in a period called the **Cambrian Period** which is the earliest of the Paleozoic (“ancient life”) Era
- With time through the increasing ecological complication, striking geological and climatic conditions of this era is what made the evolution of vertebrate species possible.

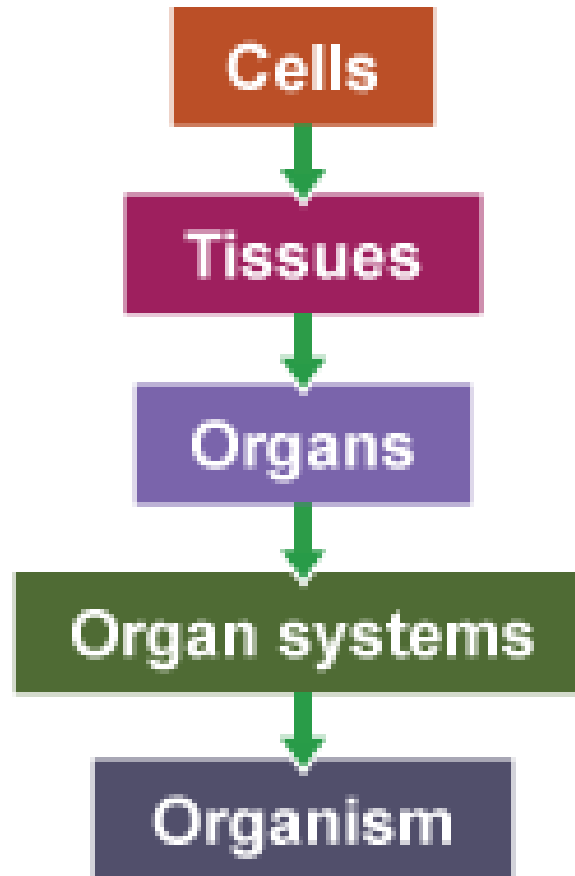
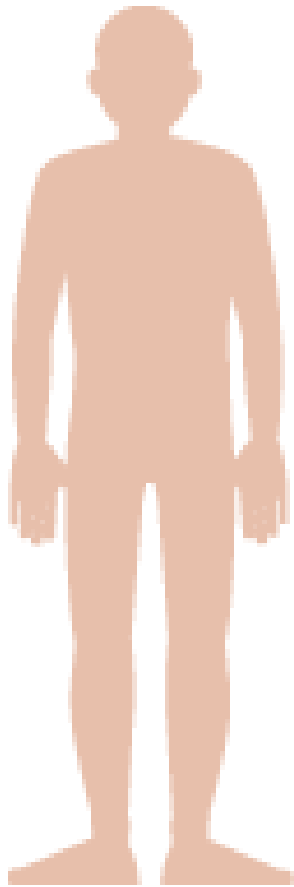
- All forms of life are classified into major groups according to a **binomial nomenclature** .
- You will be studying a group from kingdom **Animalia** kingdom **Animalia** → phylum **Chordata**
- In the kingdom **Animalia**, its members possess skeletal, muscular, digestive, respiratory, nervous, and reproductive systems.

- Before getting into the details of the phylum we shall study the material required to build the most complex organs and systems forming diversely complex organisms.

Histology: Animal Tissues

Histology : is a field that deals with the study of tissues, their structures and their functions.

Levels of organization



Define tissues ?

- Tissues are groups of specialized similar cells that work together for a particular function.
- Tissues are divided into the following four types:
 1. Epithelial (covering)
 2. Connective (support)
 3. Muscle (movement)
 4. Nervous (control)



Epithelial Tissue



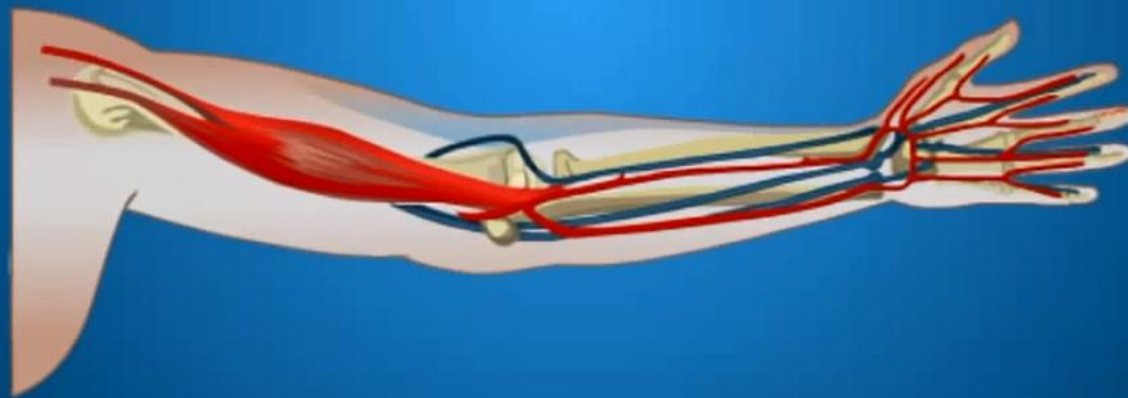
Connective Tissue



Muscular Tissue



Nervous Tissue

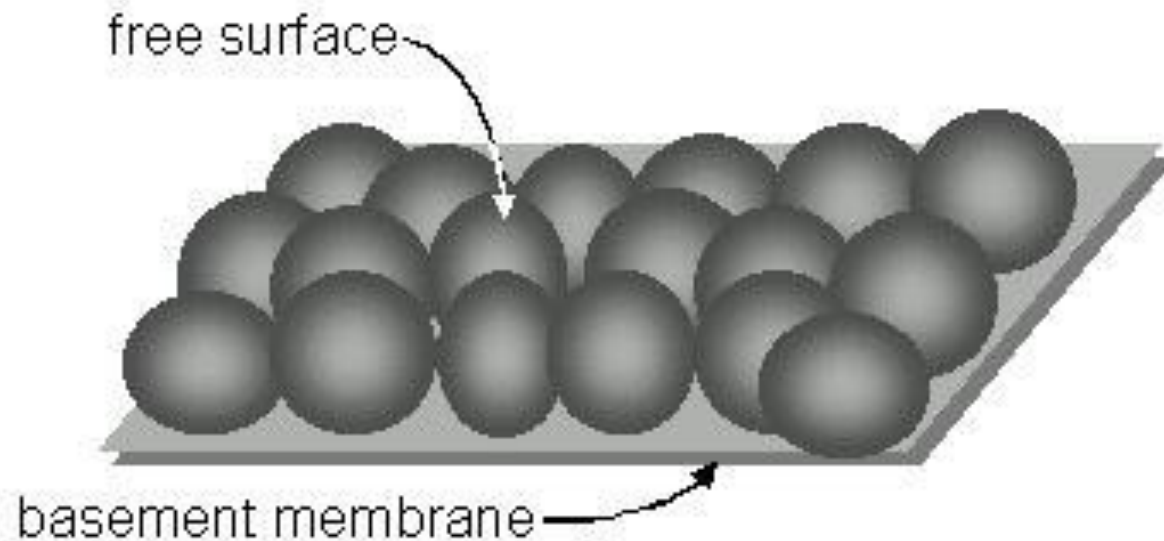


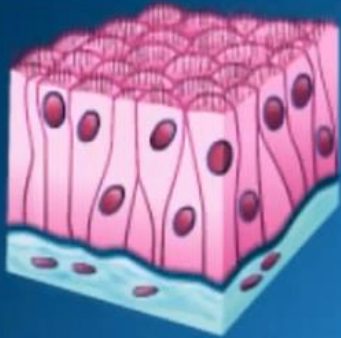
The animal body is made up of epithelial, connective, muscular and nervous tissue.

Epithelial tissue:

- Made of closely-packed cells arranged in flat sheets.
- Epithelia form the surface of the skin, line the various cavities and tubes of the body, and cover the internal organs.
- Function: protection, secretion, absorption, filtration.

One surface of the tissue is free (apical) and the other adheres to a basement membrane.





Ciliated Epithelium



Stratified Epithelium



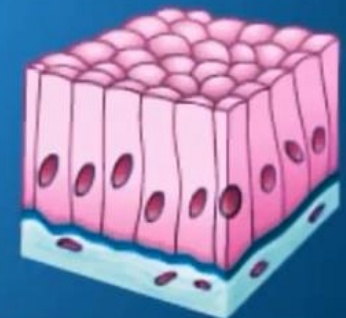
Cuboidal Epithelium



Squamous Epithelium



Glandular Epithelium



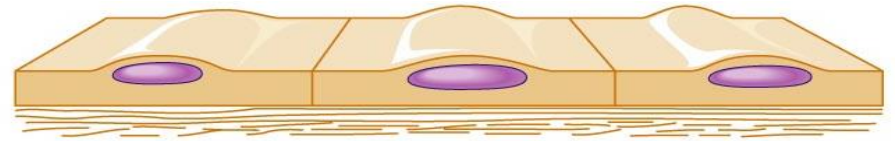
Columnar Epithelium

Classification of Epithelium

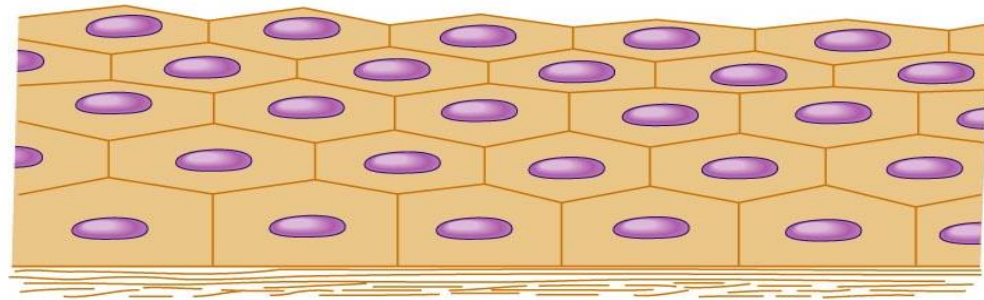
Each epithelium is given 2 names:

First: indicates relative number of cell layers

- simple (one layer of cells)
- stratified (more than one layer of cells)



Simple

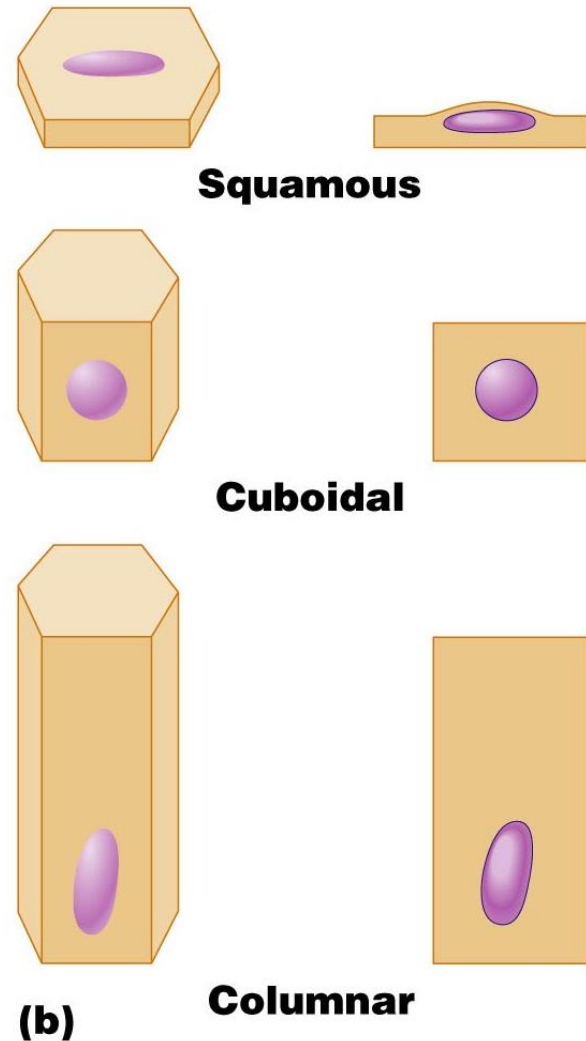


Stratified

(a)

Second: describes the shape of cells

- **Squamous** (cells flattened like scales)
- **Cuboidal** (cube-shaped)
- **Columnar** (shaped like columns)

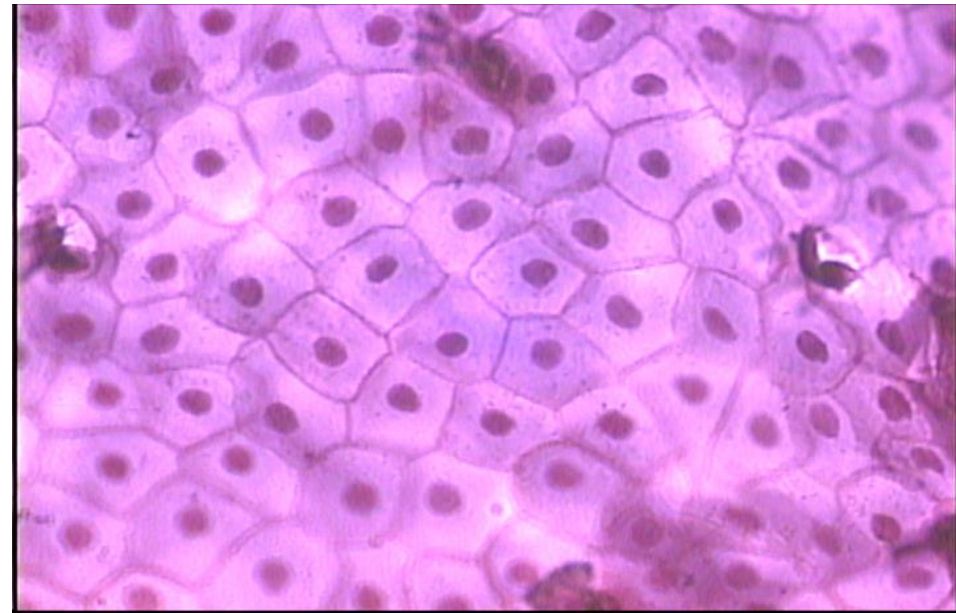


Simple Squamous Epithelium

- Composed of flat, scale-like cells that usually forms membranes
- It lines the walls of blood vessels, pulmonary alveoli, and the lining of the heart, lung.

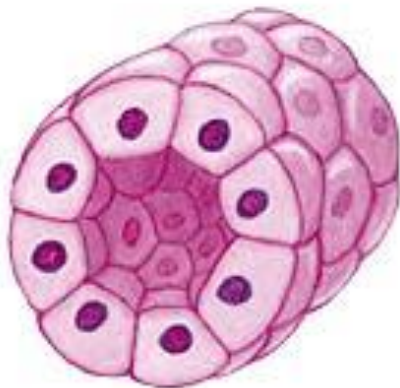


Simple squamous

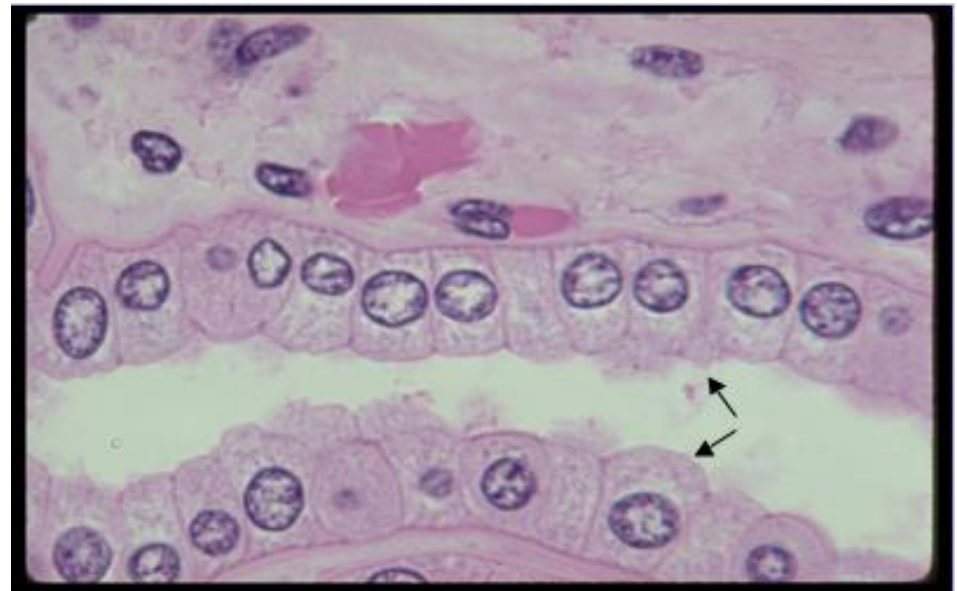


Simple Cuboidal Epithelium

- Composed of a single layer of cube-like cells.
- It lines the walls of kidney tubules, covers the surface of ovaries, and is common in **glands** and their ducts.

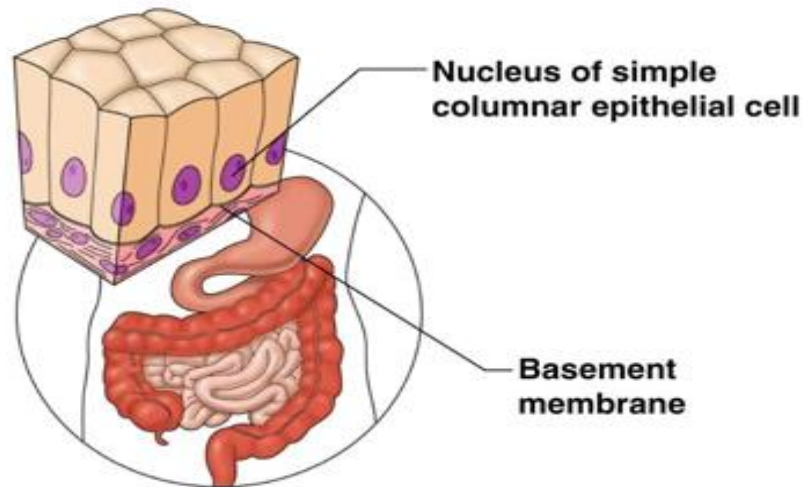


Simple cuboidal

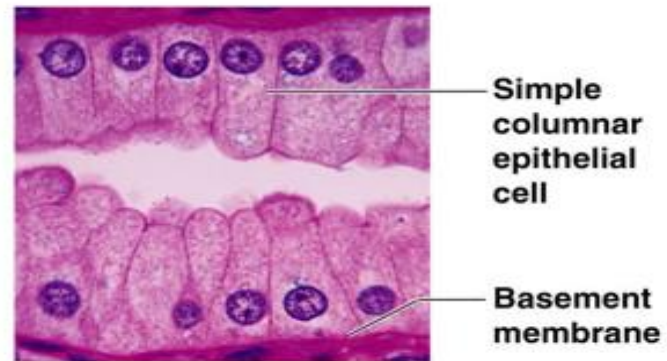


Simple Columnar Epithelium

- Composed of a single layer of tall cells.
- It often includes mucus-producing **goblet cells**.
- It often lines the digestive tract.



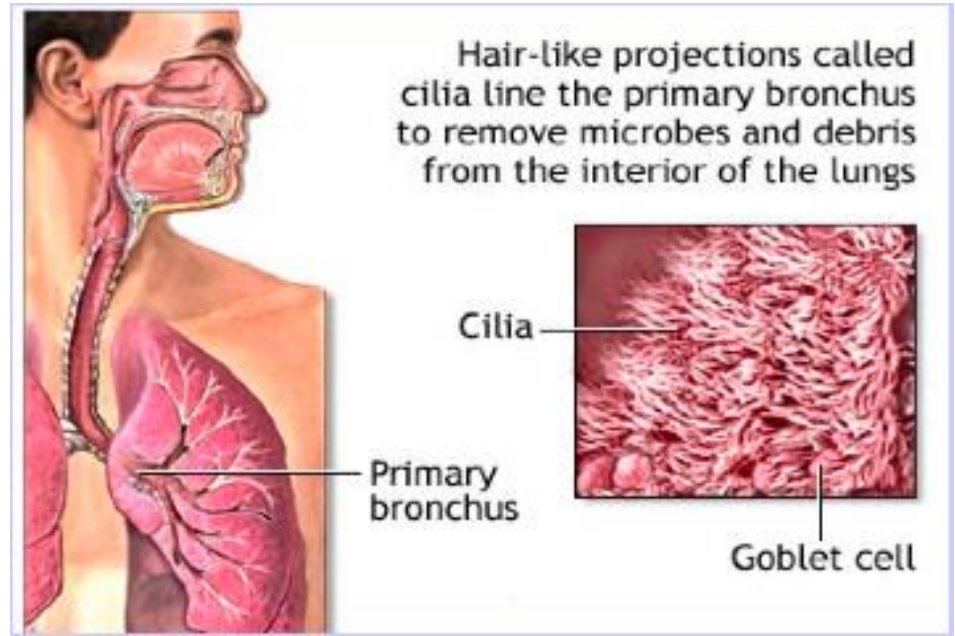
(c) Diagram: Simple columnar



Photomicrograph: Simple columnar epithelium of the stomach lining (900x).

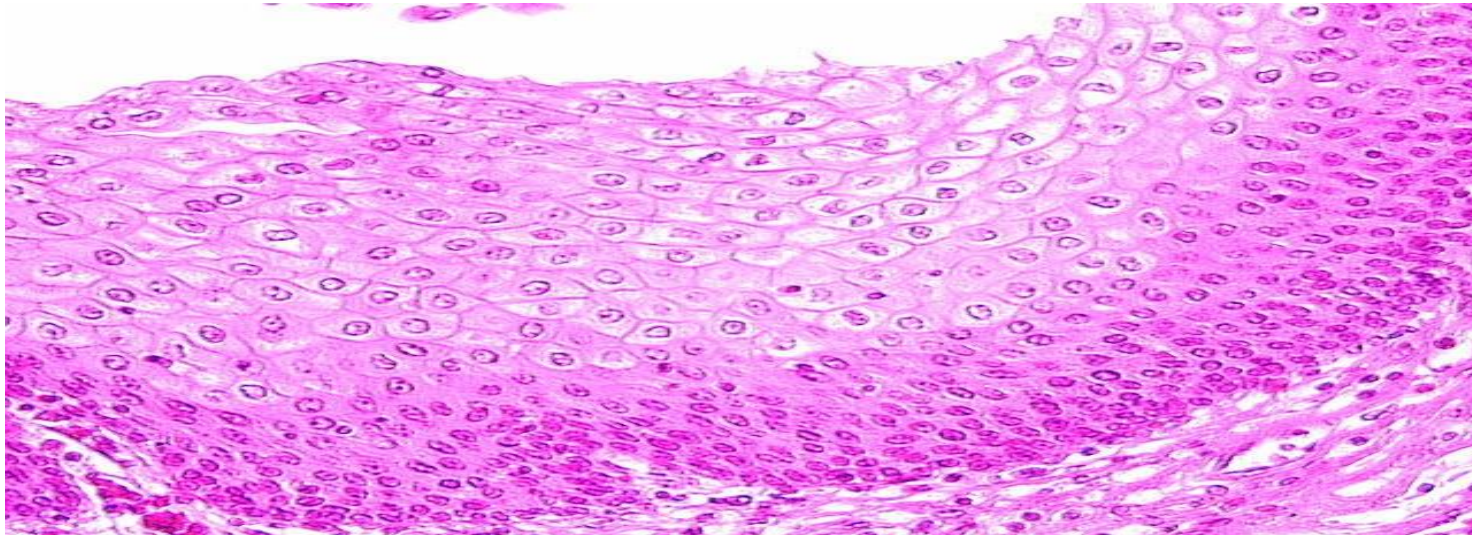
Ciliated Epithelium

- Some epithelial membranes are made up of cells with cilia, tiny projections that beat in harmony to move mucus along the surface.
- Ciliated epithelia in the trachea



Stratified Squamous Epithelium

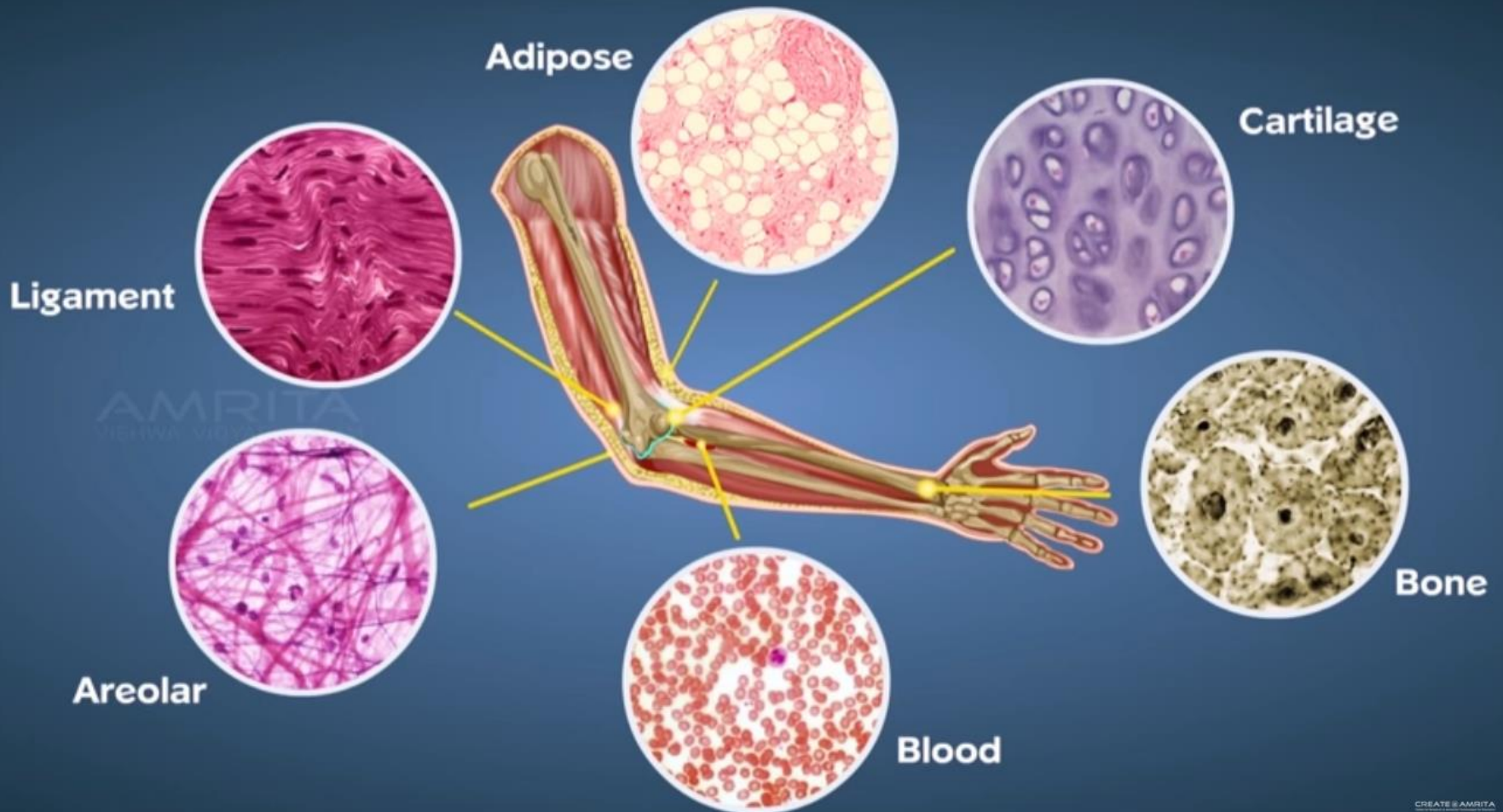
- Multilayered: the outer layers of cells appear flat, but the inner cells vary in shape from cuboidal to columnar
- Serves as a barrier to the outside environment in locations such as the skin, mouth, and esophagus.



Connective Tissue

- Connective tissues function to:
 - bind other tissues together
 - provide support
 - transport materials
 - provide nourishment

Connective Tissue



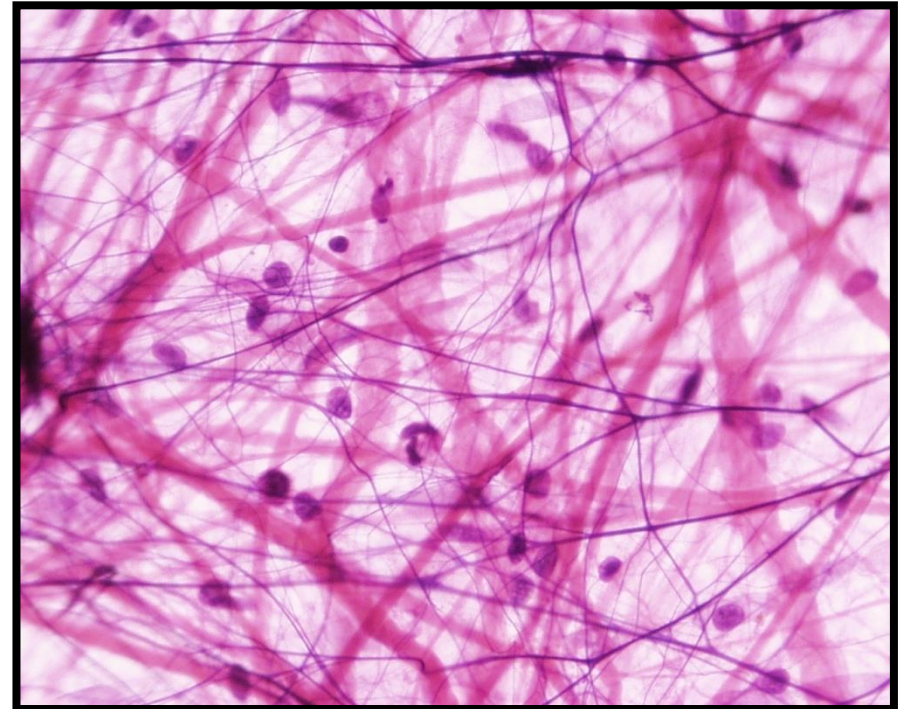
They are generally classified into three large groups:

- A) Fluid Connective Tissues**
- B) Connective Tissues Proper**
- C) Supportive Connective Tissues**

General Classification	Further Classification	Name of tissue
Fluid Connective Tissues		Lymph
		Blood
Connective Tissues Proper	Loose Connective	Areolar
		Adipose
		Reticular
	Dense Connective	Collagen Regular Fiber
		Collagen Irregular Fiber
		Elastic Fiber
Supportive Connective Tissues	Bone	Compact
		Cancellous
	Cartilage	Hyaline
		Elastic
		Fibrocartilage

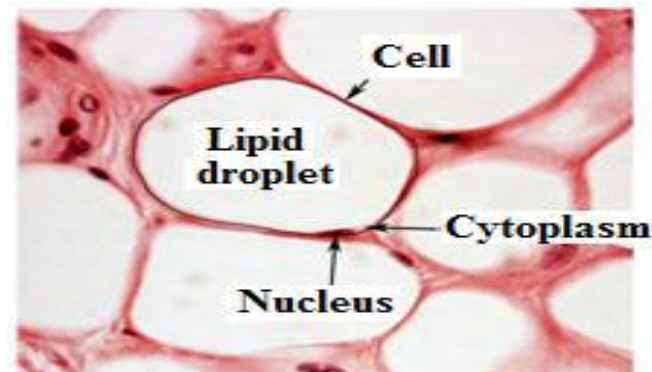
Areolar Tissue

- Most widely distributed connective tissue
- Soft tissue that cushions and protects the body's organs it wraps
- Holds internal organs together and in their proper positions



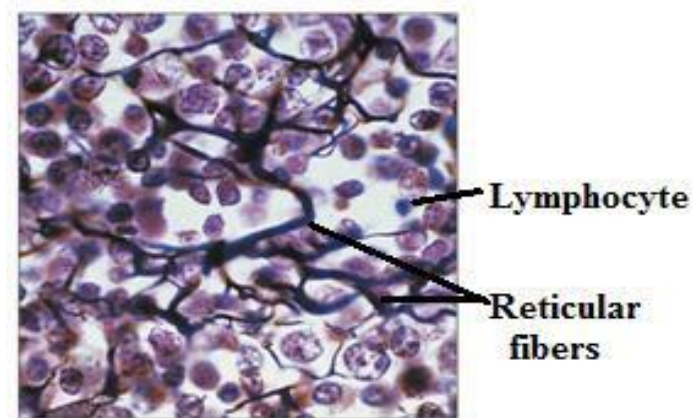
Adipose Tissue

- Contains fat droplets that enlarge to push nuclei and cytoplasm to the **periphery**.
- Mature fat cells are called **adipocytes**



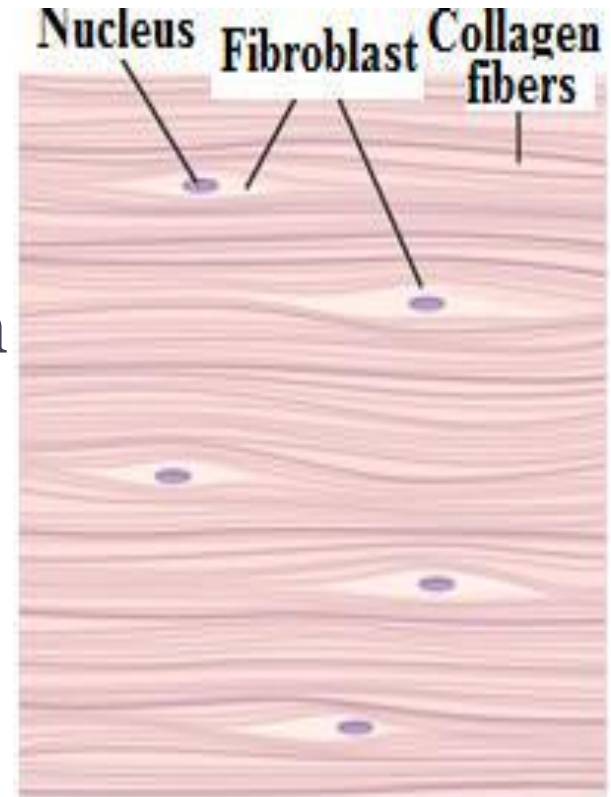
Reticular Tissue

- Present as the supportive tissue of lymph nodes, glands, organs, and bone marrow



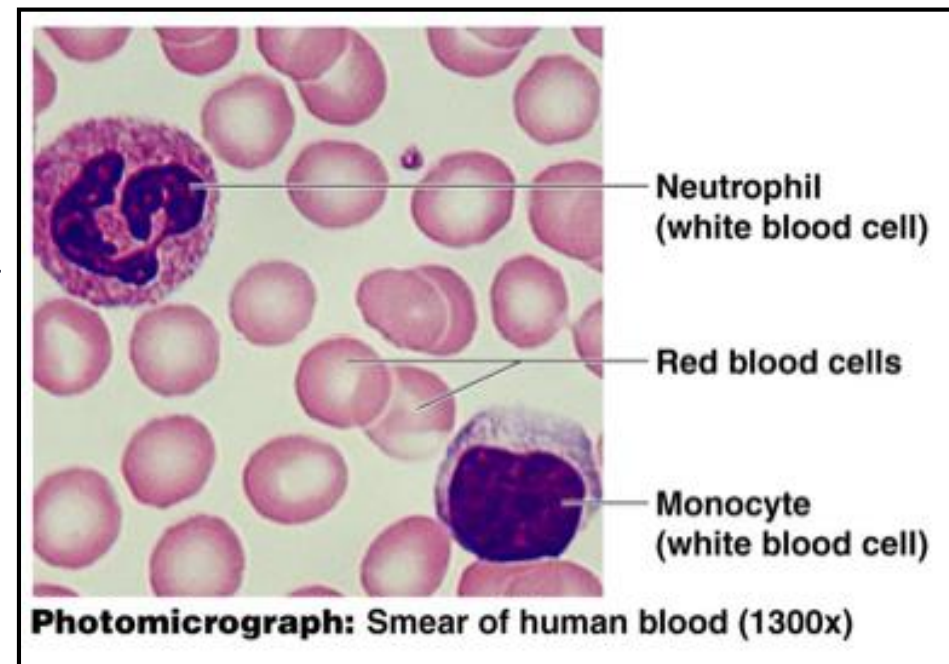
Collagen Fibrous Tissue

- Include most tendons, ligaments
- Tendons connect muscle to bone.
- The matrix is principally collagen
- Ligaments attach one bone to another.



Blood (Vascular Tissue)

- Consists of blood cells surrounded by nonliving, fluid matrix called **blood plasma**
- Functions as a transport medium for materials



Bone tissues

- Composed of
 - Hard matrix of calcium salts
 - Large numbers of collagen fibers
- Used to protect and support the body
- Sponge or dense/ compact

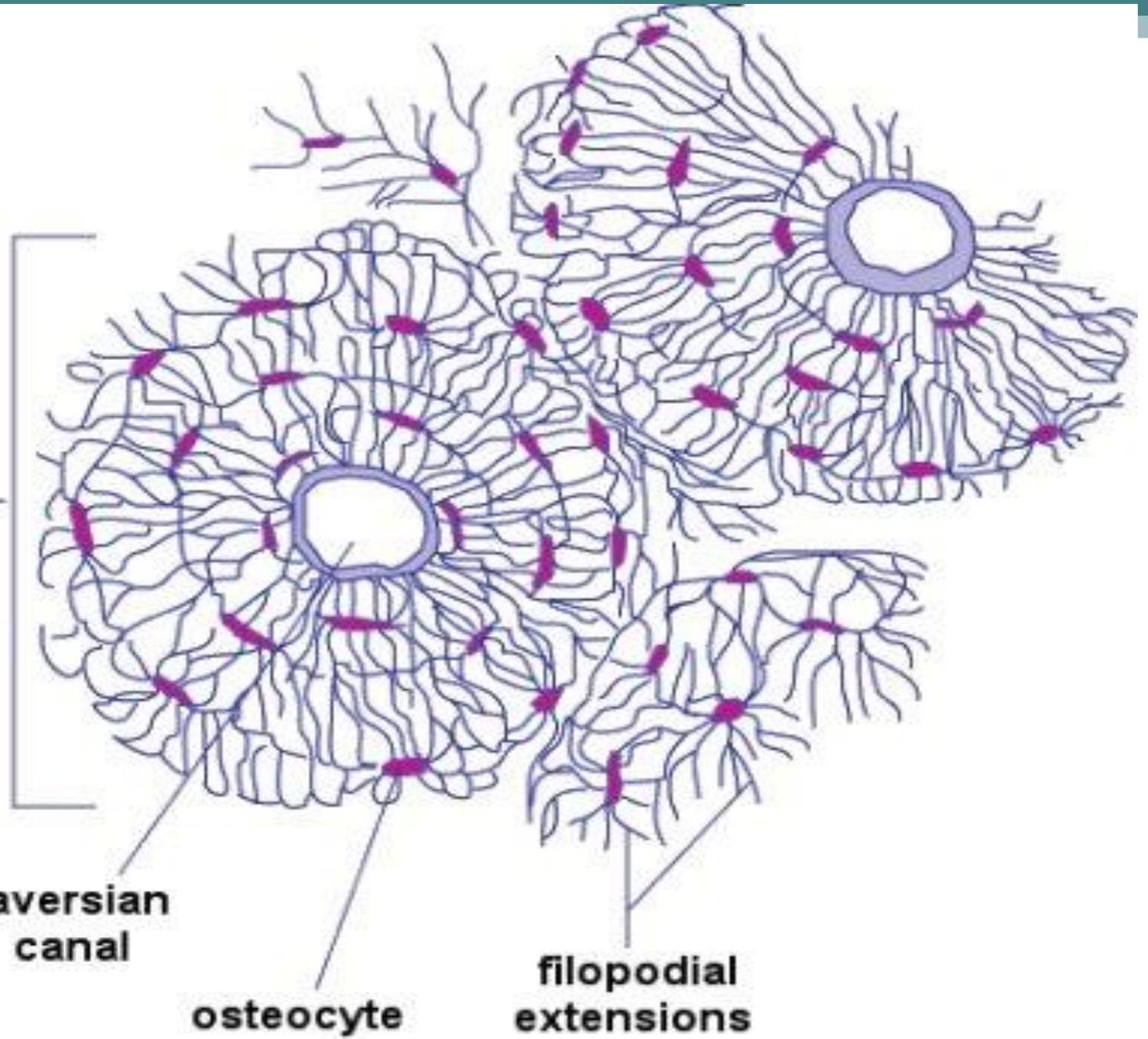
- **Haversian systems** of compact bone are what determine the strength (absent in sponge Bone tissue)
 - Mature bone cells are called **osteocytes**

Haversian system

Haversian canal

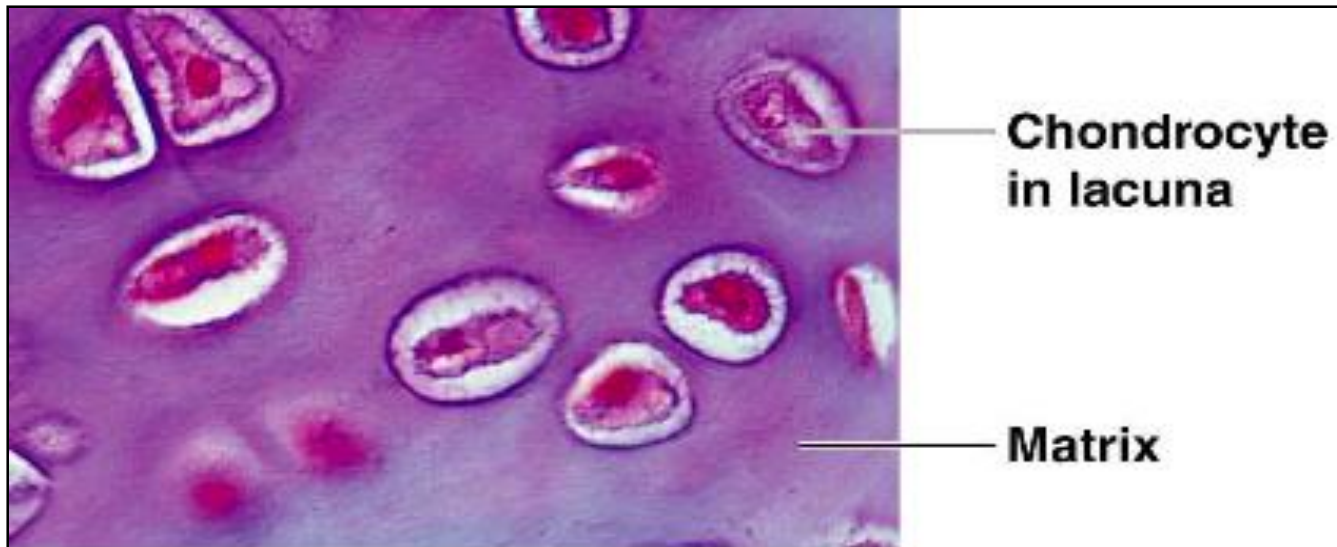
osteocyte

filopodial extensions



Cartilage tissues

- Most abundant type.
- External ears, nose, larynx, trachea.
- Mature cartilage cells are called **chondrocytes** which are found inside a space called the **lacuna**.



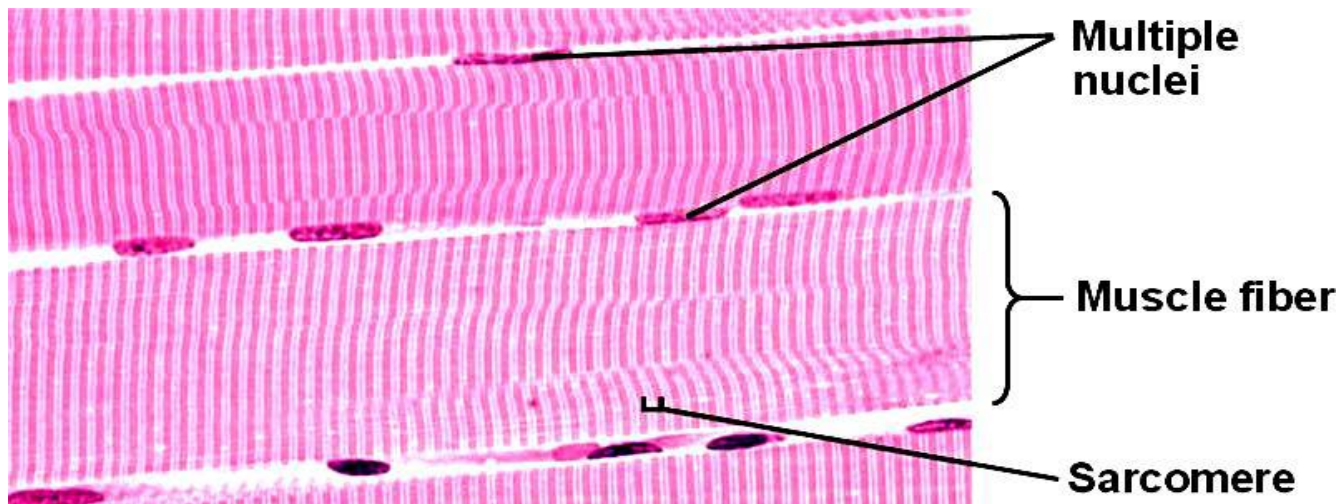
Photomicrograph: Hyaline cartilage from the trachea (400x).

3. Muscle Tissue

- Muscle is a contractile tissue.
- There are three types of muscle:
 - Skeletal/ striated
 - Cardiac
 - Smooth / non-striated
- Main function is to produce movement/ locomotion

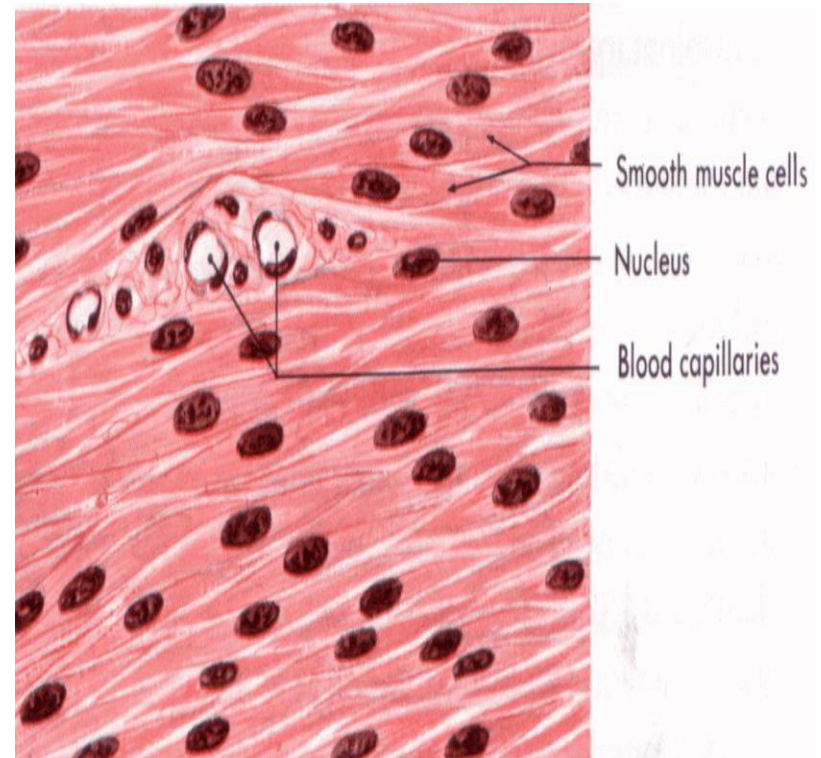
Skeletal Muscle

- Under **voluntary** control
- Characteristics of skeletal muscle cells
 - Striated (striped-like pattern)
 - Multinucleate (more than one nucleus)
 - Long fibers, cylindrical



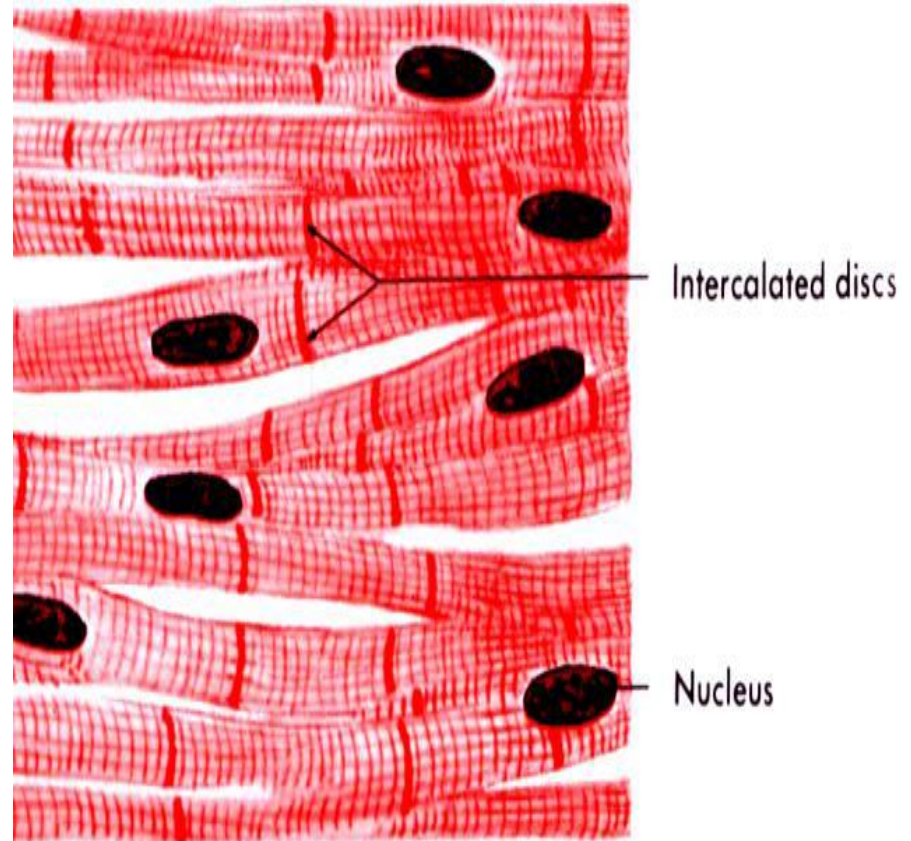
Smooth Muscle

- Under **involuntary** muscle
- Found in walls of hollow organs such as stomach, intestine, and blood vessels
- No visible striations
- One nucleus/cell
- Spindle-shaped cells



Cardiac Muscle

- Under **involuntary** control
- Found only in the heart
- Cells are attached to other cardiac muscle cells at **intercalated disks**
- **Striated**
- One nucleus per cell
- Branched fibers



4. Nervous Tissue

- Structural units are **neurons**.
- Nervous tissue also consists of **glial cells**, which are the various types of supporting cells in the nervous system.

