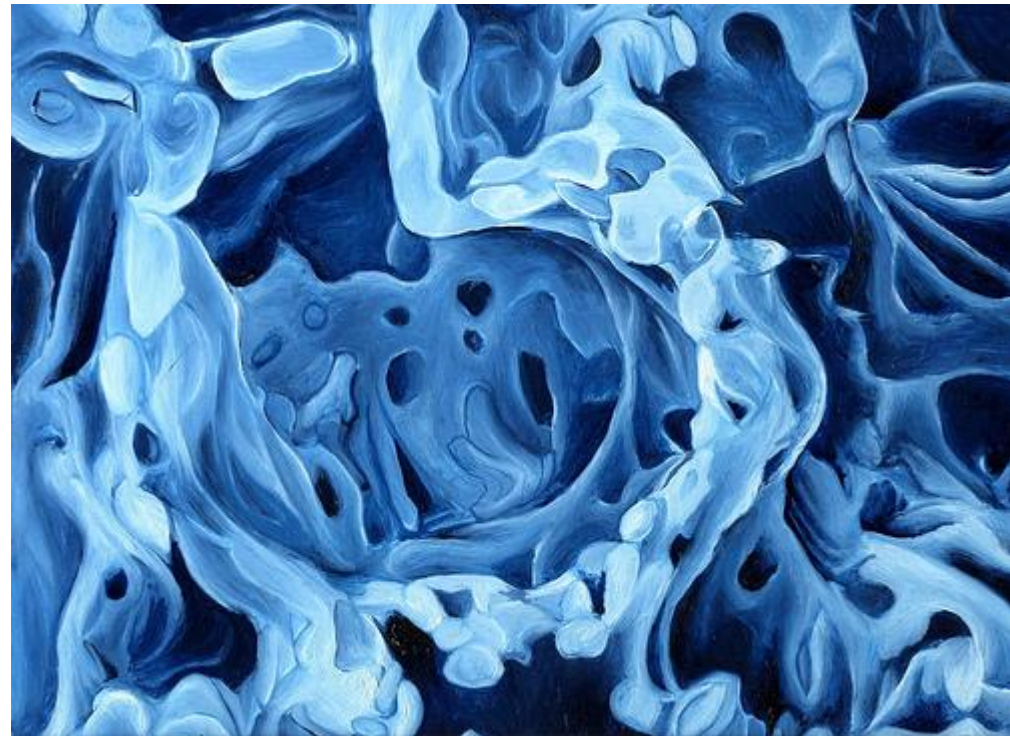
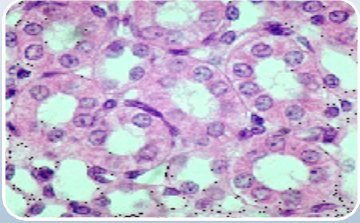


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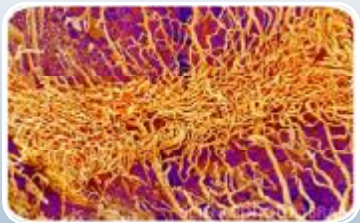
6

Animal Tissues and Organ System

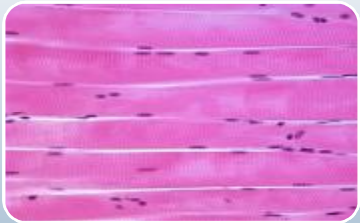




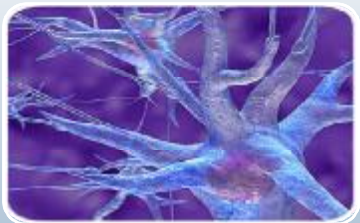
Epithelial Tissue



Connective Tissue



Muscle Tissue



Nervous Tissue

Animal Tissue Types

- An animal's body is built of **differentiated cells** as well as **stem cells** that retain the potential to divide and yield specialized cells.
- Groups of cells with a common structure and function make up tissues
- Different tissues make up organs, which together make up organ systems

Animal Tissues Types

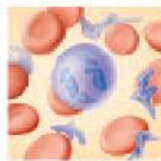
- Different types of tissues have different structures that are suited to their functions
- Tissues are classified into four main categories
 - Epithelial tissue covers and lines organs.
 - Connective tissue provides support, adhesion, insulation, and attachment.
 - Nervous tissue forms rapid communication networks among cells.
 - Muscle tissue contracts, powering the movements of life.

Nervous tissue

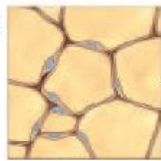


Connective tissue

Blood



Adipose



Cartilage



Loose



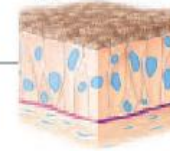
Bone



Dense



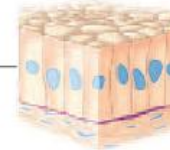
Epithelial tissue



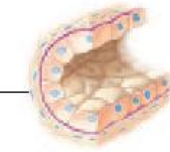
Pseudostratified ciliated columnar



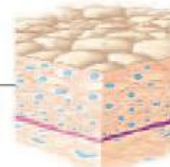
Simple squamous



Simple columnar

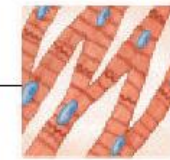


Simple cuboidal

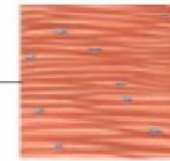


Stratified squamous

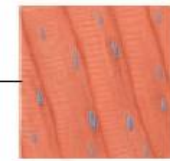
Muscular tissue



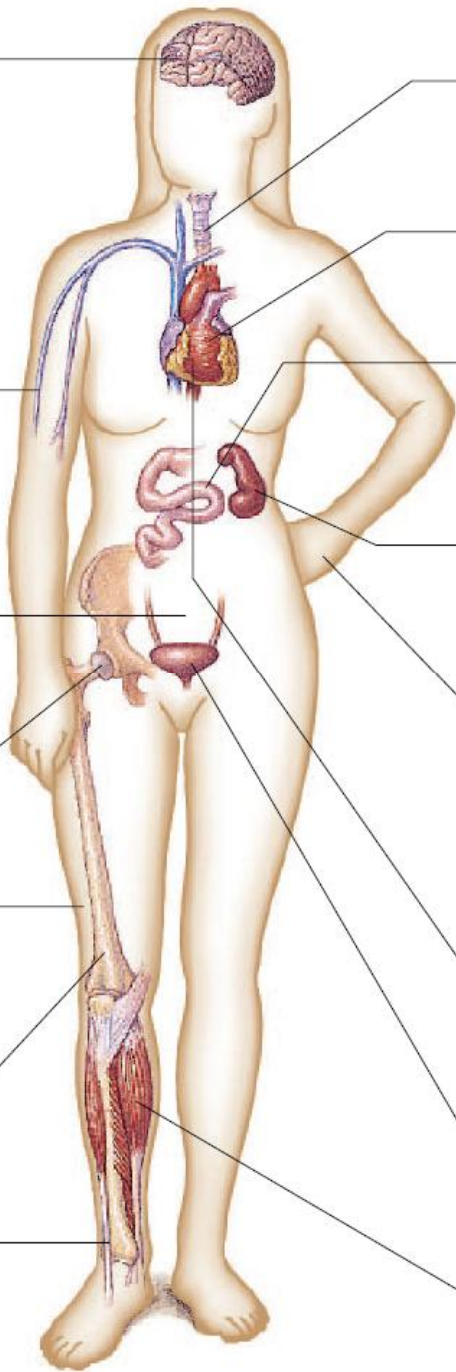
Cardiac

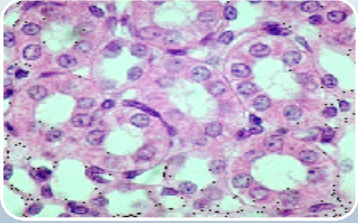


Smooth



Skeletal

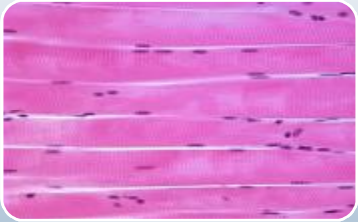




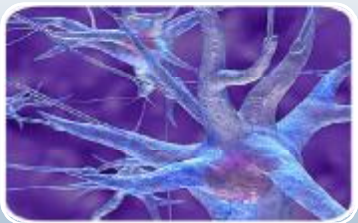
Epithelial Tissue



Connective Tissue



Muscle Tissue



Nervous Tissue

Positions

- Covers the outside of the body
- Lines organs and cavities within the body

Structure

- Contains cells that are closely joined
- Epithelial tissue always have:
 - a **free surface** is exposed either to the outside or to a space within the body
 - a **basal surface** is anchored to other tissue by a noncellular layer called a **basement membrane**.
- Epithelial tissues lack blood vessels; nutrients diffuse in and wastes out.

Functions

- These tissues have a variety of functions:
 - protection
 - absorption
 - secretion.

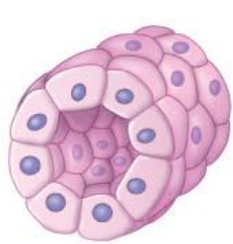
Types of Epithelial Tissue

- Epithelial tissues are classified by
 - cell shapes
 - number of layers

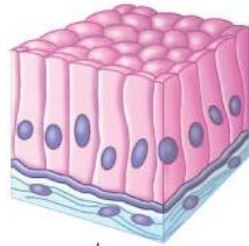
Types of Epithelial Tissue

- The three most common cell shapes are
 - squamous (flattened)
 - cuboidal (cube-shaped)
 - columnar (tall, thin).
- Cell layering is
 - simple (a single layer of cells)
 - stratified (more than one layer)
 - pseudostratified epithelium (a single layer of cells varying in height).

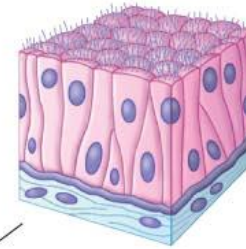
Epithelial Tissue



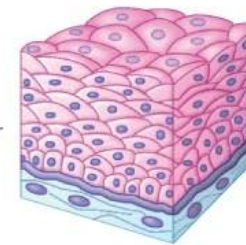
Cuboidal epithelium



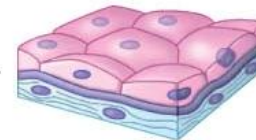
Simple columnar epithelium



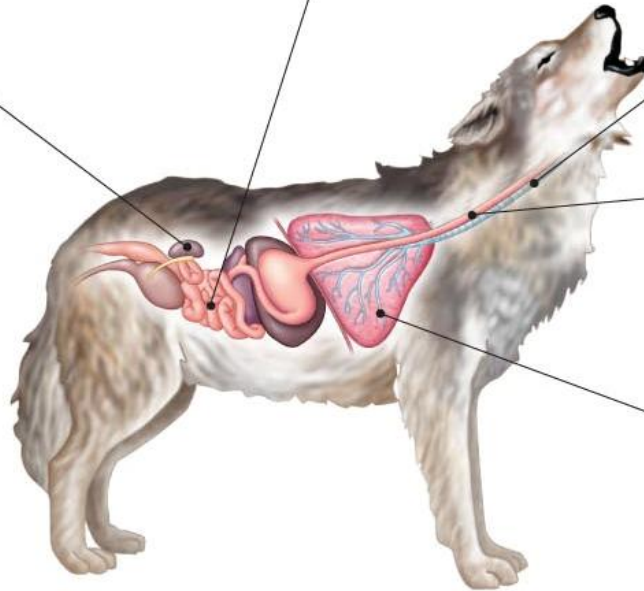
Pseudostratified ciliated columnar epithelium



Stratified squamous epithelium



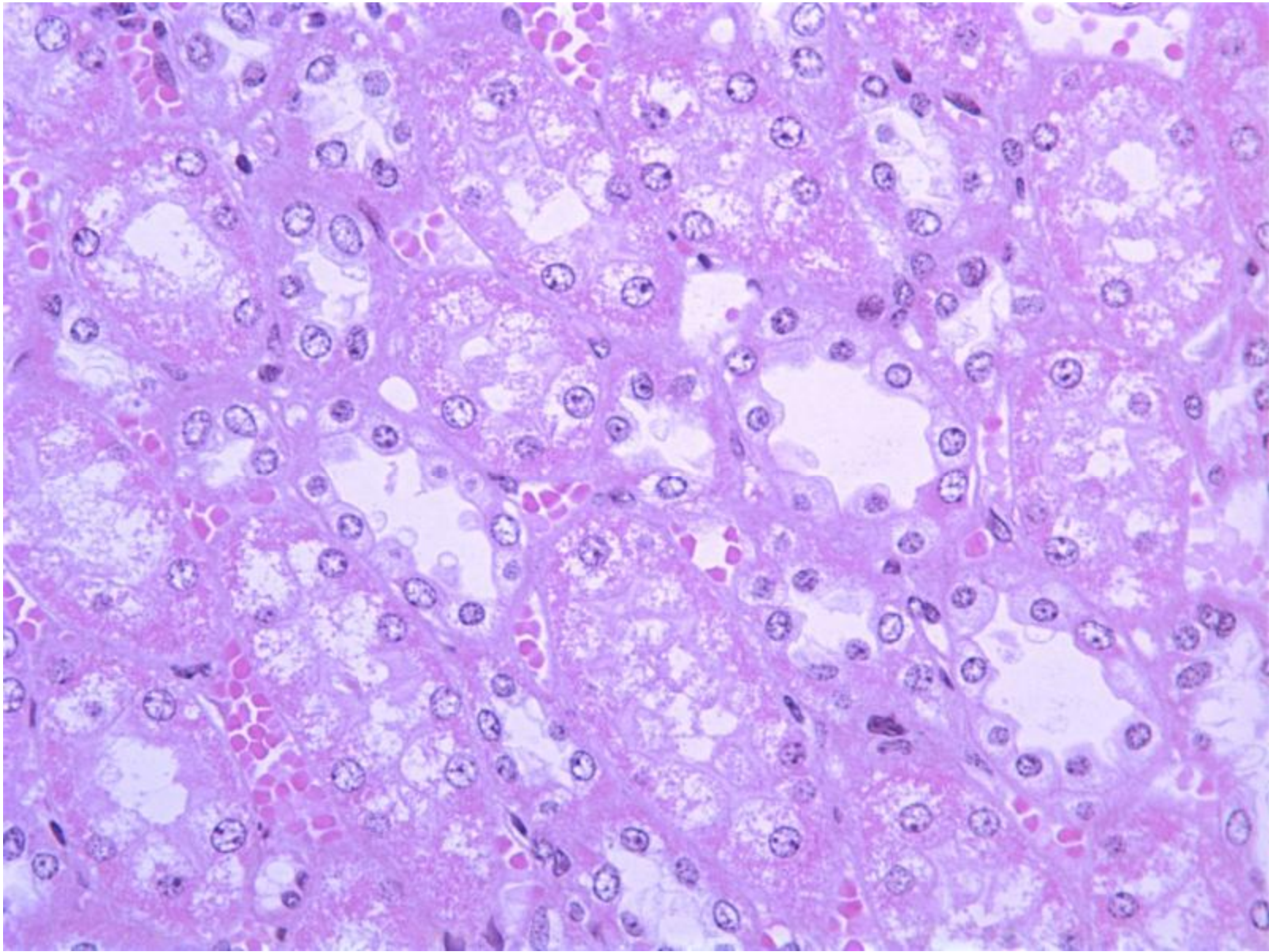
Simple squamous epithelium



Types of Epithelial Tissue

- Simple squamous epithelium
 - is thin and leaky
 - lines blood vessels and the air sacs of the lungs
 - functions in the exchange of material by diffusion

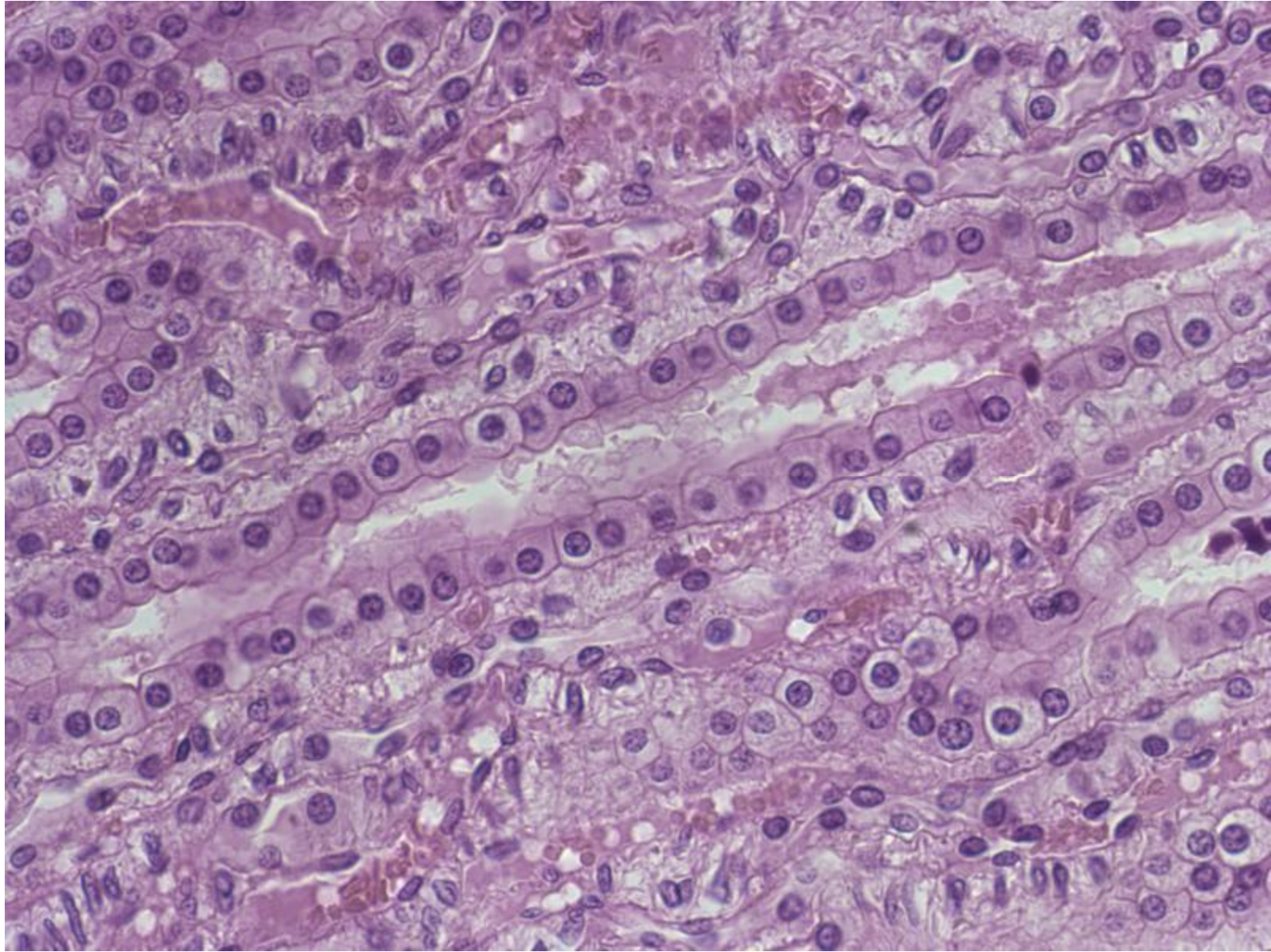
Simple squamous epithelium



Types of Epithelial Tissue

- Simple cuboidal epithelium
 - cell cube shaped
 - specialized for secretion
 - makes up the epithelium of kidney tubules and many glands

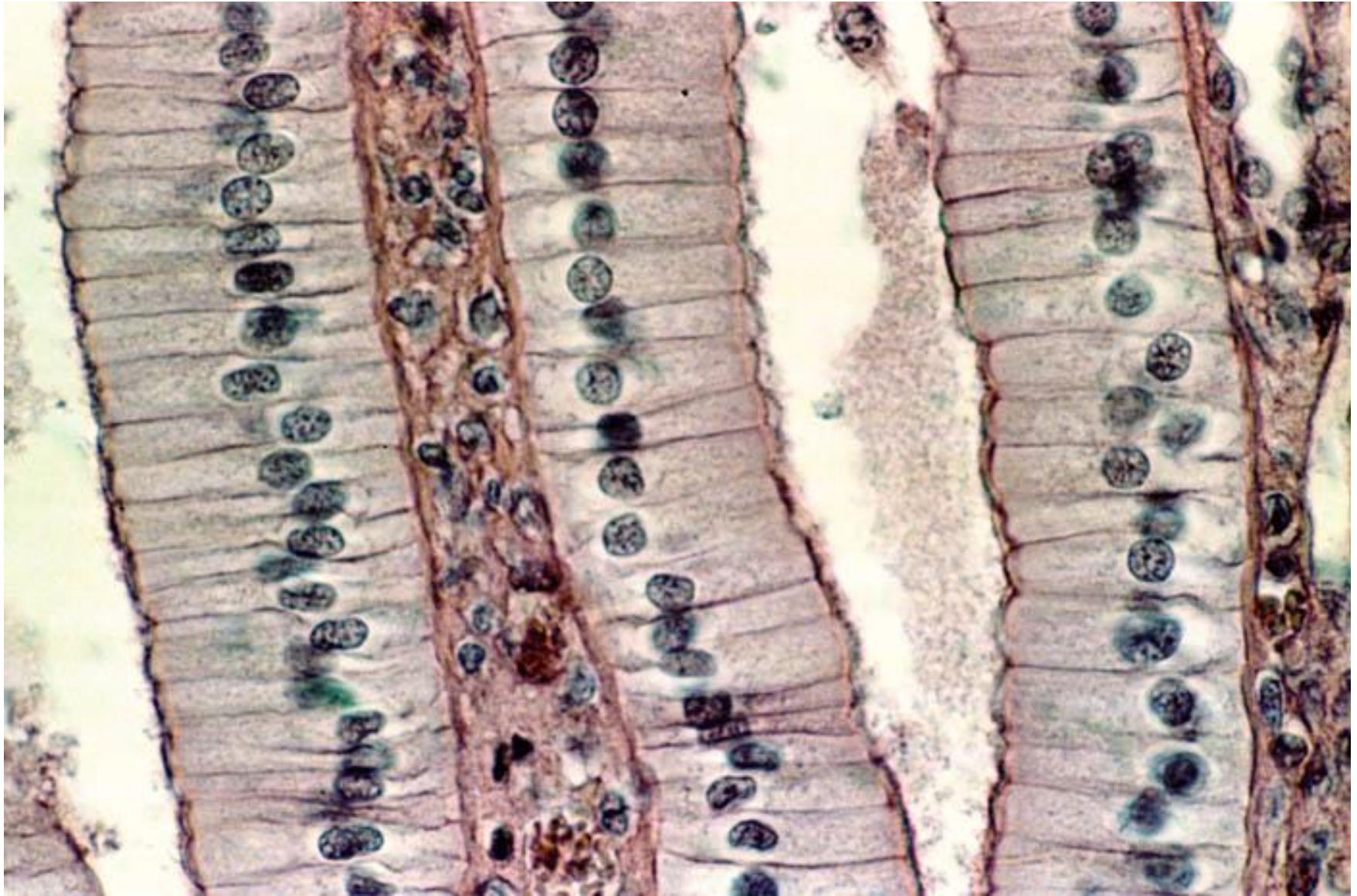
Simple cuboidal epithelium



Types of Epithelial Tissue

- Simple columnar epithelium
 - elongated cells, much longer than they are wide
 - a single layer of cells that line the digestive tract, gallbladder and excretory ducts of some glands.
 - has microvilli at surface for absorption
 - secretes digestive juices and absorbs nutrients

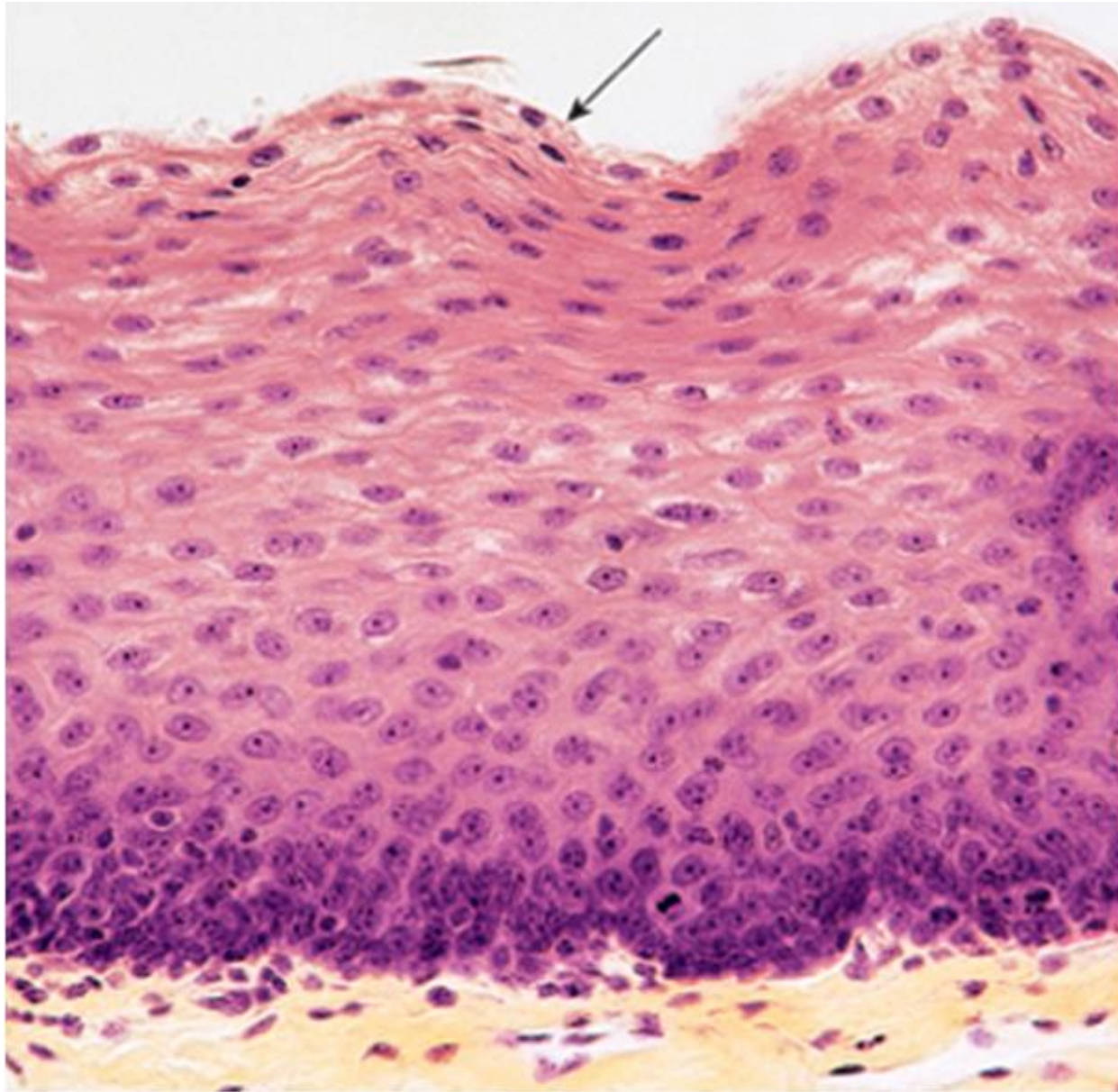
Simple columnar epithelium



Types of Epithelial Tissue

- Stratified epithelial membranes are several cell layers thick and are named according to the features of their uppermost layers.
- **Stratified squamous epithelium**
 - regenerates rapidly by cell division near the basal lamina
 - is commonly found on surfaces subject to abrasion, such as the outer skin and linings of the mouth, esophagus, anus, and vagina.

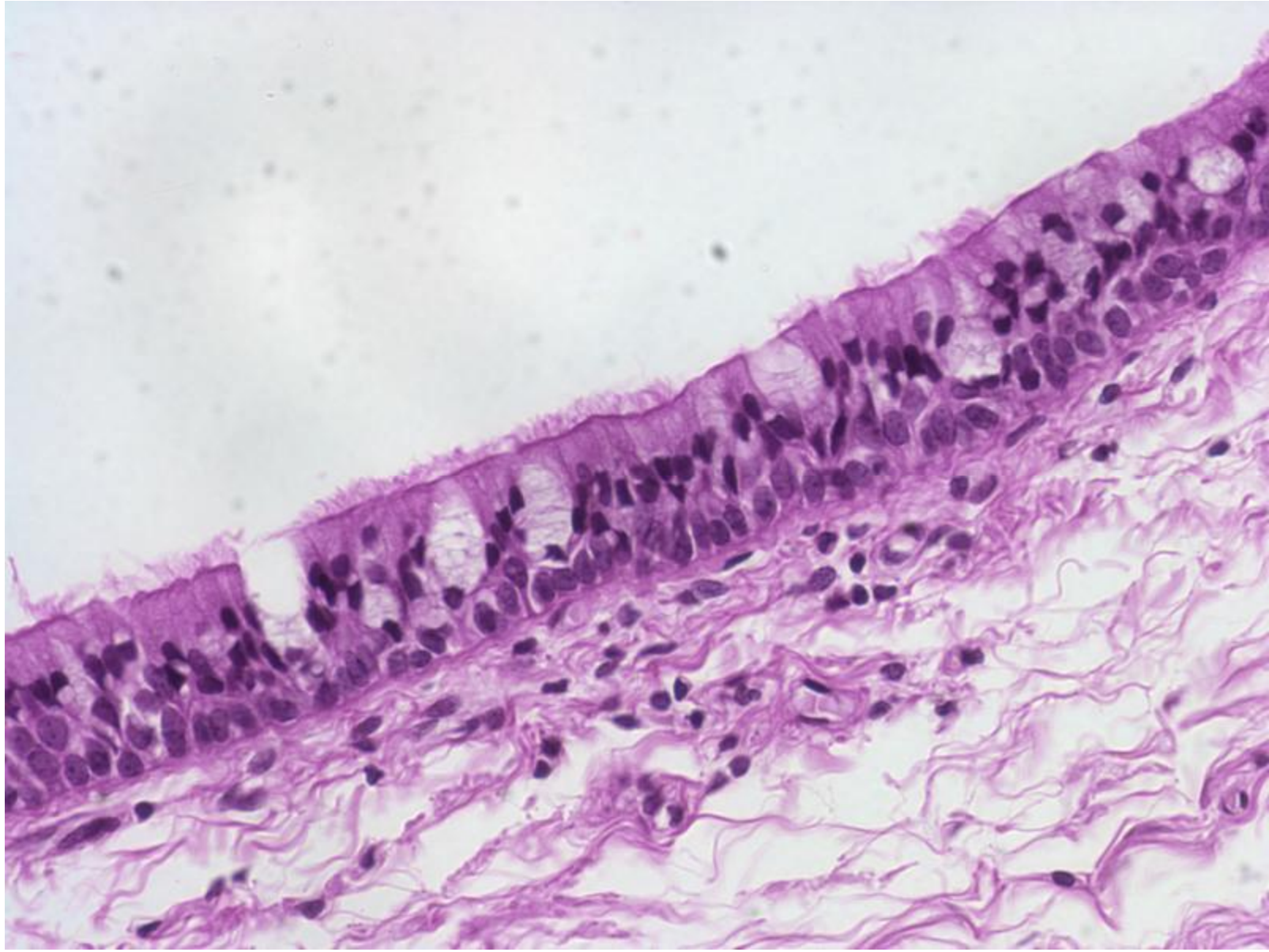
Stratified squamous epithelium

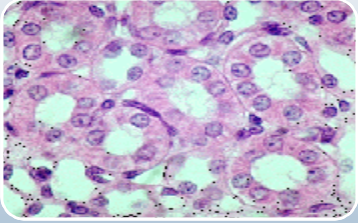


Types of Epithelial Tissue

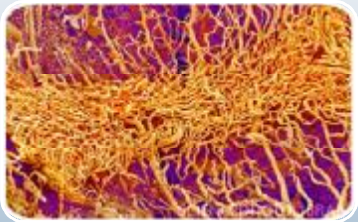
- Pseudostratified ciliated columnar epithelium
 - lines the bronchi, trachea, uterine tubes and some of the uterus.
 - propels mucus or reproductive cells by ciliary action

Pseudostratified epithelium

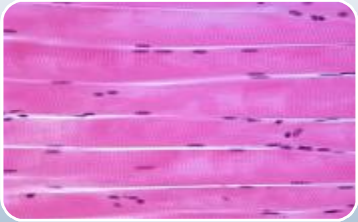




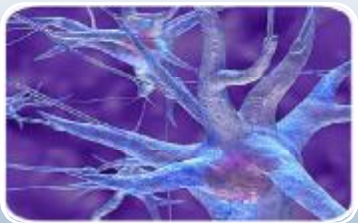
Epithelial Tissue



Connective Tissue



Muscle Tissue



Nervous Tissue

Functions

- These tissues
 - fill spaces
 - attach epithelium to other tissues
 - protect and cushion organs
 - provide mechanical support.

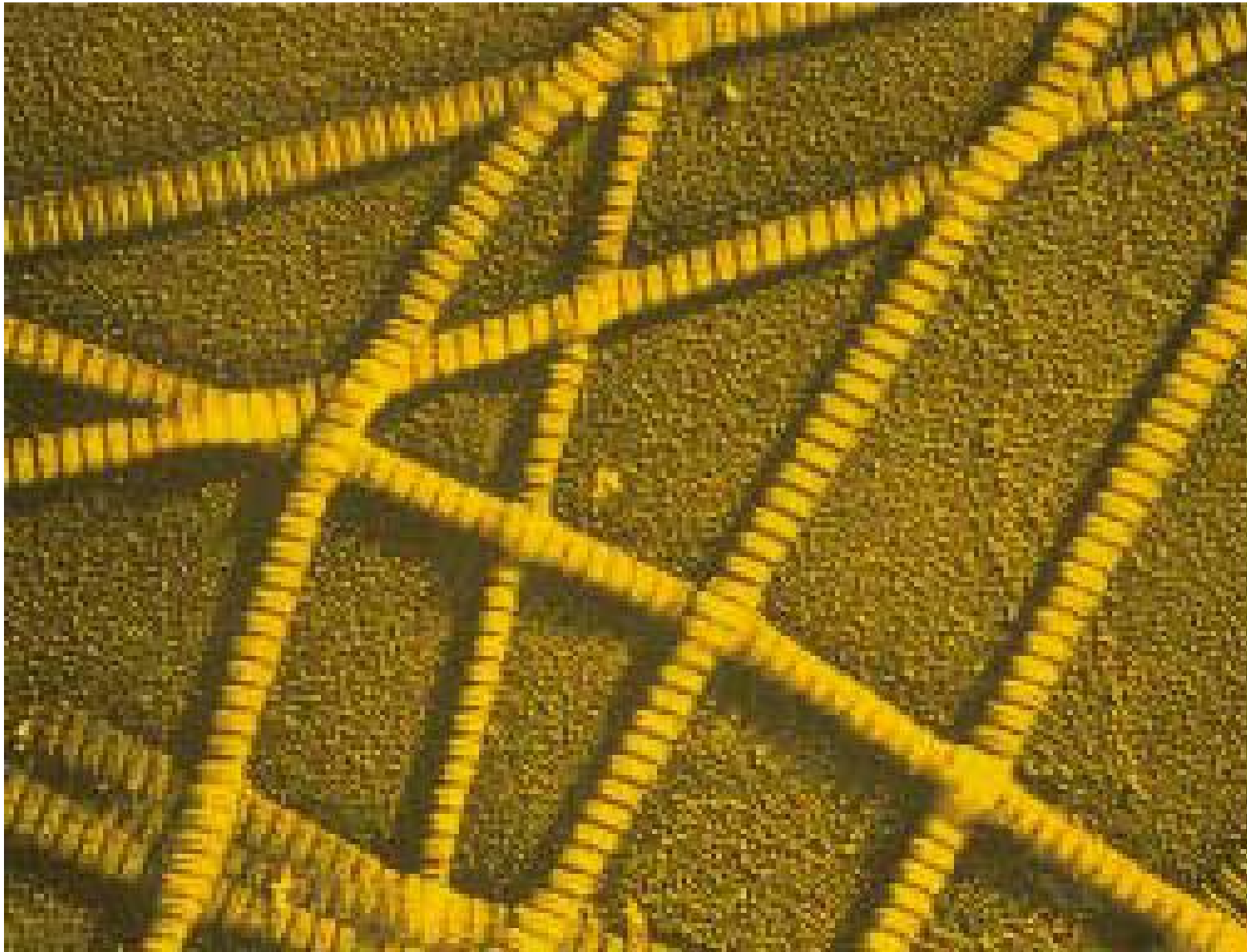
Structure

- Characterized by the cells widely separated from each other in a matrix that is produced by the cells
- Cell matrix composed of two regions:
 - Ground
 - Liquid (sol), Gel, Gum or Solid
 - Fibers
 - Non-elastic (= white or Collagen)
 - Elastic (= yellow fibers)

Fibroblast

- A **fibroblast** is a common type of connective tissue cell.
- Fibroblasts manufacture and secrete two main types of protein fibers that become part of the matrix:
 - **collagen**, a flexible white protein that resists stretching
 - **elastin**, a yellowish protein that stretches readily, like a rubber band.
- The matrix also includes a thin gel of **proteoglycans**, which are complex carbohydrates linked to proteins.

Collagen Fiber



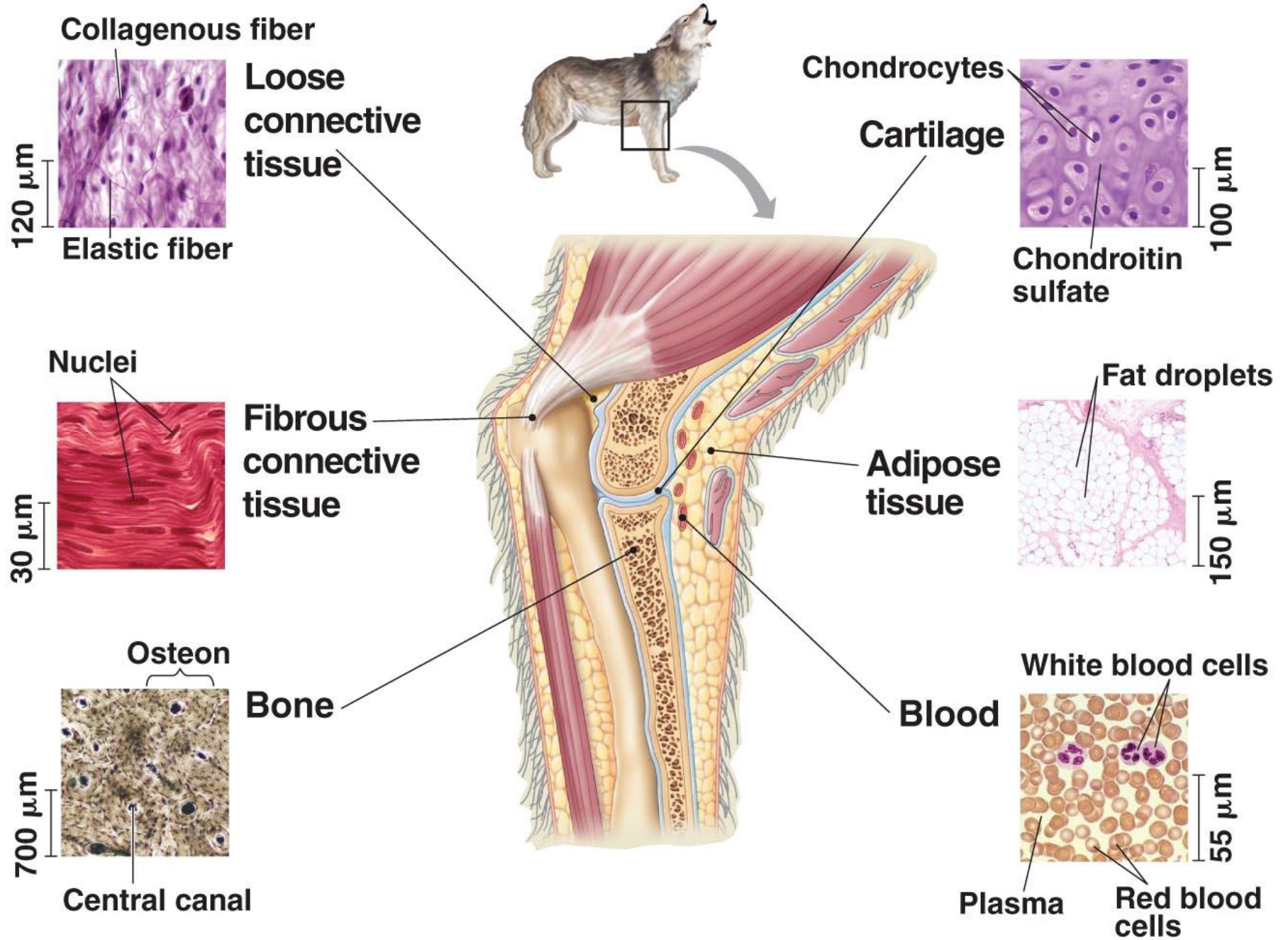
Types of Connective Tissues

- Each type of connective tissue can be distinguished by:
 - Matrix composition
 - Types of fibers
 - Cell specializations
 - The proportion of cells to matrix

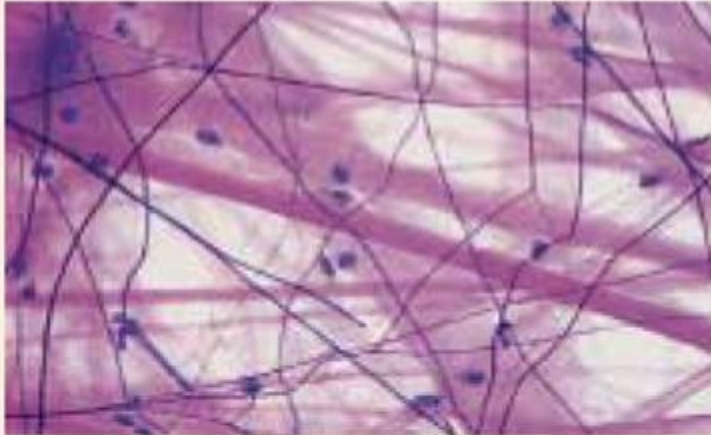
Types of Connective Tissues

- The major types of connective tissues are:
 - Loose connective tissue
 - Dense connective tissue
 - Adipose
 - Blood
 - Cartilage
 - Bone

Connective Tissue



Types of Connective Tissues



LOOSE CONNECTIVE TISSUE

Typical Location

Beneath skin; between organs

Functions

Provides support, insulation, food storage, and nourishment for epithelium.

Characteristic Cell Types

Fibroblasts, macrophages, mast cells, fat cells



DENSE CONNECTIVE TISSUE

Typical Location

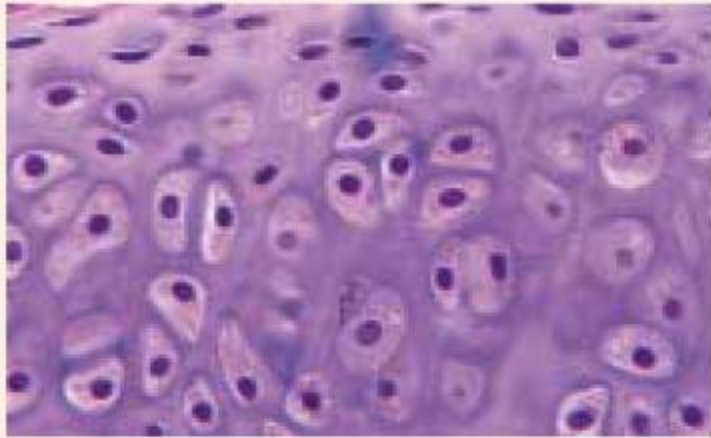
Tendons; sheath around muscles; kidney; liver; dermis of skin.

Function

Provides flexible, strong connection

Characteristic Cell Types

Fibroblasts



CARTILAGE

Typical Location

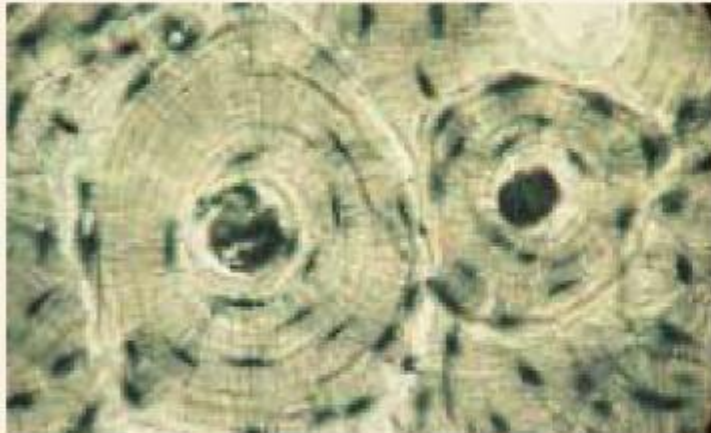
Spinal discs; knees and other joints; ear; nose; tracheal rings

Function

Provides flexible support, shock absorption, and reduction of friction on load-bearing surfaces

Characteristic Cell Types

Chondrocytes



BONE

Typical Location

Most of skeleton

Function

Protects internal organs; provides rigid support for muscle attachment

Characteristic Cell Types

Osteocytes



BLOOD

Typical Location

Circulatory system

Function

Functions as highway of immune system and primary means of communication between organs

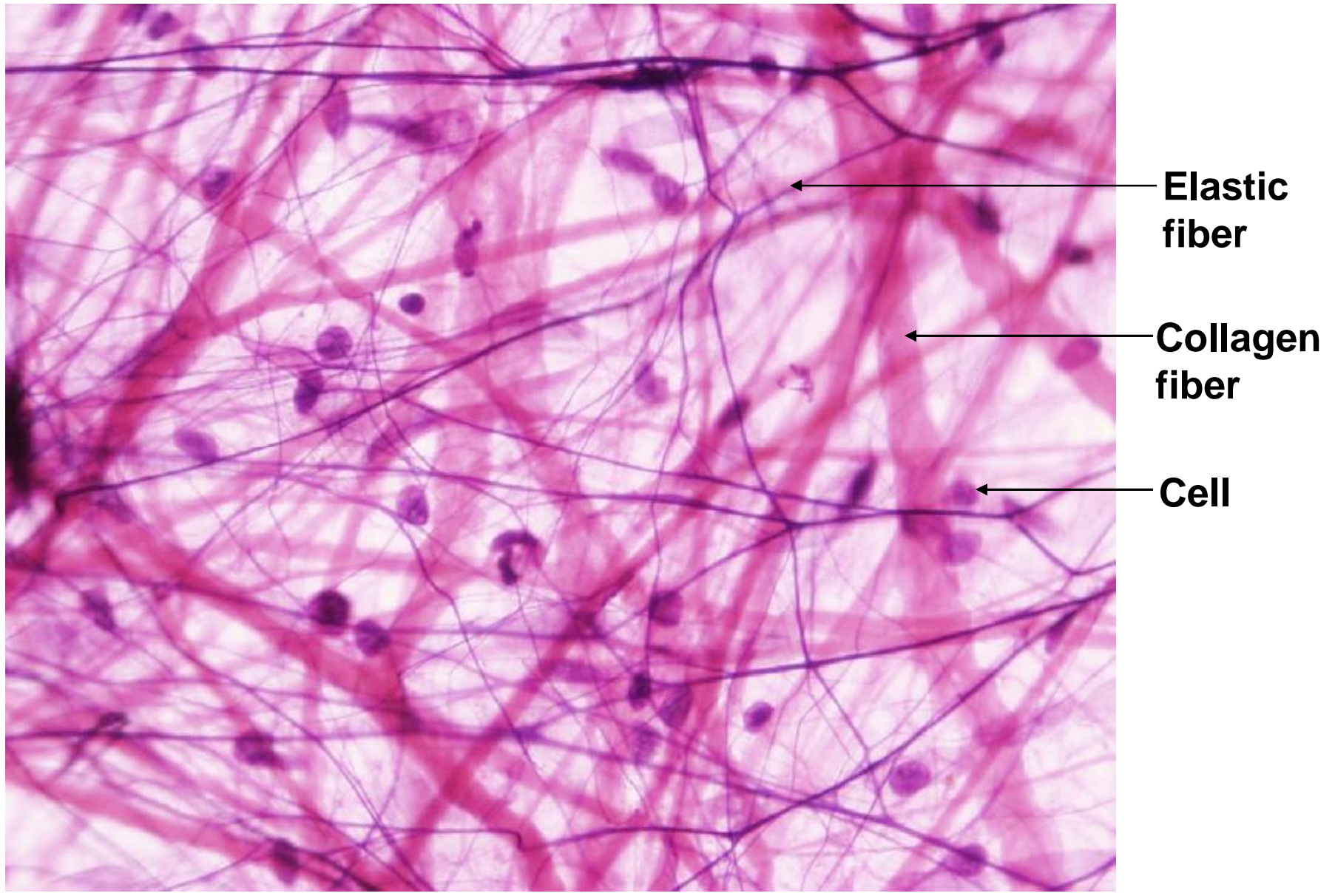
Characteristic Cell Types

Erythrocytes, leukocytes

Loose connective tissue

- Gel like ground with both collagen and elastin fibers running through the ground in many directions.
 - Wraps and cushions organs
 - Under the skin

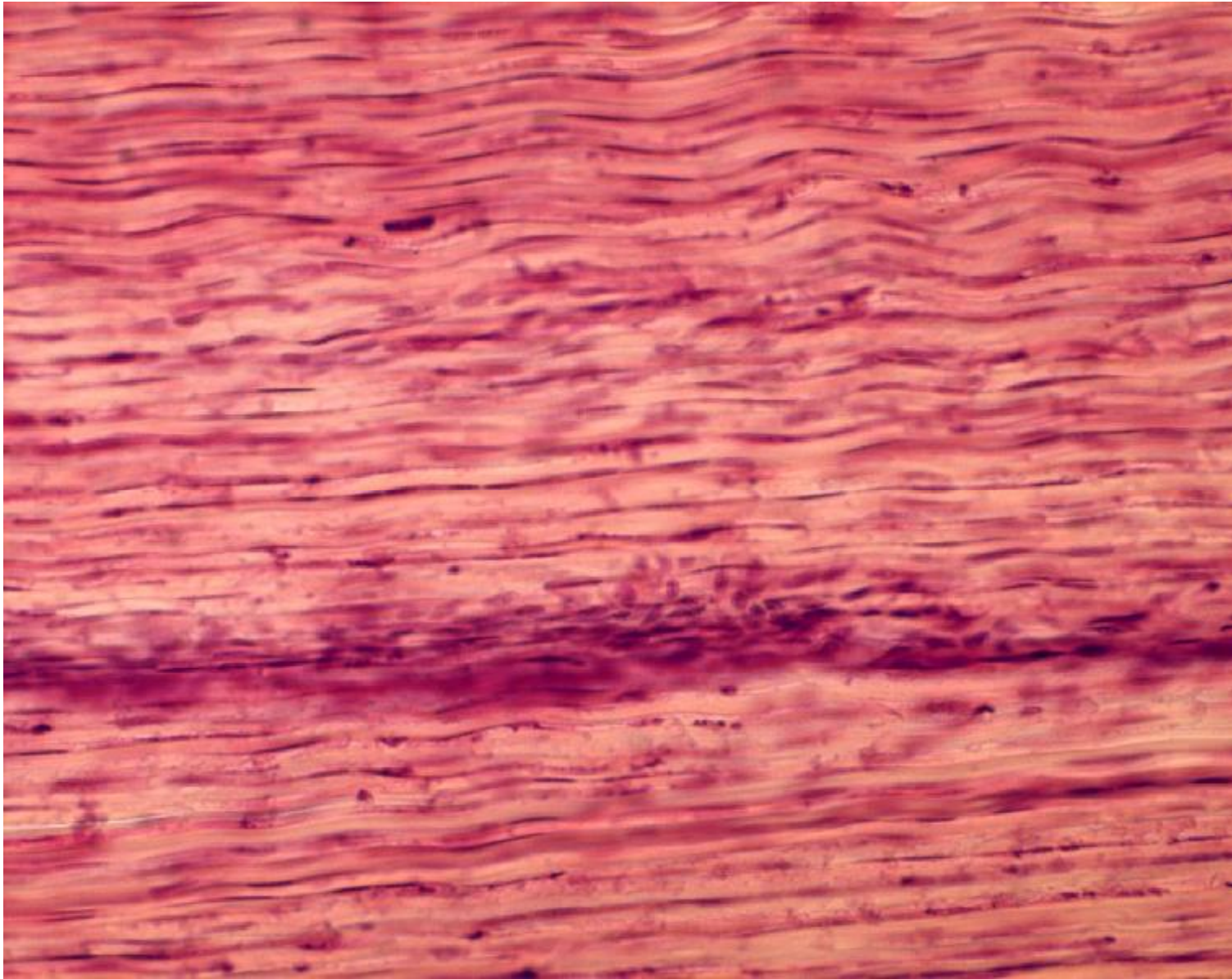
Loose connective tissue



Dense Connective Tissue

- Nuclei and fibers arranged in parallel rows.
- Fibers mostly non-elastic
- Dense connective tissue forms:
 - Ligaments: bind bones to each other
 - Tendons: connect muscles to bones
 - The middle layer of skin.

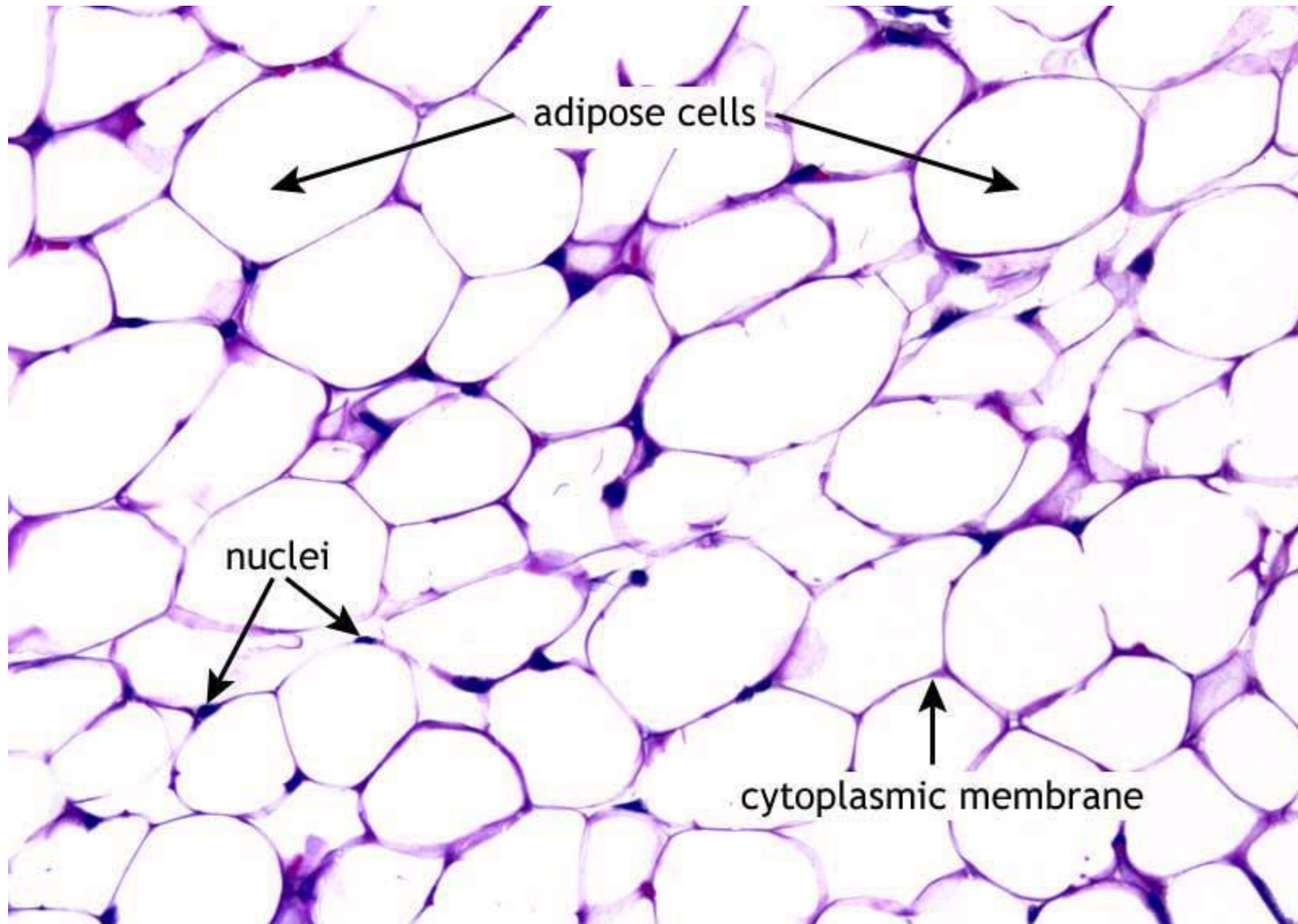
Dense connective tissue



Adipose

- Adipose cells contain a **large vacuole** which in the live cell contains lipids.
- **Cell nucleus and cytoplasm are pushed out to edge** of cell membrane.
- Adipose tissue insulates, cushions joints, protects organs, and stores energy.

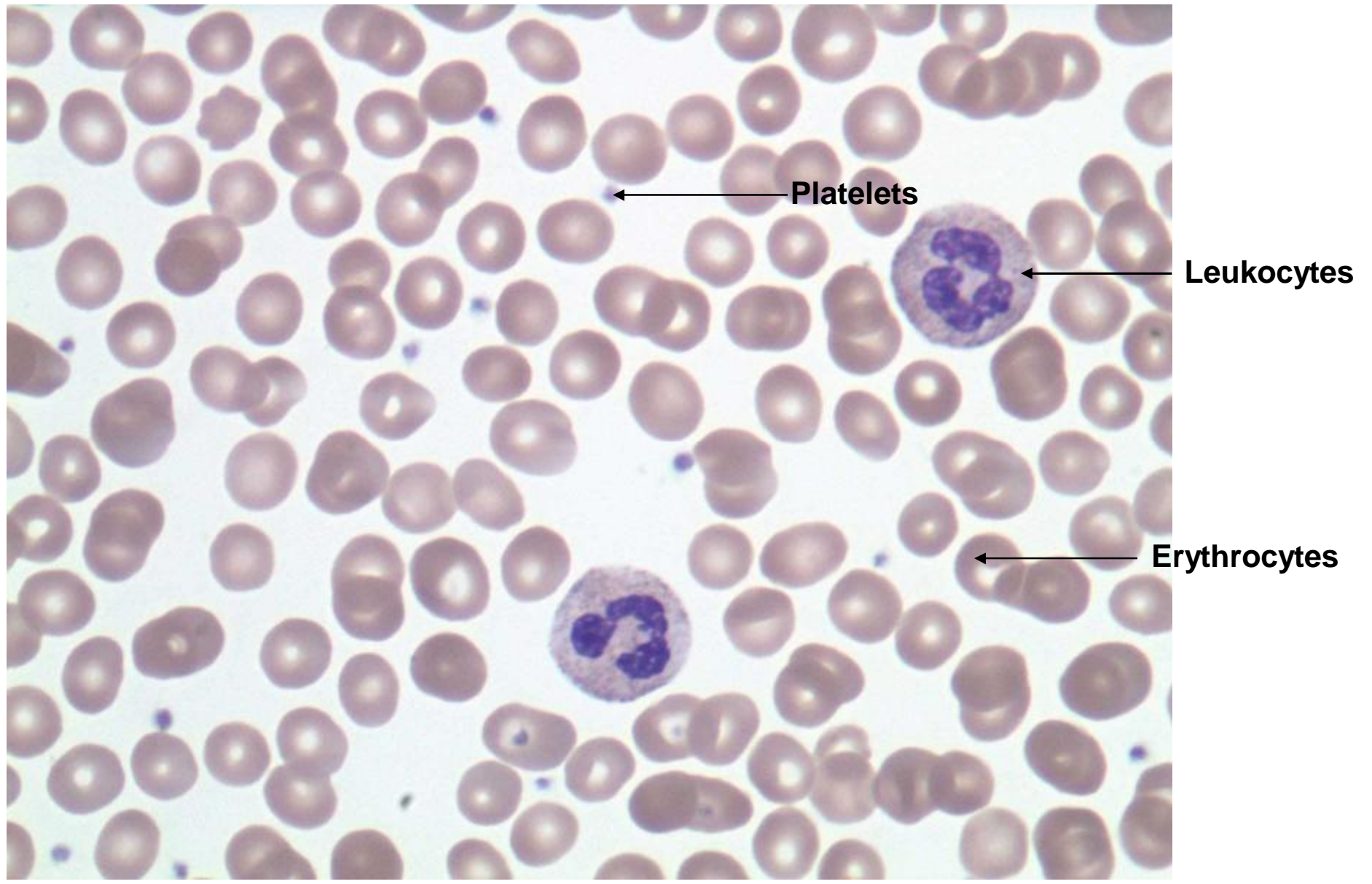
Adipose



Blood

- Blood is a complex mixture of different cell types suspended in a liquid matrix called **plasma**.
- **Erythrocytes** (red blood cells) transport oxygen and constitute the bulk of the blood cells.
- **Leukocytes** (white blood cells) protect against infection and help clear the body of wornout or abnormal cells.
- **Platelets** release chemicals that promote blood clotting.

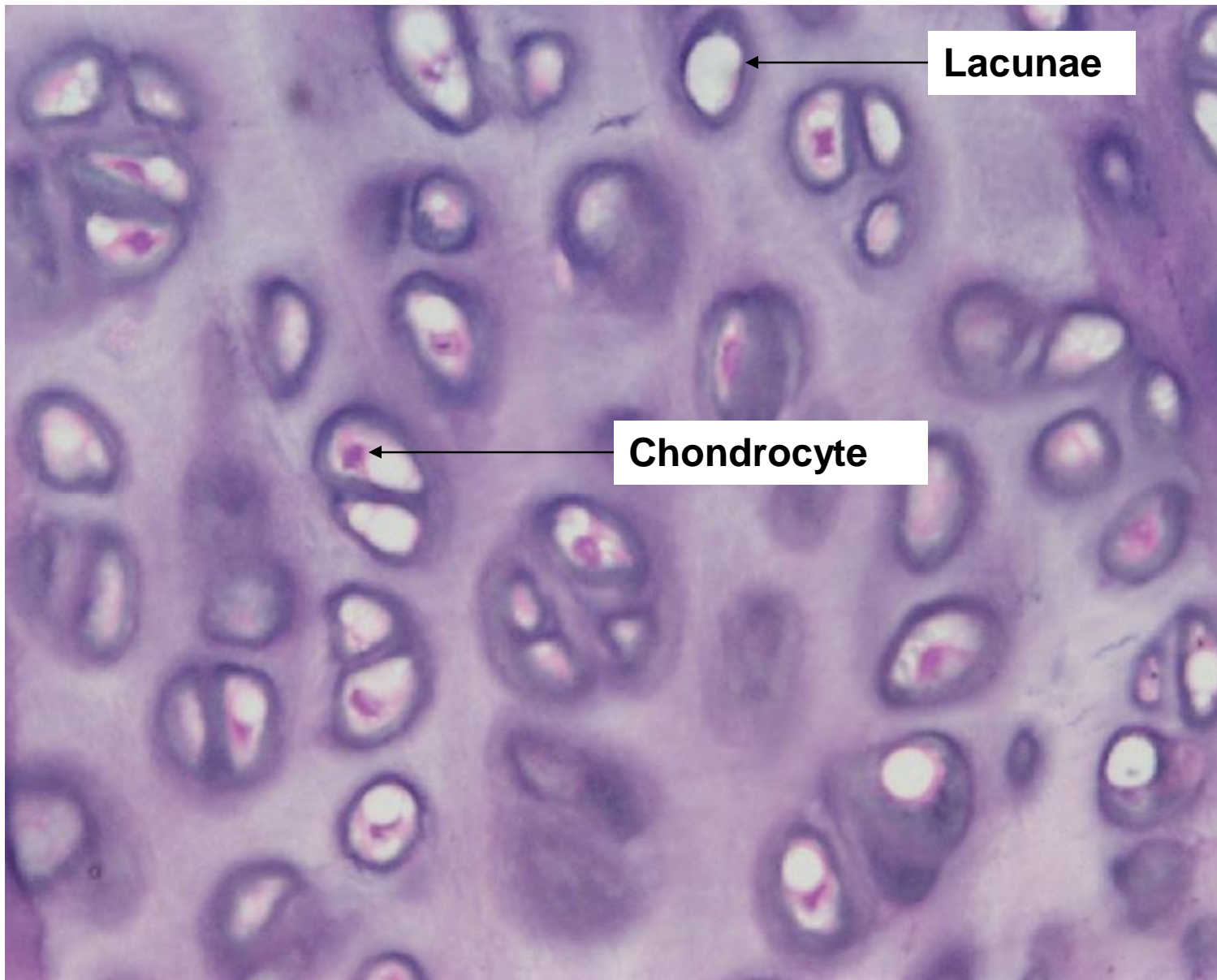
Blood cells



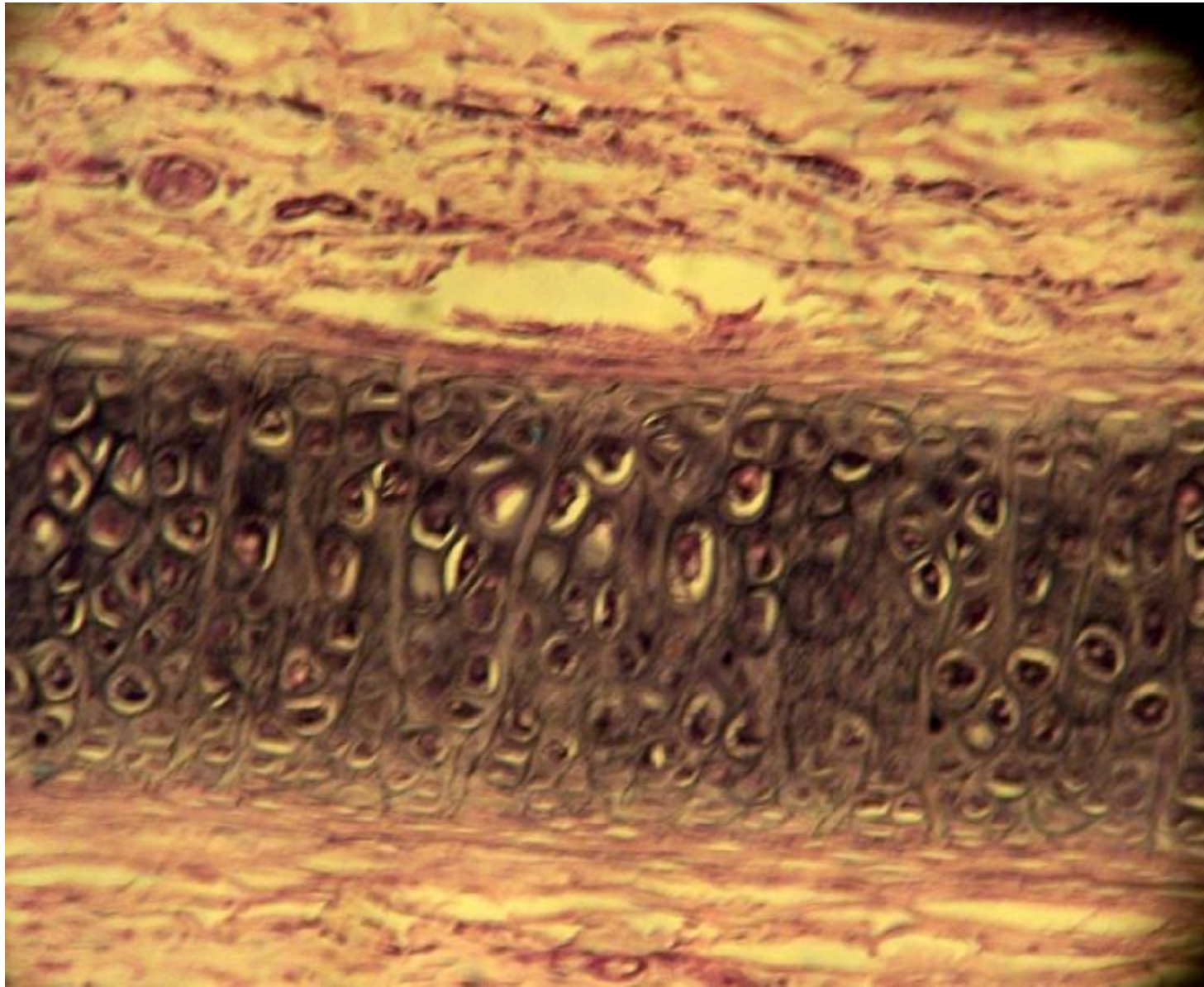
Cartilage

- Ground of **matrix is gum** like.
- Cells (**chondrocytes**) are found in **Lacunae** within the matrix.
- Fibers may be elastin or collagen, or a form of non-elastic called reticular (where the non-elastic fibers of very thin)
 - **Hyaline Cartilage** - example on the ends of bones
 - **Elastic Cartilage** - example ear cartilage
 - **Non-elastic Cartilage** - example nose cartilage.

Hyalin cartilage

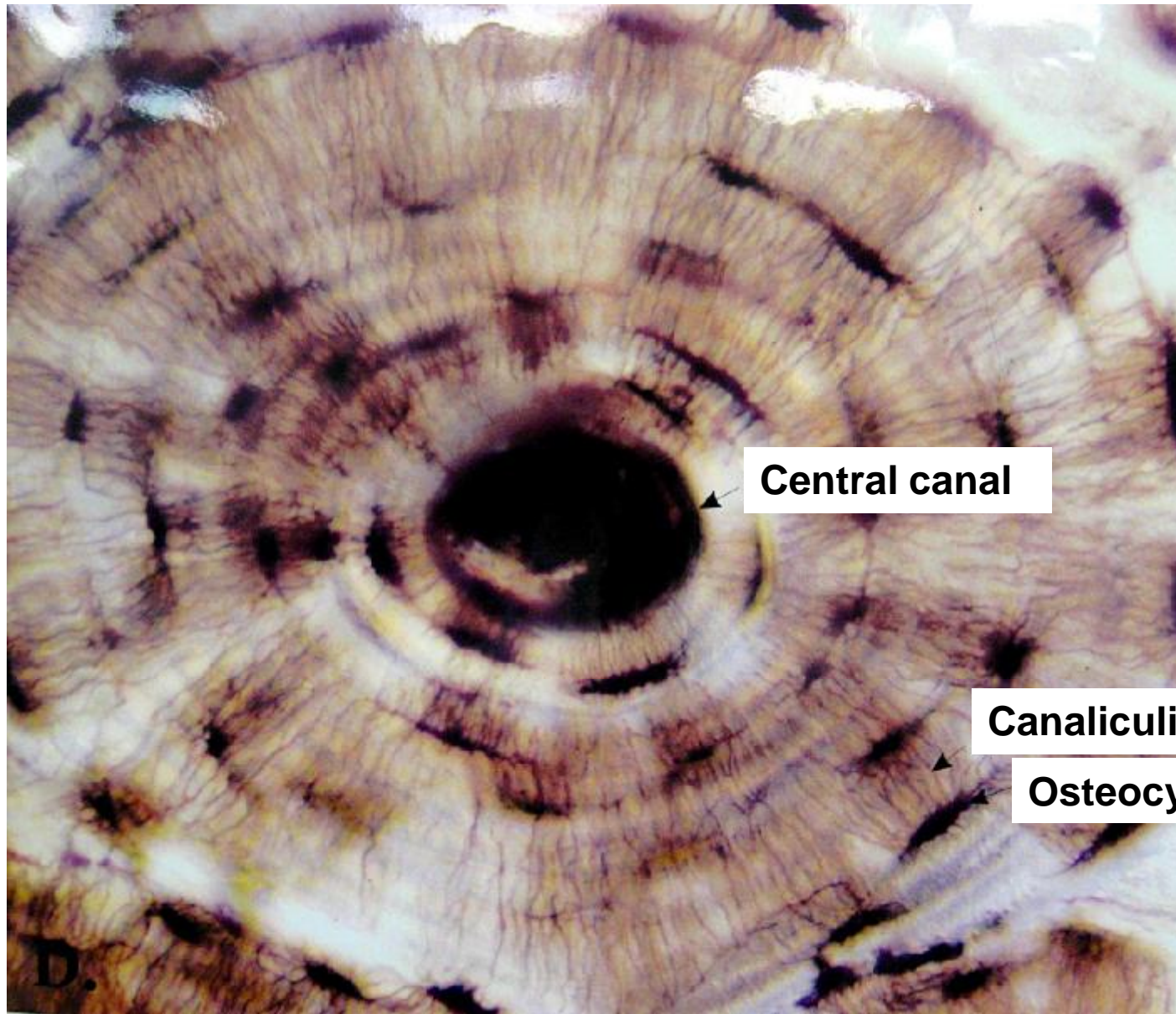


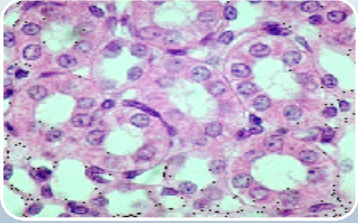
Elastic cartilage



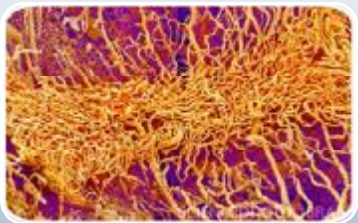
Bone

- Ground of matrix is Solid (Calcium carbonate).
- Has blood supply and nerves running through the Haversian canal systems.

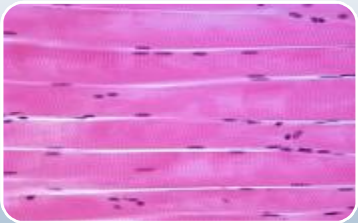




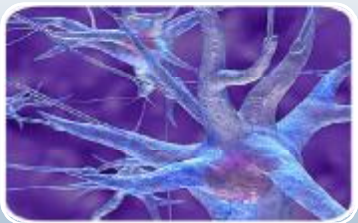
Epithelial Tissue



Connective Tissue



Muscle Tissue

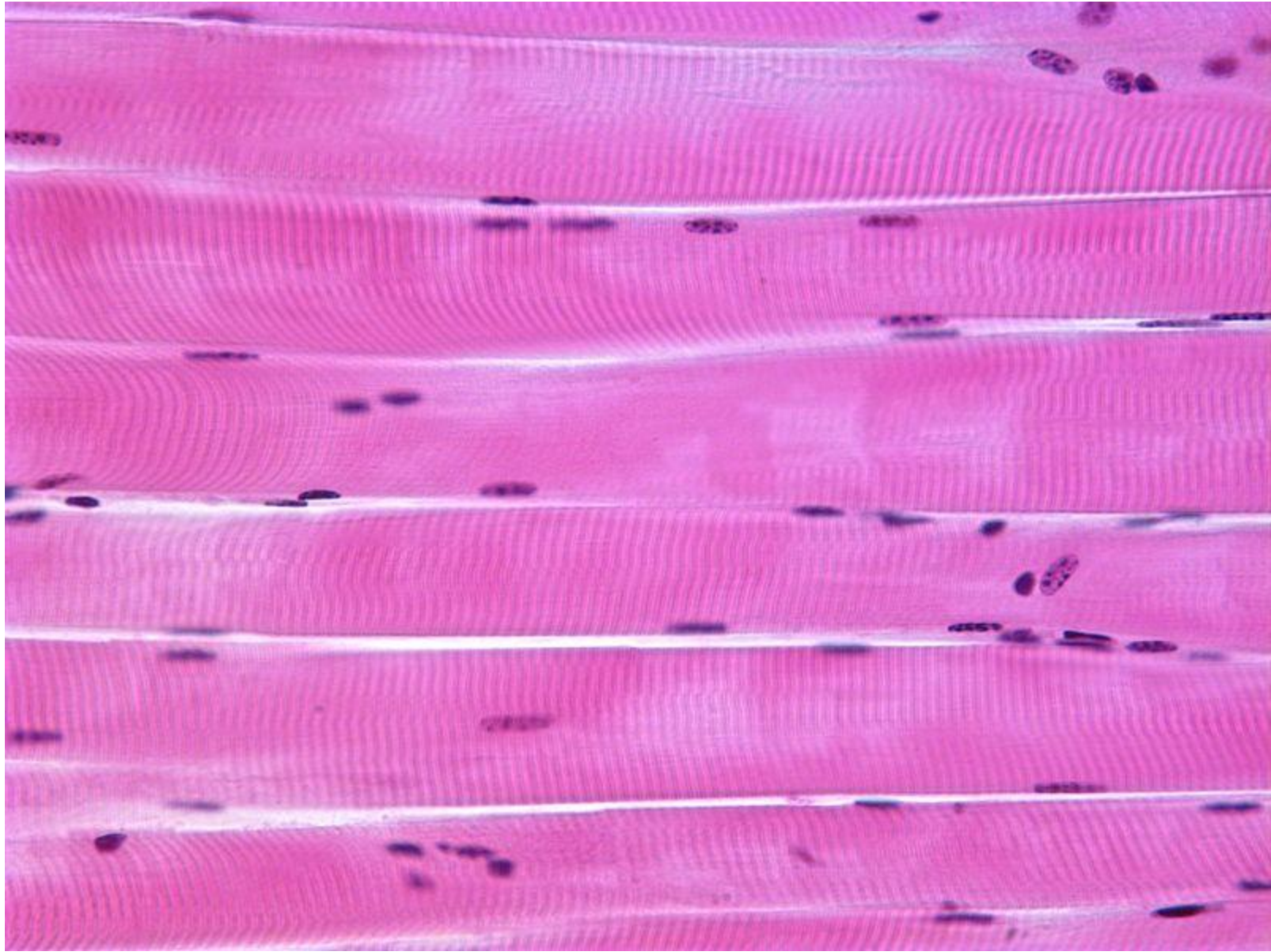


Nervous Tissue

Muscle Tissue

- Tissue with cells having fibers specialized for contraction.
- **Skeletal Muscle** (Striated, voluntary)
 - Parallel elongated cells (fibers)
 - Multinucleated and each cell is the length of the muscle.
 - Light meat, Dark meat—Slow twitch, fast twitch muscle

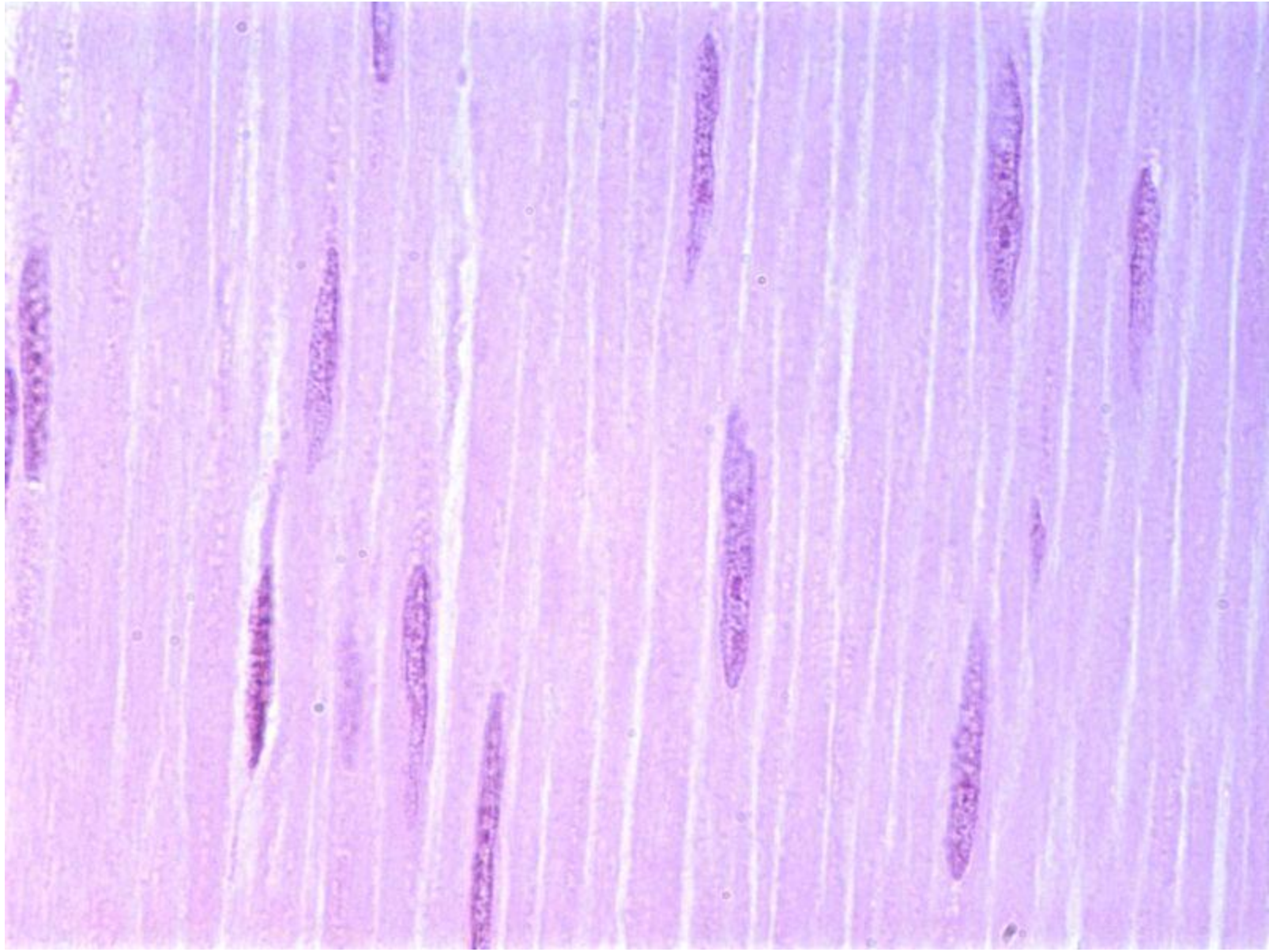
Skeleton muscle



Muscle Tissue

- Smooth Muscle (Visceral, involuntary)
 - Cells are long and tapered.
 - Organized into sheets of muscle.

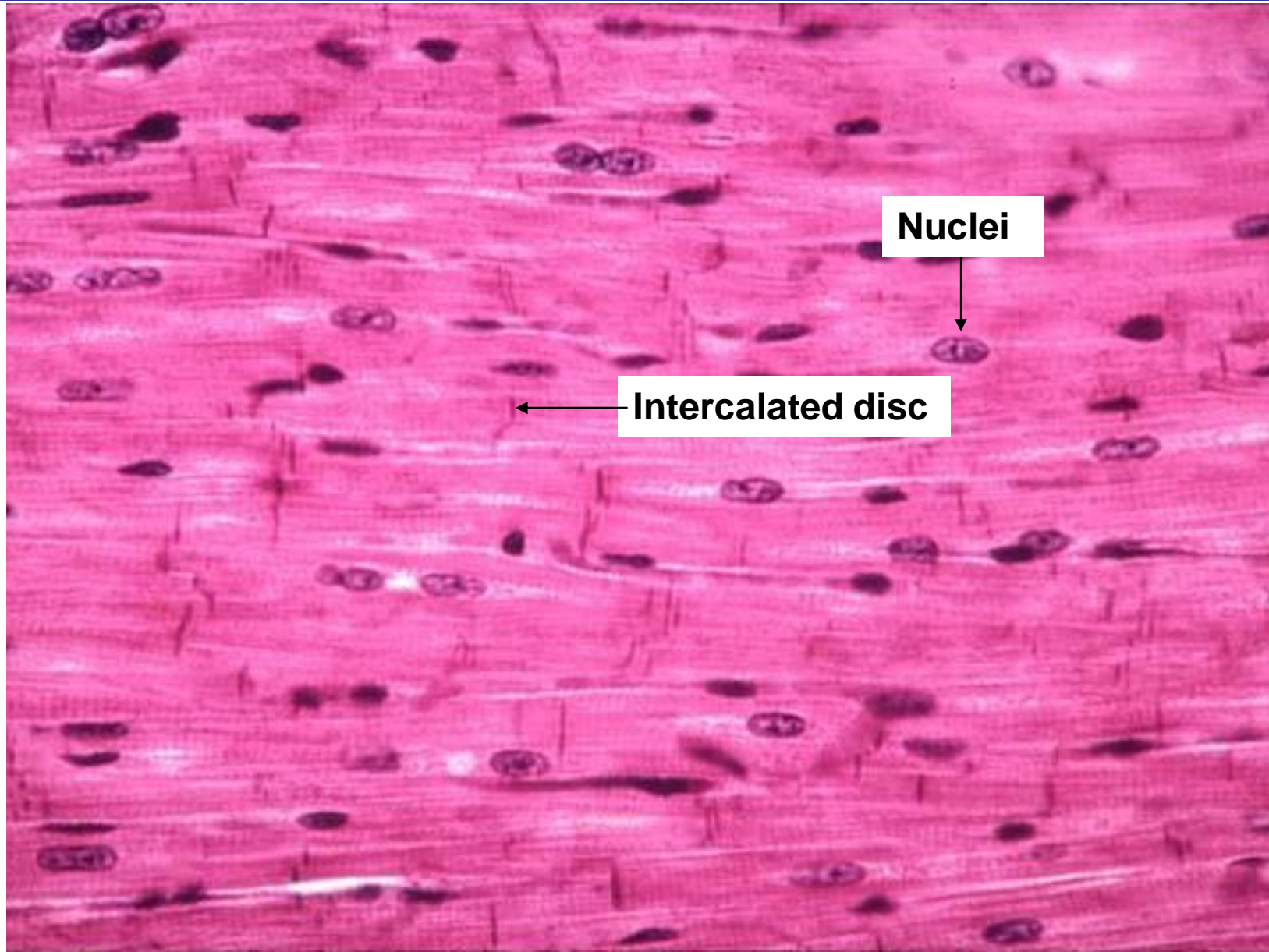
Smooth muscle

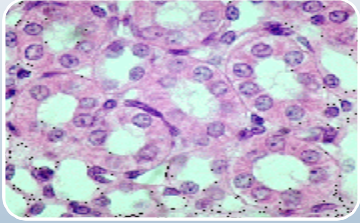


Muscle Tissue

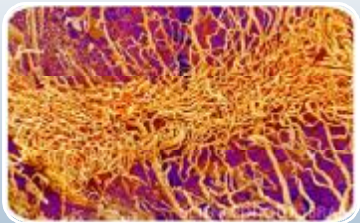
- Cardiac Muscle
 - Intercalated disc
 - Myogenic
 - branched

Cardiac muscle

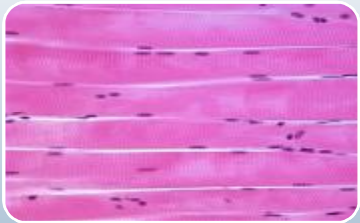




Epithelial Tissue



Connective Tissue



Muscle Tissue

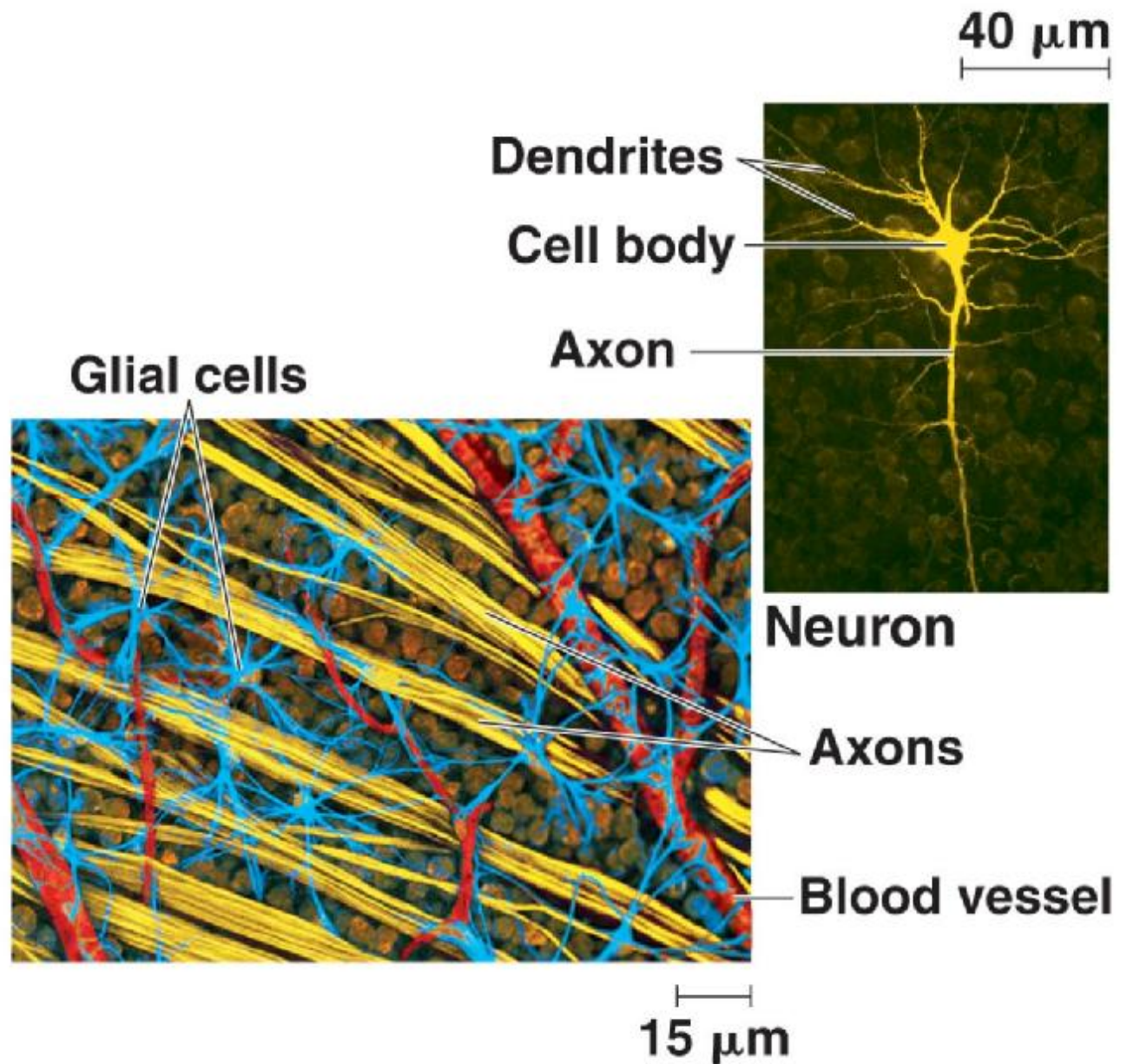


Nervous Tissue

Nervous Tissue

- Nerve cells, called **neurons**, along with associated cells called **neuroglia** make up nervous tissue.
 - Neurons form communication networks that receive, process, and transmit information quickly.
 - Neuroglial cells assist in the structural support and normal functioning of neurons.

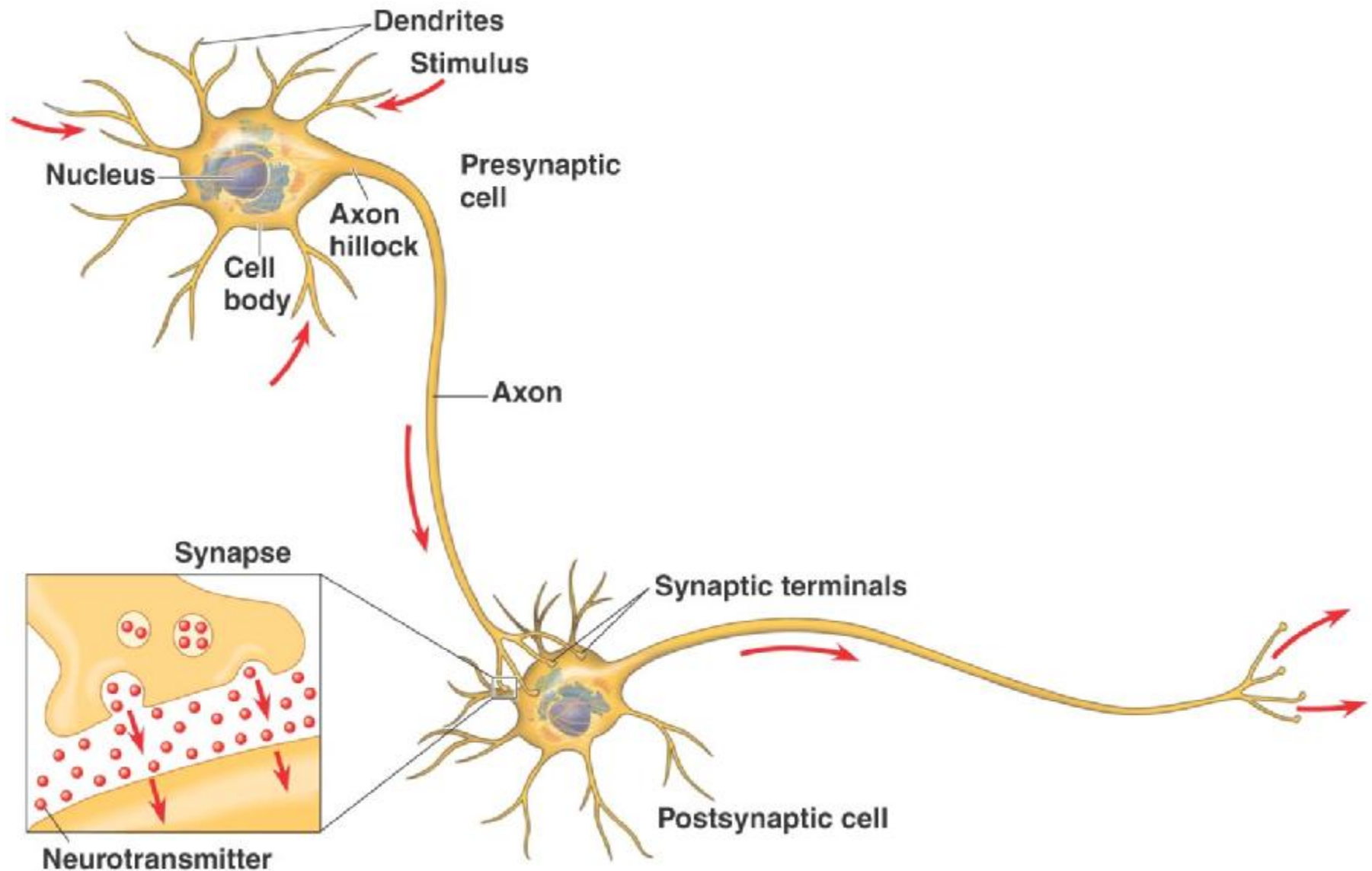
Nervous Tissue



Neurons

- A typical neuron consists of:
 - an enlarged portion called the **cell body**
 - a branch called the **axon** that transmits information to another cell
 - several branches called **dendrites** that receive information from other neurons.
- Environmental stimuli such as light, heat, or pressure may activate neurons specialized as sensory receptors, located in the skin and in sense organs.

Neurons



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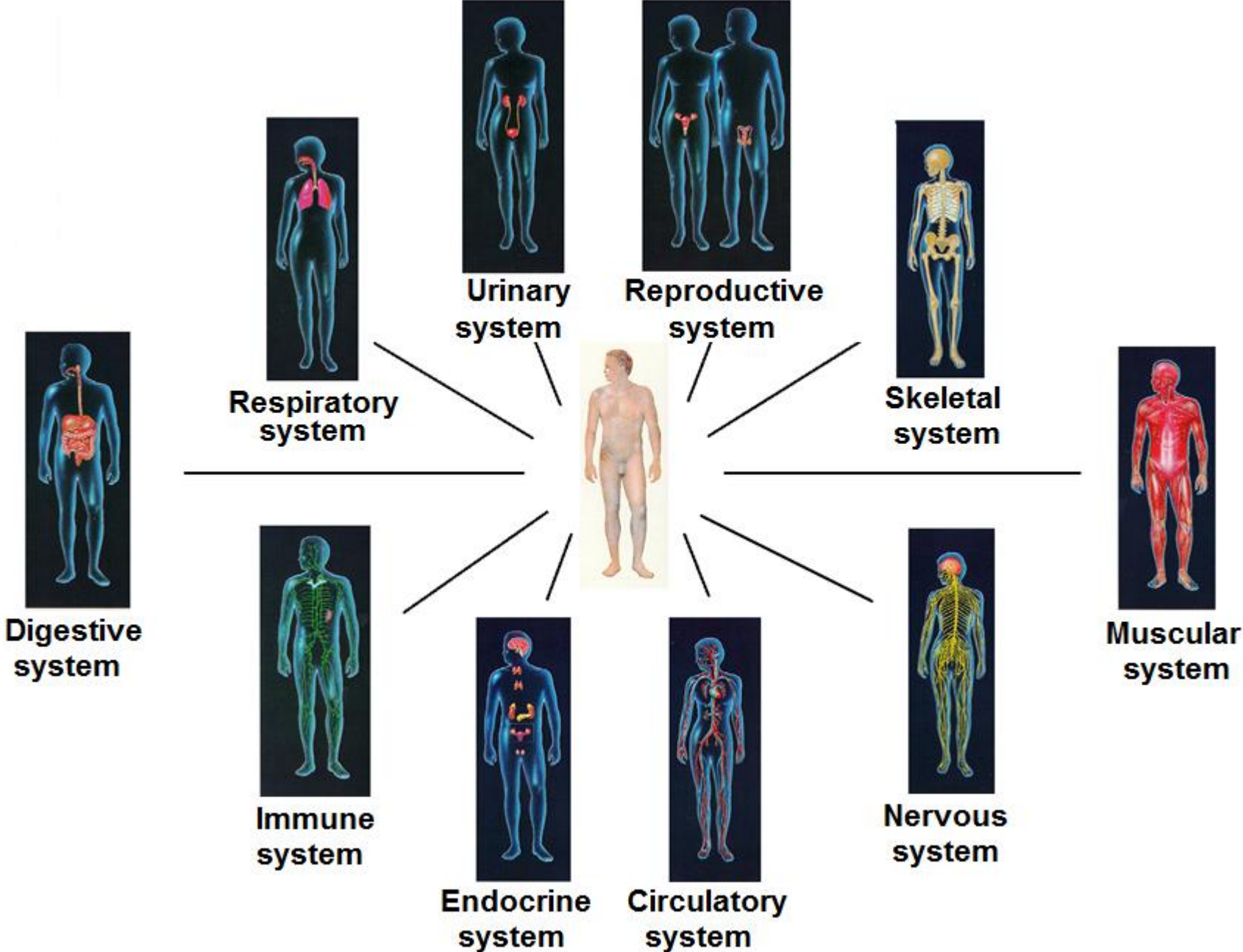
Organ Systems

-
- **Organs** are body structures composed of several different tissues that form a structural and functional unit.
 - An **organ system** is a group of organs that function together to carry out the major activities of the body.
 - The vertebrate body contains 11 principal organ systems

The Major Vertebrate Organ Systems

System	Functions	Components
Circulatory	Transports cells, respiratory gases, and chemical compounds throughout the body	Heart, blood vessels, lymph, and lymph structures
Digestive	Captures soluble nutrients from ingested food	Mouth, esophagus, stomach, intestines, liver, and pancreas
Endocrine	Coordinates and integrates the activities of the body	Pituitary, adrenal, thyroid, and other ductless glands
Integumentary	Covers and protects the body	Skin, hair, nails, scales, feathers, and sweat glands
Lymphatic/ Immune	Vessels transport extracellular fluid and fat to circulatory system; lymph nodes and lymphatic organs provide defenses to microbial infection and cancer	Lymphatic vessels, lymph nodes, thymus, tonsils, spleen
Muscular	Produces body movement	Skeletal muscle, cardiac muscle, and smooth muscle
Nervous	Receives stimuli, integrates information, and directs the body	Nerves, sense organs, brain, and spinal cord
Reproductive	Carries out reproduction	Testes, ovaries, and associated reproductive structures
Respiratory	Captures oxygen and exchanges gases	Lungs, trachea, gills, and other air passageways
Skeletal	Protects the body and provides support for locomotion and movement	Bones, cartilage, and ligaments
Urinary	Removes metabolic wastes from the bloodstream	Kidney, bladder, and associated ducts

Human organ systems



Mammal Intergumentary System

