

Objectives:

- 1) List the four major tissue types, and tell where each is located in the body.
- 2) Describe the general characteristics and functions of epithelial tissues.
- 3) Describe the general characteristics and functions of muscle tissues.
- 4) Describe the general characteristics and functions of connective tissues.
- 5) Describe the general characteristics and functions of nervous tissues.



Histology

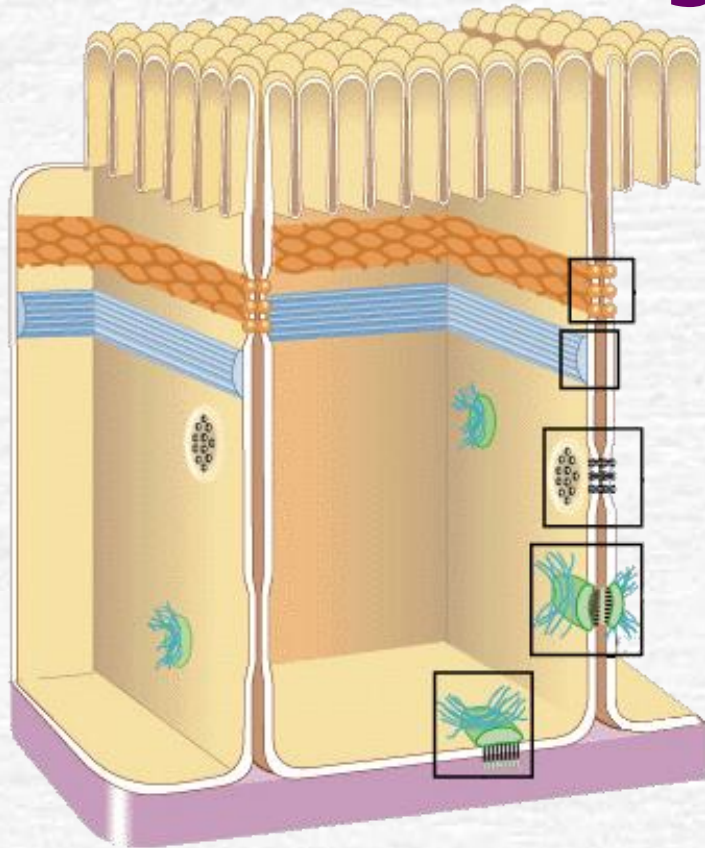
The study of body tissues



Introduction to Histology

- Four basic tissue types:
 - Epithelial, connective, muscle, nervous
- All animals are composed of **ONLY** these four tissue types
- Tissue types are organized to form organs, which form the functional systems of the body

The Tissue Level of Organization

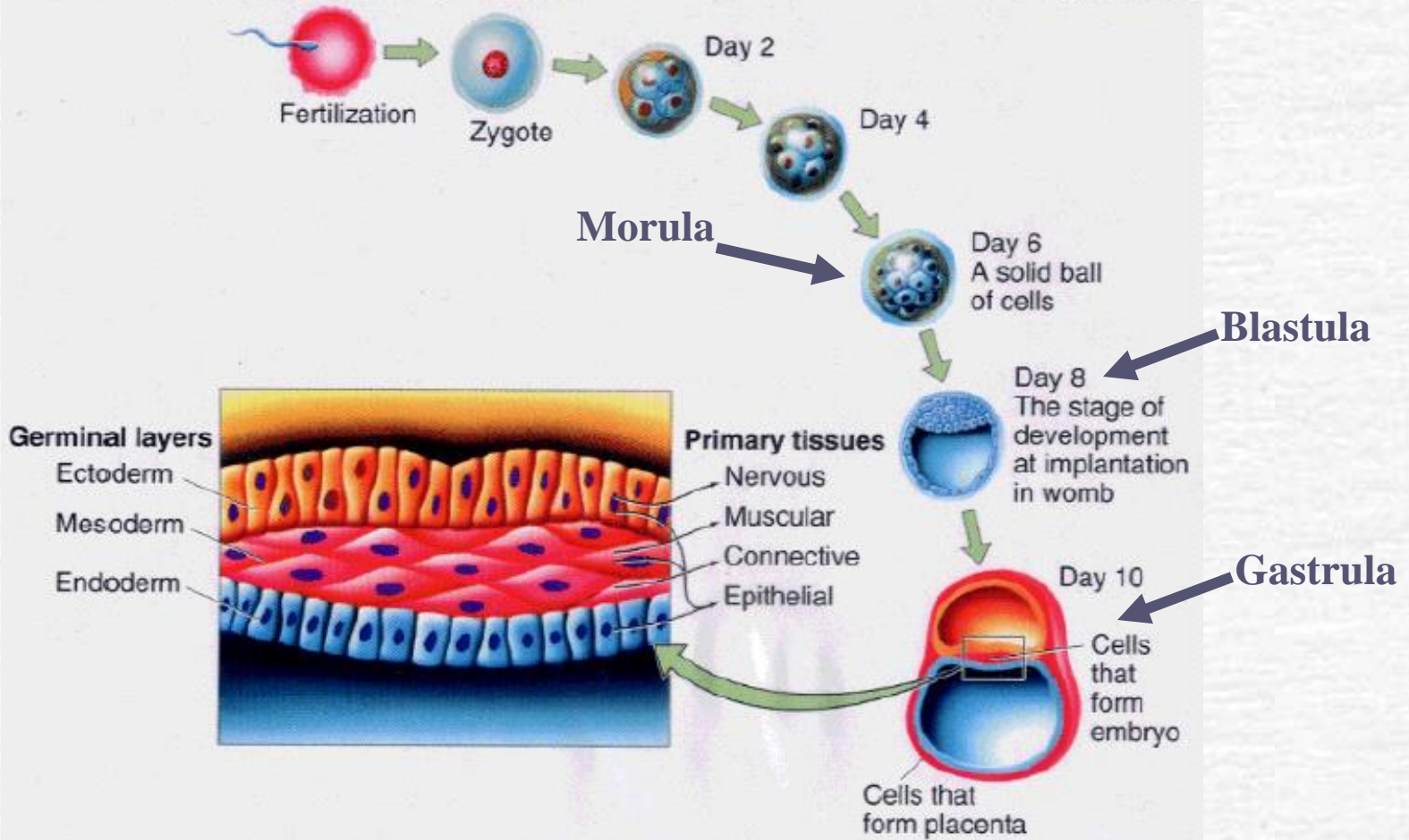


- Group of similar cells
 - common embryonic origin
 - common function
 - bound together by intercellular substance
- Histology
 - study of tissues

The Origin of Tissues

34 Formation of germinal layers and primary tissues

Fig. 3.2, p. 79

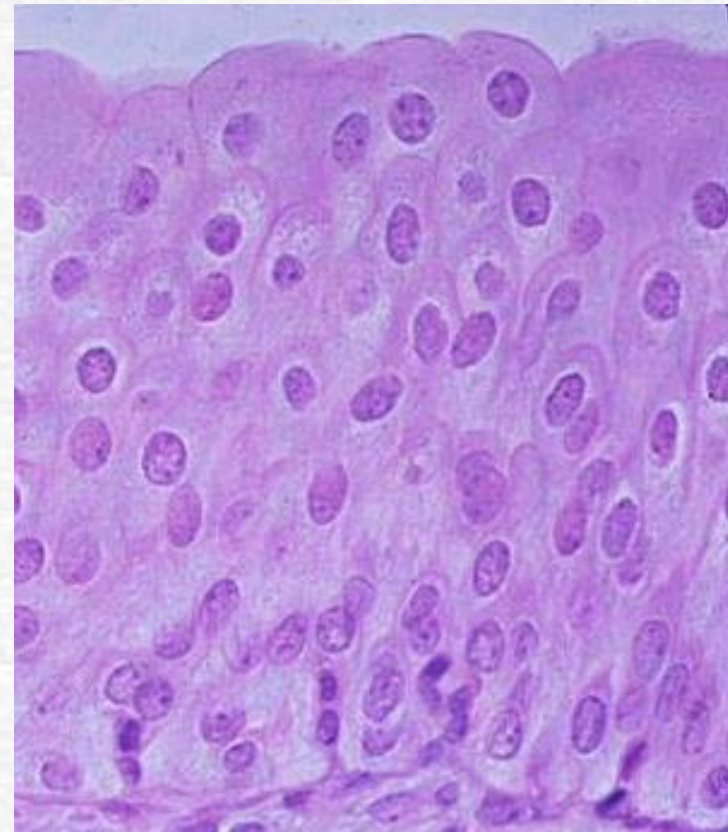


Epithelial tissue

- Function: covers the internal and external surfaces of the body
- Four types: Squamous, cuboidal, columnar, and transitional
- Organized in layers: simple or stratified
- *Attached to underlying connective tissue by a basement membrane.*
- *Avascular---without blood vessels
nutrients diffuse in from blood vessels in underlying connective tissue.*

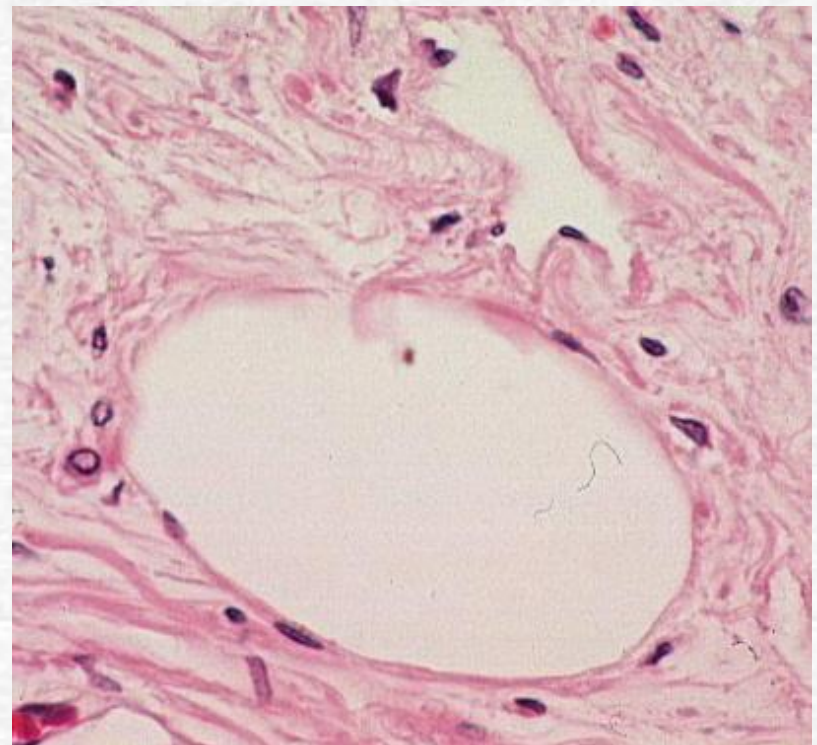
Examples: Epithelial

- Transitional epithelial: found in the bladder
- Stretches as the bladder becomes full



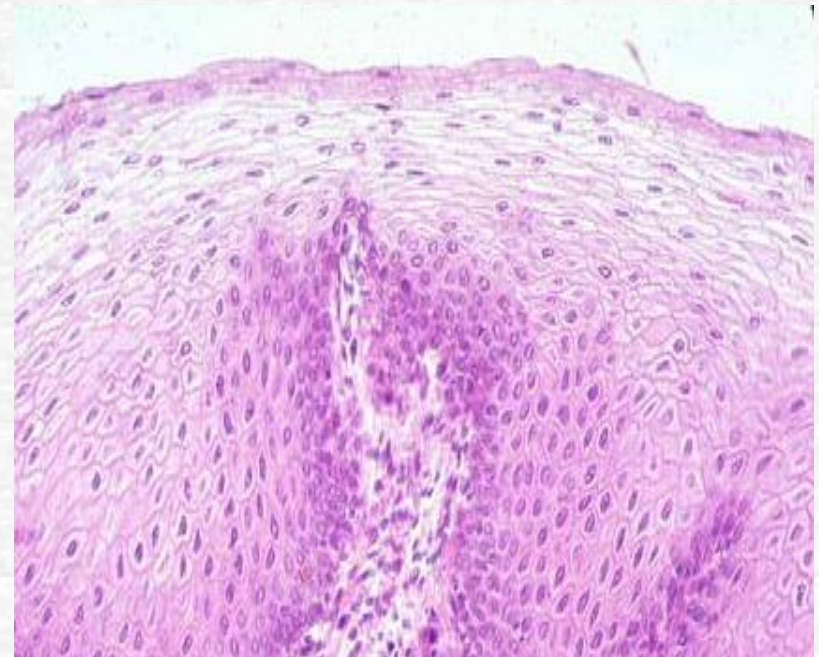
Examples: Epithelial

- Simple squamous: lines blood vessels and lungs
- Allows for increased blood flow and increased oxygen diffusion



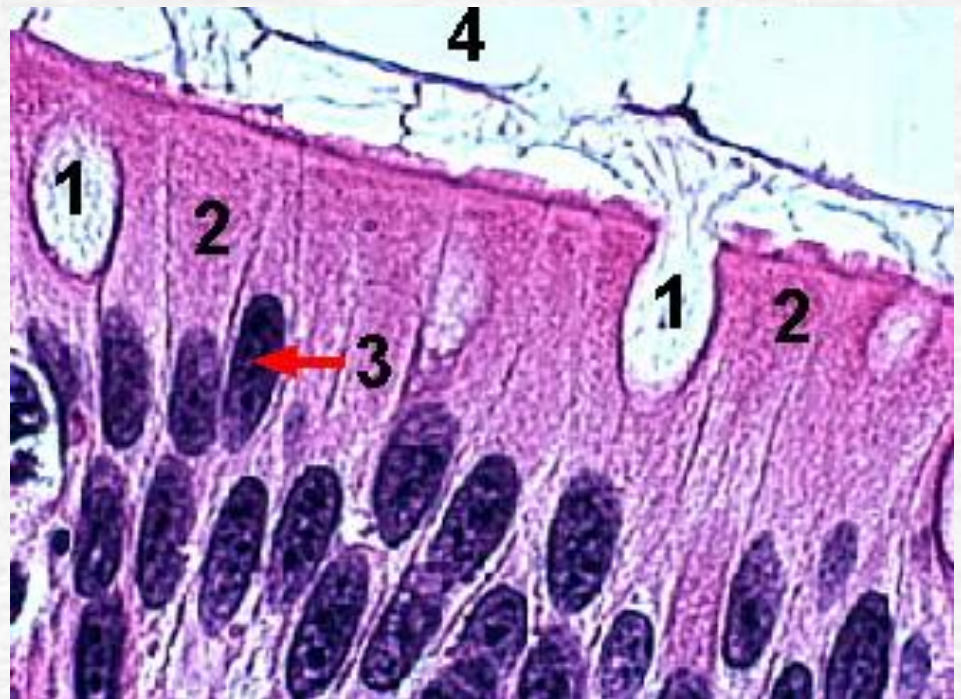
Examples: Epithelial

- Stratified squamous: lines the mouth, esophagus, cervix and skin
- Several layers offers protection to outer layers and membranes of body.



Examples: Epithelial

- Simple columnar: digestive tracts
- Cells mixed with goblet cells that secrete mucous to aid in digestion



Example	Location	Shape (form)	Function
Transitional epithelium	Bladder	Layer with no specific shape, Cells can stretch	Allow bladder to stretch as it fills
Simple squamous	Lungs, blood vessels	Flat and thin layer	Increase flow and absorption rate through tubes
Stratified squamous	Skin, esophagus, mouth cervix	Several layers of thin flat cells	Provide protection from abrasions
Simple columnar	Digestive tract	One cell layer of rectangular cells mixed with goblet (mucous –producing) cells	Aid in digestion with mucous production



Muscle Tissue

Muscle Tissue

Characteristics

- Cells are referred to as *fibers*
- Contracts or shortens with force when stimulated
- Moves entire body and pumps blood

Types

- **Skeletal:** attached to bones
- **Cardiac:** muscle of the heart.
- **Smooth:** muscle associated with tubular structures and with the skin. Nonstriated and involuntary.

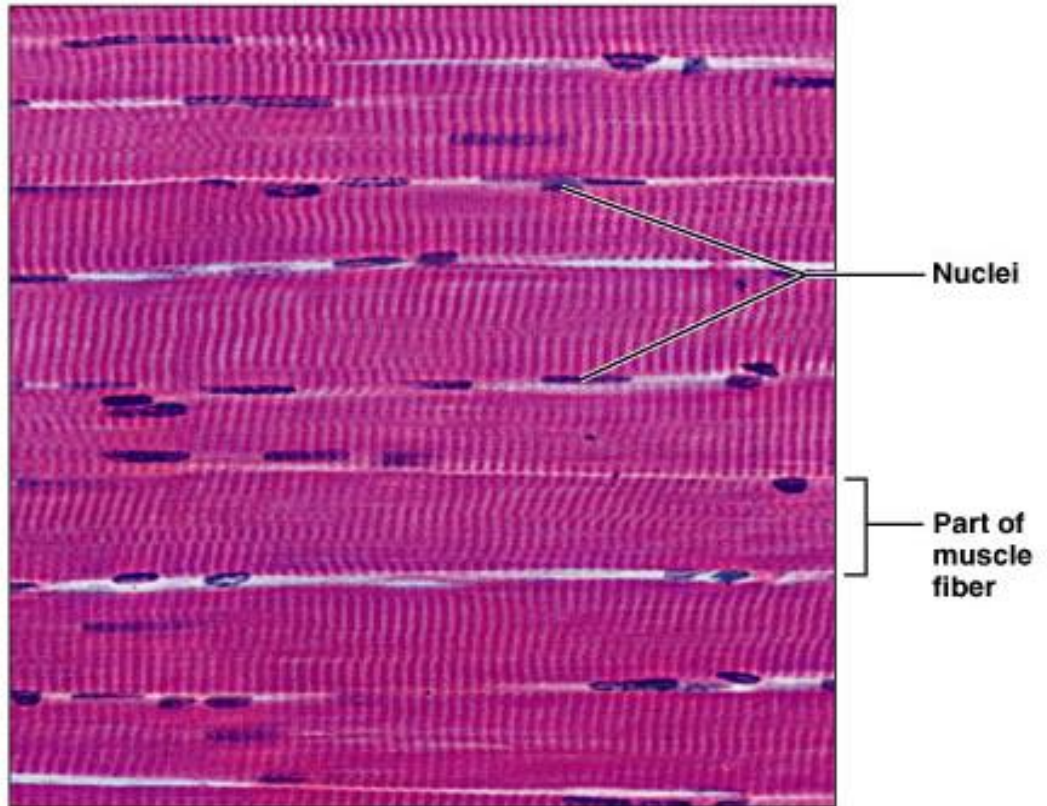
Skeletal Muscle Tissue

(a) Skeletal muscle

Description: Long, cylindrical, multinucleate cells; obvious striations.

Function: Voluntary movement; locomotion; manipulation of the environment; facial expression; voluntary control.

Location: In skeletal muscles attached to bones or occasionally to skin.



Photomicrograph: Skeletal muscle (approx. 300 \times). Notice the obvious banding pattern and the fact that these large cells are multinucleate.

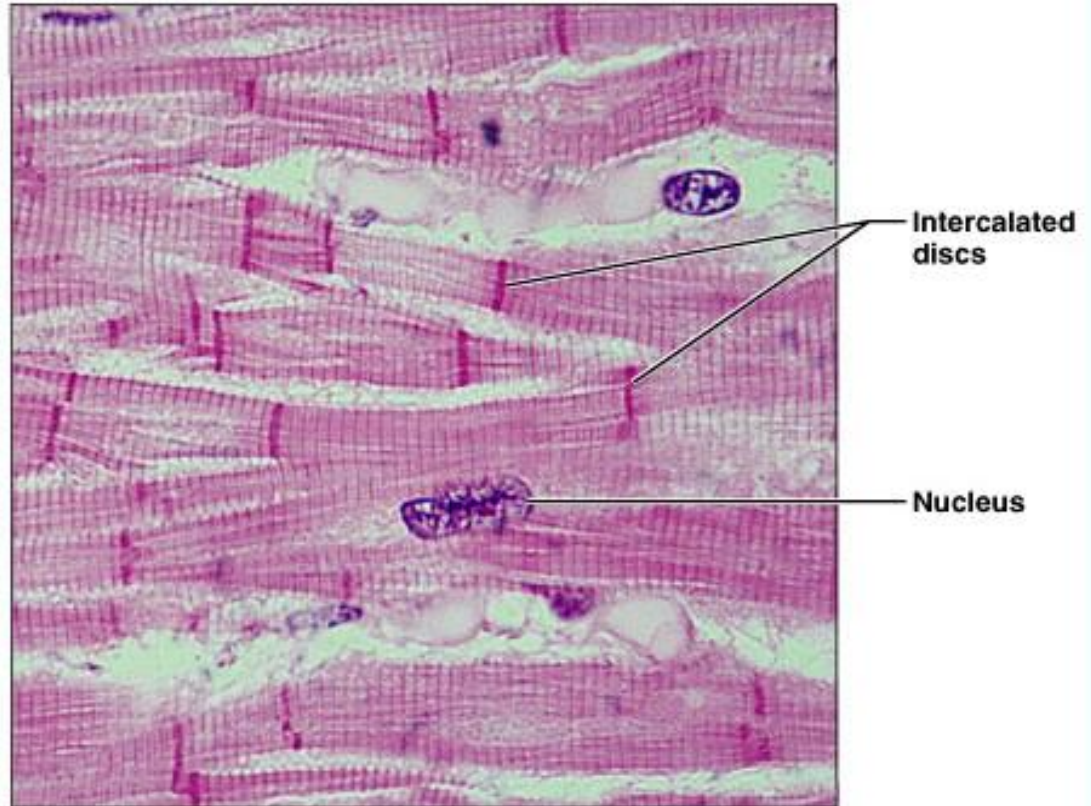
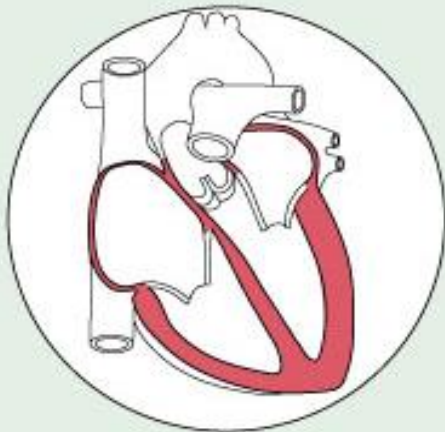
Cardiac Muscle Tissue

(b) Cardiac muscle

Description: Branching, striated, generally uninucleate cells that interdigitate at specialized junctions (intercalated discs).

Function: As it contracts, it propels blood into the circulation; involuntary control.

Location: The walls of the heart.



Photomicrograph: Cardiac muscle (800 \times); notice the striations, branching of cells, and the intercalated discs.

Connective Tissue

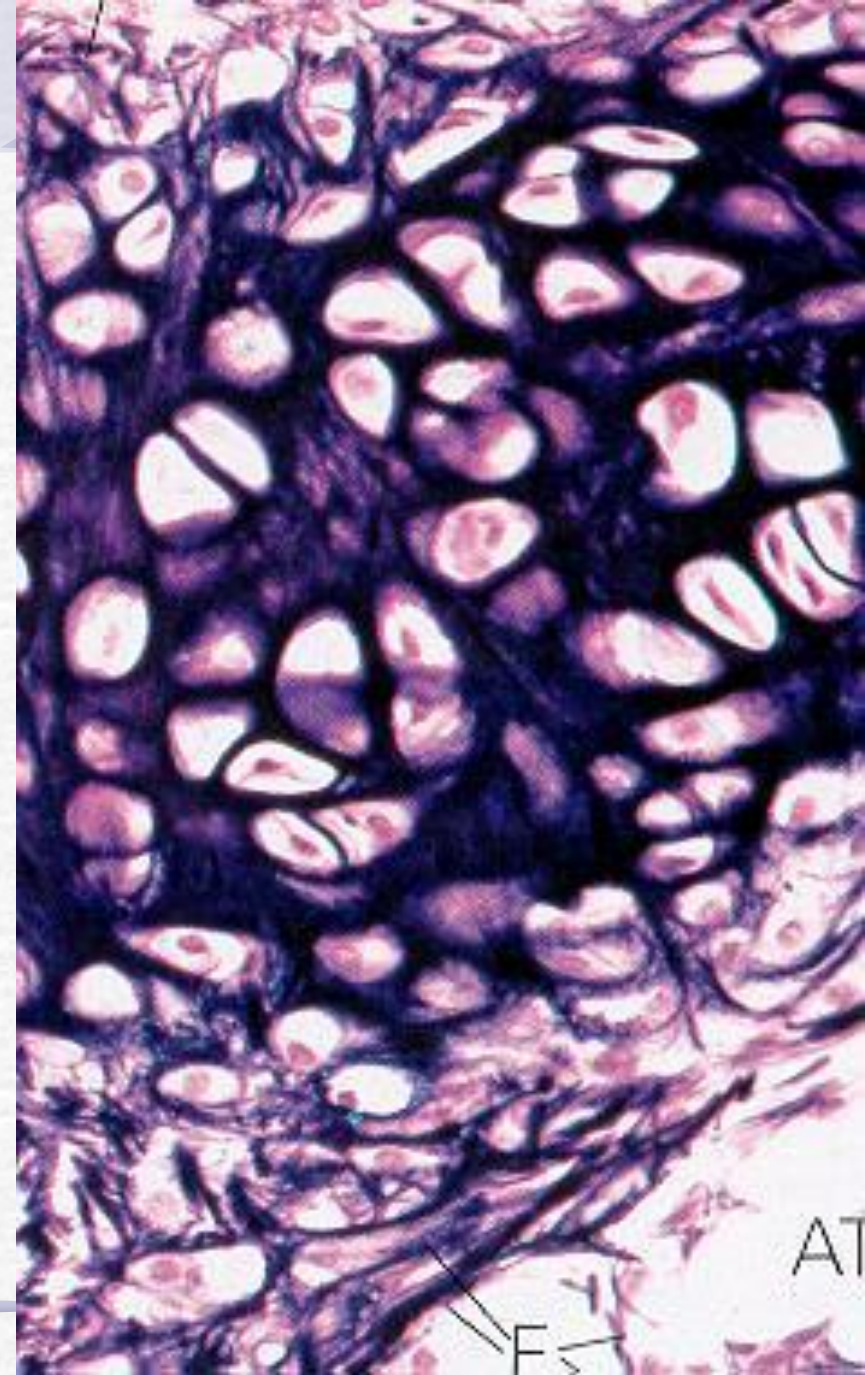
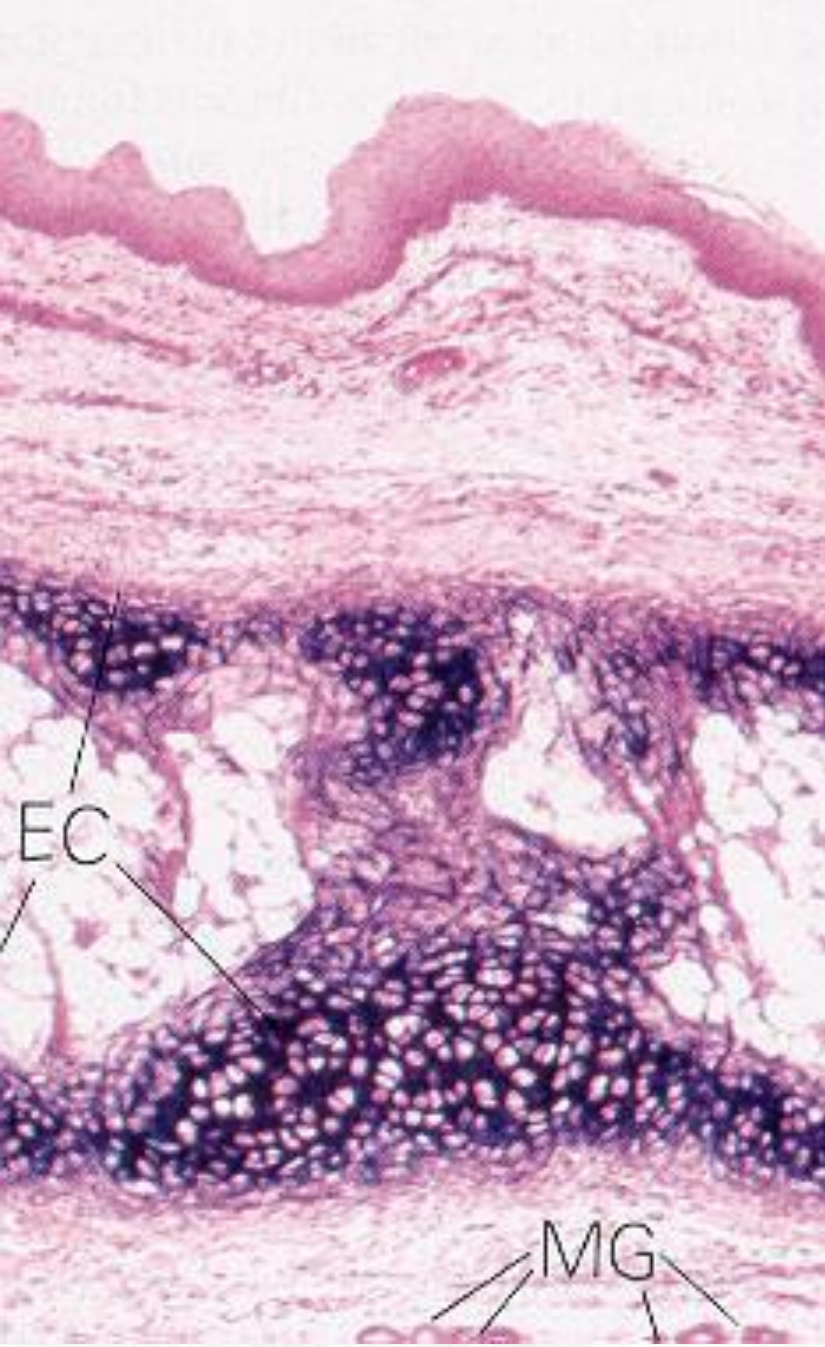
- ✓ Most diverse and abundant tissue
- ✓ Main classes
 - Connective tissue proper
 - Cartilage
 - Bone tissue
 - Blood
- ✓ Characteristics
 - (derived from mesoderm)
 - Varying degrees of vascularity
 - Nonliving extracellular matrix, consisting of ground substance and fibers
 - Cells are not as abundant nor as tightly packed together as in epithelium

Functions of Connective Tissue

- ✓ Enclose organs as a capsule and separate organs into layers. Areolar
- ✓ Connect tissues to one another. Tendons and ligaments.
- ✓ Support and movement. Bones.
- ✓ Storage. Fat.
- ✓ Insulation. Fat.
- ✓ Transport. Blood.
- ✓ Protection. Bone, cells of the immune system.

Structural Elements of Connective Tissue

- Ground substance – unstructured material that fills the space between cells
- Fibers – collagen, elastic, or reticular
- Cells – fibroblasts, chondroblasts, osteoblasts, hematopoietic stem cells, and others



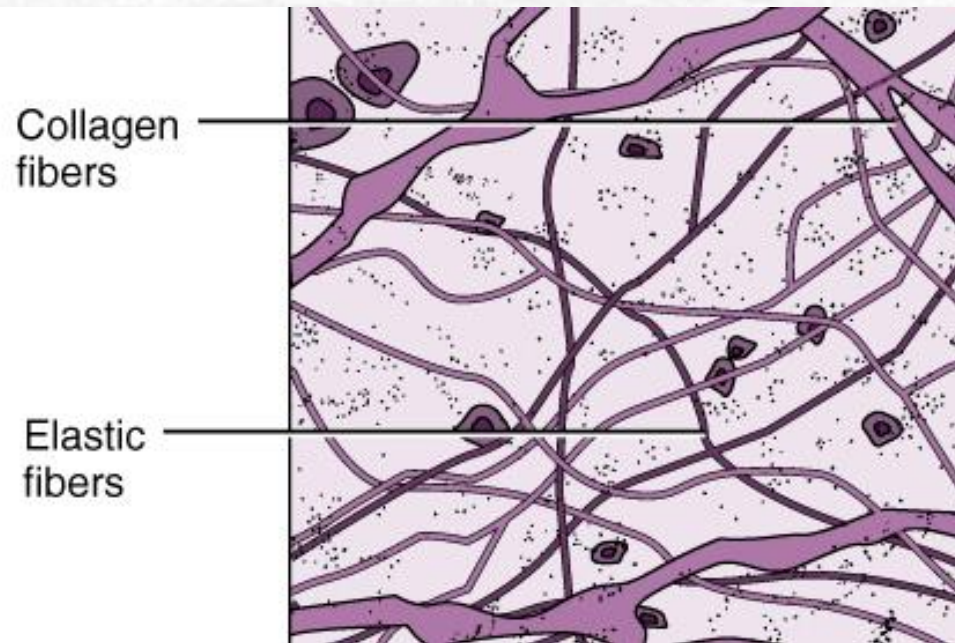
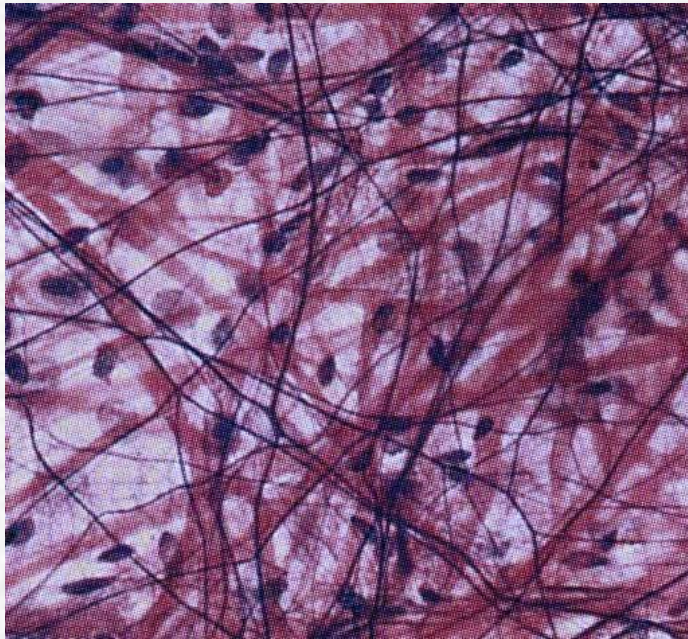
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Areolar Connective Tissue



- Black, fine = elastic fibers,
- Pink, thick = collagen fibers
- Purple Nuclei are mostly of fibroblasts

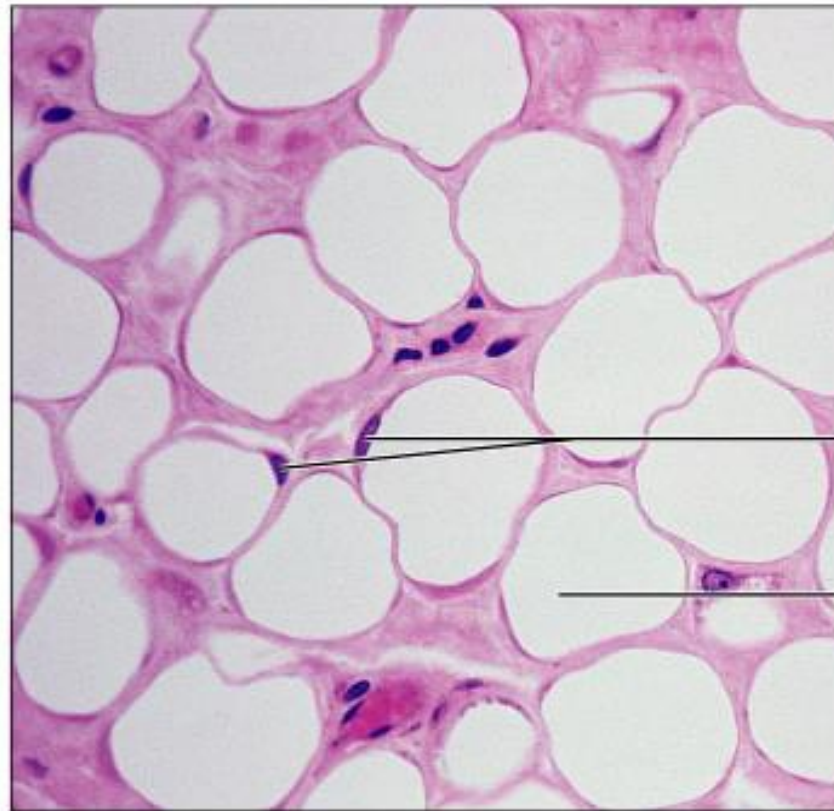
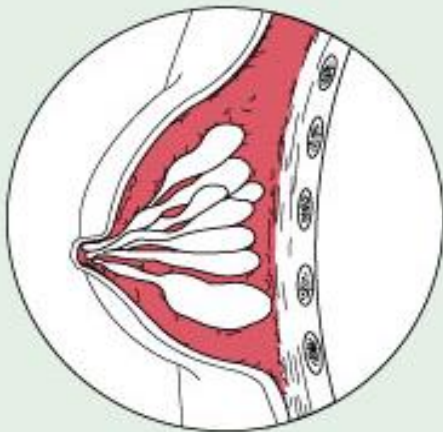
Adipose Tissue

(c) Connective tissue proper: loose connective tissue, adipose

Description: Matrix as in areolar, but very sparse; closely packed adipocytes, or fat cells, have nucleus pushed to the side by large fat droplet.

Function: Provides reserve food fuel; insulates against heat loss; supports and protects organs.

Location: Under skin; around kidneys and eyeballs; within abdomen; in breasts.



Nuclei of fat cells

Vacuole containing fat droplet

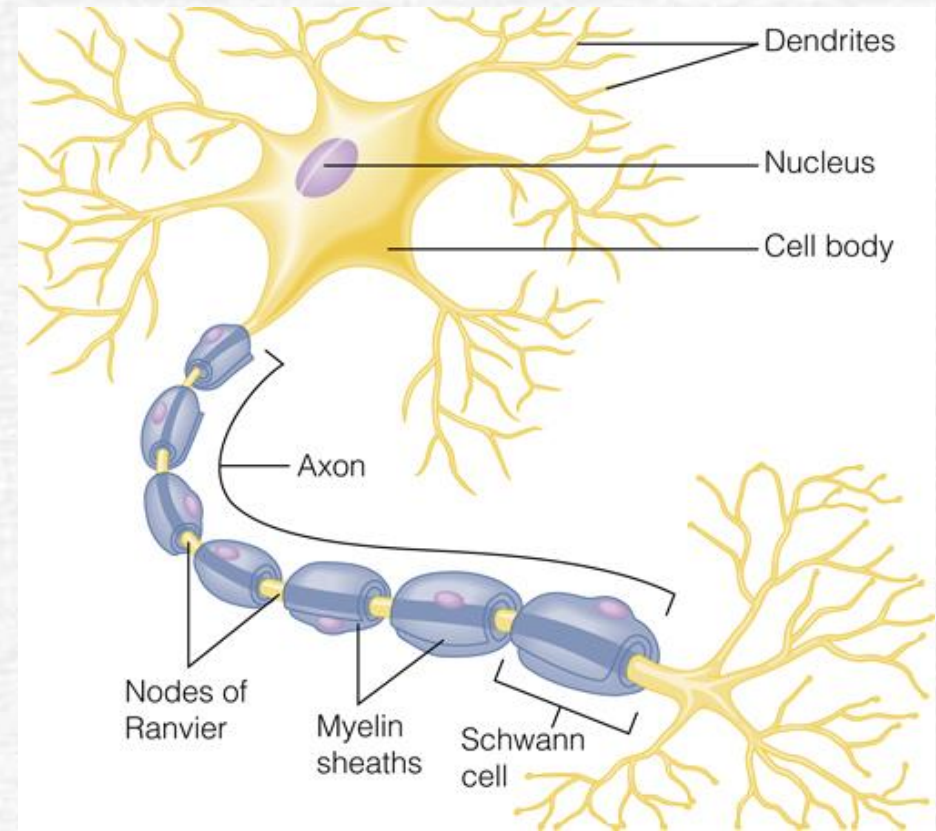
Photomicrograph: Adipose tissue from the subcutaneous layer under the skin (600 \times).



Nerve Tissue

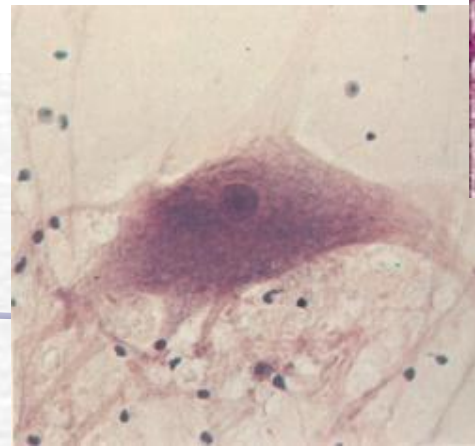
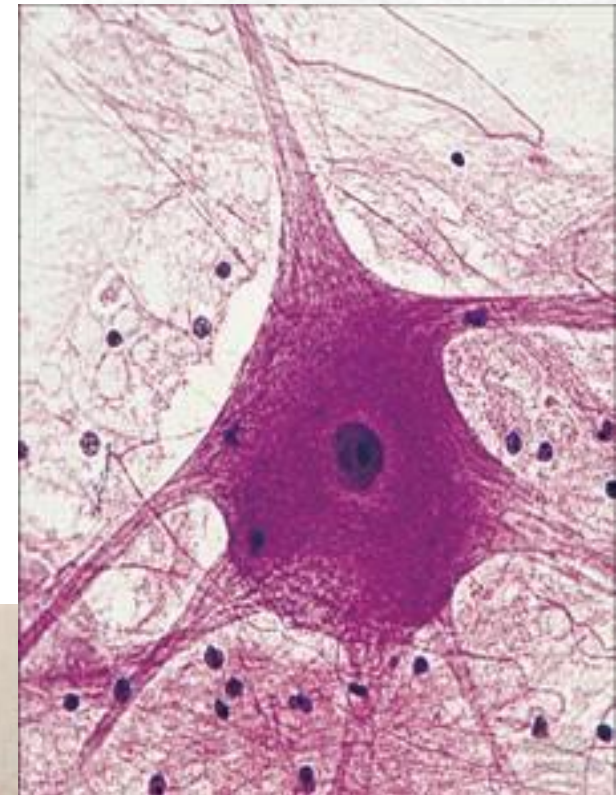
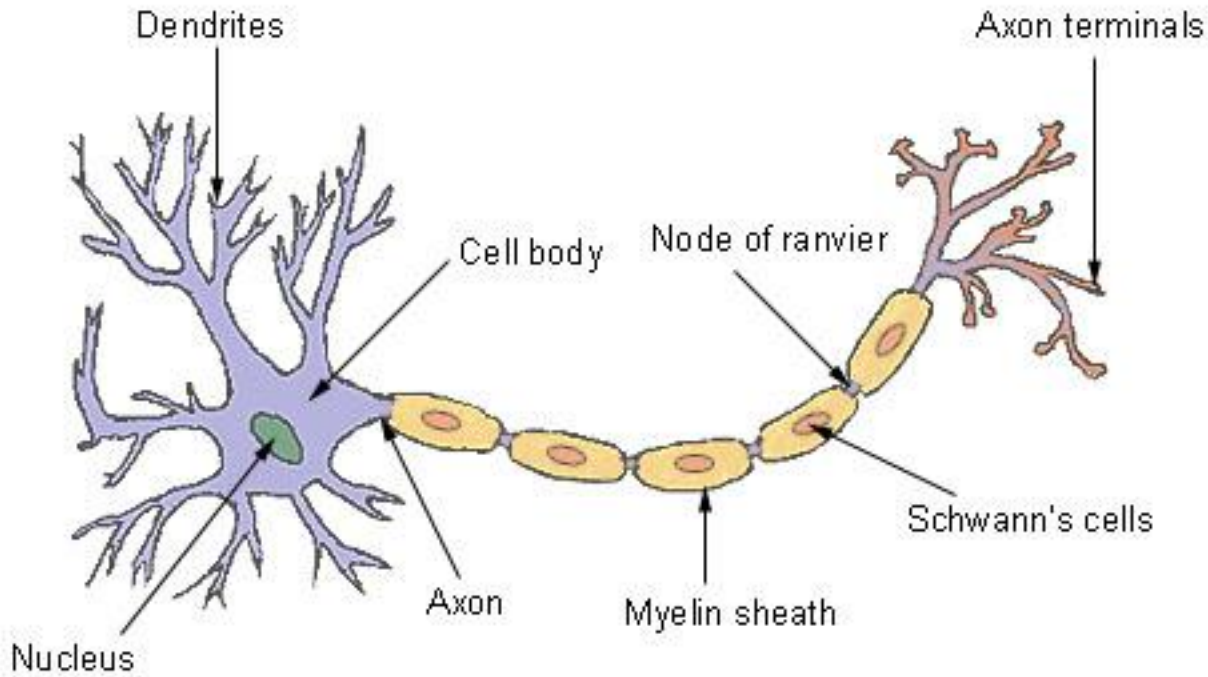
Nervous Tissue

- Contains specialized cells that conduct impulses
- Conducting cells, called **neurons**, transmit impulses from one region of the body to another.
- Nonconducting cells, **neuroglia**, are a type of nervous system connective tissue.

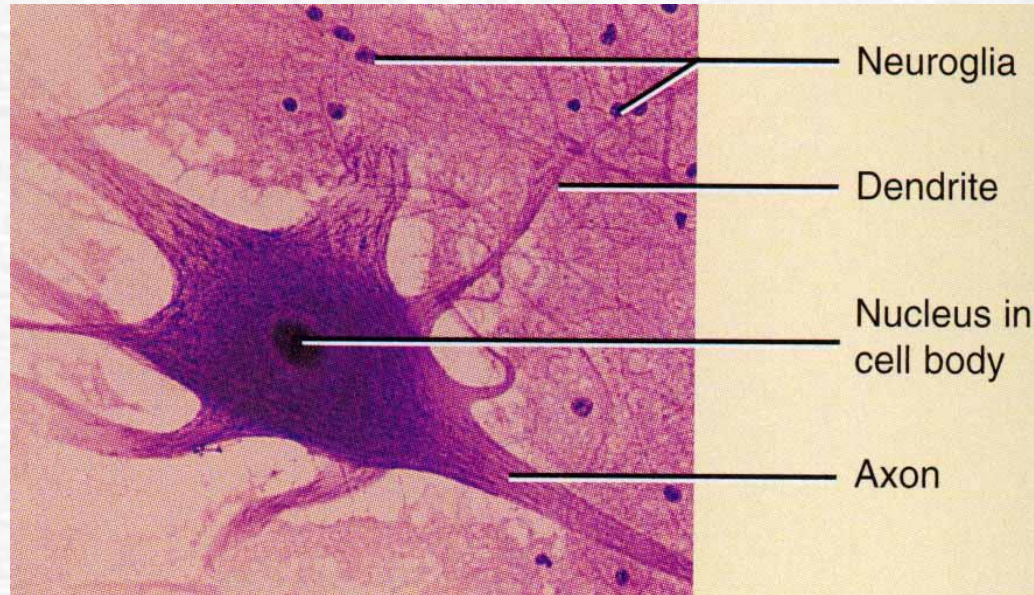


Nerve Tissue

Structure of a Typical Neuron



Neuron



- Cell types -- neurons and neuroglial (supporting) cells.
- long cell processes conduct nerve signals
 - dendrite --- signal travels towards the cell body
 - axon ---- signal travels away from cell body

Neuron

