A **tissue** is a group of cells that share a common structure and function.
The 4 basic tissue types are: **epithelial**, **connective**, **muscle**, and **nervous**.
The basic functions of these tissues are respectively: covering, support, movement, and control.

Epithelial tissue consists of groups of cells that form a body covering or line a body cavity.
It also forms certain glands.
Many of the functions of epithelia reflect the fact that it is the boundary tissue that separates the internal and external environments.
Its functions include: protection, absorption, filtration, excretion, secretion, and sensory reception.

Some basic structural characteristics of epithelial tissue include: **polarity**, **specialized contacts**, **connective tissue support**, **avascularity**, and **regeneration ability**.

The epithelial cells at the surface of the lumen (or body exterior) are the **apical layer**. The epithelial cells farthest from the surface form the **basal layer**.

Polarity means that there exists a difference between the apical and basal portions of an epithelium.
In multi-layered epithelia, the apical cells are quite different from the basal cells.
In single layer epithelia in that the apical part of the cell differs from the basal part of the cell.

The cells of the basal layer are supported by a layer of **collagen** and other proteins (products of epithelial cells and the underlying connective tissue cells) called the **basement membrane**.

Epithelial cells are often linked by specialized contacts such as **tight junctions**, **desmosomes**, and **gap junctions**.

Although epithelial cells lack blood vessels they are nourished by the diffusion of nutrients from vessels in the supporting underlying connective tissue.

Epithelial cells are quite adept at replacing damaged cells via cell division (**mitosis**).

Epithelia are classified by the number of cell layers and the shape of the apical cells.
Epithelia consisting of a single layer of cells are **simple**.
Epithelia composed of multiple cell layers are **stratified**.
There are 3 basic shapes of apical cells: **squamous** (flat/scale-like), **cuboidal**, and **columnar**.

Simple squamous epithelium is incredibly thin and thus ideal for exchange of materials.
It's found in the air sacs of the lungs and the lining of blood vessels (among other places).

Simple cuboidal epithelium performs secretion and absorption.
It's found in the urine-carrying tubules of the kidneys and in the ducts of glands (among other places).

Simple columnar epithelium performs secretion and absorption.
It forms much of the lining of the digestive, respiratory, and reproductive tracts.
Within the digestive tract, non-motile cellular extensions called **microvilli** are often found on the apical surface of simple columnar cells in order to increase their surface area.
Within the respiratory tract, motile cellular extensions called **cilia** are found on the apical surface of simple columnar epithelial cells in order to sweep mucus superiorly.

Pseudostratified columnar epithelium consists of columnar cells that give the illusion of being multi-layered b/c the cells are not all of the same height.
It's found primarily in the respiratory tract and is often ciliated.

Goblet cells are mucus-secreting cells often found in pseudostratified and simple columnar epithelia.

Stratified squamous epithelium forms the surface of the skin as well as the linings of the oral cavity, pharynx, esophagus, vaginal canal, and anal canal.
Its multiple layers afford these organs with a degree of protection from the external environment.
The stratified squamous epithelium of the skin is **keratinized**.
Its apical layers consist of dead cells whose interiors have been filled with the fibrous protein, **keratin**.

Transitional epithelium is a stratified epithelium found lining the urinary bladder and ureters.
Its apical cells are dome-shaped but flatten out as the organ fills with urine and stretches.

A **gland** is a cell or collection of cells that secretes a specialized product.
Endocrine glands release their secretions (called **hormones**) into the blood. They lack ducts.
Exocrine glands secrete their products into ducts which lead to the body surface or to body cavities.

There are 4 main classes of connective tissue: **connective tissue proper**, **cartilage**, **bone**, and **blood**.
CT is distinct in that it is not very cellular.
The bulk of CT is composed of the products of CT cells.
These products are known collectively as **extracellular matrix**.
The matrix consists of protein **fibers** and a clear viscous fluid called **ground substance**.
There are 3 main types of fibers.
Collagen fibers are composed of the **collagen protein** which is bundled into incredibly strong bands.
Elastic fibers contain the **elastin protein** which has the ability to stretch and recoil.
Reticular fibers are short collagen fibers that form networks that can support soft tissues.

Blood is a unique connective tissue in that it is a liquid connective tissue. Blood will be covered in A&P2.

CT proper, cartilage, and bone differ in the hardness of their matrix, with bone being the hardest and CT proper being the softest.

CT proper is subdivided into **loose CT** and **dense CT** depending on the packing of the fibers in the matrix.
The main loose CTs are **areolar CT**, **adipose tissue**, and **reticular tissue**.
The main dense CTs are **dense regular CT** and **dense irregular CT**.

Areolar CT is the packing material of the body.
It wraps and cushions most other body tissues.
It surrounds and supports organs and underlies almost all epithelia.
Its primary cell type is the **fibroblast**.
The suffix *–blast* literally means "sprout" but often denotes a stem cell (a cell capable of becoming another type of cell) or a cell in an active state of metabolism.
Other cells in areolar tissue include **macrophages** (immune cells that engulf foreign cells and particles) and **mast cells** (which release histamine (a vasodilator) during the inflammatory response).

All 3 fiber types are found in areolar tissue although they are rather sparse (*areola*, Lat. open space).
Much of the matrix is ground substance – particularly **tissue fluid**.

Adipose tissue is similar to areolar tissue but it is dominated by **adipocytes** (fat cells).
The preponderance of adipocytes makes the matrix rather sparse.
Adipocytes contain a large fat droplet that forces the nucleus into an eccentric position.
Adipose tissue is underneath the skin (in the **hypodermis**), around the kidneys and eyeballs, within the abdomen, and within the breasts.
Its functions include energy storage, insulation, and cushioning.

Reticular tissue is similar to areolar but it contains only reticular fibers as opposed to all 3 types.
The fibroblasts within reticular tissue are aptly called **reticular cells**.
Its primary function is to form the netlike (*reticulum*, Lat. little net) mesh supporting tissue (known as the **stroma**) of organs such as the spleen, bone marrow, and lymph nodes**.**

Dense regular CT contains fibroblasts but is dominated by parallel bundles of collagen fibers, which give it fantastic tensile strength.
It's found primarily in **tendons** (linking muscle to bone) and **ligaments** (linking bone to bone) and **fascia** (the membrane that wraps groups of muscles, blood vessels and nerves together).

Dense irregular CT is similar to dense regular CT but the collagen fibers run in multiple directions.
It's found in the skin (making up the **dermis**) as well as in **joint capsules** and the **fibrous capsules** that surround many internal organs.

Cartilage is like an intermediate btwn dense regular CT and bone.
It resists both compression and tension and lacks nerves and blood vessels.
The primary types of cartilage are **hyaline cartilage**, **elastic cartilage**, and **fibrocartilage**.
The matrix is produced by cells in growing cartilage known as **chondroblasts** (*chondros*, Gr. cartilage).
In the matrix of adult cartilage the chondroblasts have become **chondrocytes** which are usually found as small groups in little spaces known as **lacunae** (*lacuna* Lat. gap).

Hyaline cartilage is the most abundant cartilage.
The collagen fibers in its matrix are not distinct and give it a glassy appearance (*hyalinos*, Gr. glass).
It provides support with some flexibility.
It covers the ends of long bones at joints (**articular cartilage**), connects the ribs to the sternum (**costal cartilage**), and forms supportive structures in the respiratory tract (in the larynx, trachea, and bronchi).

Elastic cartilage is like hyaline cartilage but it has elastic fibers in addition to collagen within its matrix.
This gives it the ability to recoil after being stretched.
It's found in the external ear (the **pinna**) and the **epiglottis** (the flap that closes the opening to the larynx during swallowing).

Fibrocartilage is an intermediate btwn dense regular CT and hyaline cartilage.
It is found where strong support and some flexibility are needed.
Fibrocartilage structures include the **intervertebral discs** (btwn the vertebrae) and the **menisci** (cartilage w/i the knee).

Bone will be covered in a later unit.