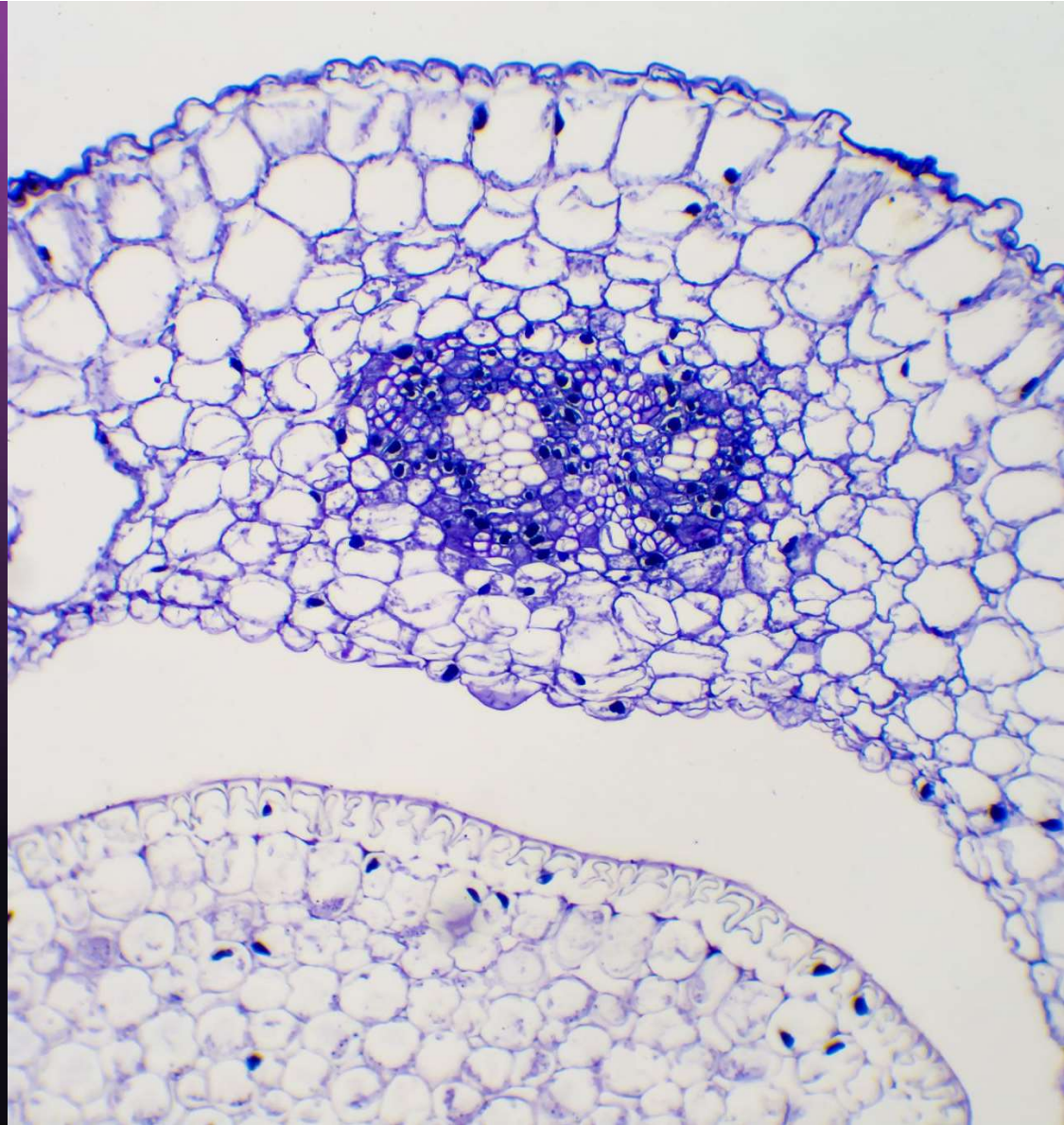


Human Morphology and Function 1

TOPICS FOR TODAY: BASICS, BODY
ORGANIZATION, HOMEOSTASIS
(CHAPTER 1)

AUGUST 20TH, 2024



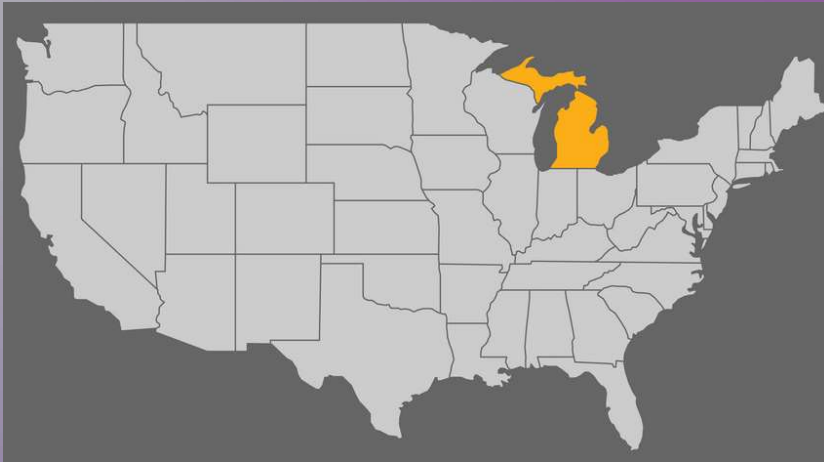
Course expectations

- This course is open to Honors college undergraduate and Master's students
 - All students will have homework assignments
 - All students will take the exams
 - Only Master's students will have an additional paper assignment due at the end of the course
- **Attendance is not part of your grade**, but if you are struggling with the material, it will likely provide important insight
- If you struggle with the material, here are 3 important things to try:
 - Study regularly instead of waiting until the last minute
 - Find additional resources online (youtube, khan academy, etc)
 - Utilize active learning methods

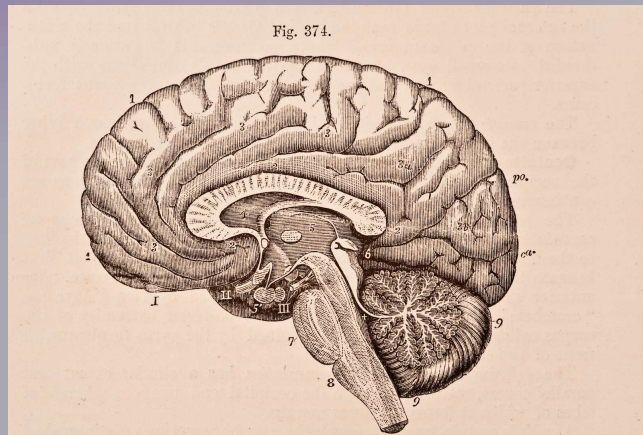
Course expectations

- Homework – 8 Canvas based quizzes
 - Open book
 - Lowest score dropped
 - Questions based on previous week's lectures
- Exams – 3 in class exams, 1 final exam (not cumulative, but dependent on the classes' comprehension)
 - Multiple choice, matching, figure labeling, short answer

About me – Dr. Paula Kurdziel



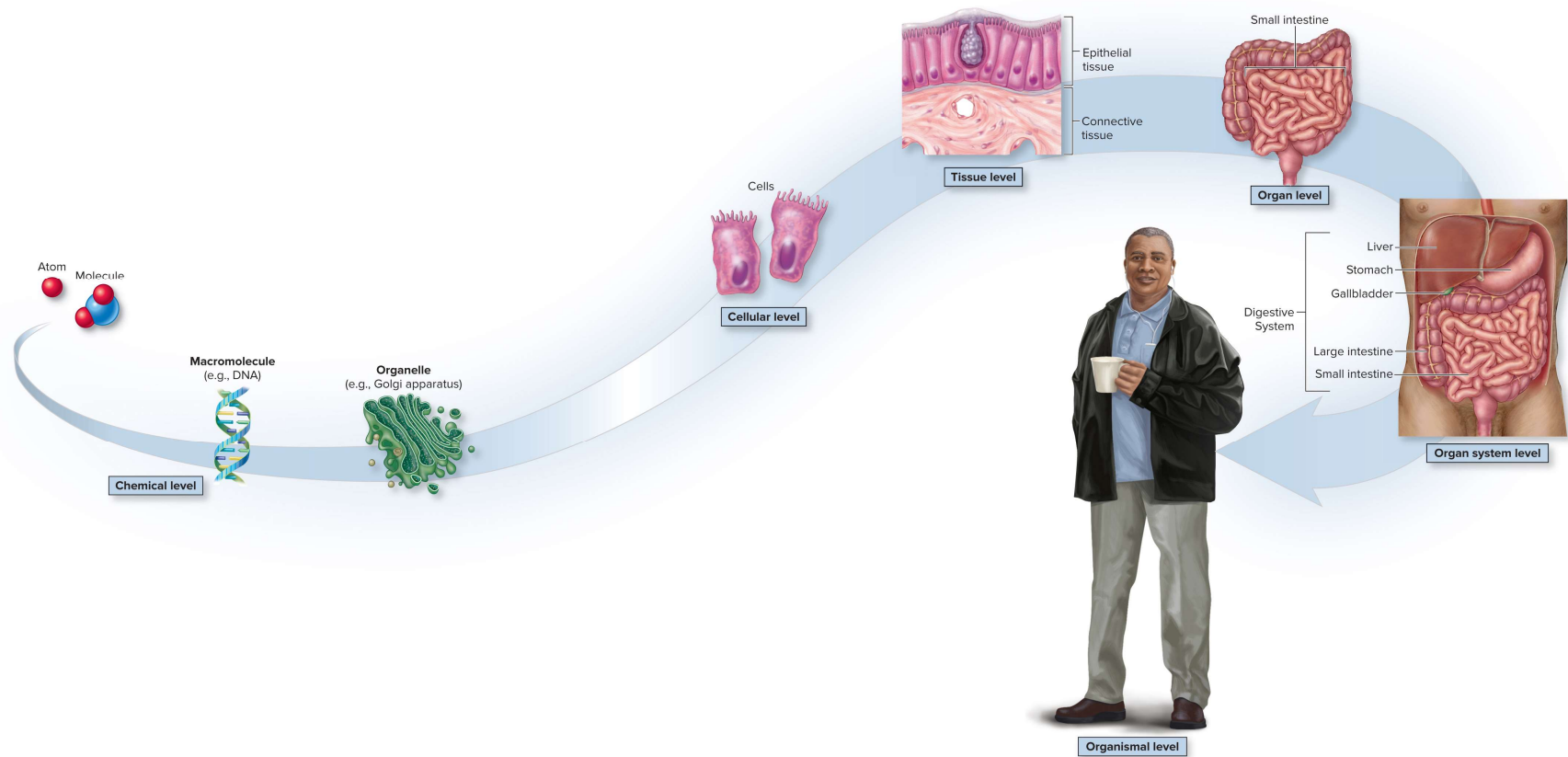
MICHIGAN STATE
UNIVERSITY



Office Hours:
Thursday 2-4pm
Room SR251

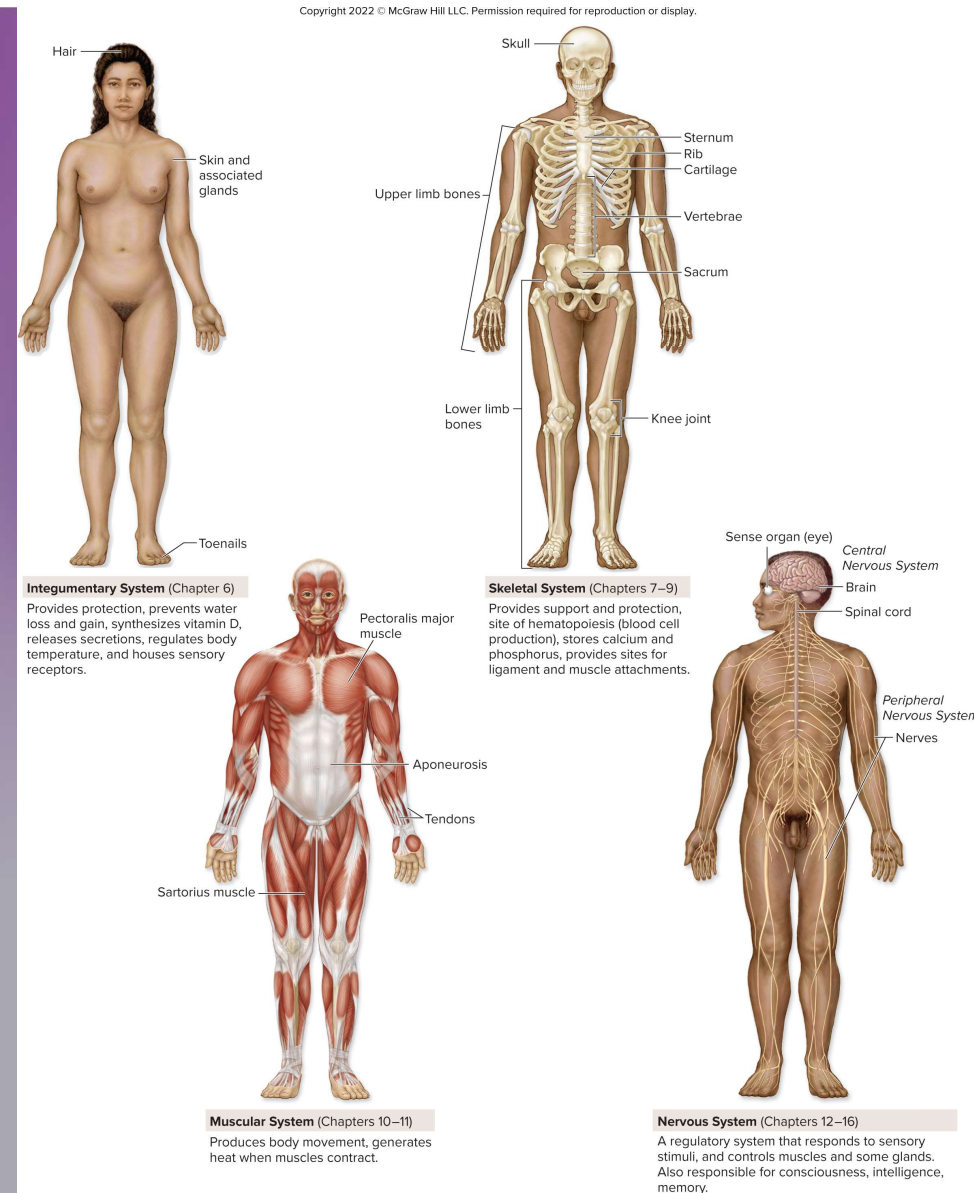
Course content

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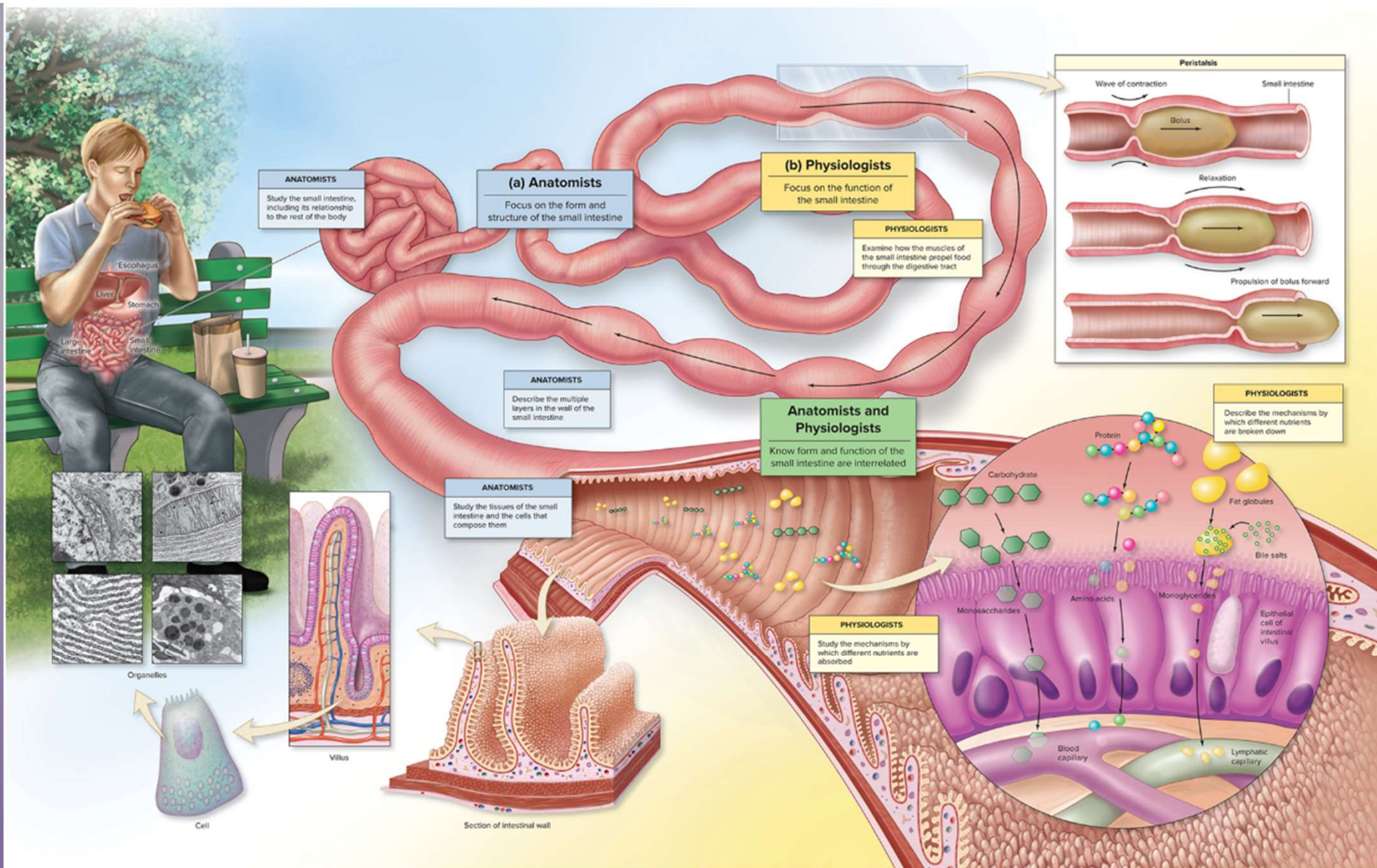
Course content

- Body organization and composition
- Basic metabolism
- Integumentary system
- Skeletal system
- Muscular system
- Nervous system



Anatomy and physiology

- **Anatomy** studies the form and structure of the body
- **Physiology** examines how the body functions
- Form and function are interrelated



Anatomy and physiology integrated

- Form (anatomy) and function (physiology) are interrelated
 - Integrating these disciplines is the easiest way to learn about both
 - Both disciplines must use information from the other field
 - Form follows function (anatomical structures are designed to perform their specific function)
 - Without a thorough knowledge of anatomical structures, the physiologist can not truly understand the structure's function

Anatomy subdivisions

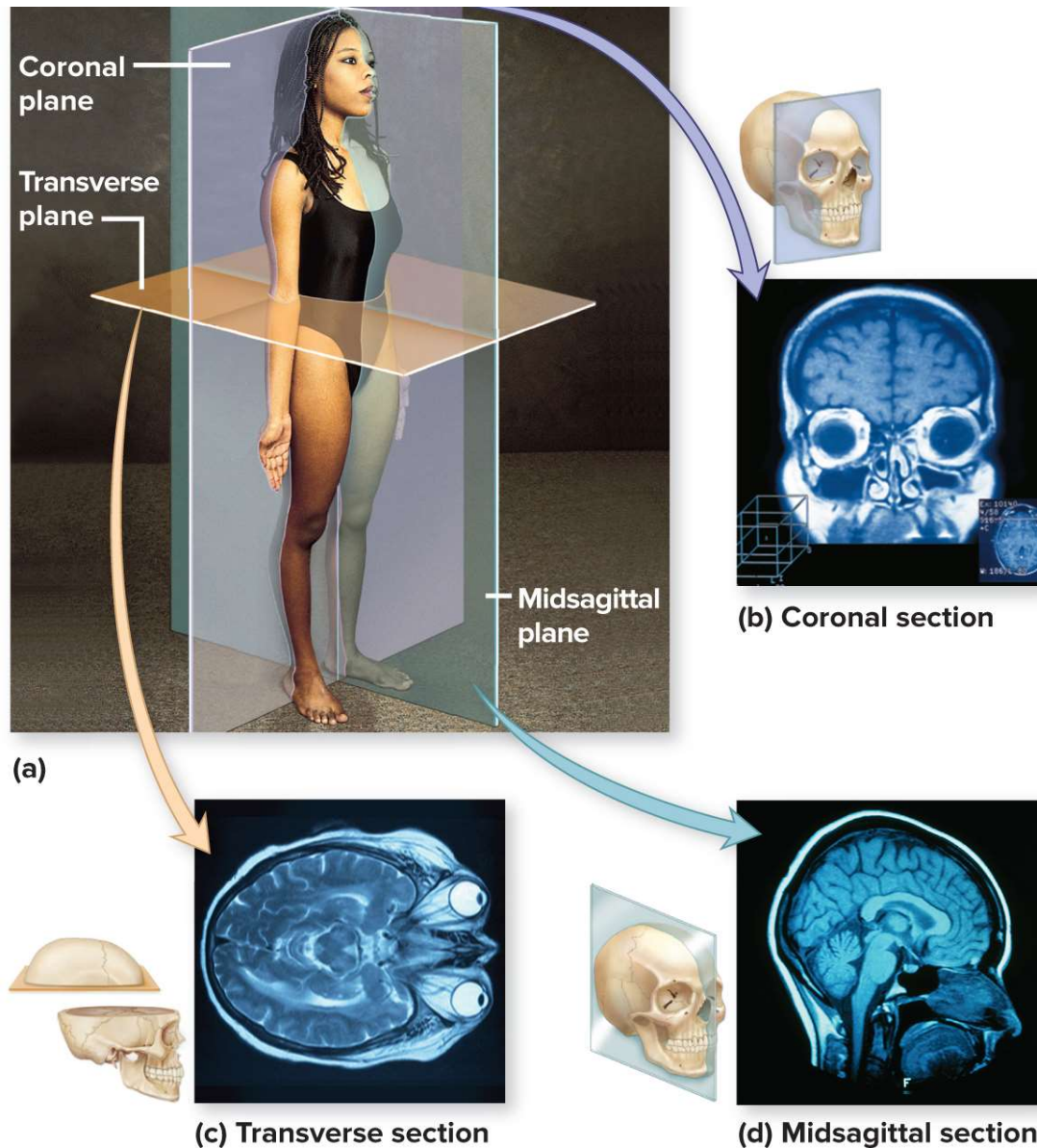
- **Microscopy anatomy**: examine structures that cannot be seen by the unaided eye
 - Individual cells
 - Thin slices of body structures
 - **Cytology** is the study of body cells and their internal structure
 - **Histology** is the study of body tissues

Anatomy subdivisions

- **Gross anatomy**: examines the structure and relationships of body parts visible to the unaided eye
 - Think: organs
 - **Systemic anatomy** studies the anatomy of each functional body system
 - **Regional anatomy** studies all the structures in a particular region of the body
 - **Surface anatomy** focuses on both superficial anatomic markings and the internal body structures that relate to the skin covering them (pulse locations)
 - **Comparative anatomy** examines similarities and differences in the anatomy of different species
 - **Embryology** studies the developmental changes occurring from conception to birth

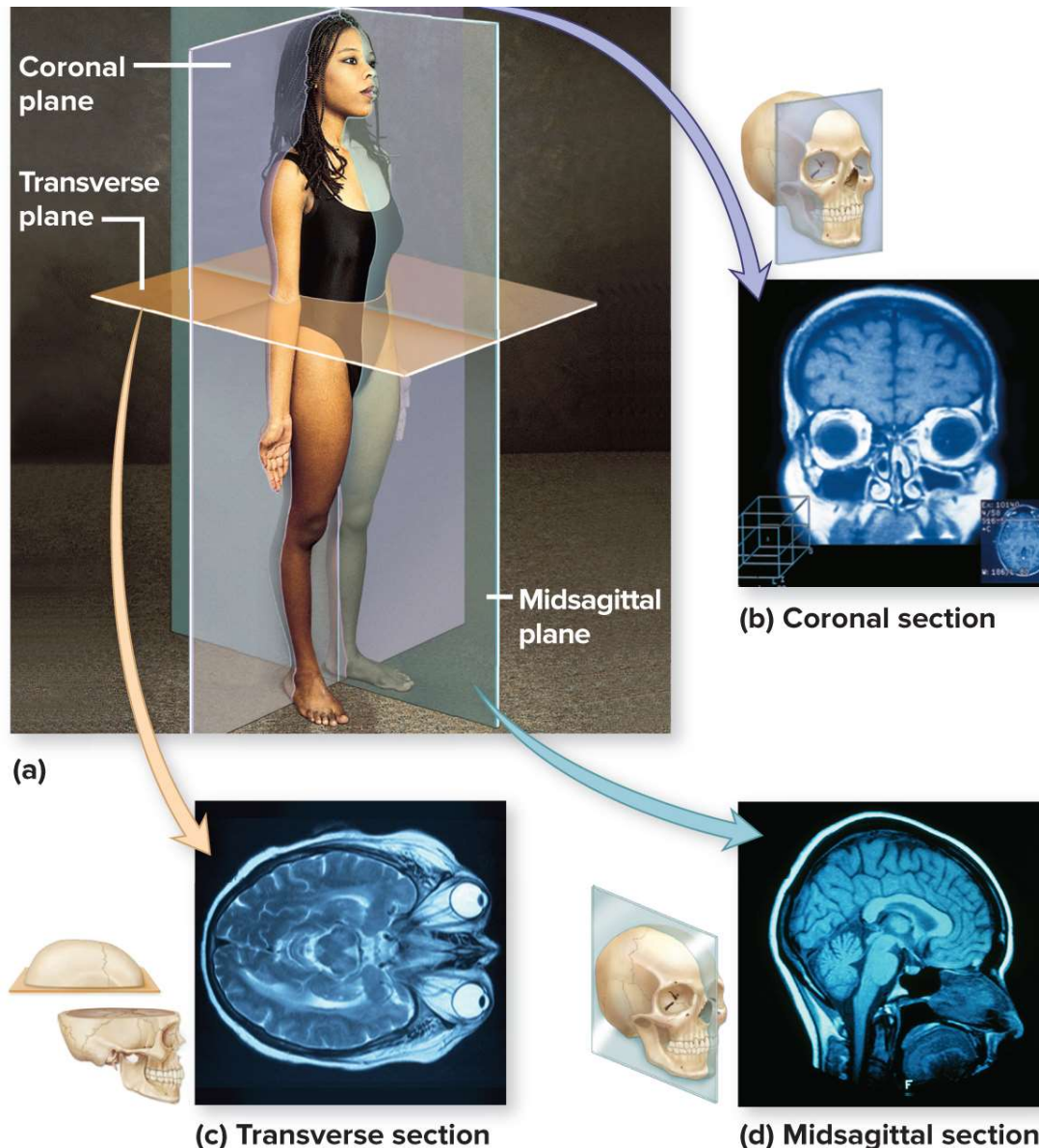
Anatomy subdivisions

- **Pathologic anatomy** examines all anatomic changes resulting from disease
 - Both gross and microscopic structures are examined
- **Radiographic anatomy** investigates the relationship among internal structures that may be visualized by specific scanning procedures (radiography aka x-ray, ultrasound, MRI)



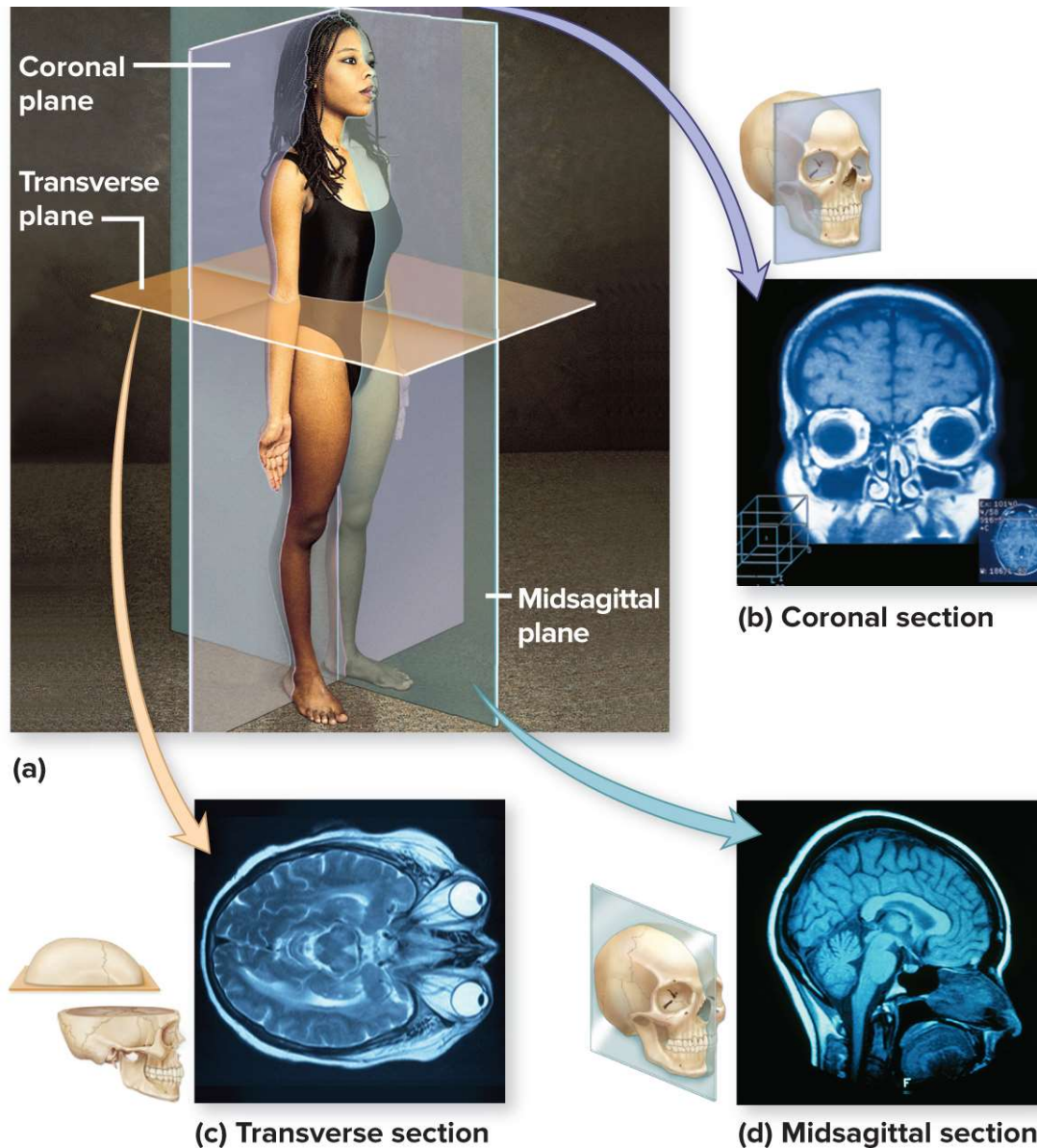
Anatomic position

- Common reference position
- Upright stance
- Feet flat
- Palms facing toward the front
- Eyes looking forward



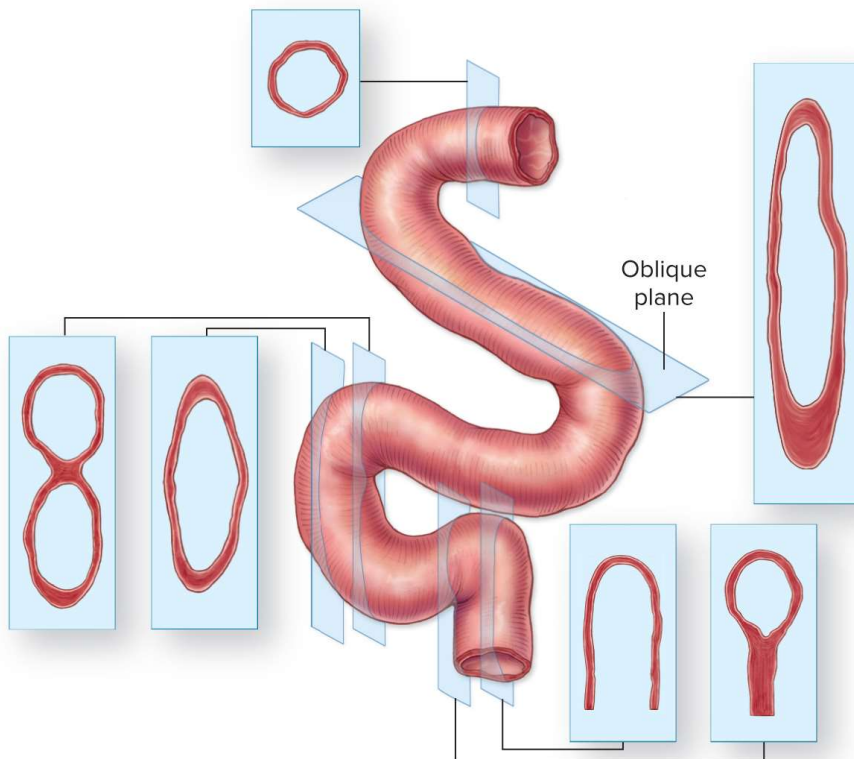
Sections and planes

- "Slices" of body called sections or planes
- **Section**—actual cut or slice that exposes internal anatomy
- **Plane**—imaginary flat surface passing through body; 3 types
 - **Coronal** (or *frontal*) **plane**
 - Vertical plane dividing the body into *anterior* (front) and *posterior* (back) parts
 - **Transverse** (or *cross-sectional*) **plane**
 - Horizontal plane dividing the body into superior (top) and inferior (bottom) parts



Sections and planes

- **Midsagittal (or median) plane**
 - Vertical plane dividing the body into equal left and right halves
- **Sagittal plane**
 - Parallel to midsagittal, but left or right of midsagittal; divides structure into unequal portions
- **Oblique plane**
 - Passes through structure at an angle



Sections and planes

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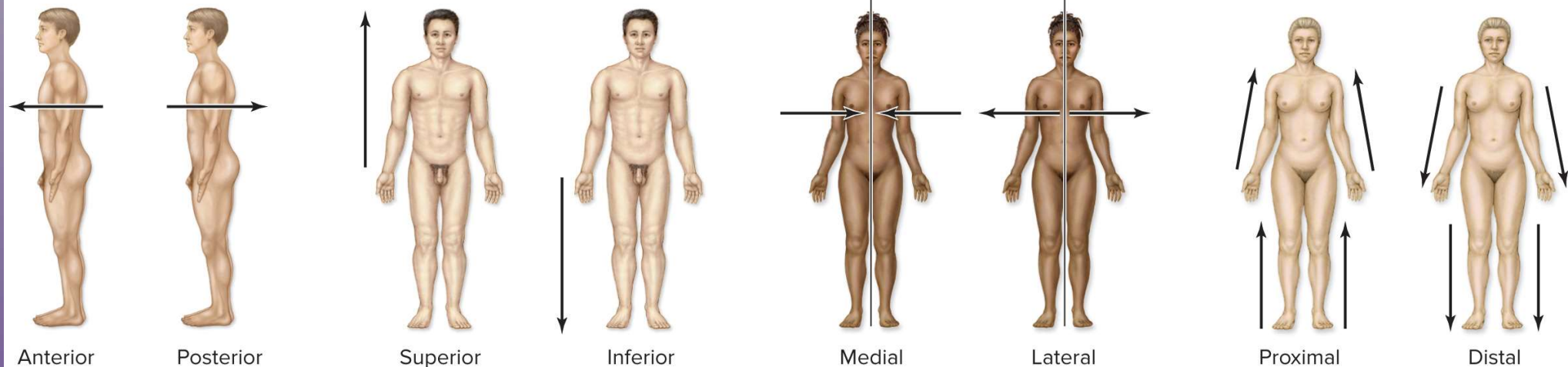
Anatomic directions

In anatomic position, specific directional terms are used to describe relative positions

Presented in opposing pairs

- for example, **anterior/posterior**; **dorsal/ventral**; **proximal/distal**

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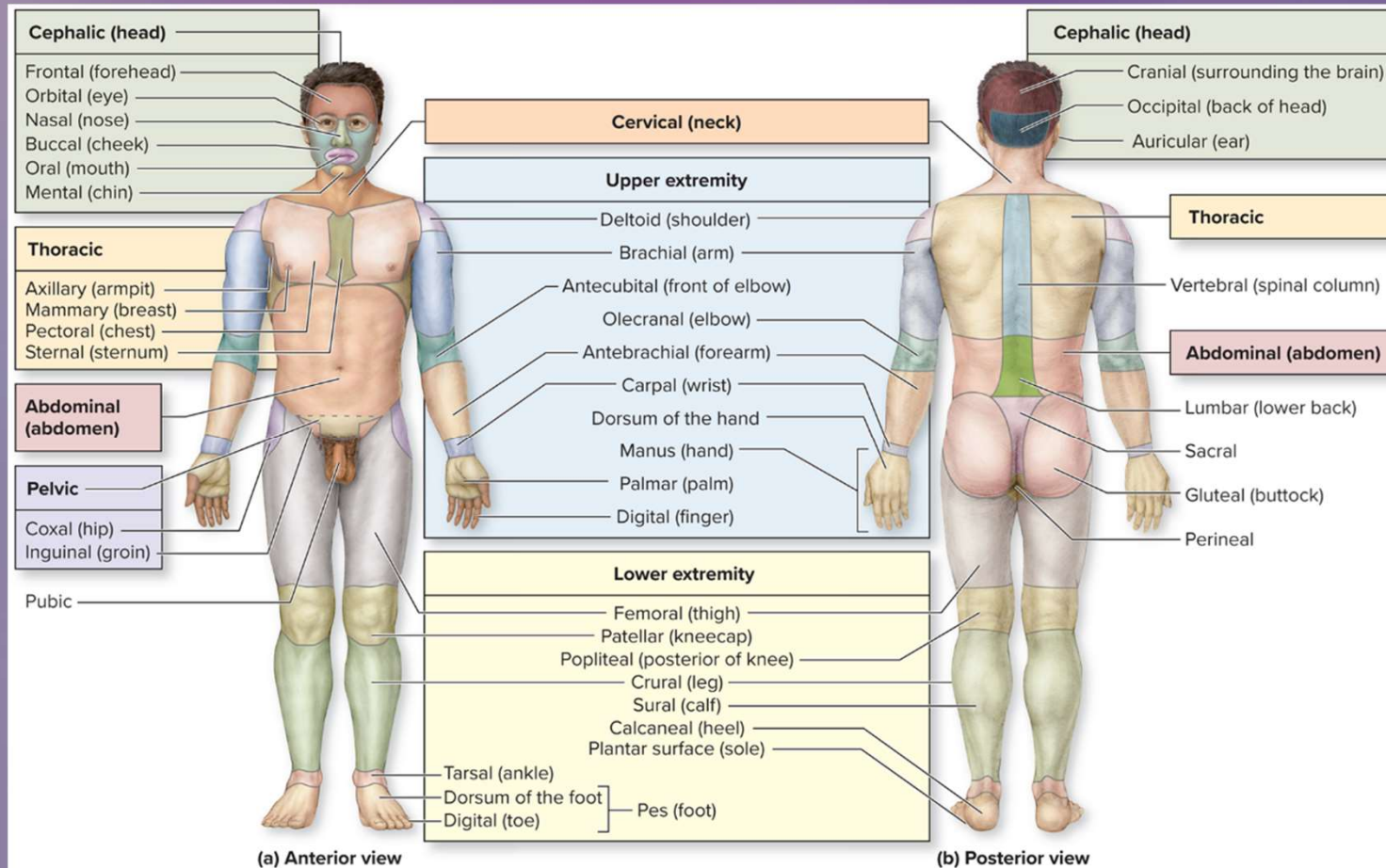
Regional anatomy

Human body is partitioned into two main regions

- **Axial region**
 - Head, neck, and trunk
 - Forms the main vertical axis of the body
- **Appendicular region**
 - Upper and lower limbs

Several more regions within these two main ones

Regional anatomy



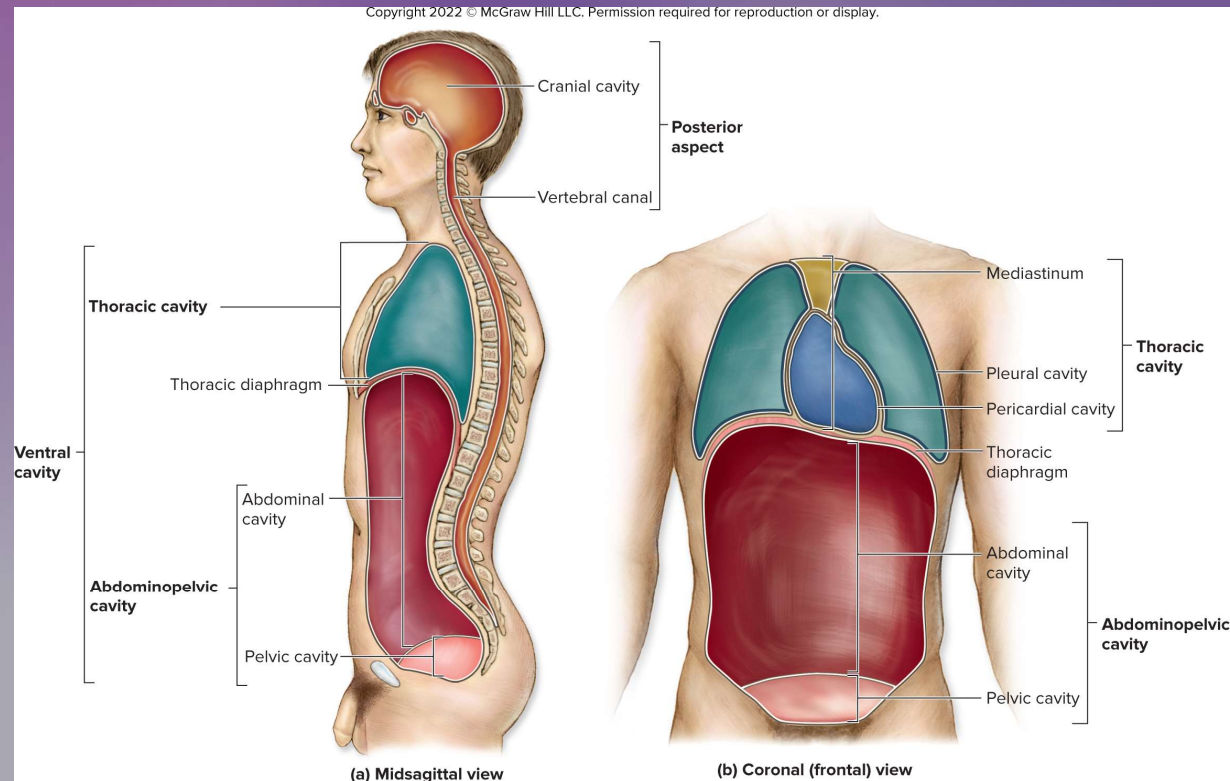
Body cavities

Posterior aspect

- encased in bone
- physically and developmentally different from ventral cavity
- Two enclosed cavities

Ventral cavity

- Larger, anterior cavity
- Does not completely encase the organs in bone
- Partitioned by thoracic diaphragm



Body cavities

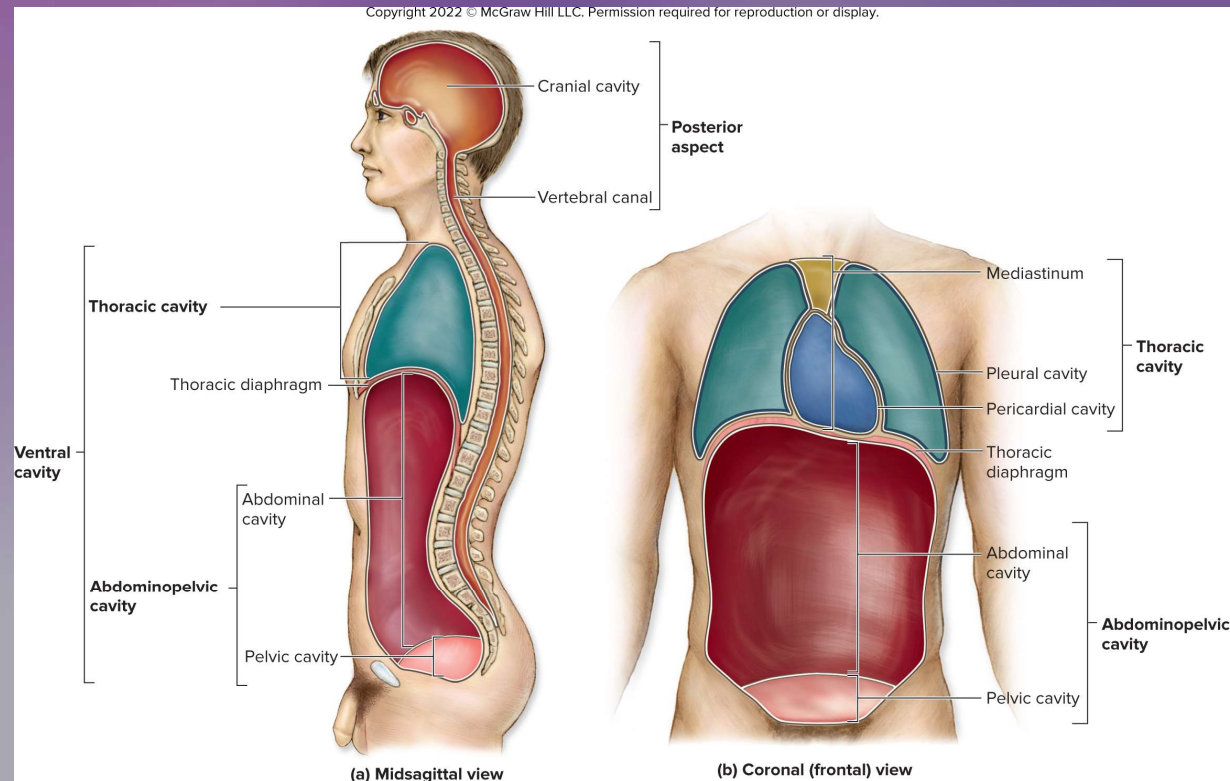
Ventral cavity contains subdivisions lined with serous membranes

Two layers of serous membranes

- **Parietal layer** lines internal surface of body wall
- **Visceral layer** covers external surface of organs (**viscera**)
 - **Serous cavity**—space between membranes

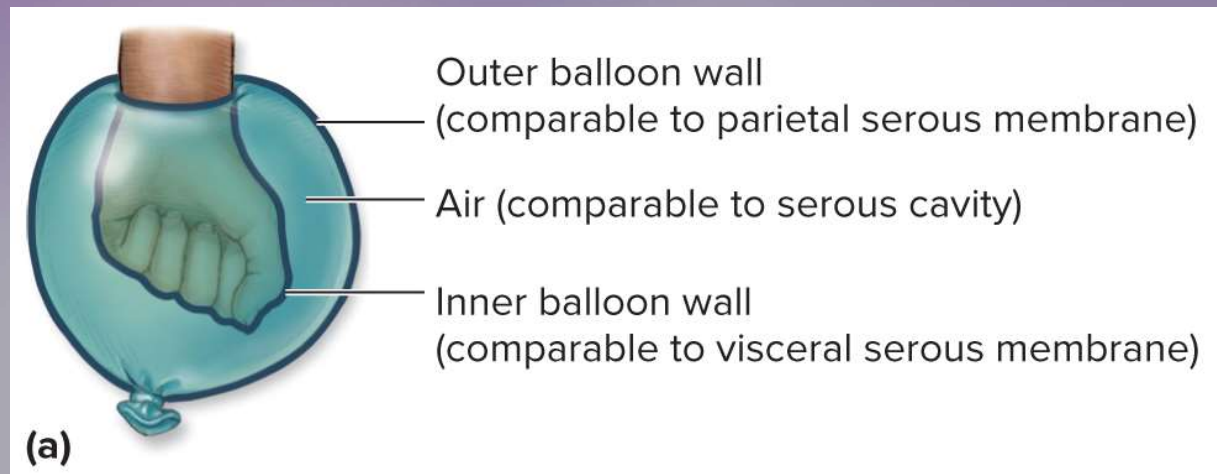
Serous fluid

- Liquid secreted by cells in serous membrane
- Acts as lubricant
- Reduces friction caused by movement of organs against body wall



Body cavities

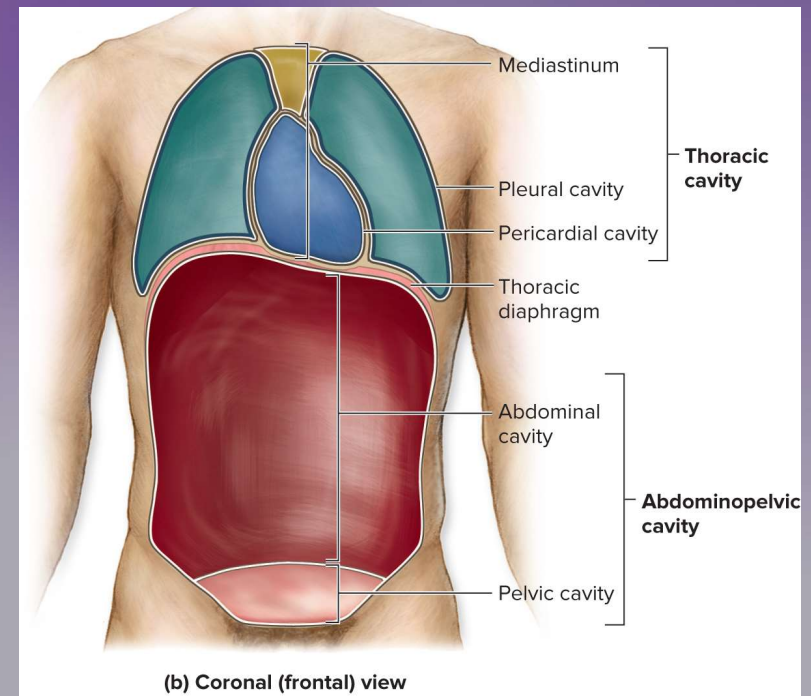
- Serous membranes arranged like fist in balloon
- Fist represents body organ
- Balloon represents serous membrane



Body cavities and membranes

Spaces and structures within thoracic cavity:

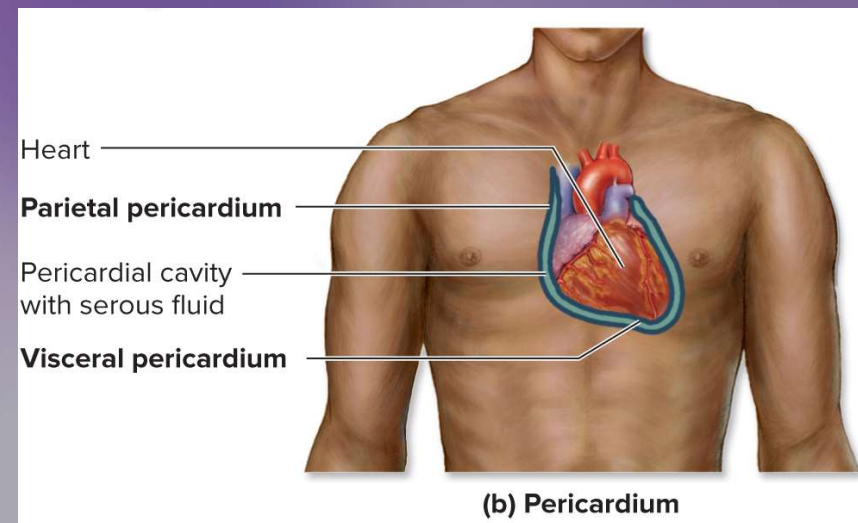
- **Mediastinum**—median space in the thoracic cavity
 - Contains heart, thymus, esophagus, trachea, and major blood vessels that connect to the heart



Body cavities and membranes

Spaces and structures within thoracic cavity:

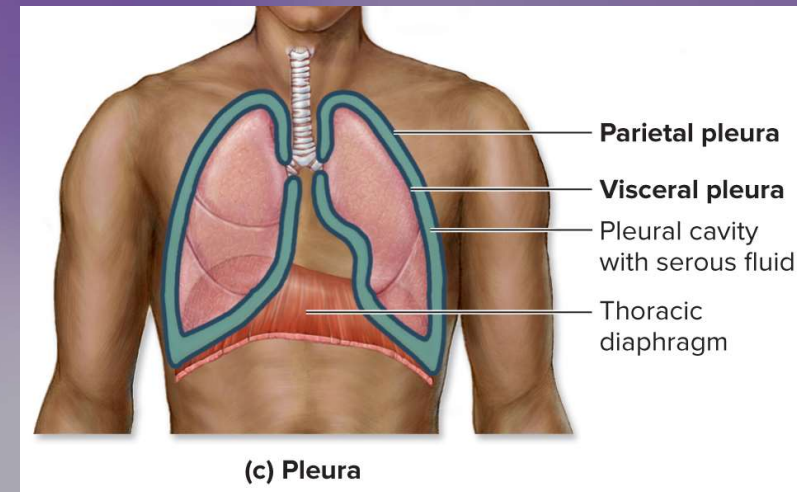
- **Mediastinum**—median space in the thoracic cavity
 - Contains heart, thymus, esophagus, trachea, and major blood vessels that connect to the heart
- **Pericardium**—two-layered serous membrane
 - **Parietal pericardium**
 - Outer layer, which forms the sac around the heart
 - **Visceral pericardium**
 - Forms the heart's external surface
 - **Pericardial cavity**
 - Space between parietal and visceral layers containing serous fluid



Body cavities and membranes

Pleura—two-layered serous membrane associated with lungs

- **Parietal pleura**
 - Outer layer lines internal surface of thoracic wall
- **Visceral pleura**
 - Inner layer covers external surface of lungs
- **Pleural cavity**
 - Space between parietal and visceral layers containing serous fluid



Body cavities and membranes

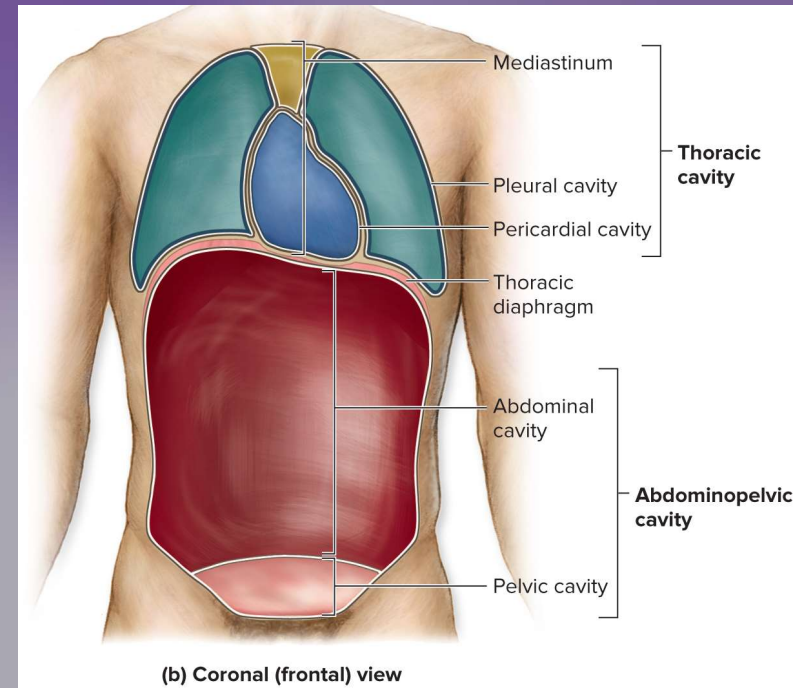
Spaces and structures within abdominopelvic cavity:

- **Abdominal cavity**

- Superior area
- Contains most of the digestive system organs, kidneys, and most of the ureters

- **Pelvic cavity**

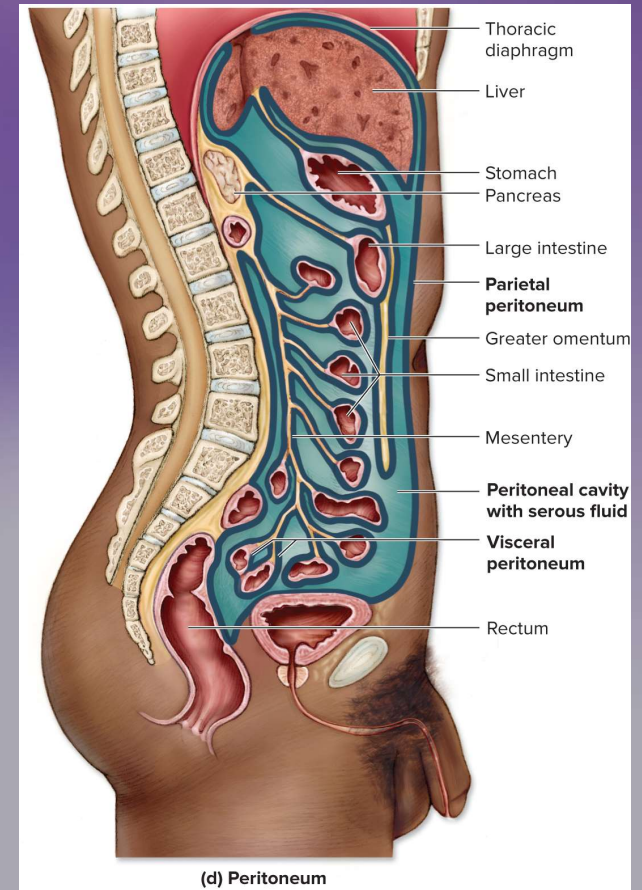
- Inferior area, between hip bones
- Contains distal part of large intestine, remainder of ureters and urinary bladder, and internal reproductive organs



Body cavities and membranes

Abdominopelvic cavity

- **Peritoneum**—two-layered serous membrane lining the abdominopelvic cavity
 - **Parietal peritoneum**
 - Outer layer, which lines the internal walls of the abdominopelvic cavity
 - **Visceral peritoneum**
 - Inner layer, which covers the external surface of most abdominal and pelvic organs
 - **Peritoneal cavity**
 - Potential space between parietal and visceral layers containing serous fluid



Homeostasis

The ability of an organism to maintain consistent internal environment in response to changing internal or external conditions

Components of homeostatic systems

Three components of homeostatic systems:

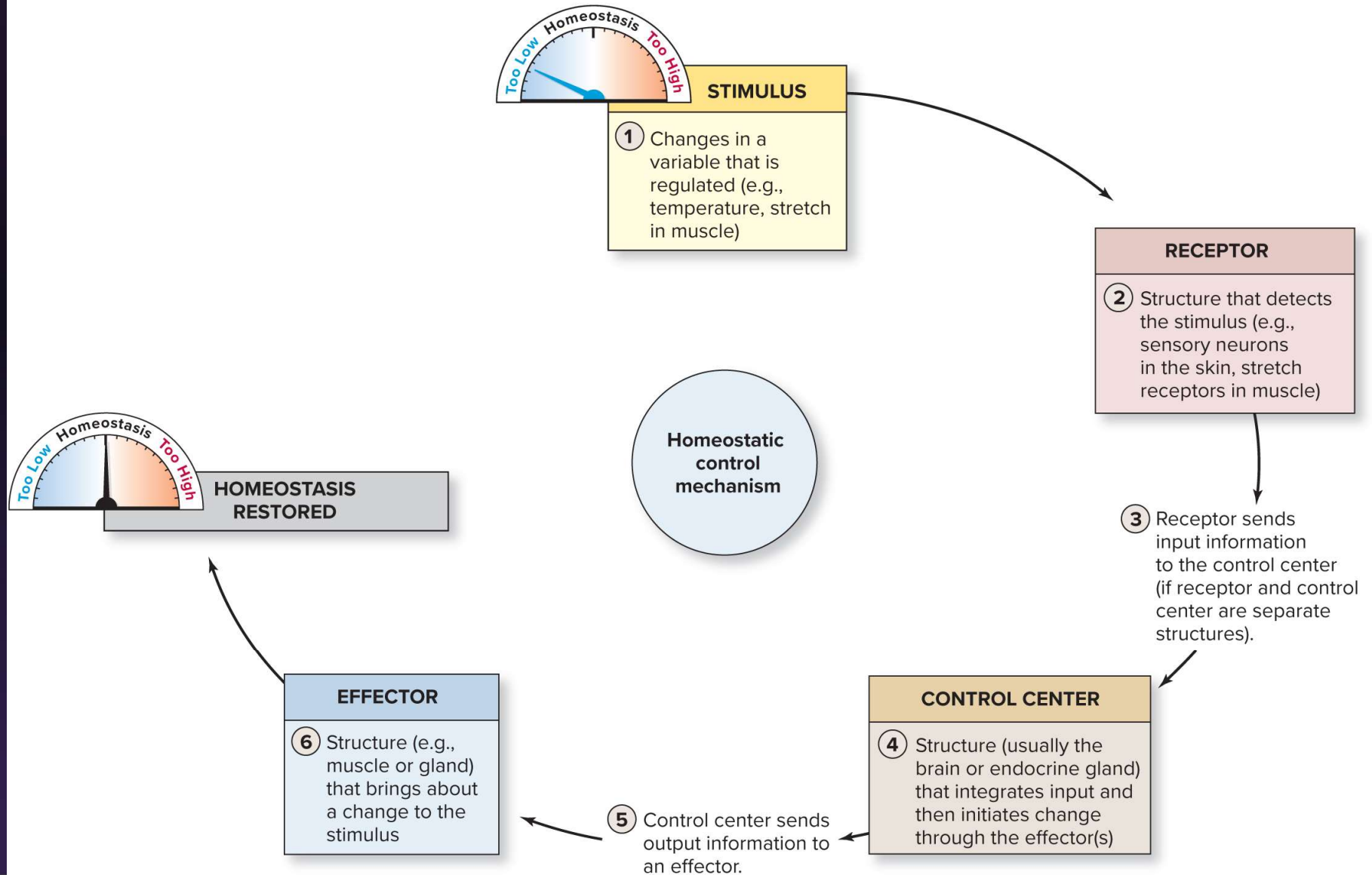
1. Receptor detects changes in a variable

- **Stimulus** (for example, change in temperature sensed by skin)

2. Control center interprets input from receptor and initiates changes through effector

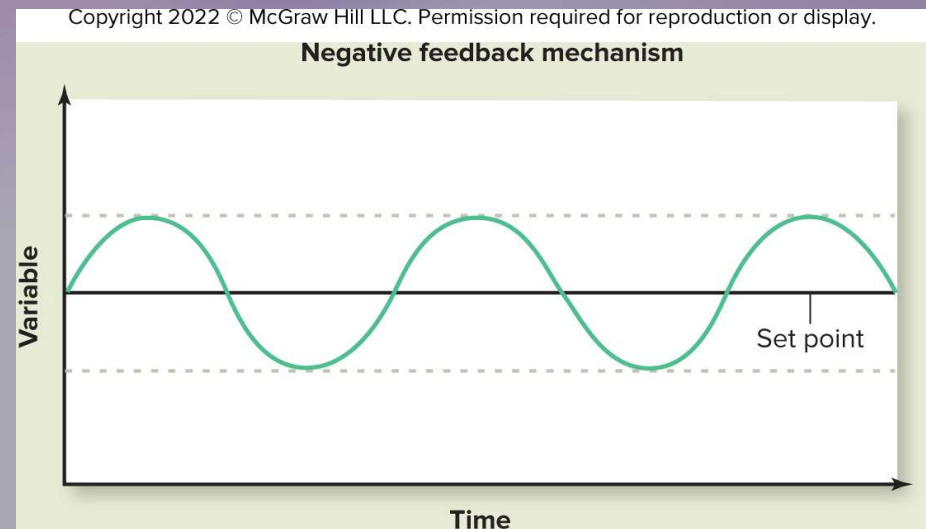
- Nervous system can provide a quicker response
 - for example, regulation of blood pressure upon rising
- Endocrine response is more sustained
 - for example, parathyroid hormone regulating calcium levels

3. Effector is the structure that brings about changes to alter the stimulus



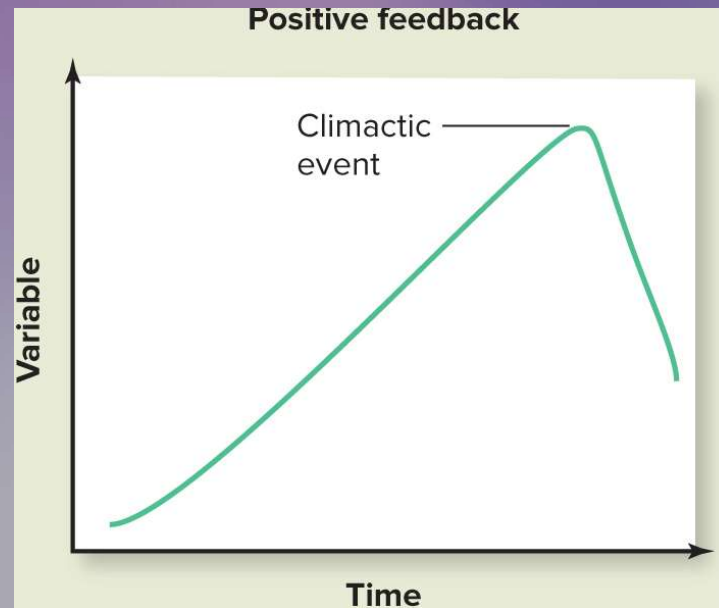
Homeostatic regulation – negative feedback

- Controls most processes in the body
- Variable fluctuates within a normal range around a **set point**
- Resulting action is in the *opposite* direction of the stimulus
 - Example: temperature regulation



Homeostatic control – positive feedback

- Occurs much less frequently than negative feedback
- Stimulus reinforced to continue moving variable in *same* direction until a climactic event occurs, then body returns to homeostasis
- Examples:
 - Breastfeeding
 - Blood clotting
 - Labor



Homeostasis – clinical examples

Normal ranges for homeostatic variables

- Body temperature 98.6°F
- Blood glucose 80 to 110 mg/dL
- Blood pressure 90 to 120/60 to 80 mm Hg
- Determined by sampling healthy individuals in a population
- Normal range is value for 95% of individuals sampled
- 5% of healthy population have values outside normal range