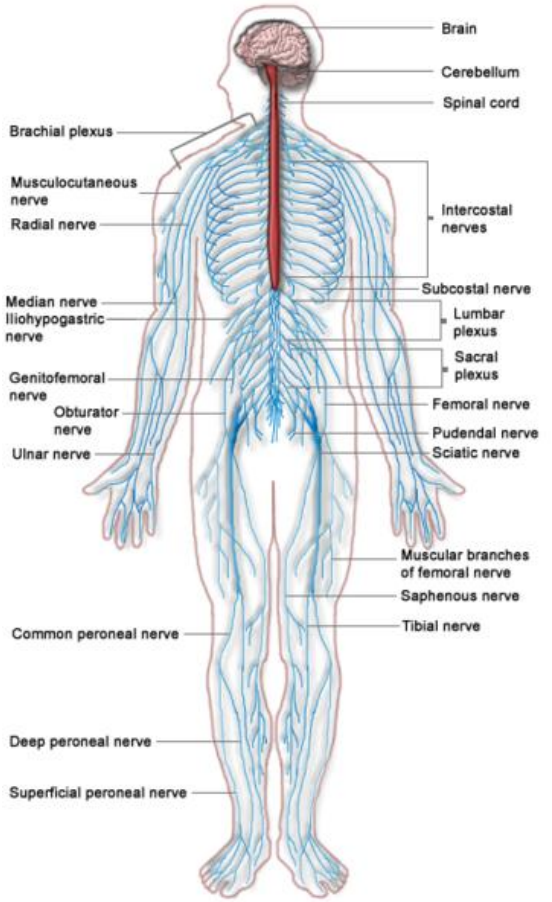
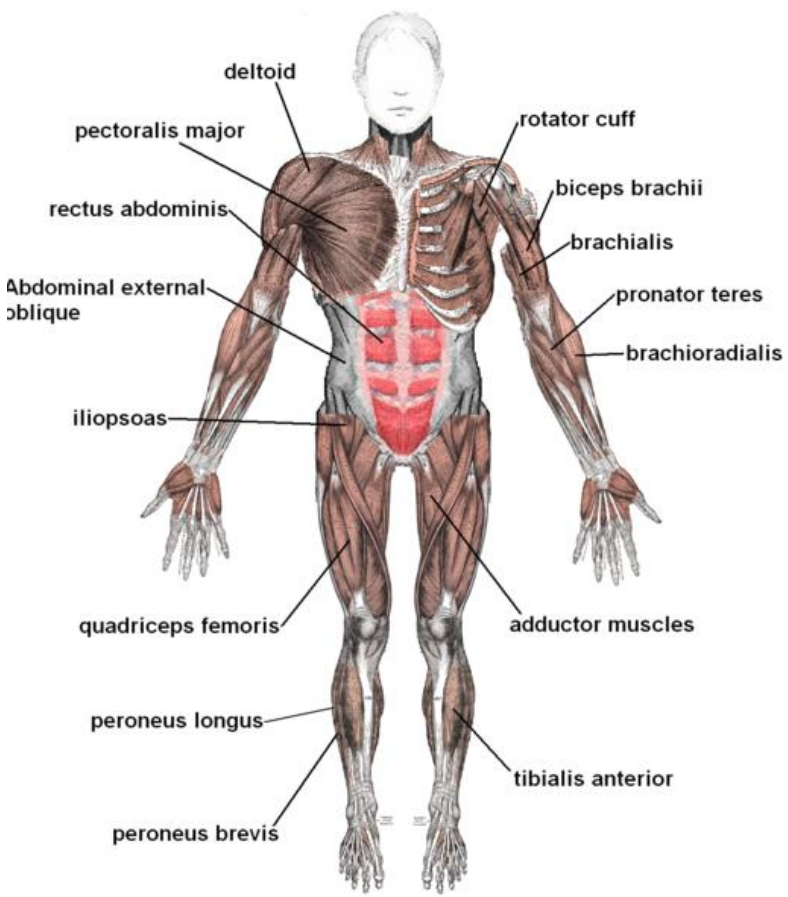
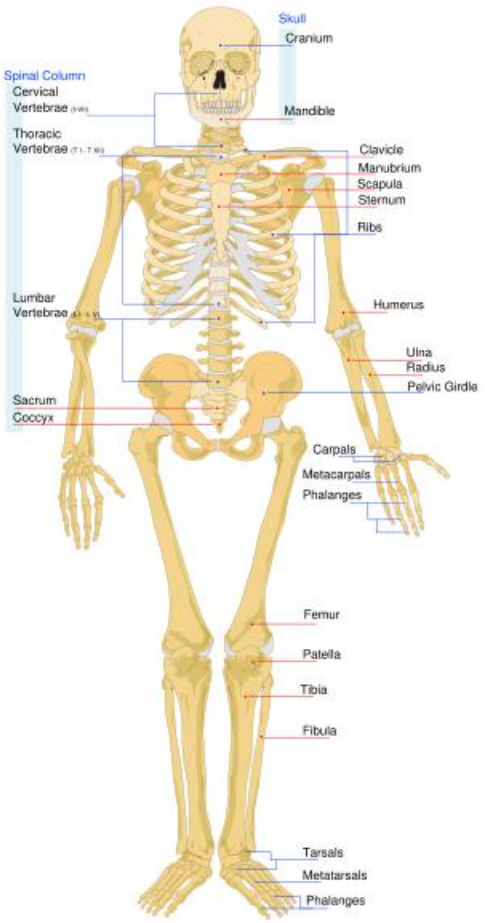




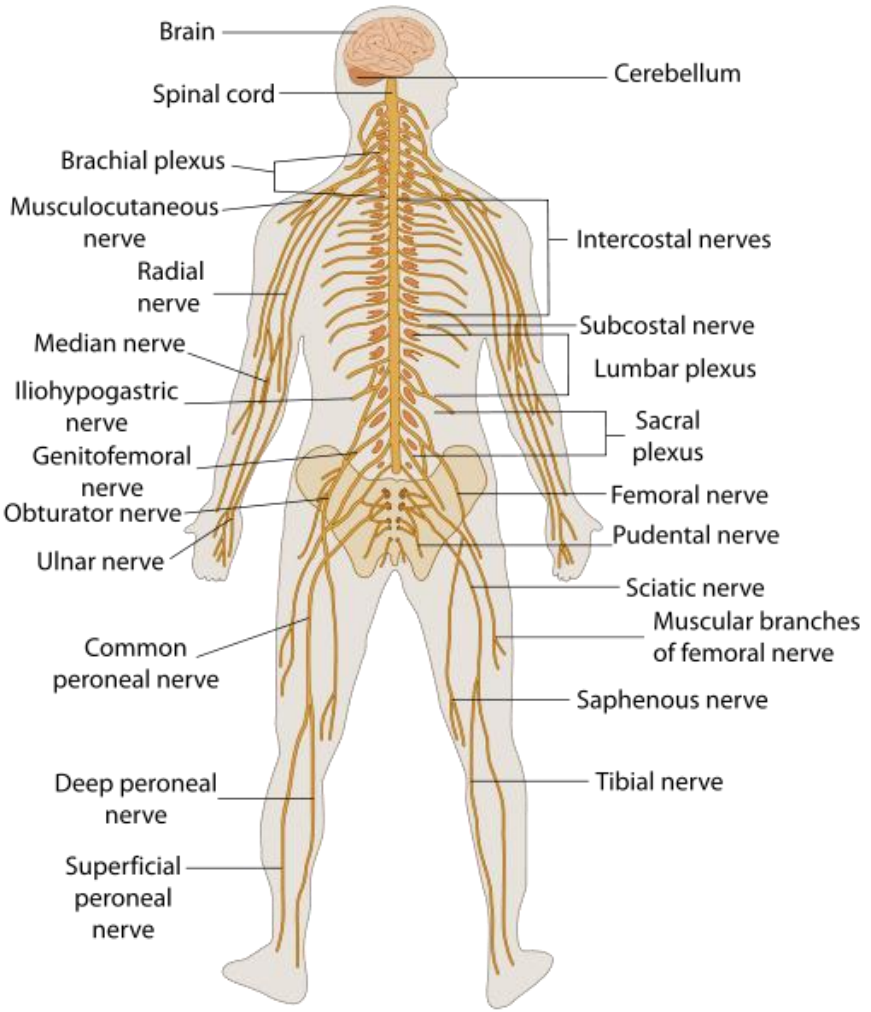


Body Systems Interactions:

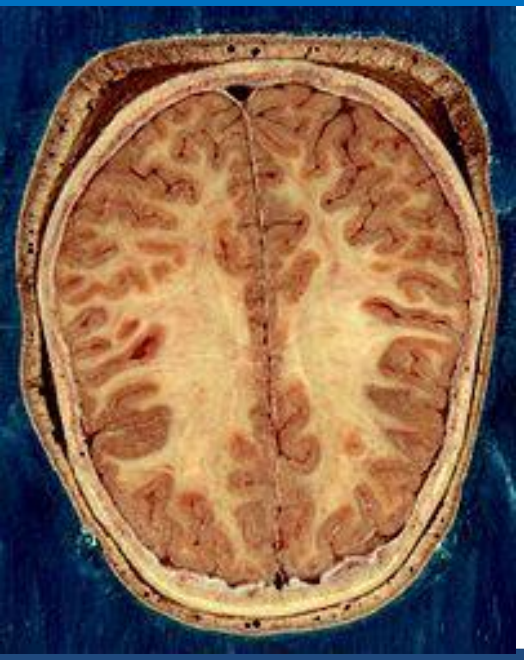
Detection and Movement

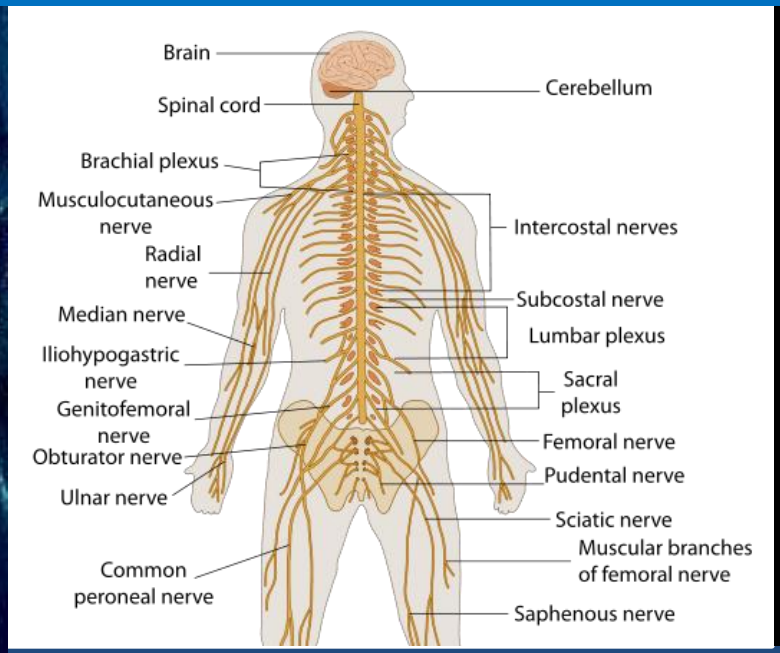
Nervous System

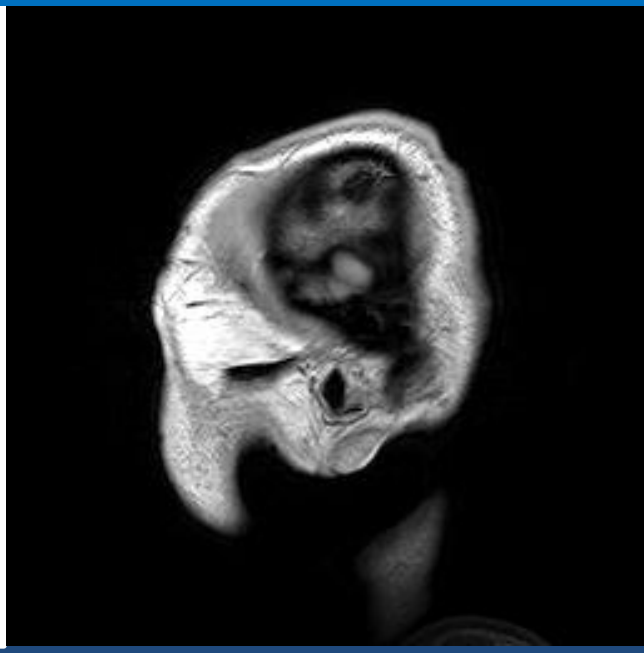
The primary job of the nervous system is to detect changes inside and outside the body and control the way you respond to these changes.



Nervous System

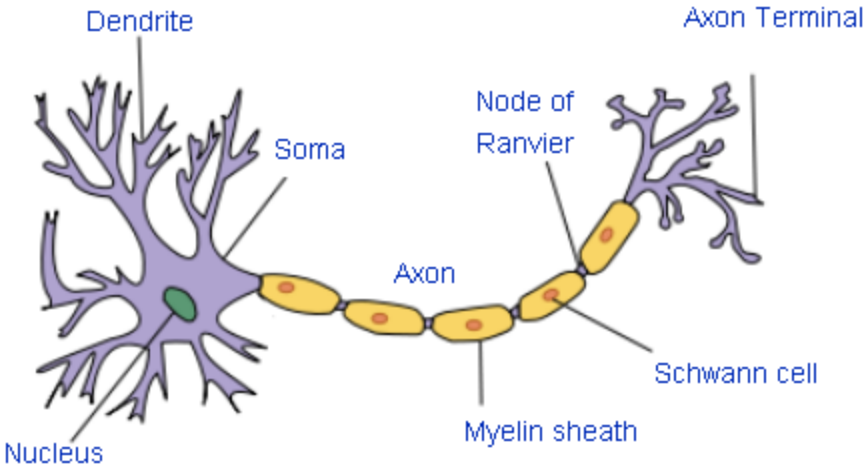


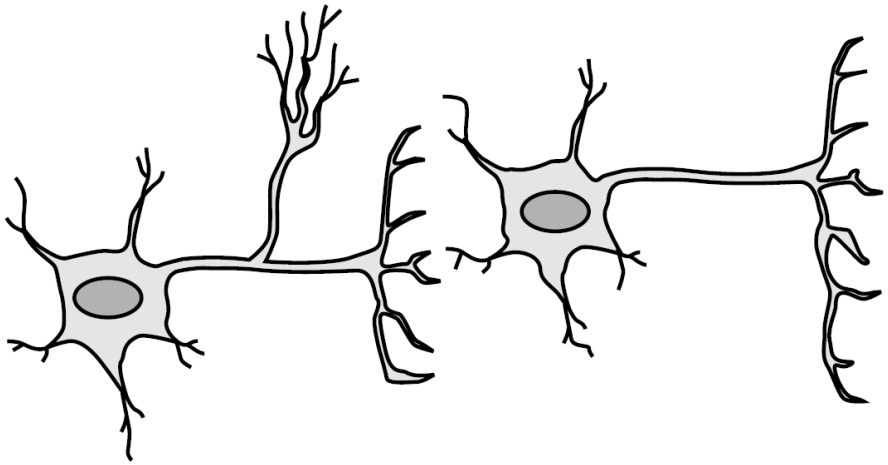




The brain and spinal cord are known as the central nervous system because they are responsible for processing and storing all of the body's information.

Nervous System

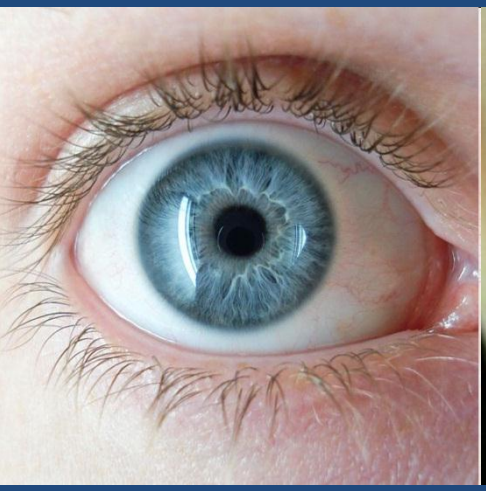
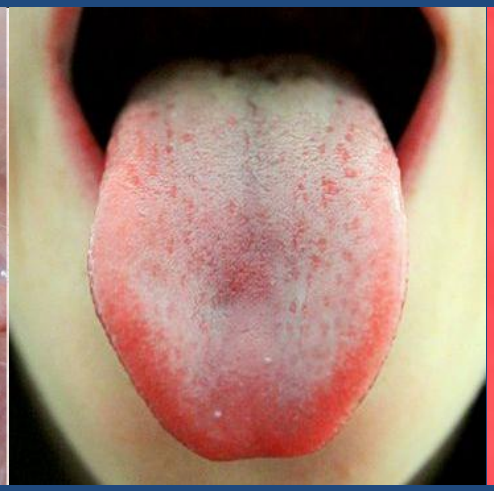




There are nerve cells, also called neurons, that run throughout the body. These cells are specially designed to send *electrical signals* over long distances in the body.

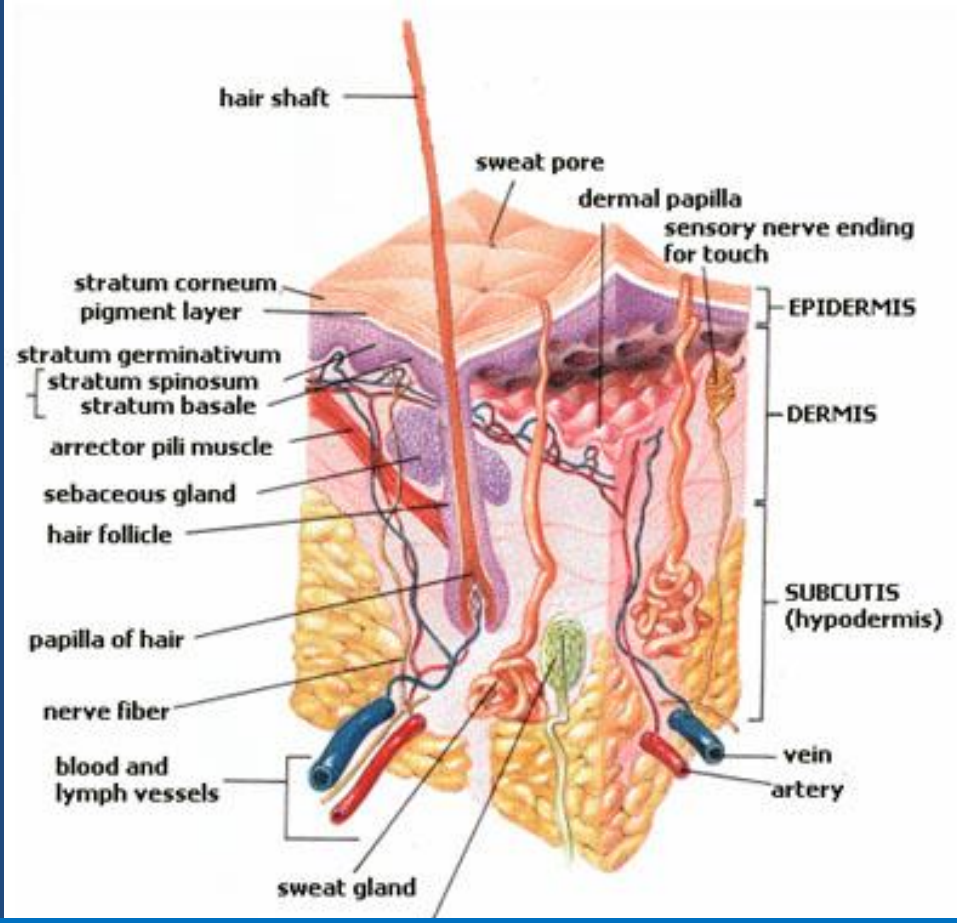
Nervous System

A stimulus is something that triggers a response from an organism. Animals detect environmental stimuli using their *five senses*. These sensory organs are part of the nervous system.


Nervous System

The sense of touch is the result of nerve cells which are found in the skin.



This shows how the nervous system interacts with the integumentary system to detect external stimuli.

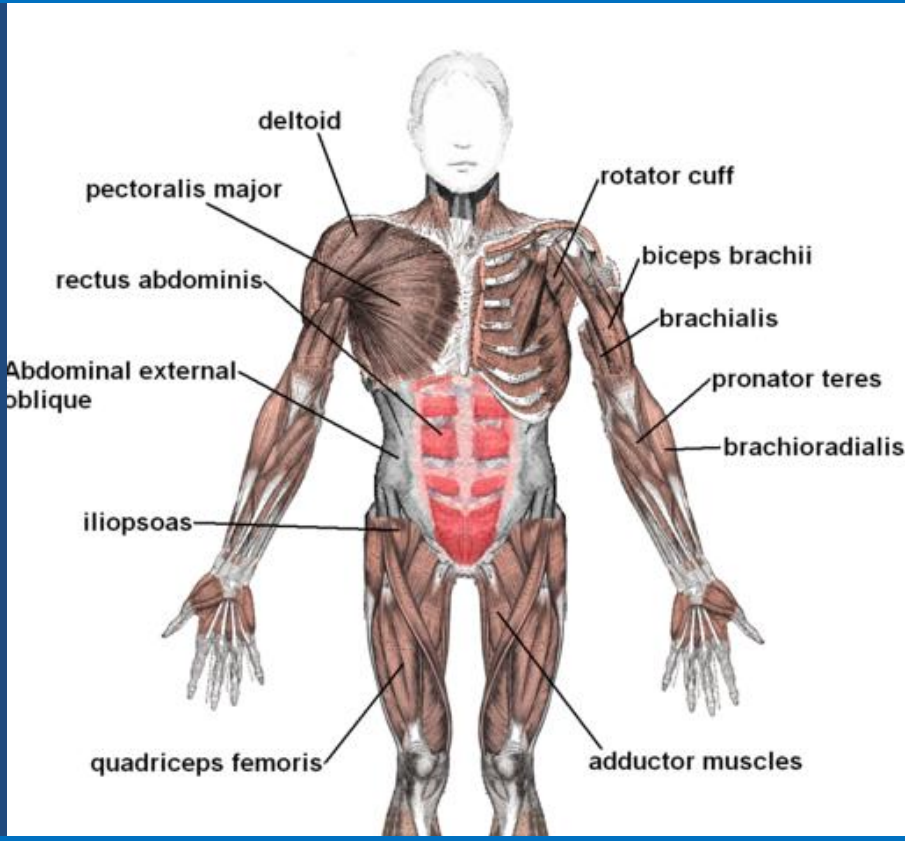
Nervous System

While pain is not considered one of the five senses, it is an important response to ***harmful stimuli***.

When tissues are damaged, nerve cells send signals to the brain which are felt as pain.

Muscular System

The muscular system is responsible for both voluntary and involuntary movements in the body.

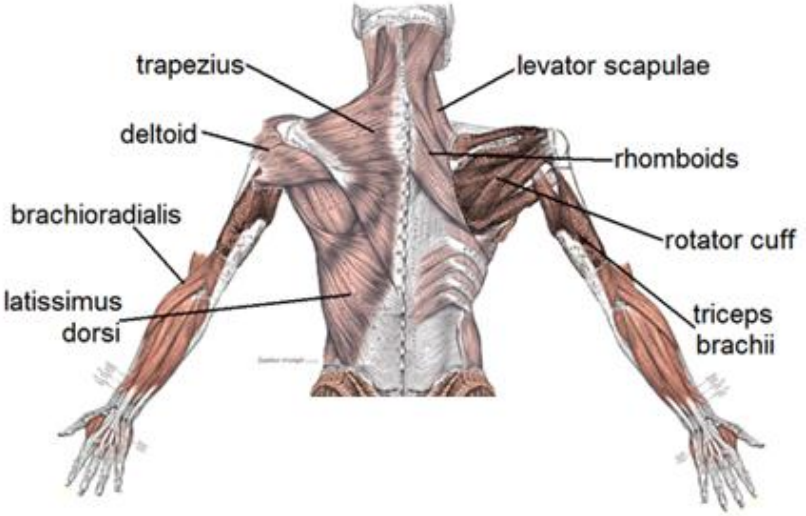


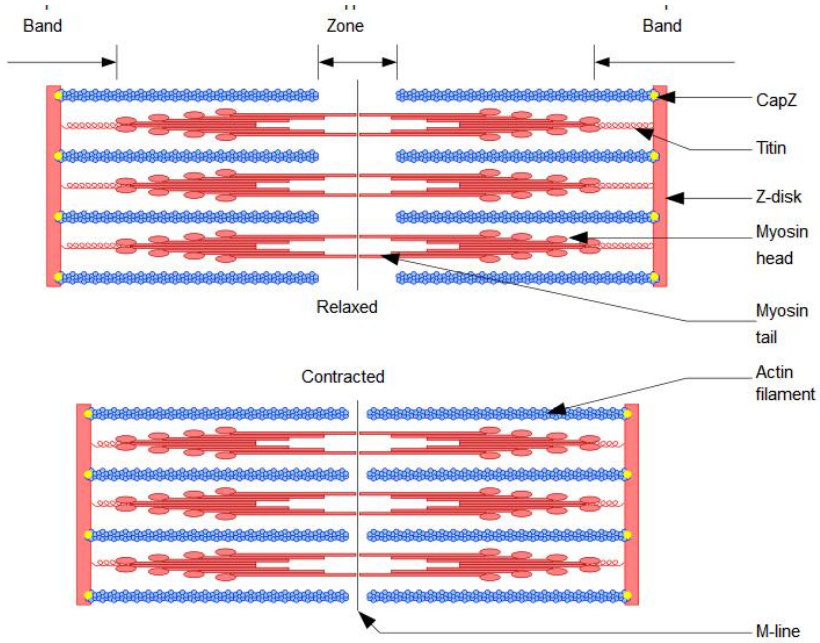
Voluntary movements – Running, jumping, etc.

Involuntary movements – breathing, heartbeat, etc.

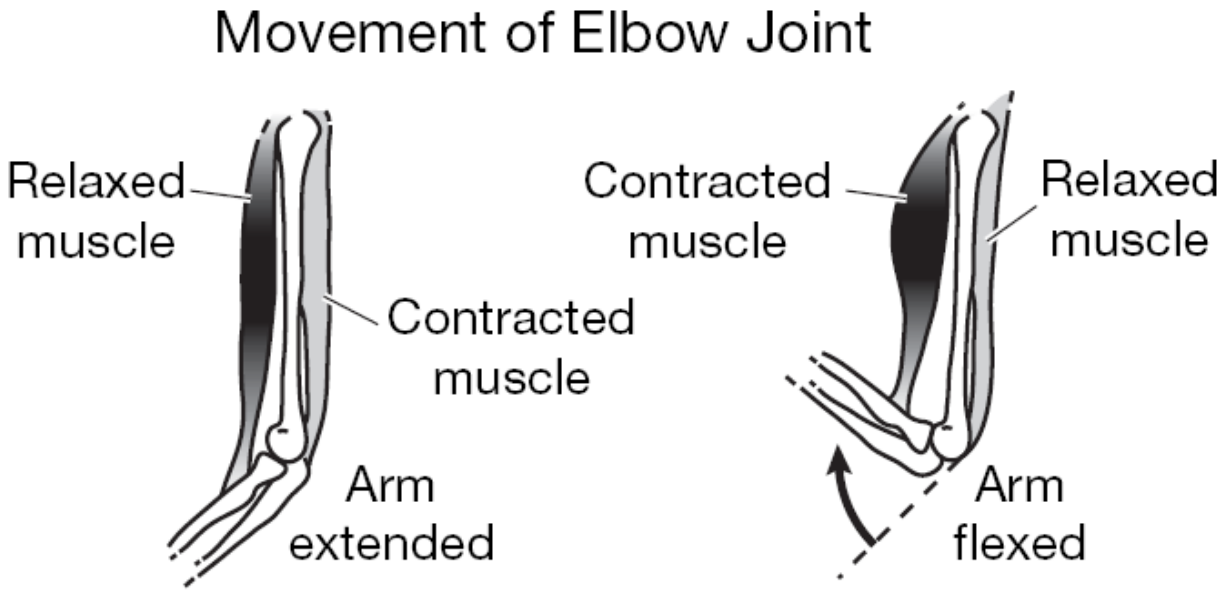
Muscular System

The main organs of the muscular system are the **muscles**. Muscles work by *pulling* or *squeezing* when they **contract**.



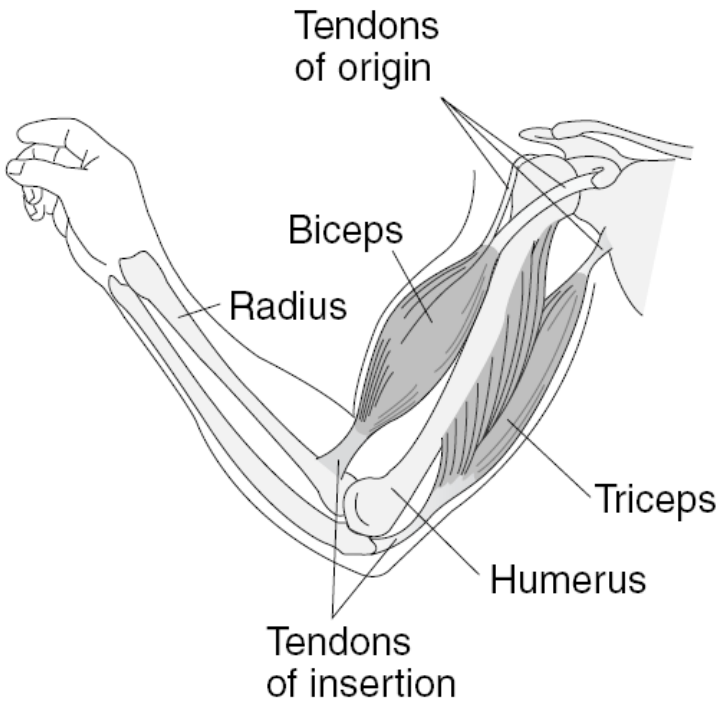


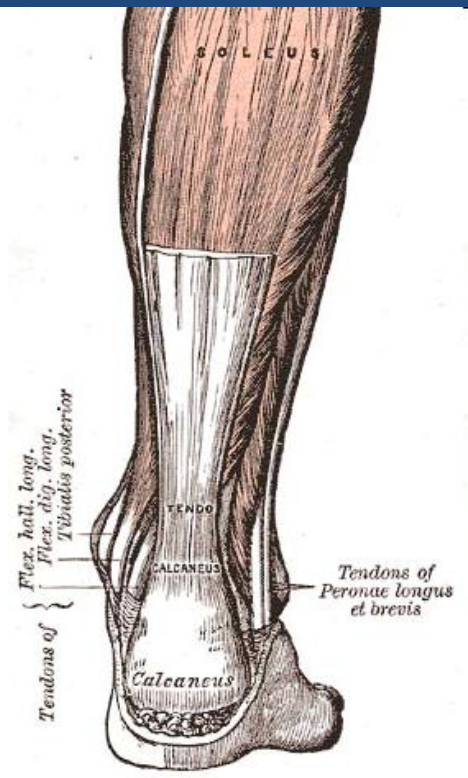
Skeletal muscle



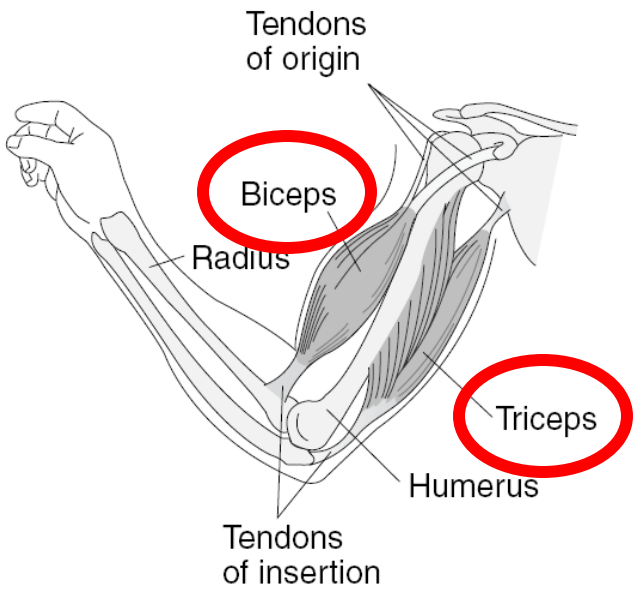
Skeletal muscles are attached to **bones** and allow for the movement of limbs. Skeletal muscles control ***voluntary movements***.

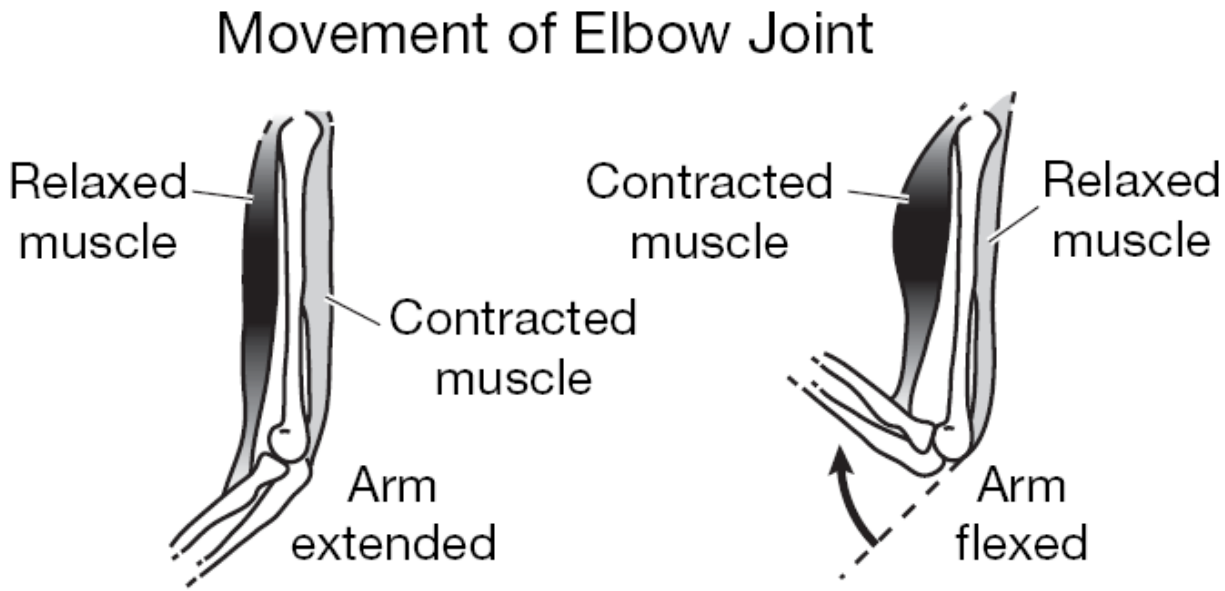
Tendons, connective tissues, attach muscles to bones.





This shows how the muscular system interacts with the skeletal system to allow organisms to move.

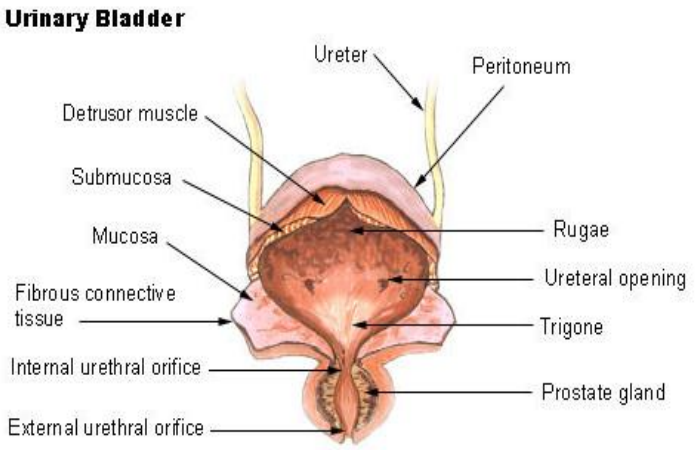




Skeletal muscles work in pairs.

In your arms, your **biceps** cause it to **bend** while your **triceps** cause it to **straighten out**.

Smooth muscle is found within the walls of organs like the diaphragm and intestines. The actions of smooth muscles are <u>not</u> under conscious control, so they are known as **<u>involuntary</u>** muscle movements.



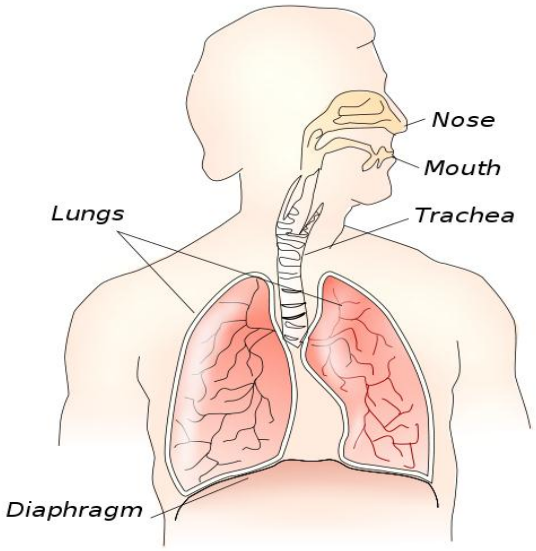
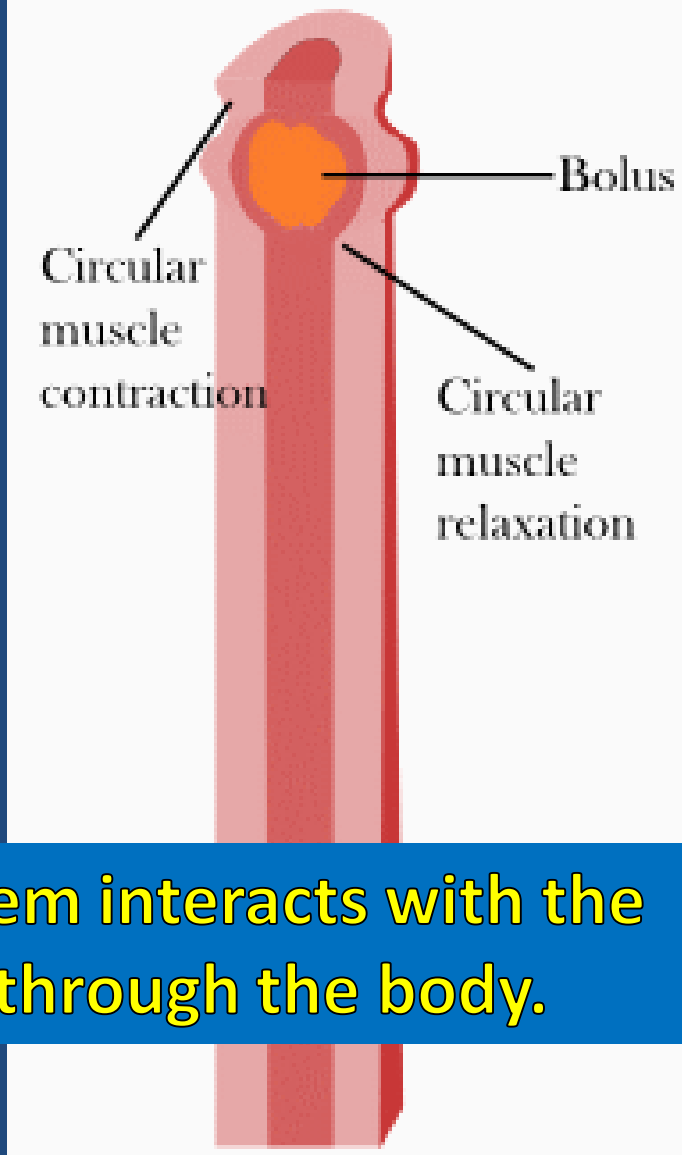


Image by Theresa Knott

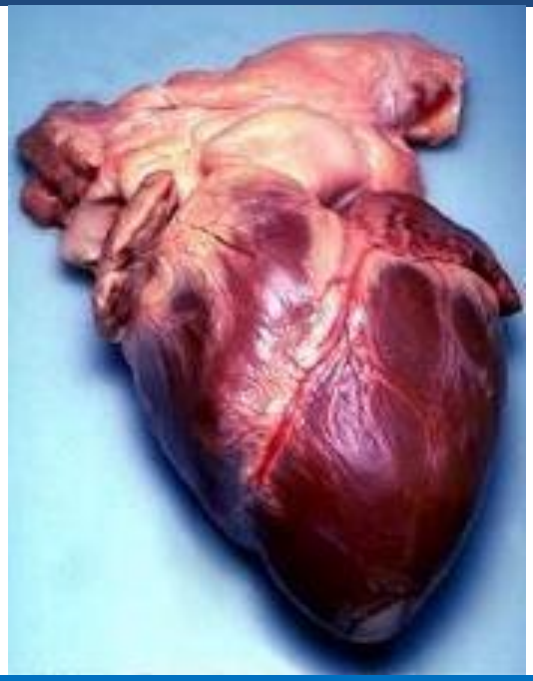
Muscular System

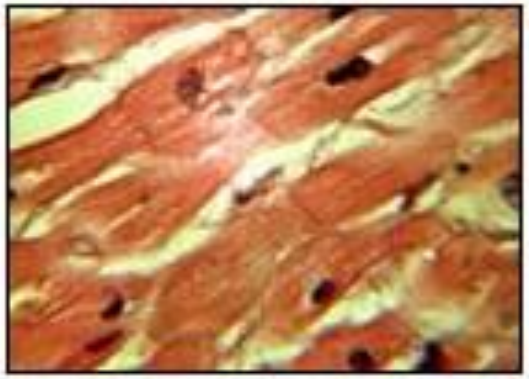
The contractions of smooth muscles move food through the *gastrointestinal tract*.



This shows how the muscular system interacts with the digestive system to move food through the body.

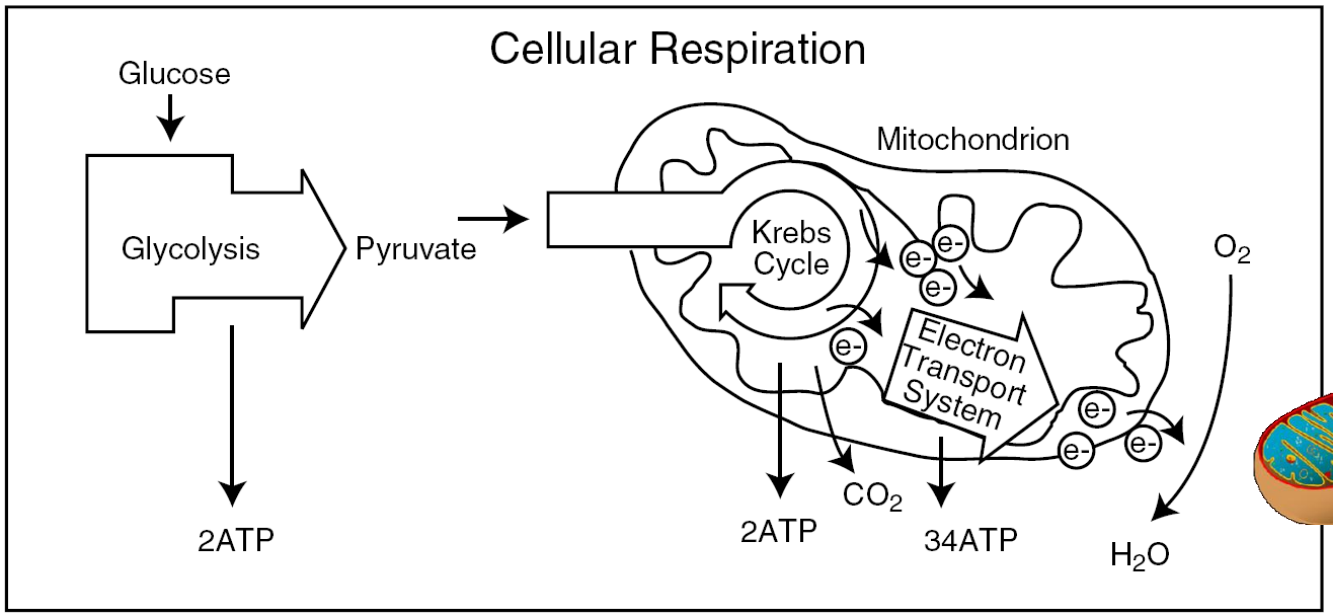
Cardiac muscle is not under your control, so it is also considered involuntary muscle. It is only found in the heart which is why it is called *cardiac* muscle.

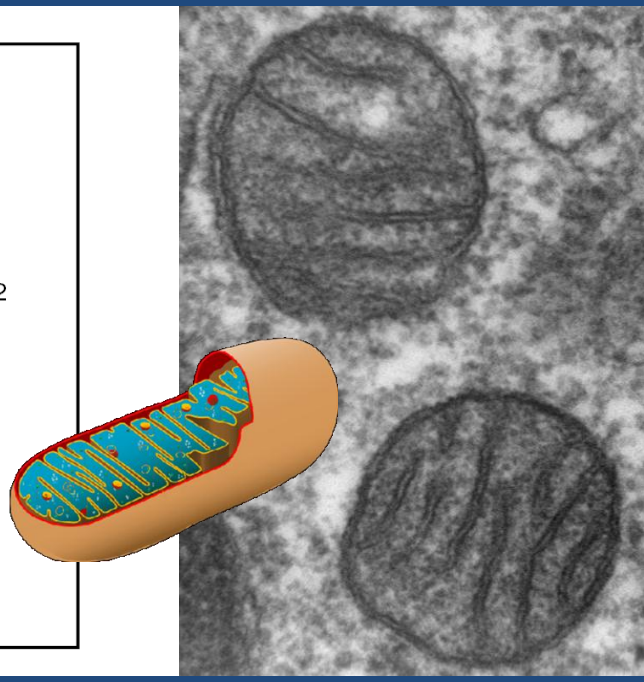




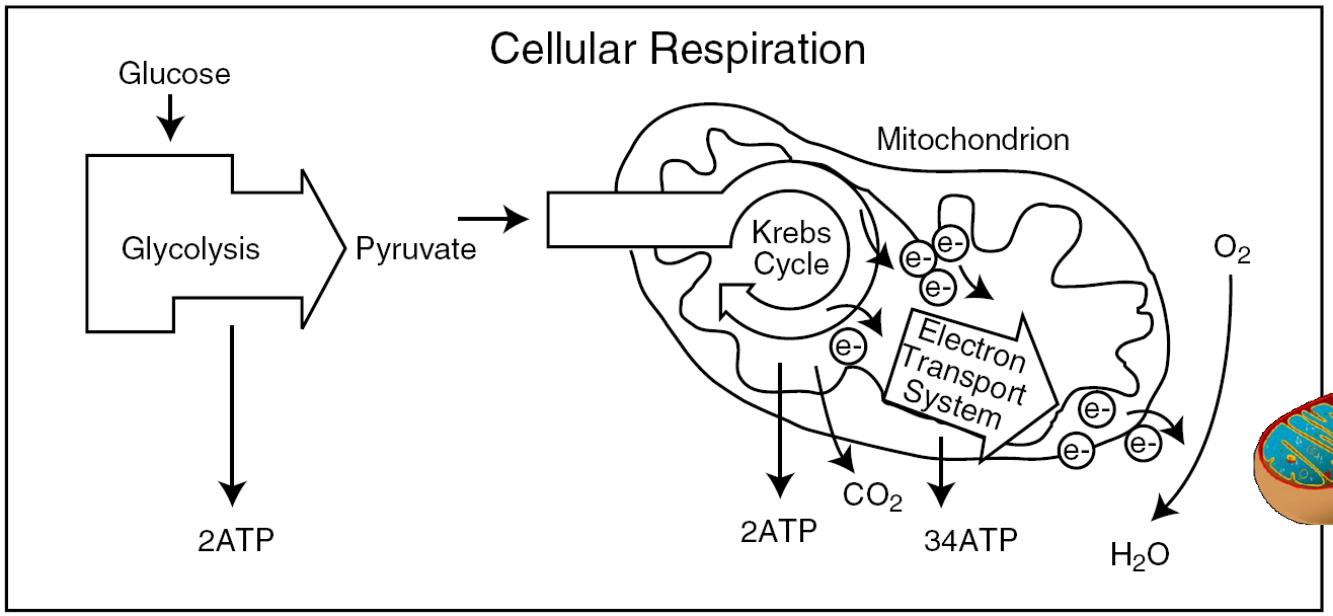
Cardiac muscle

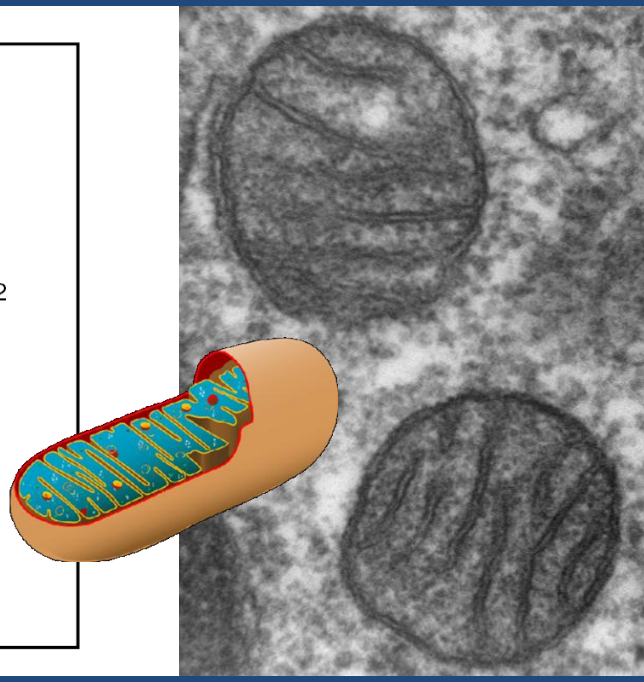
This shows how the muscular system interacts with the circulatory system to distribute blood.





Muscles are *specialized cells* which require large amounts of energy in the form of ATP. Because of this need, muscle cells have a higher concentration of mitochondria than other cells.



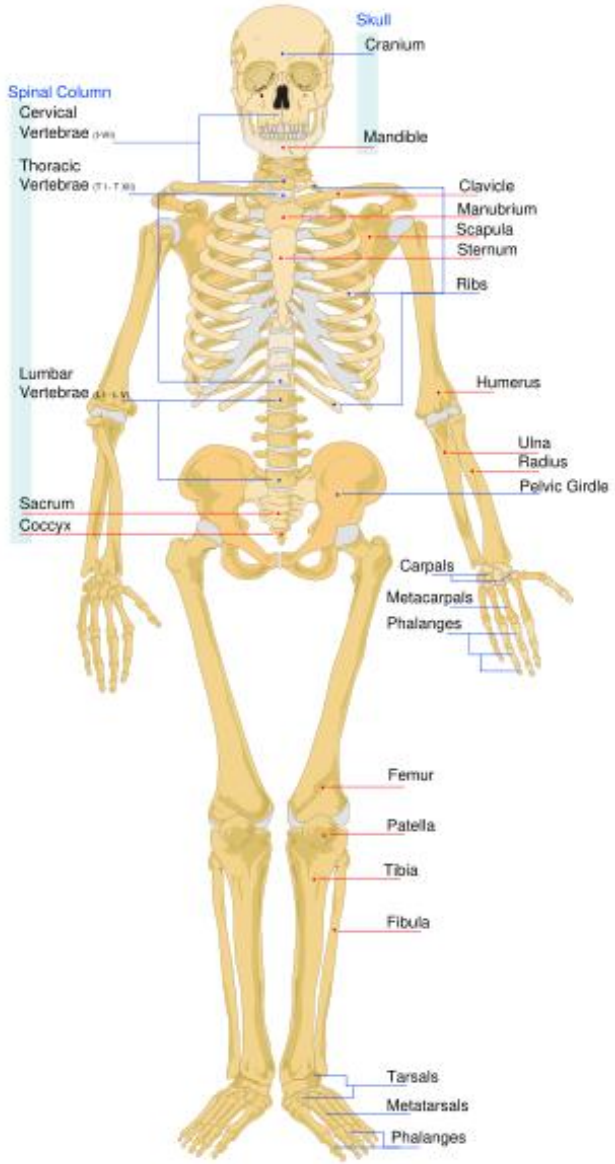


In order to perform respiration and produce ATP, the mitochondria in the muscle cells need to absorb oxygen gas.

This shows how the muscular system interacts with the respiratory system to perform energy conversions.

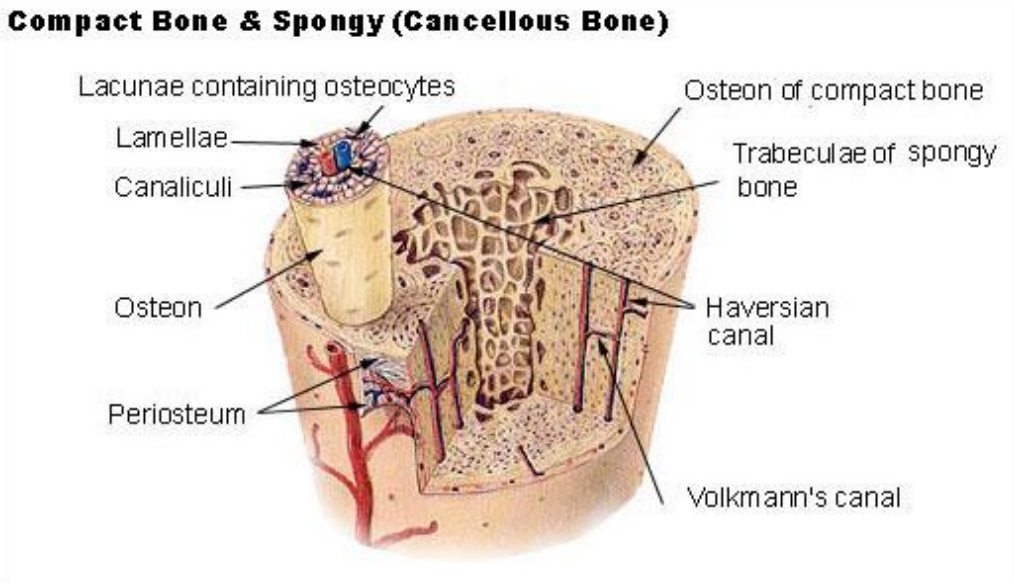
Skeletal System

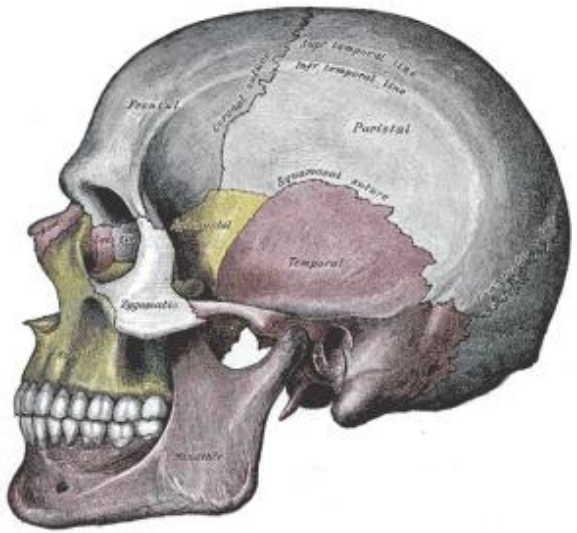
The skeletal system helps you move, protects your internal organs, and gives your body shape and support. It also stores minerals and produces blood cells.



Skeletal System

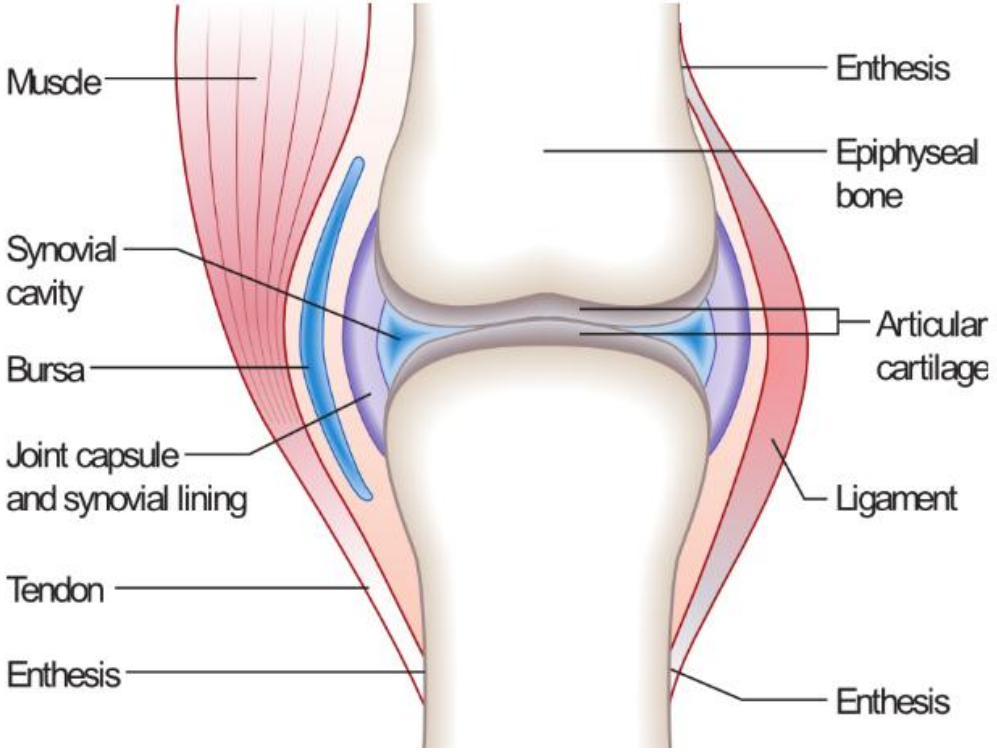
The main organs of the skeletal system are the bones. Bones work with muscles to move, protect, and support sensitive internal organs.

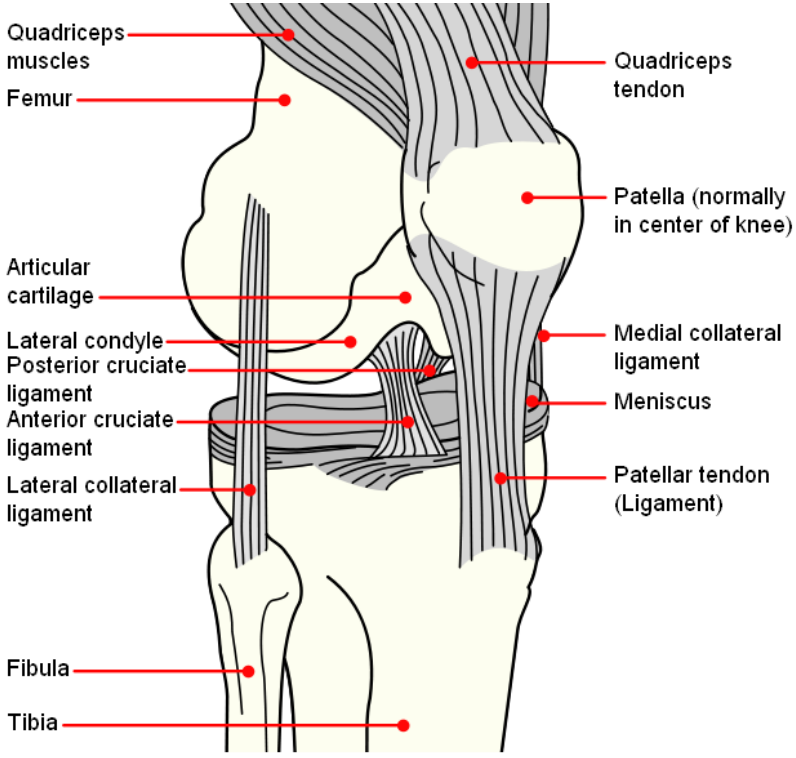




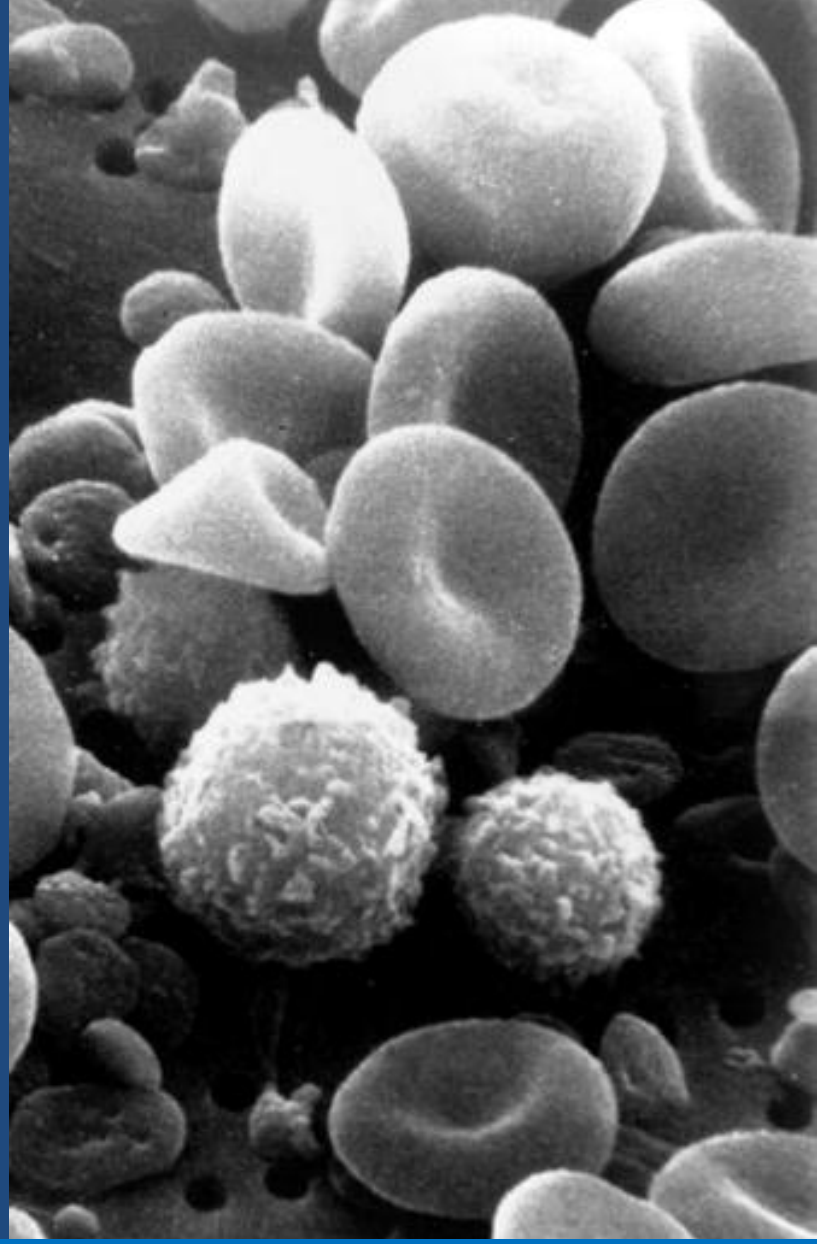
Skeletal System

Ligaments, connective tissue, attach bones to other bones.





Bone marrow is found inside of bones. This tissue is responsible for creating new blood cells in animals.

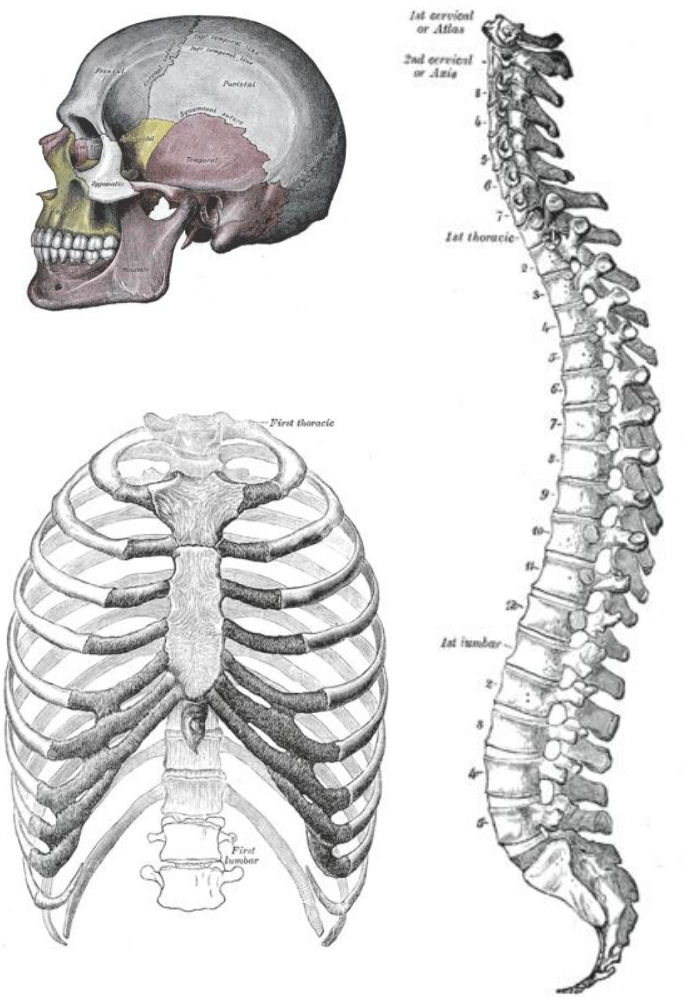


This shows how the skeletal system interacts with the circulatory system to make blood cells.

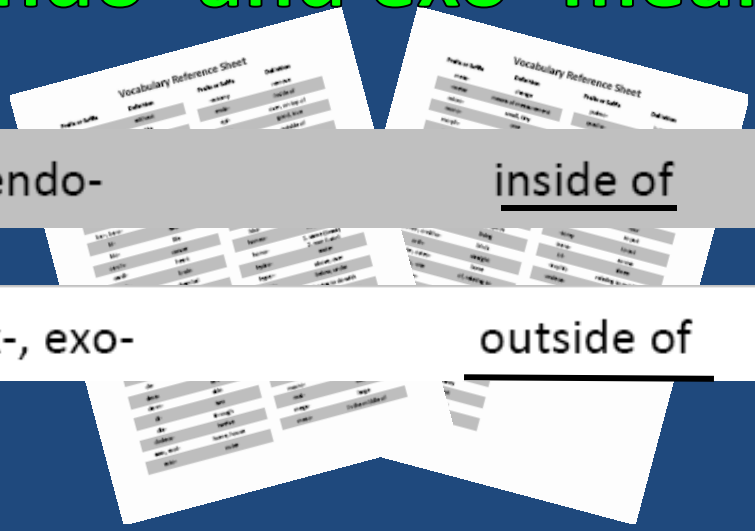
Certain bones interact with other systems to protect their vital organs.

The skull and spinal column protect the brain and spinal cord which are the central *nervous system*.

The ribcage protects the heart (*circulatory system*) and the lungs (*respiratory system*).



What do the prefixes endo- and exo- mean?

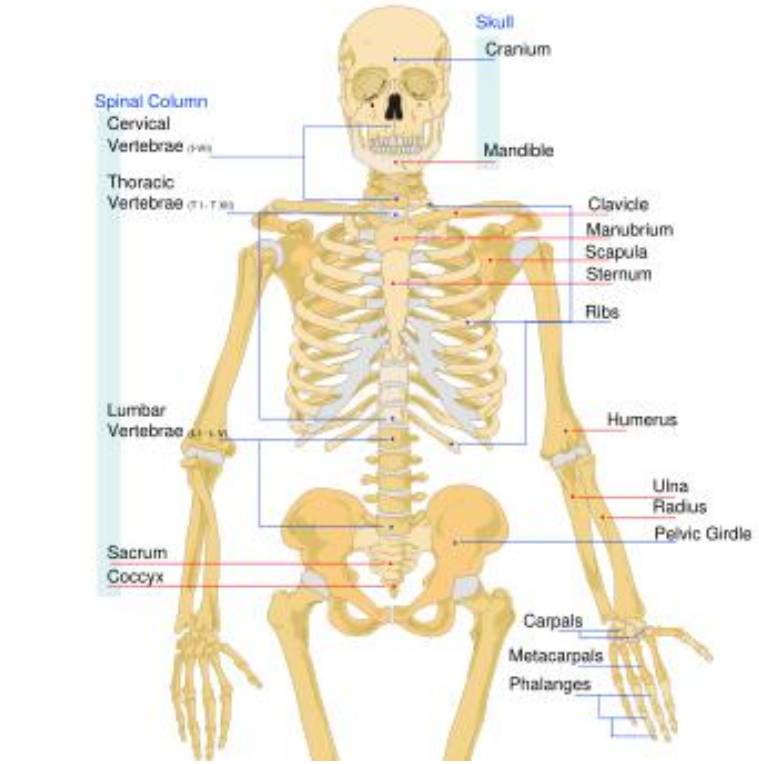


endo- inside of

ex-, exo- outside of

Humans have an endoskeleton.

Insects have an exoskeleton.



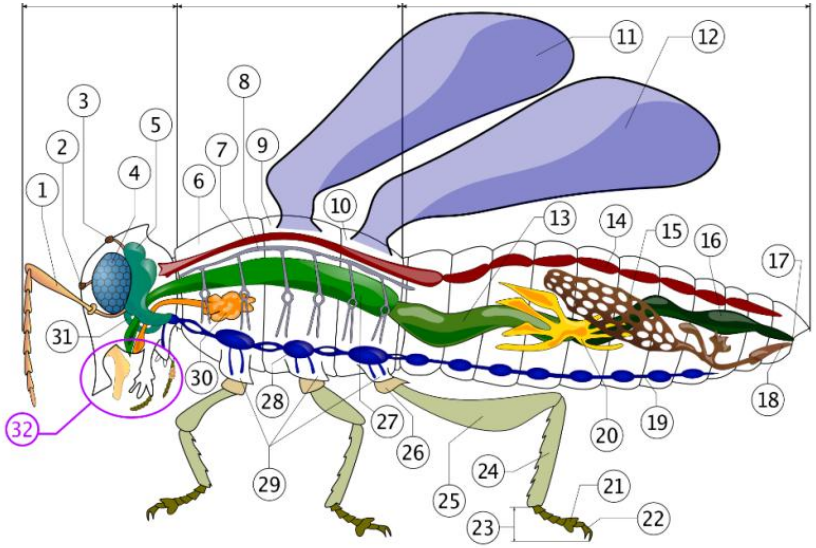


Diagram by Piotr Jaworski