Inside the Dojo

1. When entering or leaving the Dojo, stand in the doorway, face the front, perform a standing bow, This represents a mark or respect for the Dojo, our art and all of the practitioners in it.
2. If you are late for training, Be fully dressed with your Gi and Obi tied wait on the side of the mats, seek & find the highest ranking person on the mat, and when they acknowledge you, turn to them perform a standing bow. then quickly join the back of the class. ***DO NOT TO BE LATE*.**
3. Do not remove any part of your Gi (uniform) without being told to do so.
4. Do not eat, drink, smoke or chew gum in the Dojo. *NOTE*: It is acceptable to have a bottle of water during training.
5. Always move quickly in class when instructed to do something. DO NOT STROLL.
6. Always address the Black belts by their proper title – *SENSEI* or *SHIHAN* depending on there rank and for 1st kyu Brown Belt second division as *SEMPAI*, inside the Dojo. Acknowledge them when they speak to you.
7. Your training should be a serious matter. Do not laugh, giggle, talk or cause disruption during the class. NOTE: It is considered bad manners to fold your arms on your chest or put your hands on your hips.
8. If your obi comes undone during practice Turn to the sides of the mats, away from the middle of the class and or your partner, when tying or readjusting your obi. or Gi Dropdown to the right knee.
9. Your Gi must be neat and washed clean at all times. It symbolically contains the spirit of your hard training.
10. Don't wear jewellery or watches during training.
11. Keep fingernails and toenails short and clean.
12. Absolutely no training or demonstrating in the dojo before or after the commencement or conclusion of classes.
13. No instruction on other styles of Martial Arts is allowed to be shown unless by the express permission of the Head Sensei and are conducted by a 1st Kyu or Black Belt in that particular style.
14. All Grades of Goshin Ju Jitsu Kan are to only teach the syllabus under which they were graded.
    There will be no departure from these teachings.

15. It is everyone's responsibility to ensure the Dojo is clean, tidy and safe at all times, and that mats are put away.
16. Make sure your fees are paid on time. It is considered bad form to have to be asked by the Head Sensei for club fees.
17. The use of bad language, sexual reference & discriminating of any kind is not acceptable from any rank at the Goshin Ju Jitsu Kan Club.
18. Observe rank and seniority. Anyone wearing a coloured belt has earned it through diligent effort; at least respect their rank. There is no place for bigotry, chauvinism, or inflated egos in the martial arts.

Japanese Vocabulary

Principles

Ju	Gentleness, yielding or giving way
Do	Way, path or principle
Jitsu	Science of softness (soft art)
Jutsu	Techniques
Seiryoku Zenyo	Maximum efficiency (through minimum effort)
Jita Kyoei	Mutual Benefit and Welfare

Japanese Ordinal Numbers

Ichi (Sho)	1	Ju Ichi	11
Ni	2	Ju Ni	12
San	3	Ju San	13
Shi (Yo/Yon)	4	Ju Shi (Ju Yon)	14
Go	5	Ju Go	15
Roku	6	Ju Roku	16
Shichi	7	Ju Shichi	17
Hachi	8	Ju Hachi	18
Ku	9	Ju Ku	19
Ju	10	Ni Ju	20

Rank Mudansha (Sub Black Belt)

Kyu	Belt Colour
Rokyu	White
Gokyu	Yellow
Yonkyu	Orange
Sankyu	Green
Nikyu	Blue
Ikkyu	Brown

Rank Yudansha (Black belt)

Dan	Belt Colour
Shodan	Black
Nidan	Black
Sandan	Black
Yondan	Black
Godan	Black
Rokudan	Black or Red/White
Shichidan	Black or Red/White
Hachidan	Black or Red/White
Kudan	Black or Red
Judan	Black or Red

General Terms

Sensei	Teacher or Instructor
Shihan	Master
Dojo	Place of practice
Gi (Judogi)	Uniform
Seiza	Kneeling position
Anza	Sitting position with legs crossed
Ritsurei	Standing bow
Zarei	Kneeling bow
Kiotsuke	(come to) Attention
Rei	Bow
Sensei Ni rei	Bow (to Sensei)
Uke	person receiving technique
Tori	Person performing technique
Ukemi	Falling practice
Ukemi Komi	Repetition practice
Randori	Free practice
Kiai	Shout during execution of technique or falling

Gripping, Posture and Throwing Principles

Kumai Kata	Methods of gripping an opponent
Shizen Hontai	Fundamental natural posture
Jigo Hontai (Jigotai)	Fundamental defensive posture
Tsugi Ashi	Sliding foot walking
Hiza Ashi	Knee walking
Tai Subaki	Pivoting or turning the body
Kuzushi	Off balance (first element of a throw)
Tsukuri	Entry into a throw
Kake	Execution of a throw

General

Aiki	Harmonising/Unification of ki
Ashi	Foot or Leg
Atemi	A strike, hit or blow
Awase	Blending exercise with a partner using jo/bokken
Barai	Sweeping action with the leg or foot
Bokken	Wooden sword
Chi	Earth
Chudan	Middle level e.g. chudan tsuki - strike to the abdomen
Deshi	Student, pupil, disciple
Do	Way of
Dojo	Training hall
Domo arigato (gozamashita)	Thank you very much
Dori	Grab (holding)

Dojime	Body scissors/squeeze
Dozo	Please (used when giving permission)
Eri	Lapel of the Gi
Furitama	Clasped hands
Futaridori	Being held by two opponents
Gaeshi (Kaeshi)	Counter or reversal
Gaki	Hook
Garami	Entangle or twist
Gari	Reap or sweep
Gassho	Palms together, as if praying
Gatame	Pin or Lock (joint)
Gedan	Lower level – e.g. strike to legs/lower area of body
Geiko/Keiko	Practise
Giri	Cutting
Goshi	Hip
Guruma	Wheel
Gyaku	Reverse
Gyakuhanmi	Opposite stance. Partners stand with opposite feet forward
Gyakute	Reverse hand. Holding the jo with the palm facing downwards
Ha	Wing
Hachi no ji gaeshi	Figure of eight circular movement
Hadaka	Naked
Haishin-undo	Back stretch exercise
Hajimi	Start or begin
Hane	Springing action
Hanmi	Mutual stance. Partners stand facing one another with the same foot forward.
Hanmi-handachi	Techniques performed with Tori (thrower) seated, Uke (attacker) standing
Happo giri	Eight direction cutting
Hara	Stomach - Lower abdomen; physical and spiritual centre
Harai (Barai)	Sweeping action with the leg or foot
Hasso	Holding jo or bokken vertically at right shoulder
Hidari	Left
Hiji	Elbow
Hineri	Twisting
Hishigi	Crush
Hito e mi	Basic back triangle stance. "Making the body small".
Hiza	Knee
Ho	Method e.g. breathing method
Hon	Basic or fundamental
Irimi	Entering with the body
Irimi-ashi	Back foot irimi

Iriminage	Body-entering throw
Jigoku	Hell
Jime	Choke or strangle
Jodan	Upper level e.g. strike to the face
Juji	Cross, like the Roman numeral X
Junbi undo	Warm-up exercises
Jyo	Staff/stick, about 4-foot long
Jyunte	Normal hand.
Kaeshi (Gaeshi)	Counter or reversal
Kaiten	Turning
Kaitennage	Rotary throw
Kamae	Posture, stance
Kami	Upper
Kata	Single or shoulder, series of movements
Katana	Japanese sword
Katate	One hand
Katatedori	One hand held
Keiko/Geiko	Practise
Ken	Sword
Kesa	Scarf
Ki	Energy, "intention"
Kibusu	Heel
Kihon	Basic
Kiri	Cutting
Kiriotoshi	Cutting down
Kiza	Sitting on the heels, supported by the toes(in seiza, the toes lie on the mat).
Ko	Minor.
Kohai	Junior
Kokyu	Breath
Kokyu-ho	Breathing method
Kokyunage	Breath throw
Kokyu Ryoku	Breath power
Komi	Pull
Koshi (Goshi)	Hip
Koshinage	Hip Throw
Kote	Wrist
Kotegaeshi	Wrist out-turn
Kotehineri	Wrist twist. Another name for Sankyo
Kotemawashi	Wrist turn-in. Another name for Nikyo
Kubi	Neck
Kubishime	Neck choke
Kuzure	Variation
Maai	Distance

Mae-ukemi	Forward ukemi
Makikomi	Winding
Makiwara	Object used for striking practise
Makura	Pillow
Mata	Thigh
Matte	Stop (Whatever you are doing)
Men	Strike, blow, cut
Menuchi	Same as Shomenuchi
Mi	Body e.g. Irimi - entering with the body
Migi	Right
Misogi	Purification practise
Mitori-Geiko	Learning by observing others
Morote	Two Handed
Morotedori	Uke (receiver) holds one of Tori's (thrower's) arms with both hands
Mudansha	Sub Black Belt rank
Mune	Chest or Lapel
Munedori	Holding both lapels together, usually with one hand
Musubi	Uniting, bonding
Nage	Throw or thrower
Nagewaza	Throwing techniques
Nami	Normal
O	Major
Obi	Sash or belt
Okuri	Sliding
Omote	Front
Onegaishimasu	Please practise (would you do this for me)
Osae	Pin, immobilisation
Otoshi	To drop
Oyowaza	Applied techniques
Rei	Bow
Renzoku	Continuous
Renzoku Uchikomi	Continuous striking attack
Ryokata	Both shoulders
Ryote	Two handed
Ryotedori	Both of Tori's hands held
Ryotemochi	Holding with both hands
Sabaki	Movement, motion
Sansaku (Sangaku)	Triangle
Sasae	Blocking
Sate	Sit down
Seiza	Sitting posture. "Good sitting"
Sempai	Senior

Sensei	Instructor, teacher
Seoi	Shoulder
Shiai	Tournament style competition
Shikko	Knee walking
Shiho	Four corners
Shihonage	Four-direction throw
Shime (Jime)	Choke or strangle
Shimewaza	Strangulation techniques
Shizentai	Natural
Shomenuchi	Vertical blow to the head
Sode	Sleeve
Sodedori	Sleeve held
Sokumen	Side
Sono mama	Freeze
Sore	End
Soremade	Finish
Soto	Outer or outside
Suburi	Striking, cutting exercises with jo or bokken
Sukashi	Counter or evasion
Sukui	Scoop
Sumi	Corner
Sumiotoshi	Corner drop
Suwariwaza	Techniques performed in a seated posture
Tachi	Sword or Standing
Tachiwaza	Techniques performed from a standing posture
Tai	Body
Taijutsu	Body arts
Tai no henko	Body turning
Taisabaki	Body movement
Tanden	Energy centre in the lower abdomen
Tate	Straddle or Stand up
Tanren	Makiwara for weapons
Tanren Uchi	Makiwara practise with a bokken
Tanto	Knife
Tatami	Mat
Te	Hand
Tegatana	The edge of the hand. "Hand blade"
Ten	Heaven
Tenchinage	Heaven-earth throw
Tenkan	Turning
To	Sword
Toma	A great distance
Tomoe	Circle
Tori	The person who throws

Torifune	Rowing exercise
Tsugi-ashi	Glide-walking. "Forward foot irimi"
Tsuki	Thrusting
Tsuri	Lift
Uchi	A strike or Inner
Ude	Arm
Udegarame	Arm entanglement
Udekimenage	Another name for jujinage. "Arm focus throw".
Udeosae	Another name for Ikkyo. "Arm pin".
Uke	Receiver of technique
Ukemi	The art of receiving with the body.
Uki	Floating
Ura	Back
Ura sankaku	The basic back triangle stance
Ushiro	Reverse or rear
Ushiro ukemi	Backward breakfall
Ushiro Kiriotoshi	Cutting down from behind
Ushirowaza	Techniques performed against an attack from behind
Utsuri	Change or transfer
Wake	Armpit
Waza	Technique
Yame	Stop
Yoko	Side
Yokomenuchi	Circular strike to the head
Yoi	Be ready
Yoshi	Resume
Yudansha	Black Belt rank
Za	Sitting
Zafu	Firm cushion used for sitting in Zazen
Zanshin	Continuing awareness after executing a technique
Zazen	Sitting Zen
Zori	Straw sandals

About Bowing

It is common for people to ask about the practice of bowing in Ju Jitsu. In particular, many people are concerned that bowing may have some religious significance. It does not. In Western culture, it is considered proper to shake hands when greeting someone for the first time, to say "please" when making a request, and to say "thank you" to express gratitude. In Japanese culture, bowing (at least partly) may fulfill all these functions. Incorporating this particular aspect of Japanese culture into our Ju Jitsu practice serves several purposes.

It inculcates a familiarity with an important aspect of Japanese culture in Ju Jitsu practitioners. This is especially important for anyone who may wish, at some time, to travel to Japan or other countries and practice Ju Jitsu. There is also a case to be made for simply broadening one's cultural horizons.

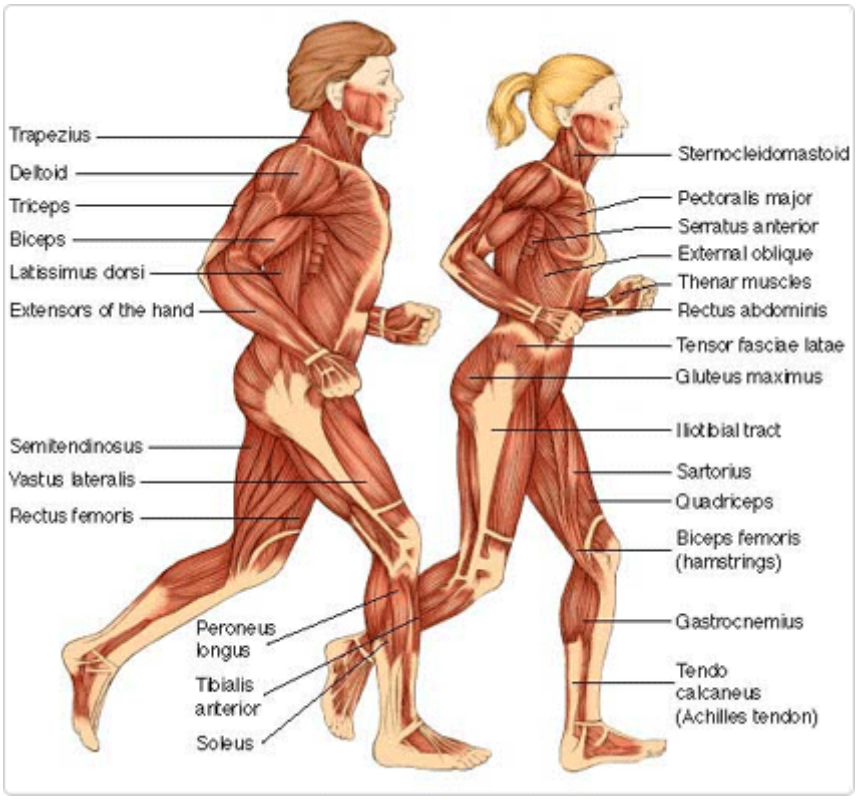
Bowing may be an expression of respect. As such, it expresses open-mindedness and a willingness to learn from one's teachers and fellow students.

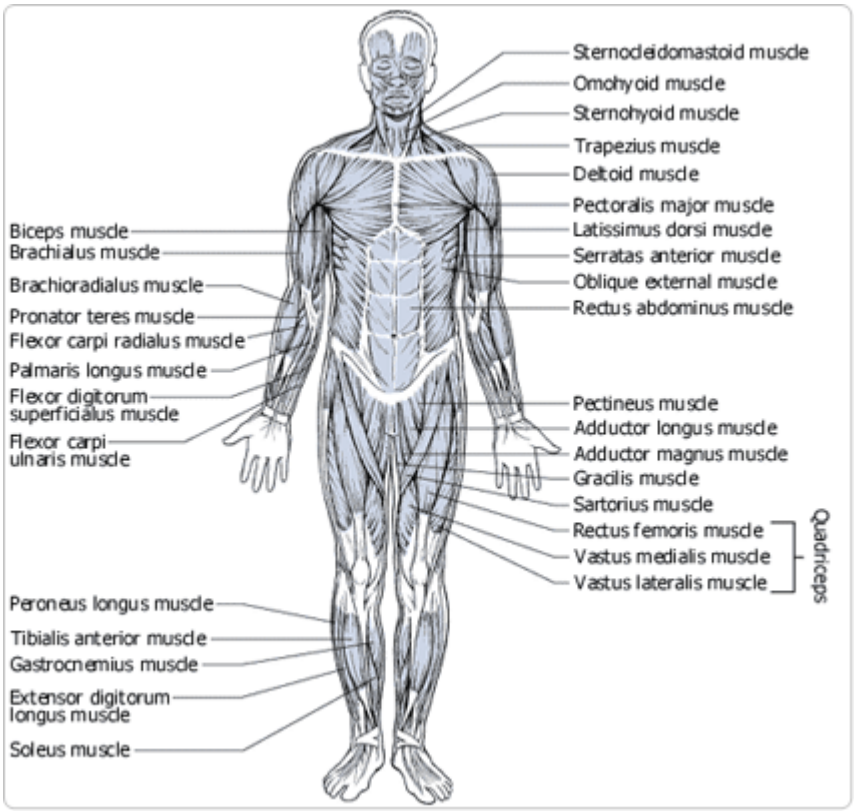
Bowing to a partner may serve to remind you that your partner is a person -- not a practice dummy. Always train within the limits of your partner's abilities.

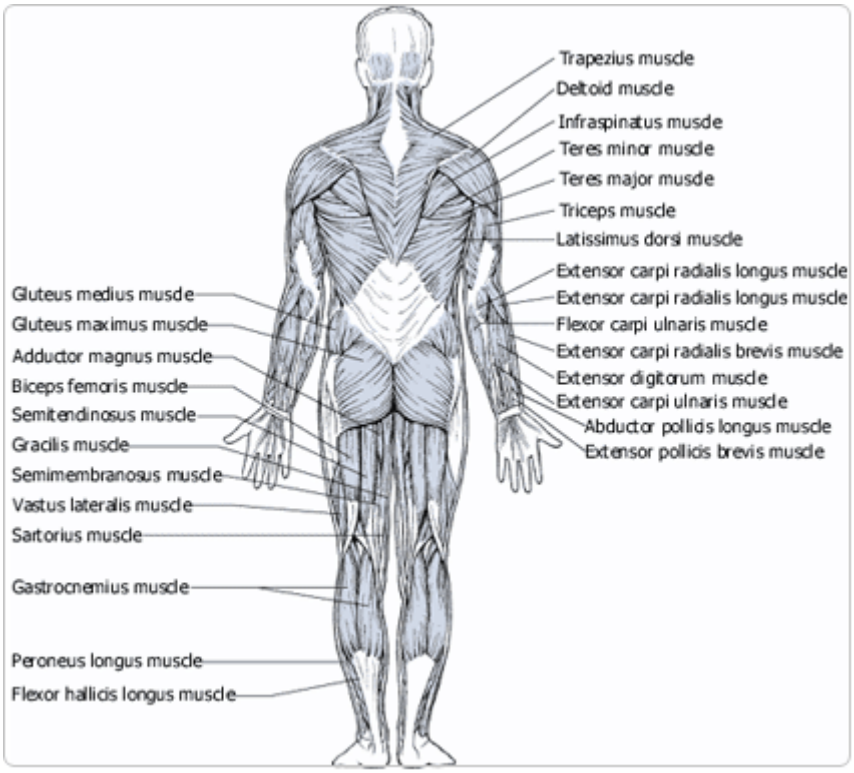
The initial bow, which signifies the beginning of formal practice, is much like a "ready, begin" uttered at the beginning of an examination. So long as class is in session, you should behave in accordance with certain standards of deportment. Ju Jitsu class should be somewhat like a world unto itself. While in this "world," your attention should be focused on the practice of Ju Jitsu. Bowing out is like signaling a return to the "ordinary" world.

When bowing either to the instructor at the beginning of practice or to one's partner at the beginning of a technique it is considered proper to say "Onegaishimasu" (lit. "I request a favour") and when bowing either to the instructor at the end of class or to one's partner at the end of a technique it is considered proper to say "Domo Arigato Gozaimashita" ("thank you").

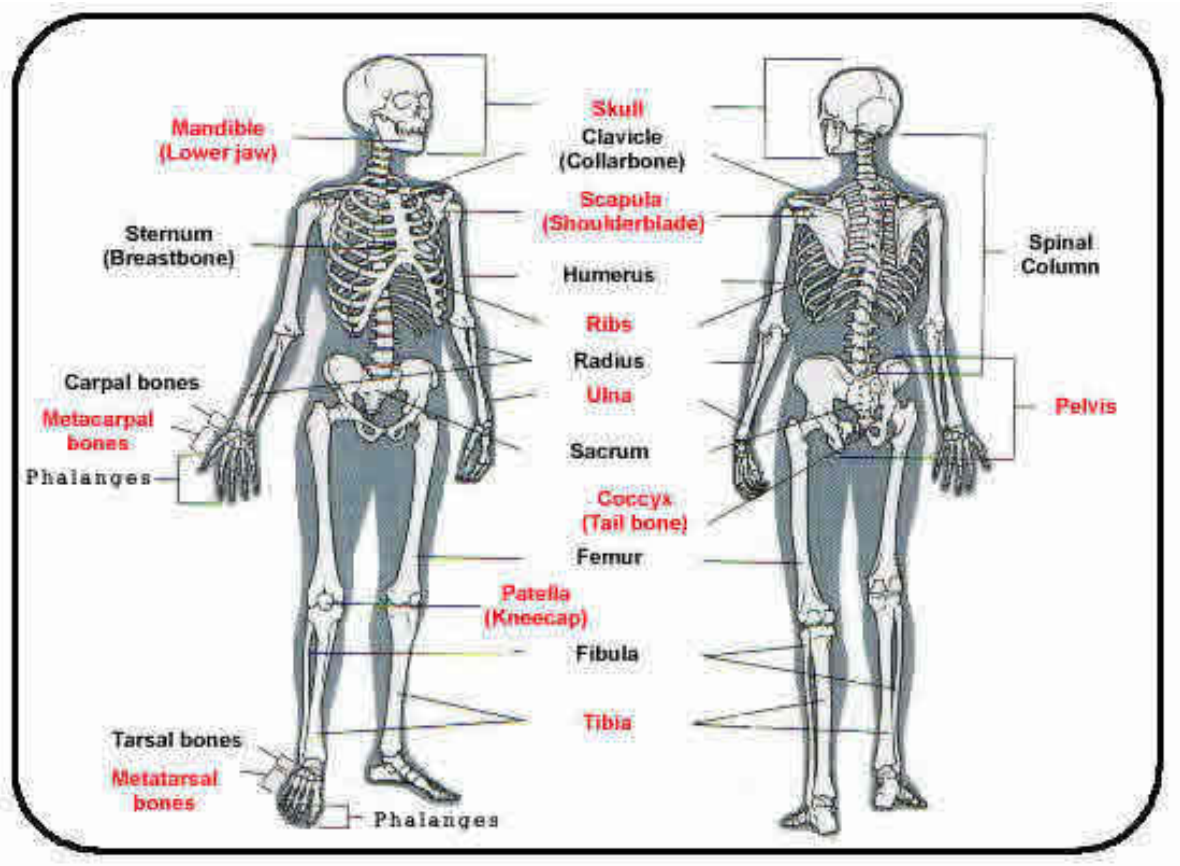
Major Muscles of the Human Body






Trapezius muscle
Deltoid muscle
Infraspinatus muscle
Teres minor muscle
Teres major muscle
Triceps muscle
Latissimus dorsi muscle
Extensor carpi radialis longus muscle
Extensor carpi radialis longus muscle
Flexor carpi ulnaris muscle
Extensor carpi radialis brevis muscle
Extensor digitorum muscle
Extensor carpi ulnaris muscle
Abductor pollicis longus muscle
Extensor pollicis brevis muscle
Gluteus medius muscle
Gluteus maximus muscle
Adductor magnus muscle
Biceps femoris muscle
Semitendinosus muscle
Gracilis muscle
Semimembranosus muscle
Vastus lateralis muscle
Sartorius muscle
Gastrocnemius muscle
Peroneus longus muscle
Flexor hallicis longus muscle

Human Skeletal System



The Skeletal System

The Skeleton is the name given to the collection of bones that holds up the rest of our body. Our skeleton is very important to us. It does three major jobs.

1. It protects our vital organs such as the brain, the heart and the lungs.
2. It gives us the shape that we have. Without our skeleton, we would just be a blob of blood and tissue on the floor.
3. It allows us to move. Because our muscles are attached to our bones, when our muscles move, they move the bones, and we move.

When you were born, your skeleton had around 350 bones. By the time you become an adult, you will only have around 206 bones. This is because, as you grow, some of the bones join together to form one bone.

The Skeletal System

The Skeletal System serves many important functions; it provides the shape and form for our bodies in addition to supporting, protecting, allowing bodily movement, producing blood for the body, and storing minerals.

Functions

Its 206 bones form a rigid framework to which the softer tissues and organs of the body are attached.

Vital organs are protected by the skeletal system. The brain is protected by the surrounding skull as the heart and lungs are encased by the sternum and rib cage.

Bodily movement is carried out by the interaction of the muscular and skeletal systems. For this reason, they are often grouped together as the musculo-skeletal system. Muscles are connected to bones by tendons. Bones are connected to each other by ligaments. Where bones meet one another is typically called a joint. Muscles which cause movement of a joint are connected to two different bones and contract to pull them together. An example would be the contraction of the biceps and a relaxation of the triceps. This produces a bend at the elbow. The contraction of the triceps and relaxation of the biceps produces the effect of straightening the arm.

Blood cells are produced by the marrow located in some bones. An average of 2.6 million red blood cells are produced each second by the bone marrow to replace those worn out and destroyed by the liver.

Bones serve as a storage area for minerals such as calcium and phosphorus. When an excess is present in the blood, build-up will occur within the bones. When the supply of these minerals within the blood is low, it will be withdrawn from the bones to replenish the supply.

Divisions of the Skeleton

The human skeleton is divided into two distinct parts:

The axial skeleton consists of bones that form the axis of the body and support and protect the organs of the head, neck, and trunk.

The Skull
The Sternum
The Ribs
The Vertebral Column

The appendicular skeleton is composed of bones that anchor the appendages to the axial skeleton.

The Upper Extremities
The Lower Extremities
The Shoulder Girdle
The Pelvic Girdle--(the sacrum and coccyx are considered part of the vertebral column)

Types of Bone

The bones of the body fall into four general categories: long bones, short bones, flat bones, and irregular bones. Long bones are longer than they are wide and work as levers. The bones of the upper and lower extremities (ex. humerus, tibia, femur, ulna, metacarpals, etc.) are of this type. Short bones are short, cube-shaped, and found in the wrists and ankles. Flat bones have broad surfaces for protection of organs and attachment of muscles (ex. ribs, cranial bones, bones of shoulder girdle). Irregular bones are all others that do not fall into the previous categories. They have varied shapes, sizes, and surfaces features and include the bones of the vertebrae and a few in the skull.

The Skull

Fun Fact

Pound for pound, bone is almost as strong as steel.

The skull is the bony framework of the head. It is comprised of the eight cranial and fourteen facial bones.

Cranial Bones

The cranial bones makeup the protective frame of bone around the brain.
The cranial bones are:

- The frontal forms part of the cranial cavity as well as the forehead, the brow ridges and the nasal cavity.
- The left and right parietal forms much of the superior and lateral portions of the cranium.
- The left and right temporal form the lateral walls of the cranium as well as housing the external ear.
- The occipital forms the posterior and inferior portions of the cranium. Many neck muscles attach here as this is the point of articulation with the neck.

- The sphenoid forms part of the eye orbit and helps to form the floor of the cranium.
- The ethmoid forms the medial portions of the orbits and the roof of the nasal cavity.

The joints between bones of the skull are immovable and called sutures. The parietal bones are joined by the sagittal suture. Where the parietal bones meet the frontal is referred to as the coronal suture. The parietals and the occipital meet at the lambdoidal suture. The suture between the parietals and the temporal bone is referred to as the squamous suture. These sites are the common location of fontanelles or "soft spots" on a baby's head.

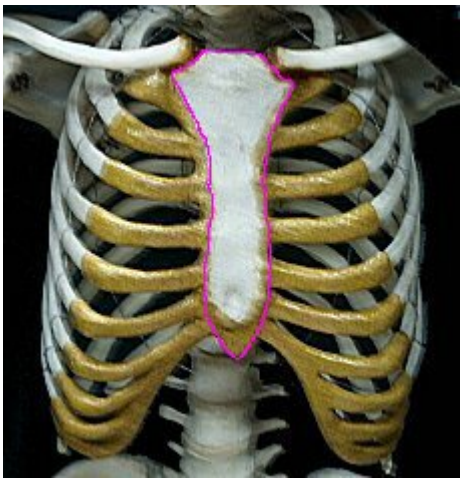
Facial Bones

The facial bones makeup the upper and lower jaw and other facial structures.
The facial bones are:

- The mandible is the lower jawbone. It articulates with the temporal bones at the temporomandibular joints. This forms the only freely moveable joint in the head. It provides the chewing motion.
- The left and right maxilla are the upper jaw bones. They form part of the nose, orbits, and roof of the mouth.
- The left and right palatine form a portion of the nasal cavity and the posterior portion of the roof of the mouth.
- The left and right zygomatic are the cheek bones. They form portions of the orbits as well.
- The left and right nasal form the superior portion of the bridge of the nose.
- The left and right lacrimal help to form the orbits.
- The vomer forms part of the nasal septum (the divider between the nostrils).

The left and right inferior turbinate forms the lateral walls of the nose and increase the surface area of the nasal cavity.

The Sternum



Fun Fact

Bones mass account for 20 percent of the body weight.

The sternum is a flat, dagger shaped bone located in the middle of the chest. Along with the ribs, the sternum forms the rib cage that protects the heart, lungs, and major blood vessels from damage.

The sternum is composed of three parts:

The manubrim, also called the "handle", is located at the top of the sternum and moves slightly. It is connected to the first two ribs.

The body, also called the "blade" or the "gladiolus", is located in the middle of the sternum and connects the third to seventh ribs directly and the eighth through tenth ribs indirectly.

The xiphoid process, also called the "tip", is located on the bottom of the sternum. It is often cartilaginous (cartilage), but does become bony in later years.

These three segments of bone are usually fused in adults.

The sternum serves an important function in the body. The ribs are connected to it by the costal cartilage. Without the sternum, there would be a hole in the bone structure in the middle of your chest, right above your heart and lungs. The sternum protects this vital area and completes the circle of the rib cage.

The Ribs

Fun Fact

The strength of bone comes from its inorganic components of such durability that they resist decomposition even after death.

The ribs are thin, flat, curved bones that form a protective cage around the organs in the upper body. They are comprised 24 bones arranged in 12 pairs.

These bones are divided into three categories:

The first seven bones are called the true ribs. These bones are connected to the spine (the backbone) in back. In the front, the true ribs are connected directly to the breastbone or sternum by a strips of cartilage called the costal cartilage.

The next three pairs of bones are called false ribs. These bones are slightly shorter than the true ribs and are connected to the spine in back. However, instead of being attached directly to the sternum in front, the false ribs are attached to the lowest true rib.

The last two sets of rib bones are called floating ribs. Floating ribs are smaller than both the true ribs and the false ribs. They are attached to the spine at the back, but are not connected to anything in the front.

The ribs form a kind of cage the encloses the upper body. They give the chest its familiar shape.

The ribs serve several important purposes. They protect the heart and lungs from injuries and shocks that might damage them. Ribs also protect parts of the stomach, spleen, and kidneys. The ribs help you to breathe. As you inhale, the muscles in between the ribs lift the rib cage up, allowing the lungs to expand. When you exhale, the rib cage moves down again, squeezing the air out of your lungs.

The Vertebral Column

The vertebral column (also called the backbone, spine, or spinal column) consists of a series of 33 irregularly shaped bones, called vertebrae. These 33 bones are divided into five categories depending on where they are located in the backbone.

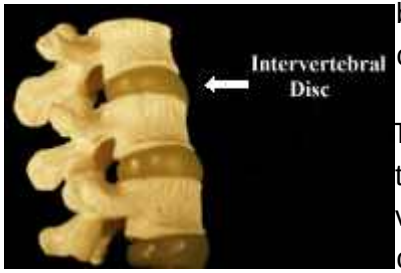
The first seven vertebrae are called the cervical vertebrae. Located at the top of the spinal column, these bones form a flexible framework for the neck and support the head. The first cervical vertebrae is called the atlas and the second is called the axis. The atlas' shape allows the head to nod "yes" and the axis' shape allows the head to shake "no".

The next twelve vertebrae are called the thoracic vertebrae. These bones move with the ribs to form the rear anchor of the rib cage. Thoracic vertebrae are larger than cervical vertebrae and increase in size from top to bottom.

After the thoracic vertebrae, come the lumbar vertebrae. These five bones are the largest vertebrae in the spinal column. These vertebrae support most of the body's weight and are attached to many of the back muscles.

The sacrum is a triangular bone located just below the lumbar vertebrae. It consists of four or five sacral vertebrae in a child, which become fused into a single bone after age 26. The sacrum forms the back wall of the pelvic girdle and moves with it.

The bottom of the spinal column is called the coccyx or tailbone. It consists of 3-5 bones that are fused together in an adult. Many muscles connect to the coccyx.



These bones compose the vertebral column, resulting in a total of 26 movable parts in an adult. In between the vertebrae are intervertebral discs made of fibrous cartilage that act as shock absorbers and allow the back to move. As a person ages, these discs compress and shrink, resulting in a distinct loss of height (generally between 0.5 and 2.0cm) between the ages of 50 and 55.

When looked at from the side, the spine forms four curves. These curves are called the cervical, thoracic, lumbar, and pelvic curves. The cervical curve is located at the top of the spine and is composed of cervical vertebrae. Next come the thoracic and lumbar curves composed of thoracic and lumbar vertebrae respectively. The final curve called the pelvic or sacral curve is formed by the sacrum and coccyx. These curves allow human beings to stand upright and help to maintain the balance of the upper body. The cervical and lumbar curves are not present in an infant. The cervical curves forms around the age of 3 months when an infant begins to hold its head up and the lumbar curve develops when a child begins to walk.

In addition to allowing humans to stand upright and maintain their balance, the vertebral column serves several other important functions. It helps to support the head and arms, while permitting freedom of movement. It also provides attachment for many muscles, the ribs, and some of the organs and protects the spinal cord, which controls most bodily functions.

The Upper Extremities

Fun Fact

There are 206 named bones in the adult human body.

The upper extremity consists of three parts:

the arm,the forearm, and the hand.

The Arm The arm, or brachium, is technically only the region between the shoulder and elbow. It consists of a single long bone called the humerus. The humerus is the longest bone in the upper extremity. The top, or head, is large, smooth, and rounded and fits into the scapula in the shoulder. On the bottom of the humerus, are two depressions where the humerus connects to the ulna and radius of the forearm. The radius is connected on the side away from the body (lateral side) and the ulna is connected on the side towards the body (medial side) when standing in the anatomical position. Together, the humerus and the ulna make up the elbow. The bottom of the humerus protects the ulnar nerve and is commonly known as the "funny bone" because striking the elbow on a hard surface stimulates the ulnar nerve and produces a tingling sensation.

The Forearm The forearm is the region between the elbow and the wrist. It is formed by the radius on the lateral side and the ulna on the medial side when the forearm is

viewed in the anatomical position. The ulna is longer than the radius and connected more firmly to the humerus. The radius, however, contributes more to the movement of the wrist and hand than the ulna. When the hand is turned over so that the palm is facing downwards, the radius crosses over the ulna. The top of each bone connects to the humerus of the arm and the bottom of each connects to the bones of the hand.

The Hand The hand consists of three parts (the wrist, palm, and five fingers) and 27 bones.

The wrist, or carpus, consists of 8 small bones called the carpal bones that are tightly bound by ligaments. These bone are arranged in two rows of four bones each. The top row (the row closest to the forearm) from the lateral (thumb) side to the medial side contains the scaphoid, lunate, triquetral, and pisiform bones. The second row from lateral to medial contains the trapezium, trapezoid, capitate, and hamate. The scaphoid and lunate connect to the bottom of the radius.

The palm or metacarpus consists of five metacarpal bones, one aligned with each of the fingers. The metacarpal bones are not named but are numbered I to V starting with the thumb. The bases of the metacarpal bones are connected to the wrist bones and the heads are connected to the bones of the fingers. The heads of the metacarpals form the knuckles of a clenched fist.

The fingers are made up of 14 bones called phalanges. A single finger bone is called a phalanx. The phalanges are arranged in three rows. The first row (the closest to the metacarpals) is called the proximal row, the second row is the middle row, and the farthest row is called the distal row. Each finger has a proximal phalanx, a middle phalanx, and a distal phalanx, except the thumb (also called the pollex) which does not have a middle phalanx. The digits are also numbered I to V starting from the thumb.

The Lower Extremities

The lower extremity is composed of the bones of the thigh, leg, foot,

The Thigh The thigh is the region between the hip and the knee and is composed of a single bone called the femur or thighbone. The femur is the longest, largest, and strongest bone in the body.

The Leg The leg is technically only the region from the knee to the ankle. It is formed by the fibula on side away from the body (lateral side) and the tibia, also called the shin bone, on the side nearest the body (medial side). The tibia connects to the femur to form the knee joint and with the talus, a foot bone, to allow the ankle to flex and extend. The tibia is larger than the fibula because it bears most of the weight, while the fibula serves as an area for muscle attachment.

The Foot The foot, or pes, contains the 26 bones of the ankle, instep, and the five toes. The ankle, or tarsus, is composed of the 7 tarsal bones which correspond to the carpals in the wrist. The largest tarsal bone is called the calcaneus or heel bone. The talus rests on top of the calcaneus and is connected to the tibia. Directly in front of the talus is the navicular bone. The remaining bones from medial to lateral are the medial, intermediate, the lateral cuneiform bones, and the cuboid bone. The metatarsal and phalanges bones of the foot are similar in number and position to the metacarpal and phalanges bones of the hand. The five metatarsal bones are numbered I to V starting on the medial side with the big toe. The first metatarsal bone is larger than the others because it plays a major role in supporting the body's weight. The 14 phalanges of the foot, as with the hand, are arranged in a proximal row, a middle row, and a distal row, with the big toe, or hallux, having only a proximal and distal phalanx. The foot's two arches are formed by the structure and arrangement of the bones and are maintained by tendons and ligaments. The arches give when weight is placed on the foot and spring back when the weight is lifted off of the foot. The arches may fall due to a weakening of the ligaments and tendons in the foot.

The Patella The patella or kneecap is a large, triangular sesamoid bone between the femur and the tibia. It is formed in response to the strain in the tendon that forms the knee. The patella protects the knee joint and strengthens the tendon that forms the knee. The bones of the lower extremities are the heaviest, largest, and strongest bones in the body because they must bear the entire weight of the body when a person is standing in the upright position.

The Shoulder Girdle

Fun Fact

Bones mass account for 20 percent of the body weight.

The Shoulder Girdle, also called the Pectoral Girdle, is composed of four bones: two clavicles and two scapulae .

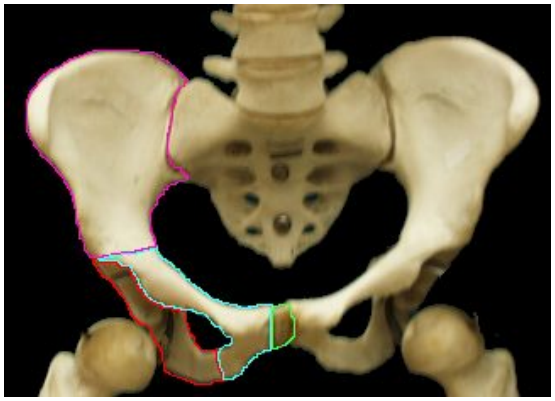
The clavicle, commonly called the collarbone, is a slender S-shaped bone that connects the upper arm to the trunk of the body and holds the shoulder joint away from the body to allow for greater freedom of movement.

One end of the clavicle is connected to the sternum and one end is connected to the scapula.

The scapula is a large, triangular, flat bone on the back side of the rib cage commonly called the shoulder blade. It overlays the second through seventh rib and serves as an attachment for several muscles. It has a shallow depression called the glenoid cavity that the head of the humerus (upper arm bone) fits into. Usually, a "girdle" refers to something that encircles or is a complete ring. However, the shoulder girdle is an incomplete ring. In the front, the clavicles are separated by the sternum. In the back, there is a gap between the two scapulae.

The primary function of the pectoral girdle is to provide an attachment point for the numerous muscles that allow the shoulder and elbow joints to move. It also provides the connection between the upper extremities (the arms) and

The Pelvic Girdle

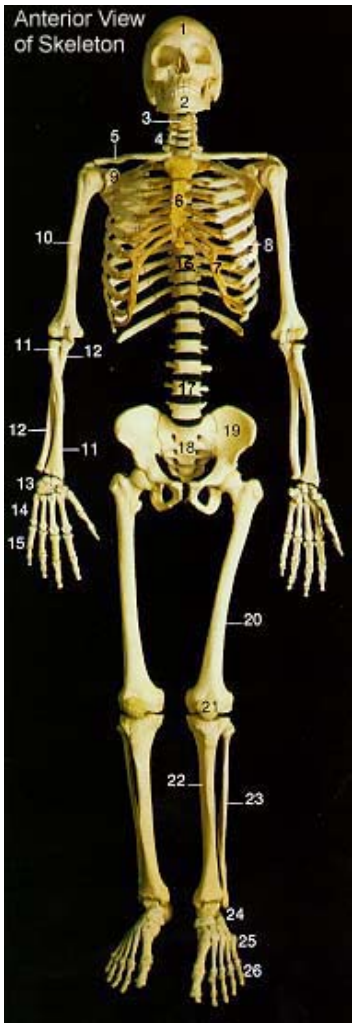


The Pelvic Girdle, also called the hip girdle, is composed to two coxal (hip) bones. The coxal bones are also called the ossa coxae or innominate bones. During childhood, each coxal bone consists of three separate parts: the ilium (denoted in purple above), the ischium (denoted in red above), and the pubis (denoted in blue above). In an adult, these three bones are firmly fused into a single bone. In the picture above, the coxal bone on the left side has been divided into its component pieces while the right side has been preserved. In the back, these two bones meet on either side of the sacrum. In the front, they are connected by a muscle called the pubic symphysis (denoted in green above). The pelvic girdle serves several important functions in the body. It supports the weight of the body from the vertebral column. It also protects and supports the lower organs, including the urinary bladder, the reproductive organs, and the developing fetus in a pregnant woman.

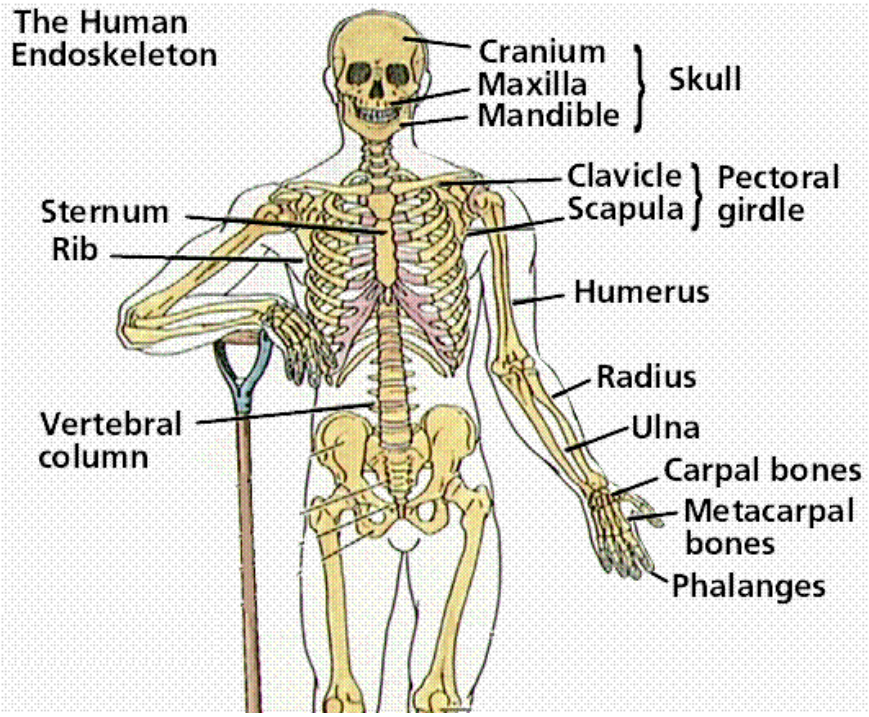
General Skeleton

Anterior View

1.	Skull	14	Metacarpal Bones
2.	Mandible	15.	Phalanges of Fingers
3.	Hyoid Bone	16.	Thoracic Vertebra
4.	Cervical Vertebra	17.	Lumbar Vertebra
5.	Clavicle	18.	Sacrum
6.	Sternum	19.	Os Coxa
7.	Costal Cartilage	20.	Femur
8.	Ribs	21.	Patella
9.	Scapula	22.	Tibia
10.	Humerus	23.	Fibula
11.	Radius	24.	Tarsal Bones
12.	Ulna	25.	Metatarsal Bones
13.	Carpal Bones	26.	Phalanges of Toes



MUSCULAR AND SKELETAL SYSTEMS



The human endoskeleton.

Functions of Muscles and Bones

The skeleton and muscles function together as the musculoskeletal system. This system (often treated as two separate systems, the muscular, and skeletal) plays an important homeostatic role: allowing the animal to move to more favorable external conditions. Certain cells in the bones produce immune cells as well as important cellular components of the blood. Bone also helps regulate blood calcium levels, serving as a calcium sink. Rapid muscular contraction is important in generating internal heat, another homeostatic function.

The Axial and Appendicular Skeletons

The axial skeleton consists of the skull, vertebral column, and rib cage. The appendicular skeleton contains the bones of the appendages (limbs, wings, or flippers/fins), and the pectoral and pelvic girdles.

The human skull, or cranium, has a number of individual bones tightly fitted together at immovable joints. At birth many of these joints are not completely sutured together as bone, leading to a number of "soft spots" or fontanels, which do not completely join until the age of 14-18 months.

The vertebral column has 33 individual vertebrae separated from each other by a cartilage disk. These disks allow a certain flexibility to the spinal column, although the disks deteriorate with age, producing back pain. The sternum is connected to all the ribs except the lower pair. Cartilage allows for the flexibility of the rib cage during breathing.

The arms and legs are part of the appendicular skeleton. The upper bones of the limbs are single: humerus (arm) and femur (leg). Below a joint (elbow or knee), both limbs have a pair of bones (radius and ulna in the arms; tibia and fibula in legs) that connect to another joint (wrist or ankle). The carpals makeup the wrist joint; the tarsals are in the ankle joint. Each hand or foot ends in 5 digits (fingers or toes) composed of metacarpals (hands) or metatarsals (feet).

Limbs are connected to the rest of the skeleton by collections of bones known as girdles. The pectoral girdle consists of the clavicle (collar bone) and scapula (shoulder blade). The humerus is joined to the pectoral girdle at a joint and is held in place by muscles and ligaments. A dislocated shoulder occurs when the end of the humerus slips out of the socket of the scapula, stretching ligaments and muscles. The pelvic girdle consists of two hipbones that form a hollow cavity, the pelvis. The vertebral column attaches to the top of the pelvis; the femur of each leg attaches to the bottom. The pelvic girdle in land animals transfers the weight of the body to the legs and feet. Pelvic girdles in fish, which have their weight supported by water, are primitive; land animals have more developed pelvic girdles. Pelvic girdles in bipeds are recognizable different from those or quadrupeds.

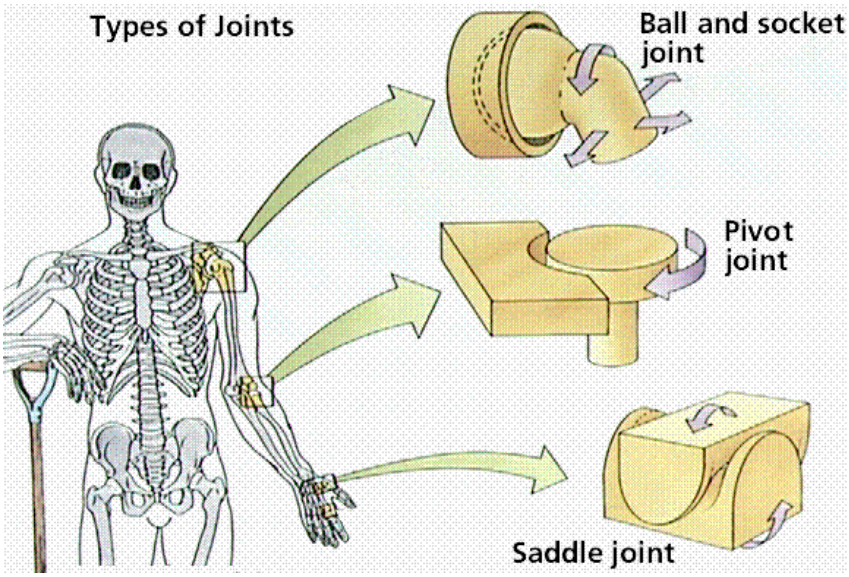
Bone Tissue

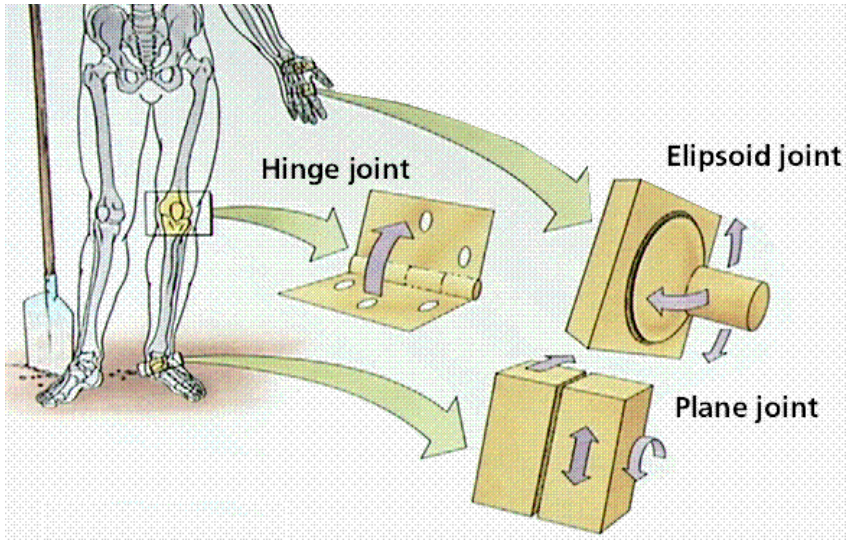
Although bones vary greatly in size and shape, they have certain structural similarities. Bones have cells embedded in a mineralized (calcium) matrix and collagen fibers. Compact bone forms the shafts of long bones; it also occurs on the outer side of the bone. Spongy bone forms the inner layer.

Joints

There are three types of joints: immovable, partly movable, and synovial. Immovable joints, like those connecting the cranial bones, have edges that tightly interlock. Partly movable joints allow some degree of flexibility and usually have cartilage between the bones; example: vertebrae. Synovial joints permit the greatest degree of flexibility and have the ends of bones covered with a connective tissue filled with synovial fluid; example: hip.

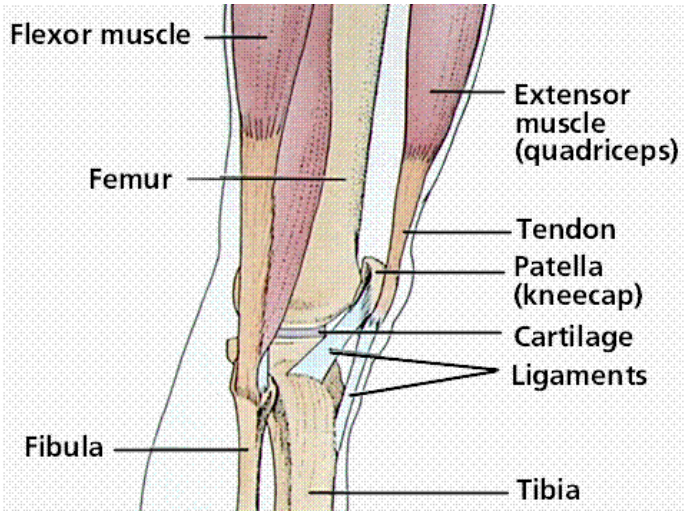
The outer surface of the synovial joints contains ligaments that strengthen joints and hold bones in position. The inner surface (the synovial membrane) has cells producing synovial fluid that lubricates the joint and prevents the two cartilage caps on the bones from rubbing together. Some joints also have tendons (connective tissue linking muscles to bones). Bursae are small sacs filled with synovial fluid that reduce friction in the joint. The knee joint contains 13 bursae

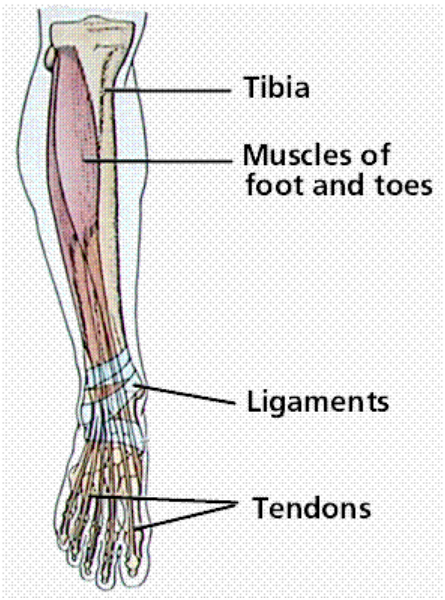




Skeletal Muscle Systems

Vertebrates move by the actions of muscles on bones. Tendons attach many skeletal muscles across joints, allowing muscle contraction to move the bones across the joint. Muscles generally work in pairs to produce movement: when one muscle flexes (or contracts) the other relaxes, a process known as antagonism.





Ligaments and tendons of the arm and leg.

Muscles have both electrical and chemical activity. There is an electrical gradient across the muscle cell membrane: the outside is more positive than the inside. Stimulus causes an instantaneous reversal of this polarity, causing the muscle to contract (the mechanical characteristic) producing a twitch or movement.