The Hard Stuff! All About Bones

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Written by Lisa Trumbauer

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Correlation

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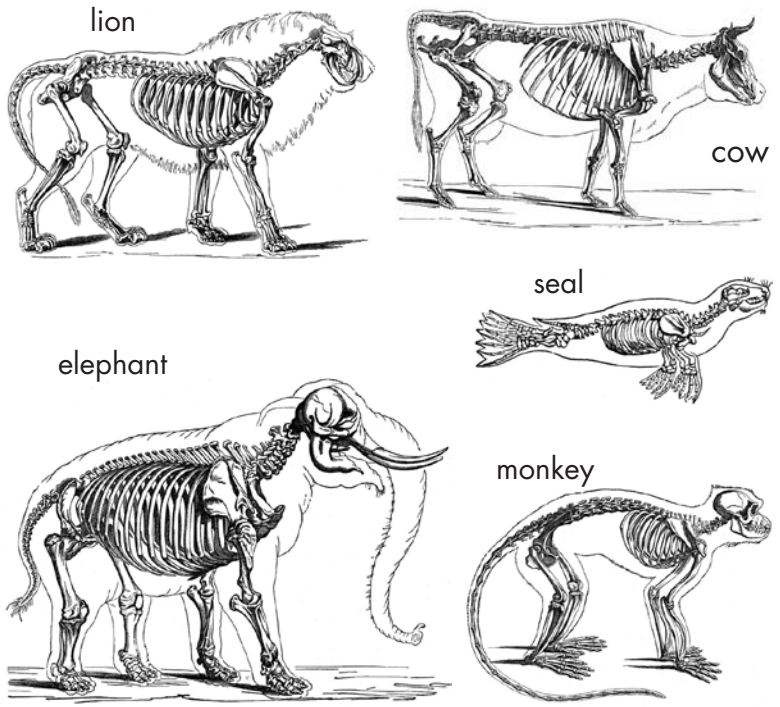


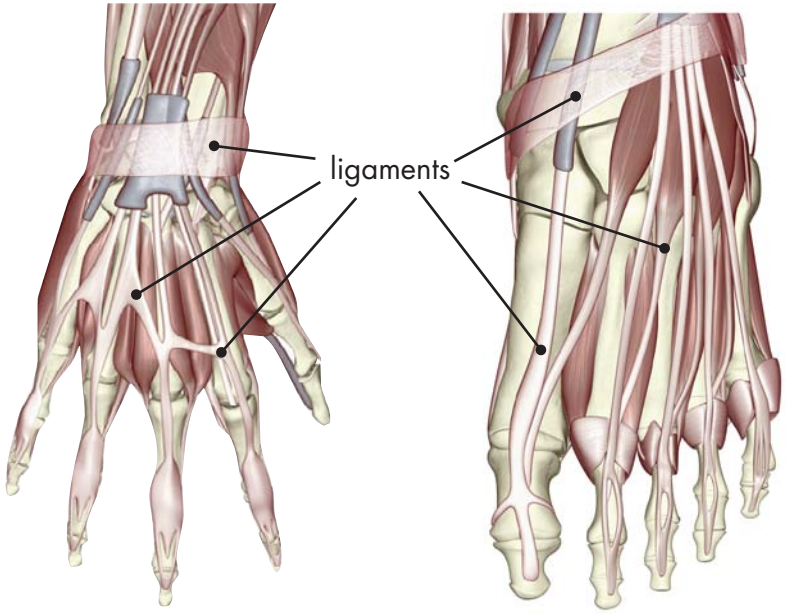
Body Shapers

Lizards have one. Elephants have one. Even fish in the ocean have one. You have one, too! What do you all have? You all have skeletons.

A skeleton is a collection of bones inside an animal's body. The skeleton is like a frame that has muscles, blood vessels, and skin wrapped around it. Skeletons give **vertebrates**—humans and many other animals—their shape and form. In fact, you can probably identify many animals just by looking at their skeletons.

The human skeleton is made up of 206 bones, starting at the top with the skull and ending at the bottom with the toe bones. The bones that help us move have muscles attached to them by **tendons**. Some bones protect delicate organs inside our bodies, for example, the heart and the brain. And many large bones have a special core that produces blood cells. Special tissues called **ligaments** connect the bones to make up the skeleton.

To fully appreciate the function of bones, let's take a closer look at specific body areas.



Ligaments hold the hand and foot bones together.

These racers wear helmets to protect their skulls.

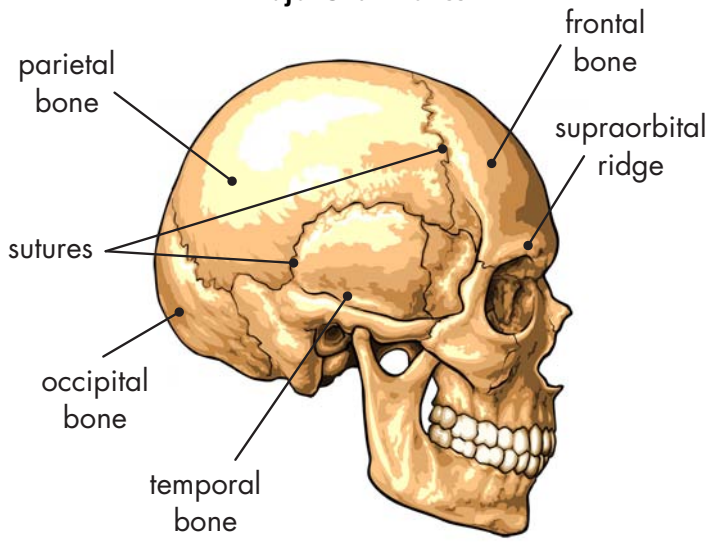
Heads Up

Press your hand against your forehead—the part of your face above your eyebrows. Does your forehead feel soft, like a pillow, or does it feel hard, like a desk? Your forehead feels hard because you can feel your skull, or *cranium*, under the skin. The cranium, one set of bones in your body, protects your brain, a very important and very delicate organ. In some ways, the cranium is like a crash helmet, except that it is not as strong. For that reason, it's a good idea to wear a helmet for extra protection when you ride a bike, in-line skate, or participate in certain other sports.

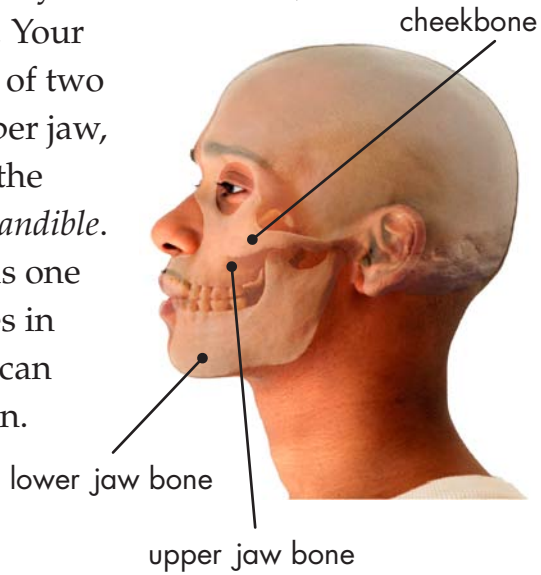
If you feel around your head, your skull appears to be all one piece. Actually, though, the skull is made up of many different bones. The bones come together at special joints called **sutures**. Unlike other joints, which allow quite a bit of movement, sutures don't move much.

Remember touching your forehead? This part of the skull is the *frontal bone.* The ridge of bone above your eyes is the *supraorbital ridge*. The largest part of your skull covers the top and back of your head. These two bones are the *parietal* (puh-RY-eh-tul) *bones*. The part of your skull just above your neck in the back is the *occipital* (awk-SIP-ih-tul) *bone*, and the sides of the skull, above the ears, are the *temporal bones.*

Major Skull Bones

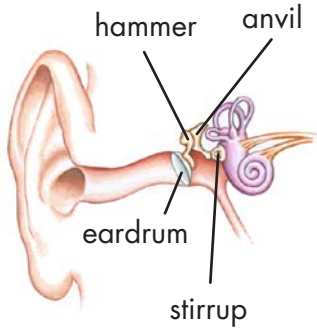


In all, your skull has twenty-two bones, not counting the six in your middle ears and one in your throat. Beneath the skin on your cheeks, you can probably feel your cheekbones, or *zygomatic bones.* Your jaw is made up of two bones—the upper jaw, or *maxilla*, and the lower jaw, or *mandible*. The lower jaw is one of the few bones in your skull that can move on its own.



Bones Bonus

Your ears also have bones—the hammer, anvil, and stirrup, which are attached to the eardrum. These bones are the tiniest bones in your body. When the eardrum picks up sounds and vibrates, the eardrum moves the hammer. The hammer then vibrates, which makes the anvil vibrate, which in turn pushes the stirrup. Nerves detect these vibrations and send them to the brain, which makes meaning of the sounds.



Cartilage is softer than bones, but teeth are harder.

If you look at a skeleton, you might see something missing from its face—a nose. The part of your nose that sticks out is not made of bone but rather of a tissue called **cartilage** (CAR-tih-ledj). Touch your nose and move it around. It can bend, whereas bones cannot. Cartilage, also found at the ends of bones, keeps one hard bone from rubbing against another one.

Skeletons also have teeth, but teeth are not bones. Teeth are harder than bones. The outside of a tooth is made of a substance called *enamel*, which is the hardest substance in the body.

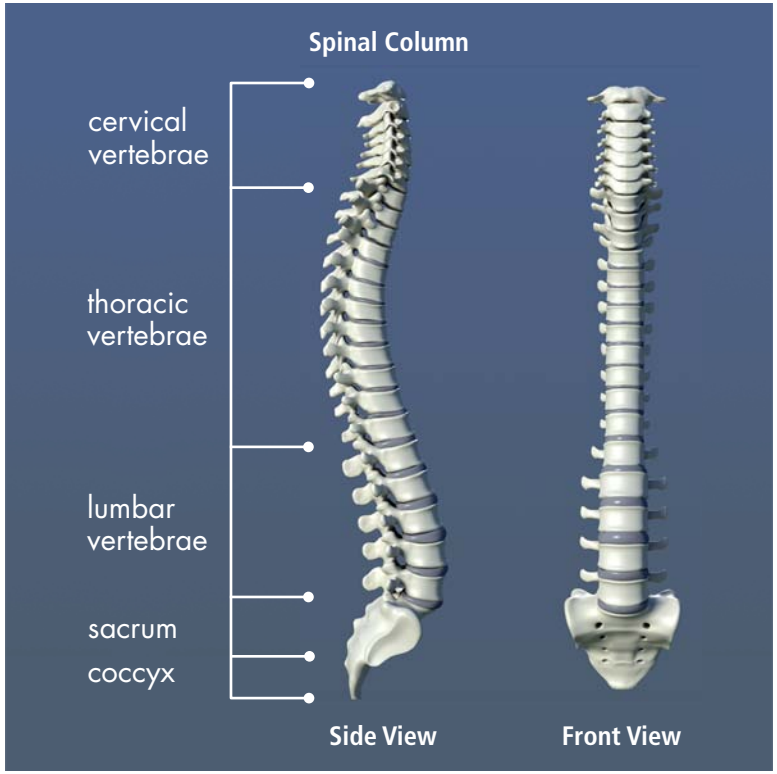
Put Your Back Into It

The skull connects to a major system of bones—the *spinal column*, or backbone. You can feel the first few parts of the spinal column along the back of your neck. These ridges continue down your back, all the way to your hips. The ridges, called *vertebrae* (VER-teh-bray), are the individual bones of your backbone.

The spinal column has thirty-three vertebrae in all. Seven vertebrae—the *cervical* vertebrae—are found in the neck. Twelve vertebrae—the *thoracic* (thor-AH-sik) vertebrae—run from the top of your back to about the middle of your back. Five *lumbar* vertebrae are located at the back of your waist, followed by five **fused** *sacral* vertebrae, which sit between your hips. The remaining vertebrae form the *coccyx* (KOK-siks) at the bottom of your spinal column.

Bones Bonus

The top two vertebrae are the *atlas* and *axis*. These two vertebrae allow you to nod and shake your head.

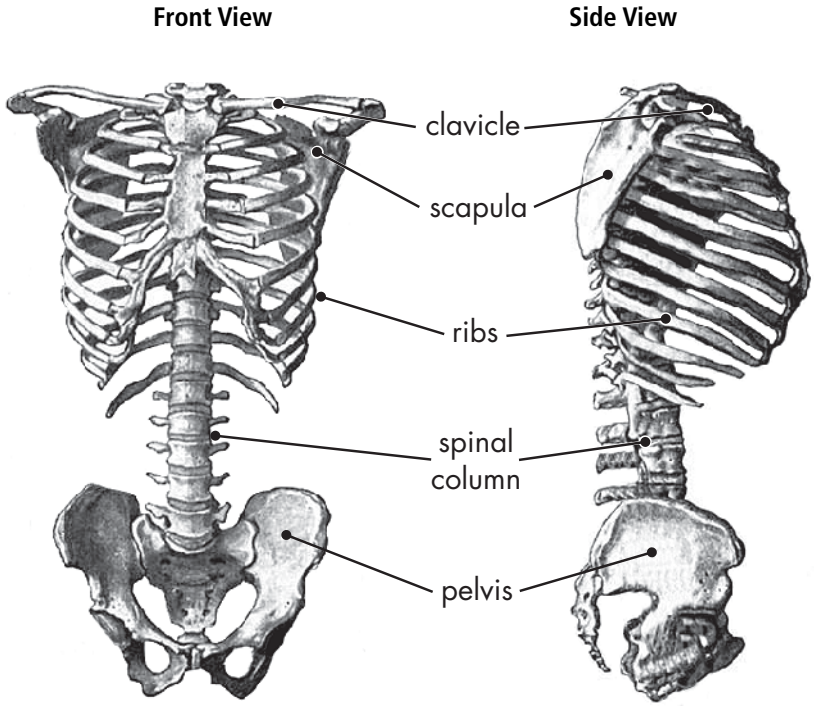


Your spinal column has two important functions. First, it protects the delicate **spinal cord**, which runs through the vertebrae. The spinal cord is the place where all the nerves in your body meet to transmit information to your brain.

The second function of the spinal column is to allow you to bend, twist, roll, and flip. Because the backbone is a chain of bones instead of one solid bone, it is very flexible and can move in many directions.

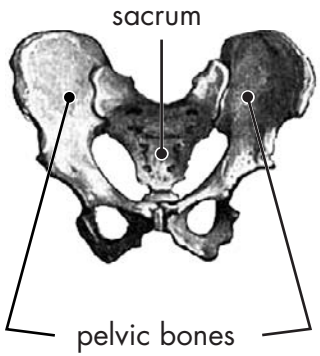
The skull is not the only set of bones attached to the backbone; the ribs and pelvic bones are attached to it, too.

Along with giving shape to your chest, the ribs serve an important purpose—protecting the lungs and heart. These organs lie inside the ribs, enclosed in the rib cage. If you pound on your chest, your lungs and heart don't get squashed because the ribs provide a sturdy wall around them. Your rib cage has twelve bones on each side, each of which is connected to one of the twelve thoracic vertebrae.



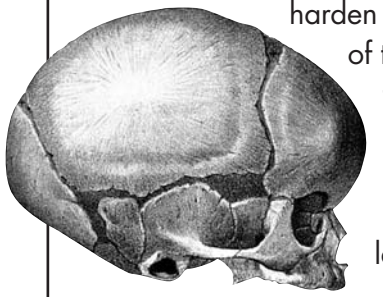
Near the top of the spinal column, you will also find a *scapula* and *clavicle* on each side. *Scapula* is the technical term for the shoulder blade, and *clavicle* is the technical term for the collarbone. The scapula and the clavicle make up the shoulder.

Near the bottom of the spinal column, two hip bones form the *pelvis*. On each side, a pelvic bone looks like a shallow dish or bowl. That's because your intestines and other lower-body organs rest inside it.



Boning Up

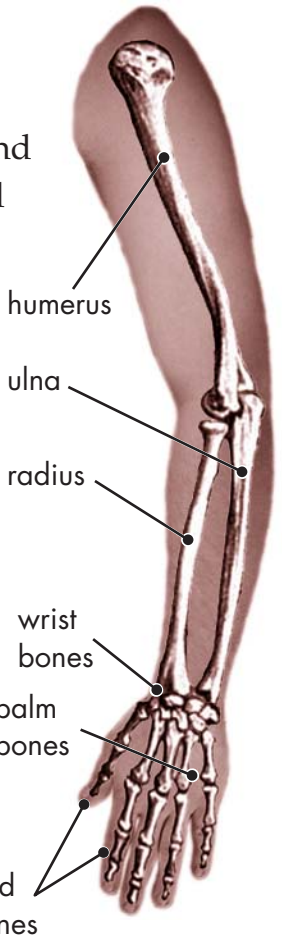
The skeleton of a newborn baby is not the same as the skeleton of an adult. An unborn baby has cartilage instead of bones. As the unborn baby grows and develops, the cartilage hardens and turns to bone. By the time the baby is born, most of the cartilage has become bone. As babies become children and then adults, their bones continue to harden or even join together. One of the last sets of bones to join together is the group that makes up the pelvis. These bones become one solid structure when a person is in his or her late teens or early twenties.



And Now the Appendages

Your arms and hands, legs and feet—your **appendages**—enable you to perform many different activities. Your arms and hands allow you to lift and hold things, while your legs and feet help you to move around. Being able to perform these actions is partially possible because of the bones in your appendages.

Your arms are made up of three bones each—the *humerus*, the *radius*, and the *ulna*. The humerus is the upper-arm bone, attached at the top to the shoulder. The radius and the ulna make up the lower part of the arm, between the elbow and the wrist.



These kids use their arms to help hold themselves up.

An X-ray of a hand

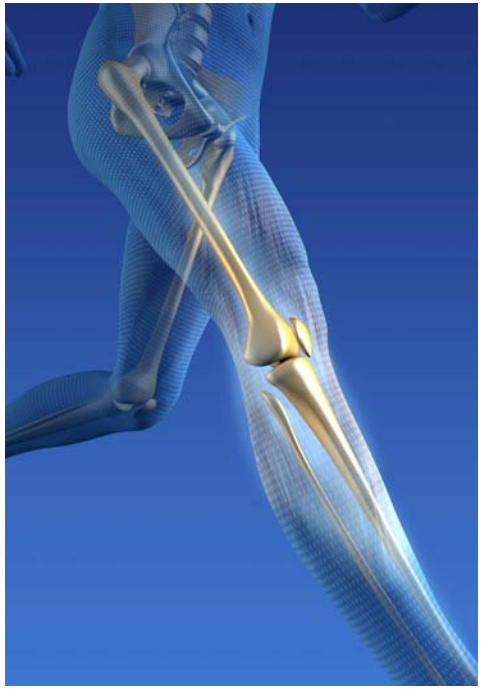
Your wrist and hand together have more bones than any other part of your body—twenty-seven! That's a total of fifty-four bones for both hands. Because wrists and hands have so many bones, they are very flexible and **dexterous**, allowing us to do small, precise activities such as writing, drawing, playing the piano, and tying shoelaces.

Many for Manipulating

Your fingers may be smaller than your arms, but they have more bones. Here's how the number of bones in each part of your arms and hands compare.

Arm: 3 bones
Wrist: 8 carpals
Palm: 5 metacarpals
Each finger: 3 phalanges (fuh-LAN-jeez)
Each thumb: 2 phalanges
Fingers and thumb: 14 phalanges total

The structure of the legs and feet is comparable to the structure of the arms and hands. The top portion of the leg is one solid bone—the thighbone, or *femur*. The bottom part of the leg has two bones—the shinbone, or *tibia*, and the *fibula*. Between the upper and lower parts of the leg is one more bone—the kneecap, or *patella*. The patella lies over the knee joint, protecting the tendons beneath it that allow the leg to bend.



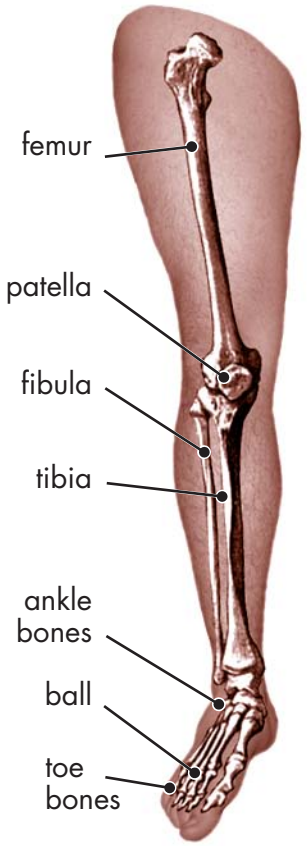
Bones of a runner's leg

Bones Bonus

The longest, strongest, and largest bone in your body is in your leg. It's the thighbone, or *femur*. The femur extends from the pelvis to the knee. To break the femur requires a large amount of force—for example, you would have to fall from a great height or have a high-speed collision while skiing or skating.

Like the hand, the foot is a complex collection of many bones. Each foot has only one less bone than a hand—twenty-six—for a total of fifty-two bones for both feet. The ankle and heel of a foot have seven *tarsal* bones, and the ball of a foot has five *metatarsal* bones. Like the hand, the foot has fourteen *phalanges*—two for the big toe and three each for the remaining toes. Skin and tissue on the bottoms, or soles, of the feet protect the bones from the impact of jumping and running.

Foot bones are cushioned by the skin and tissue around them so they don't break when you run, jump, and hop.



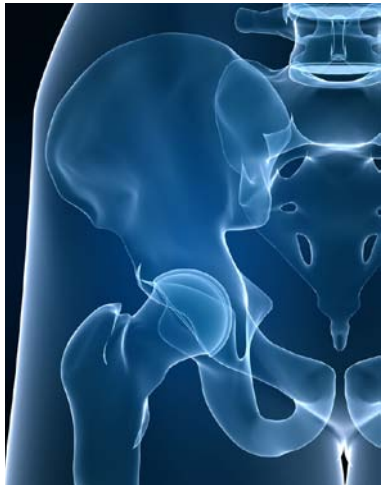
Your joints allow you to bend and twist into unusual positions.

Don't Get Out of Joint

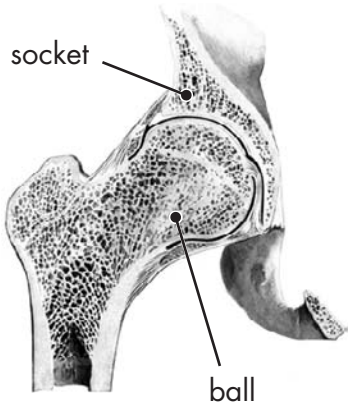
Along with 206 bones, the adult human body has over 100 joints. Joints are the places where bones meet. Bones are hard and unbending, but because bones are connected at joints, our bodies can bend and twist.

Bones Bonus

Sometimes we say that people are double-jointed, which doesn't mean that they have two joints instead of one. Double-jointed people are more flexible than the average person because the ligaments between their joints are looser. These loose ligaments allow them to bend in unusual ways.



An X-ray of the hip joint, which connects the pelvis and femur



The hip joint is a ball-and-socket joint.

Not all joints are the same. The joints where the humerus connects to the shoulder bone and where the femur connects to the pelvis bone are **ball-and-socket joints**. The top ends of the humerus and femur have a ball shape, each of which fits snugly into a round socket in the shoulder and pelvis respectively.

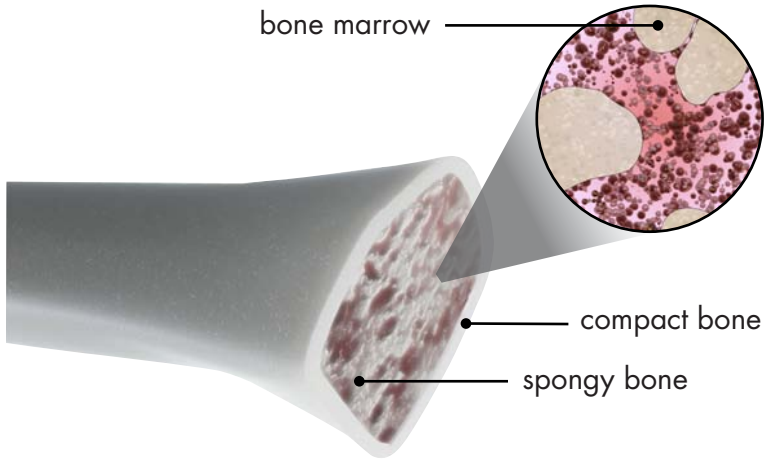
The elbow joint and the knee joint are examples of **hinge joints**, which can only bend in one direction. The joints between the vertebrae of your spine, which are **swivel joints,** enable your body to tilt and turn. The last type of joint is a suture, like those found on the skull. Sutures connect the skull bones but don't allow much movement.

Inside Your Bones

It might seem as if a bone is nothing more than a hard, dead object, like a rock, but that isn't the case. Bones are definitely alive with millions of bone cells that need oxygen and food to survive, just like other types of cells.

On the outside, a bone is hard and solid. This outer layer is the *compact bone.* Below the compact bone is the *spongy bone,* which contains tiny holes to keep the bones light in weight so our muscles can lift them.

Below the spongy bone and also within it is the **bone marrow**. Bone marrow is important because it is the place where the body makes blood cells. The bone marrow in a typical adult produces over 50 billion red blood cells every day!



Keeping Bones Healthy

Even though bones are very strong, they can break if they are struck with enough force. Healing a broken bone requires a little help from a doctor and a great deal of help from bone cells.

For a bone to heal properly, the bone must be put back together exactly the way it was before the break. Depending on the severity of the break, doctors may need to move around the broken bones to put them back in position. Then they place a cast around the body part where the bone was broken. The cast prevents the body part from moving so the bone has time to heal. As soon as a bone breaks, bone cells immediately begin repairing it. Holding the broken bone in place with a cast allows the bone cells to do their job.

A cast helps hold a broken bone in place so it can heal.

Bones need to stay healthy to remain strong. Exercising regularly is the best way to keep your bones in good working order. Eating a well-balanced diet helps the bone marrow to produce healthy blood cells. **Legumes** (such as pinto beans or peas), other vegetables, and fruits are good for your bones. Foods rich in calcium, such as dairy products and fortified soy milk, rice milk, and orange juice, can also help bones to grow.

Your bones give your body its shape, and they also give you much more. They give you the ability to move, sit, stand, and write. You wouldn't be you without your bones!

Bones help you do all kinds of fun activities.

Glossary

appendages *(n.)* external body parts that stick out of the body, such as arms or legs (p. 14)

ball-and-socket joints *(n.)* joints that fit together as a ball fits into a glove (p. 19)

bone marrow *(n.)* spongy material in the center of bones that creates blood cells (p. 20)

cartilage *(n.)* an elastic tissue found in humans and other vertebrates (p. 9)

dexterous *(adj.)* able to make complex movements gracefully (p. 15)

fused *(adj.)* joined together (p.10)

hinge joints *(n.)* joints that open like a door (p. 19)

legumes *(n.)* plants with seed pods, such as beans, lentils, or peas (p. 22)

ligaments *(n.)* tissues that connect one bone to another bone (p. 5)

spinal cord *(n.)* a collection of nerves that are protected by vertebrae (p. 11)

sutures *(n.)* joints or seams between skull bones (p. 7)

swivel joints *(n.)* joints that can tilt or turn (p. 19)

tendons *(n.)* tough tissues that attach muscles to bones (p. 5)

vertebrates *(n.)* animals with backbones (p. 4)

Human Skeleton