

The Locomotive System

Makes motion happen

The locomotive system is the system in the body that makes movement possible. It consists of the bones that make up the skeleton, the joints that hold the bones together and the muscles that contract and relax to actually make you move.

The skeleton is the framework of the body, and it is made up of bones and cartilage. Bone is made mostly of calcium, which is why it is important to drink milk to keep your bones strong. Milk is a food that is rich in calcium.

Inside the bone is sponge-like matter called bone marrow. This makes bones light so people can move easily, but strong enough to support body weight. Bone marrow also produces red and white blood cells. Red blood cells have hemoglobin and carry oxygen. White blood cells produce antibodies to attack bacteria, infections and diseases.

The skeleton has many jobs. It provides protection to internal organs, it supports the body and gives it its shape, and it provides a place for muscles to attach.

Bones are important to almost every movement we make. Bones couldn't move a pencil, though, without help from muscles. Muscles consist of cells that contract.

Muscles and bones are connected by

tendons, which are something like ropes. When a muscle contracts, it pulls the tendon, which then tugs on the bone, and everything moves.

Although it may seem easy to do something like throw a ball, it's actually complicated when looked at inside the body. To make the motion of throwing, many muscle groups in the

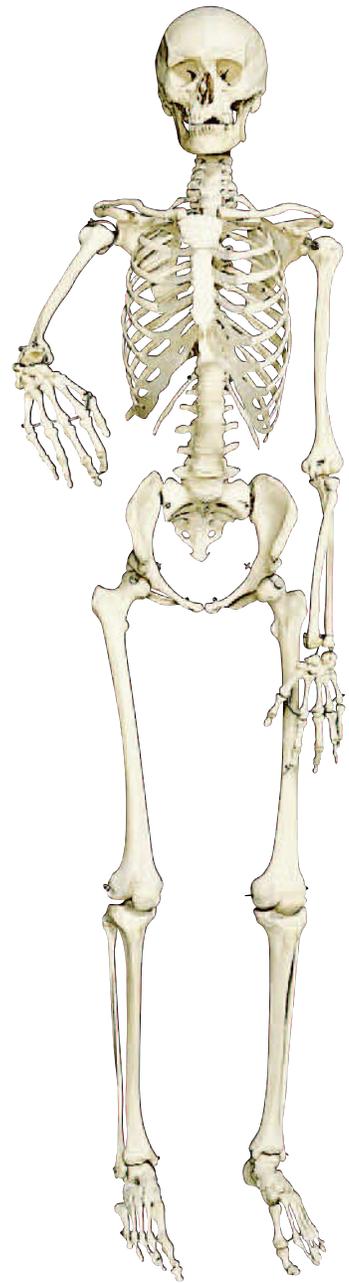
COOL FACT

At birth, humans have 300 bones. As a baby grows, however, many of the smaller bones fuse together so that adults have just 206 bones.

shoulders, arms, chest, abdomen and even legs must be used! Each of these groups must work together with nerves in order for motion to occur. And all this happens in a fraction of a second!

Voluntary muscles are used when you throw a ball. These are the muscles we can control. People also have involuntary muscles, which we cannot control, such as the heart and the stomach.

Another important part of the locomotive system are the joints. Joints are positioned between major bones that come together and help you to move and bend.



There are different kinds of joints, including ball and socket joints in the hips and hinge joints at the knees and elbows. Joints are surrounded by capsules containing fluid that help the bones move smoothly.

Learn with BODY WORLDS

The bones of the human skeleton give the body both strength and structure. A strong and healthy skeleton is important for every person for both work and recreation. Think of three things that you do every day that involve the use of certain bones.

The Nervous System

The messenger and the Boss

The nervous system is the system of the body that controls movements, thoughts and emotions throughout the body. Without it, you wouldn't be able to function!

There are two parts to the nervous system: the central nervous system and the peripheral nervous system. The central nervous system includes the brain and the spinal cord. They work together with nerves to send messages back and forth between the brain and the rest of the body. The brain is the boss. It has five parts: the cerebrum, the cerebellum, the brain stem, the pituitary gland and the hypothalamus.

The cerebrum is the biggest part of the brain and controls thoughts, language and voluntary muscles, which are the muscles you can control. You also use the cerebrum when you think hard in school and when you need to remember things. The cerebellum is a lot smaller than

COOL FACT

The nervous system carries messages from the brain to other parts of the body at more than 100 miles per hour.

the cerebrum, but still very important. It controls balance, movement and coordination. If it weren't for the cerebellum, you wouldn't be able to stand without falling!

The brain stem connects the rest of the brain to the spinal cord. It's the part in charge of major things that keep you alive like breathing, blood pressure and digesting food. Unlike the cerebrum, the brain stem controls the involuntary muscles—the ones that work without you thinking about it, such as the heart and stomach.

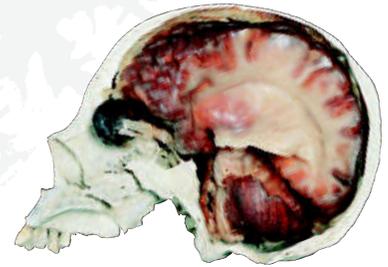
The tiny pituitary gland produces and releases hormones into the body—hormones like those that help you grow and change.

Finally, the hypothalamus regulates your body temperature, your emotions and hunger and thirst.

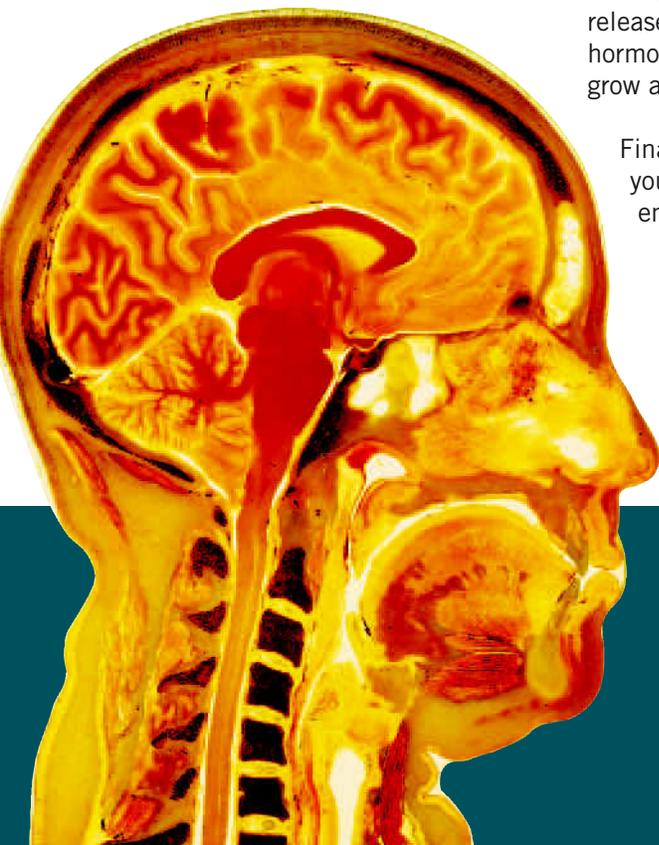
The brain has many jobs, but it needs help from nerves and the spinal cord, too. Every action you do happens because your brain, your nerves and your spinal cord work together.

The nervous system includes millions and millions of neurons, which are microscopic cells. When you do something, messages travel from the neurons to your brain.

The peripheral nervous system is composed of the nerves and neurons that go outside the central nervous system to operate the body's limbs and organs. It is here that everything gets connected.



Next time you take a test, drink a glass of water, laugh or do anything at all, thank your nervous system. Actually, you can thank it right now since it just helped you read this!



Learn with BODY WORLDS

The nervous system carries messages to the brain that make it possible for the body's five senses to work. The five senses are touch, taste, hearing, sight and smell. Explore the five senses by writing about one of your favorite things for each sense. For example you may say that you enjoy listening to classical music, because it helps you concentrate. This relates to your sense of hearing.

The Respiratory System

Oxygen in, carbon dioxide out

The organs of the respiratory system work together, along with other body systems, to ensure that the cells of the body receive the oxygen they need to live.

When you breathe in, the muscles of your chest expand. Your diaphragm lowers, and creates lower air pressure in your lungs than in the world outside. This causes air to enter through the nose or mouth.

Once air enters, it travels past your esophagus, sometimes called the “foodpipe,” and is moistened as it goes down the trachea, or “windpipe,” into the lungs. As the air enters the lungs, the lungs expand outward.

Once inside the lungs, the air travels through tubes called bronchi, into smaller tubes called bronchioles, which get smaller and smaller until they reach alveoli, which are sacs about the size of a grain of sand.

It is through the walls of the alveoli that the oxygen in the air you breathe enters the body’s blood, which flows past the alveoli. The blood receives the oxygen, and in return passes carbon dioxide into the alveoli.

The cells of your body need oxygen to live, and carbon dioxide is the waste of things the cells do. Your red blood cells are little workers that carry the oxygen to the cells, and take the carbon dioxide away.

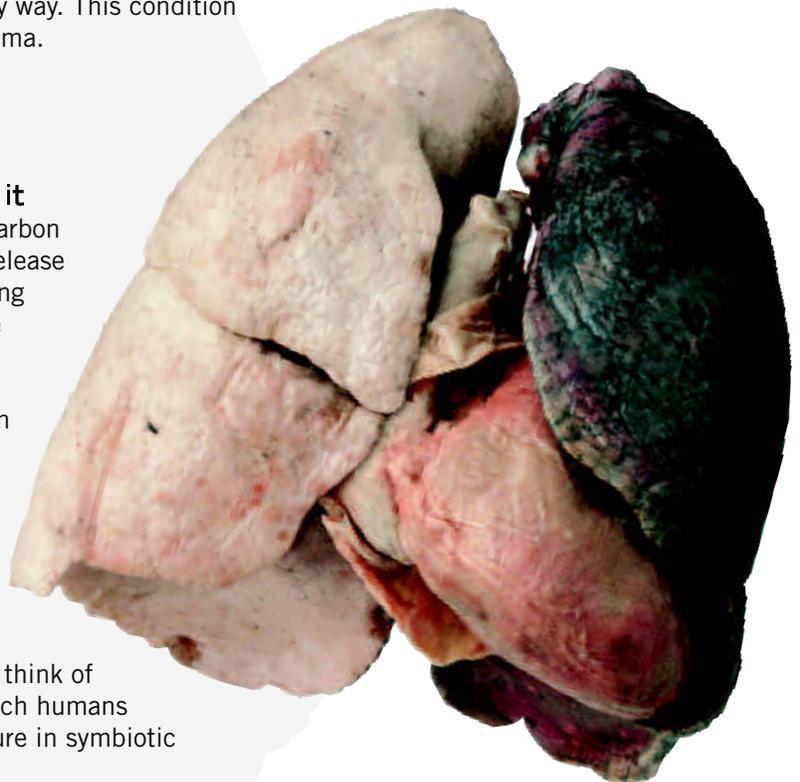
Smoking, as we all know, makes the lungs less healthy, and can lead to death. One of the reasons for this is that smoking makes little structures called cilia stop working. Cilia move within the lungs to help clear things out that enter the lungs. Smoking disables or even kills them. Then harmful particles stay in the lungs. Another bad effect of smoking is that chemicals from cigarettes will build up in the lungs, and the delicate alveoli can become thickened, swollen, and unable to exchange oxygen and carbon dioxide with the blood in a healthy way. This condition leads to emphysema.

Think about it

Plants take the carbon dioxide that we release and use it, creating oxygen, which we need. We in turn take oxygen and turn it into carbon dioxide, which plants need. This is what is called a symbiotic relationship—one that is good for both organisms. Try to think of other ways in which humans interact with nature in symbiotic relationships.

COOL FACT

Your left lung is a bit smaller than the right, to leave room for your heart.



Learn with BODY WORLDS

A healthy respiratory system makes it possible for people to live active lives. Smoking causes problems for the respiratory system. Make a list of five reasons why you shouldn't smoke.

The Cardiovascular System

The body's great pump

Images of hearts are often used to symbolize romance or love.

But actually—and more importantly—the heart is the central organ of the cardiovascular system, and it doesn't look much like the drawings found on Valentines.

Cardio means heart, and the cardiovascular system is essential to our survival.

The cardiovascular system is sometimes referred to as the circulatory system because it's responsible for the circulation of blood through the body.

COOL FACT

At every stage of life, your heart is about the size of the fist you make when you close your hand.



It consists of the heart, which is a muscular pumping device, and a closed system of vessels called arteries, veins and capillaries.

The cardiovascular system's vital role is to provide a continuous and controlled movement of blood through the thousands of miles of microscopic capillaries that reach every tissue and cell in the body.

Human survival depends on the circulation of blood to the organs, tissues and cells of your body. Arteries carry blood enriched with oxygen away from the heart, and veins carry blood that has used up its oxygen back to the heart. Through the heart and lungs, the blood gets a fresh supply of oxygen and delivers it to the rest of the body.

Twenty major arteries make a path through the tissues of the body. Then they branch out into smaller vessels called

arterioles. These branch further into the capillaries, most of which are thinner than a hair—some so tiny, in fact, that only one blood cell can move through at a time.

Once the blood in capillaries delivers oxygen and nutrients, it picks up carbon dioxide and other waste. Then blood moves back through wider vessels, called venules. These eventually join to form veins, which deliver the blood back to your heart to pick up oxygen.

If all the vessels of this network were laid end to end, they would extend about 60,000 miles, far enough to circle Earth more than twice!

Because all the tissues in the body rely on it, the cardiovascular system appears early in developing embryos—in the fourth week after fertilization—and reaches a functioning state long before any other major organ system.

Learn with BODY WORLDS

The cardiovascular system is a delicate system and can be affected by many things. Fats and cholesterol, for example, can slow or even block the flow of blood in the body. Fats and cholesterol enter the body through foods people eat, and that is one reason people are encouraged to limit the amount of fatty or oily foods they eat. Think of ten fatty foods and ten healthier options. For example, you may think of a doughnut as a fatty food and toast as an alternative.

The Digestive System

Converting food into energy

The body's digestive system converts the food you eat into the energy you need to live.

The journey through your digestive system is a long one for food. It starts in the mouth, where teeth grind and tear the food into small pieces. Saliva then wets and softens the food, and begins to dissolve carbohydrates. Once the food is properly mashed and wet, it is pushed by muscle action into the pharynx, or throat, and down the esophagus, which leads to the stomach.

When food reaches the stomach it is mixed and broken down further by acids the stomach produces. The

COOL FACT

Your mouth makes about half a quart of saliva each day, and you produce a total of about seven quarts of digestive juices.

stomach protects itself from these acids by secreting a layer of mucus that lines the inside of the stomach. Some things, such as water and sugars, can be absorbed right out of the stomach and into the bloodstream.

The things that need more digestion have further steps ahead of them. When the stomach has made the food a liquid, the food passes through a valve into the small intestine.

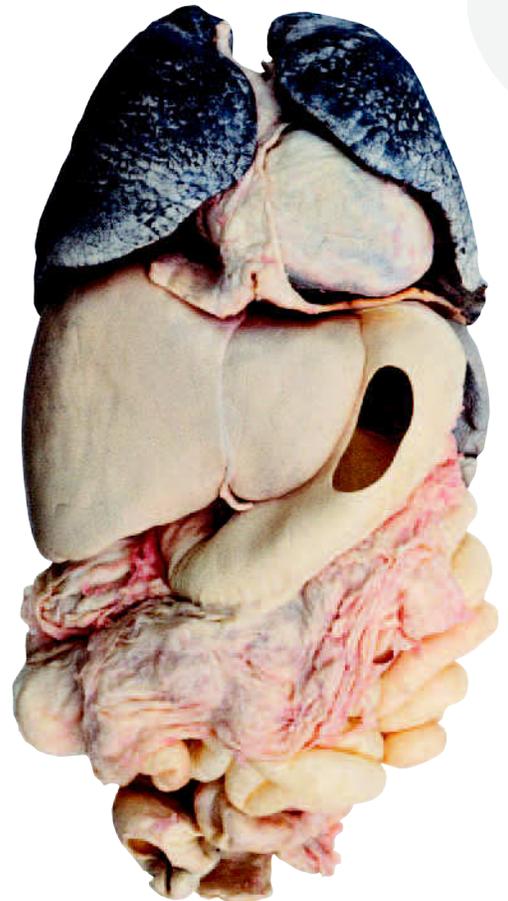
The small intestine has a large surface area because it contains villi. Villi are tiny little structures like very short hairs that stick out into the small intestine. Through the walls of the villi nutrients from food pass into the bloodstream. The bloodstream carries the nutrients to your cells so they can live.

Once all the useful nutrients have been taken from food in the small intestine, the unusable parts pass into the large intestine, or colon.

In the large intestine, water is extracted from the waste and the material hardens into feces. The feces are passed out of the body when you go to the bathroom.

Digestive helpers

The pancreas, liver and gallbladder are all organs that do things important to the digestive system. The pancreas makes enzymes that help digest proteins, fats and carbohydrates. The liver makes bile, which helps the body absorb fat. Bile is stored in the gallbladder until it is needed. Enzymes and bile travel into the small intestine through ducts. Interestingly, people don't really need the gallbladder. If it is removed, the bile just flows right into the small intestine and does its job.



Learn with BODY WORLDS

The digestive system breaks down the food that supplies the human body with energy. What foods would you eat if you needed energy for sports or active recreation? Pick five foods you think would be good sources of energy. Then pair off and research your foods. Were they all healthy choices for getting the energy you needed?