Bluebonnet Learning
K–5 Reading Language Arts

ENGLISH

HOW DOES YOUR BODY WORK?



GRADE 3 UNIT 3 | READER

EDITION 1

Grade 3 | Unit 3

How Does Your Body Work?

Reader

Acknowledgement:

Thank you to all the Texas educators and stakeholders who supported the review process and provided feedback. These materials are the result of the work of numerous individuals, and we are deeply grateful for their contributions.

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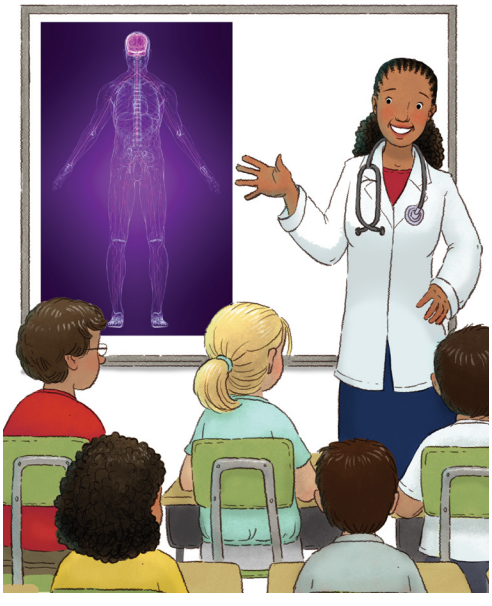
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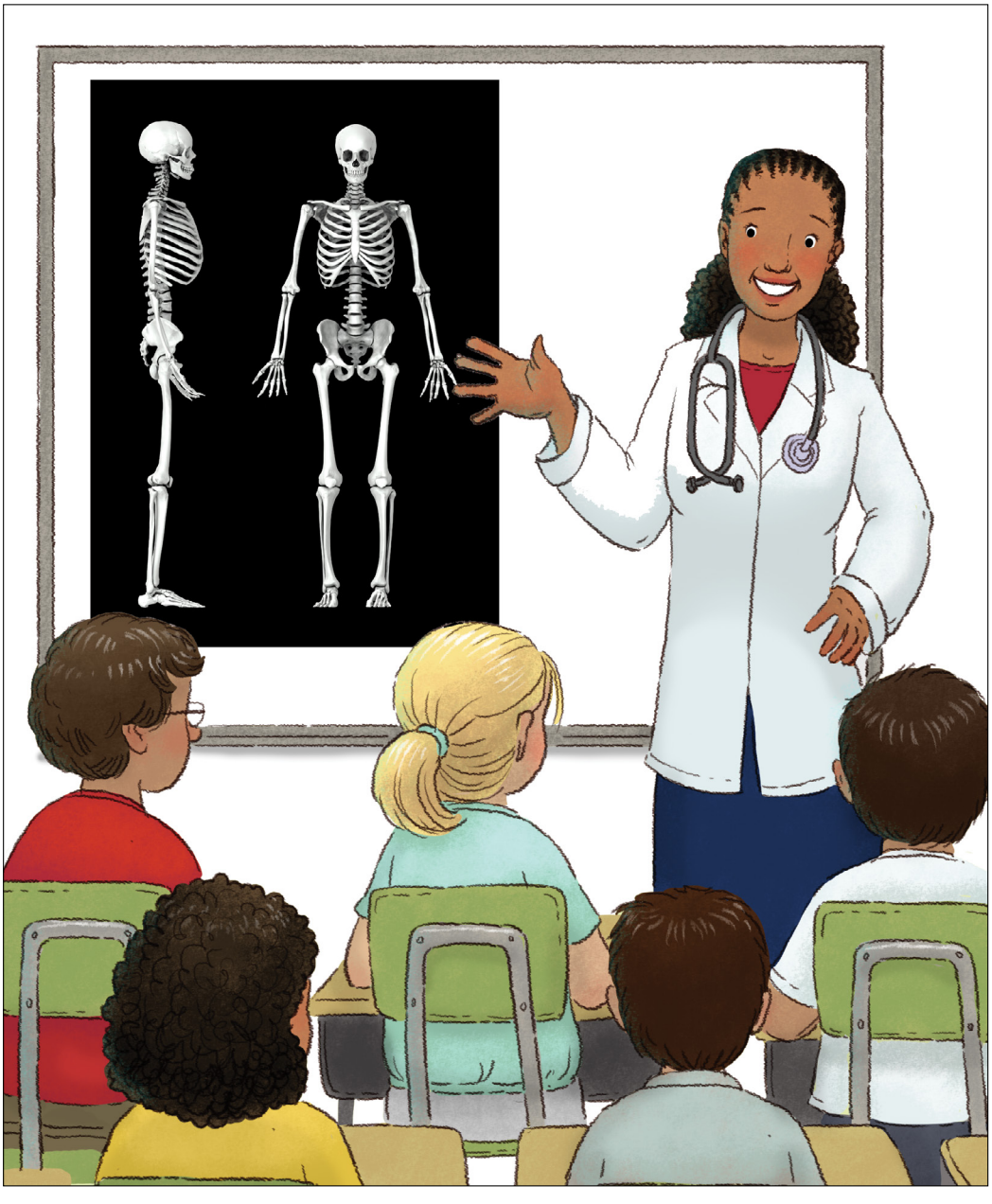
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Chapter 1 The Skeletal System

Hello! My name is Dr. Welbody. Some of you may remember me. I visited your school once before. You were in first grade then. We learned about some of the systems that keep your body working. I told you to eat healthy food so you would grow up to be big and strong. It looks like you listened to me, too! I see that you have grown a lot since then! You are getting big and tall!

I am here today to help you learn more about the body and its systems. In the next few days we will learn about three systems: the **skeletal system**, the **muscular system**, and the **nervous system**.



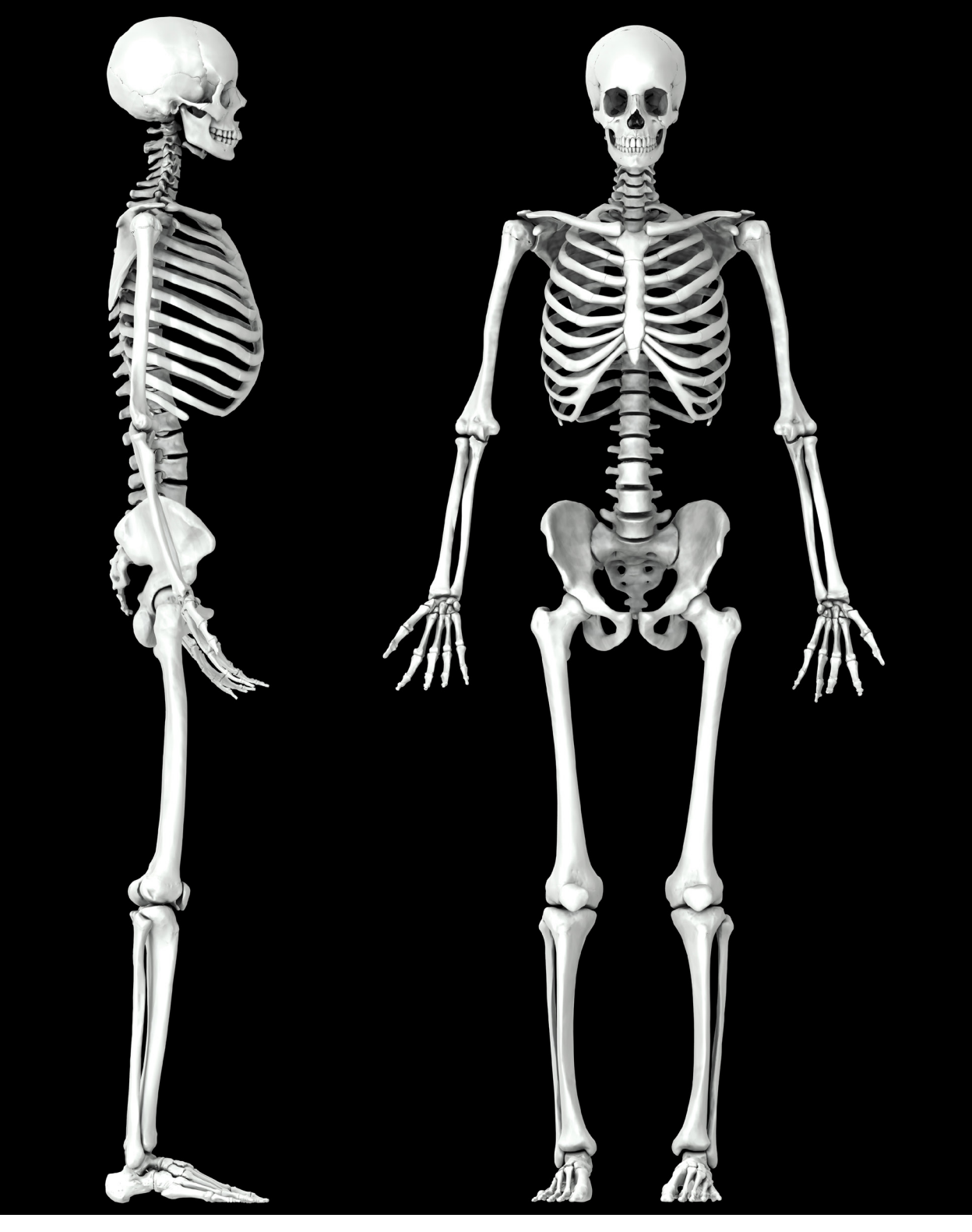
Dr. Welbody presents a slide showing two views of a human skeleton.

I'd like to begin with the **skeletal system**. The **skeletal system** is made up of bones that give your body shape.

I have a slideshow here on my computer. The first slide shows the **skeletal system**. The picture on the right shows what the **skeletal system** looks like from the front. The one on the left shows what it looks like from the side.

There are more than 200 bones in your body. When I went to medical school to learn to be a doctor, I had to learn the name of every bone in the body. I had to study very hard!

You kids don't need to be able to name every bone in the body. But you should know the names of some of the more important bones. So let's get started!



*The **skeletal system** seen from the side and from the front*

Let's start at the top, with the **skull**. Doctors call this set of bones the **cranium**. The **skull**, or **cranium**, has a very important job. It protects your brain.

You might think the **skull** is all one big bone. But that's not the case. In fact, a human **skull** is a set of 22 bones.

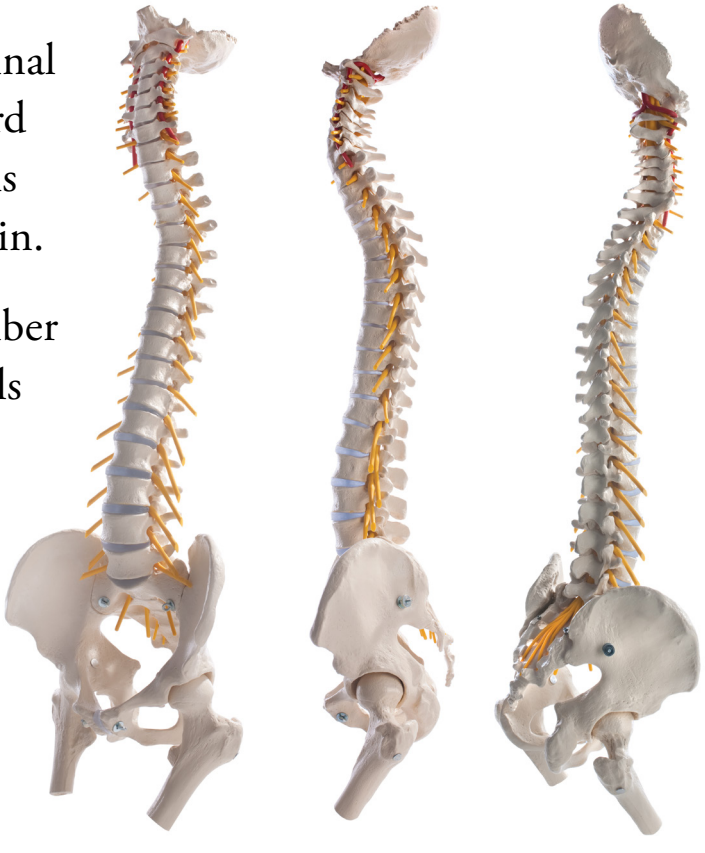


*Human **skull**, or **cranium***

Rub the back of your neck. Can you feel the bone that's right at the base of your neck? That's one of the bones in your spine, or spinal column. The spine is a chain of bones that runs down through your neck and back. It runs from the base of the **skull** all the way down to your hips (or **pelvis**).

The spinal column is made up of more than thirty smaller bones, stacked one on top of another. These smaller bones are called **vertebrae**. The **vertebrae** protect a bundle of nerves called the spinal cord. The spinal cord delivers nerve signals to and from the brain.

You may remember learning that animals with spines, or backbones, are called vertebrates. That's because their spines are made up of **vertebrae**.



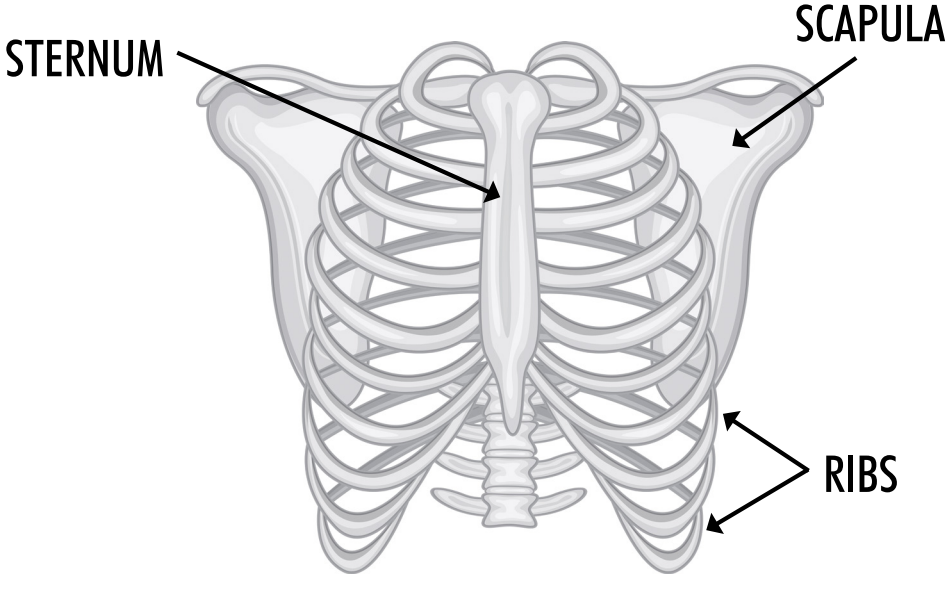
Human spinal column and pelvic bones

My next slide shows the bones inside your chest. If you tap on your chest, right in the middle, you can feel your breastbone. It's also known as the **sternum**.

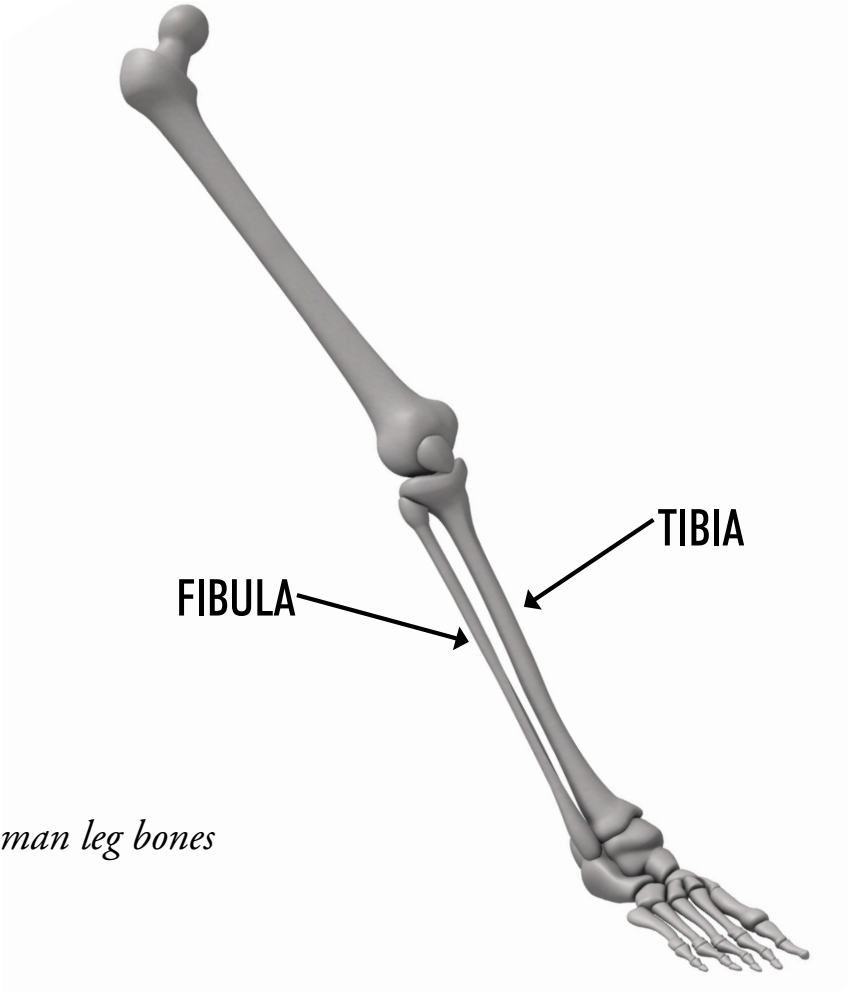
If you tap a bit to the left or the right, you may be able to feel some of your ribs. The sternum and ribs protect inner **organs** like the heart and lungs.

If you look at the slide, you can see why people sometimes talk about "the rib cage." The rib bones look like the bars of a cage.

Do you see the two large bones behind the rib cage? They are shaped like triangles. There's one on each side. These are your **shoulder blades**. The medical name for the **shoulder blade** is the **scapula**.



*Front view of the rib cage with **scapulae** (in back)*



Human leg bones

The last two bones I want to tell you about are leg bones. They are called the **tibia** and the **fibula**. These are the two bones in the lower part of your leg. The **tibia** is the larger of the two.

Okay, that's a lot of bones—and a lot of names. Let's play Simon Says and see if you can remember the names. I'll be Simon.

Are you ready?

Simon says, tap your **skull**.

Simon says, now tap your **cranium**.

Ha! The **cranium** is the same thing as the **skull**. Did I trick any of you?

Simon says, flex your **vertebrae** by bending over and touching your **tibia**.

Simon says, take a deep breath and feel your rib cage **expand**.

Simon says, put your **pelvis** to work and sit down.

Now, reach back and see if you can touch one of your **scapulae**, or **shoulder blades**.

Wait! I didn't say Simon says! Did I catch anyone?



Dr. Welbody plays Simon Says with students.

Chapter

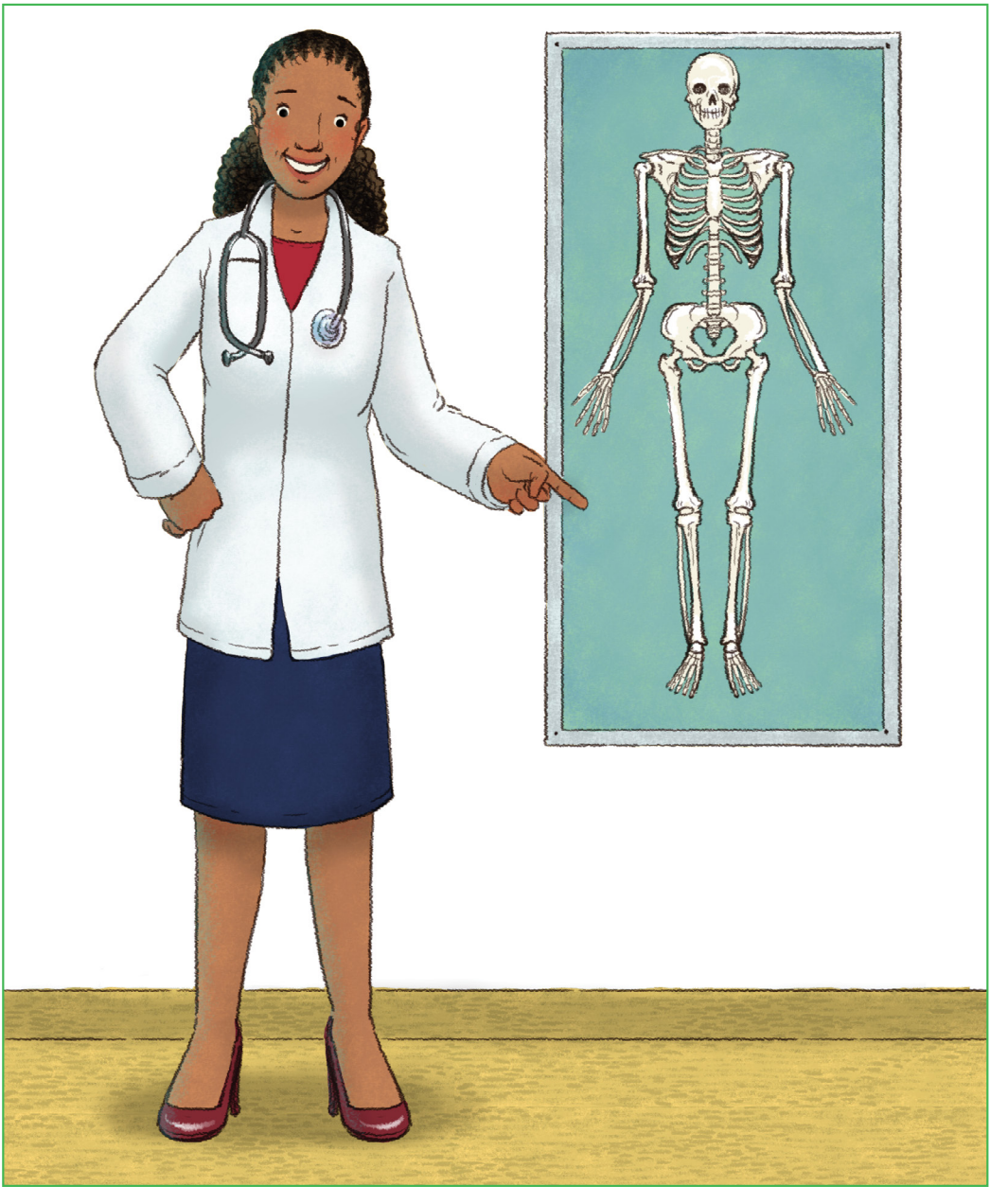
2 All About Bones

Last time, we learned the names of some of the bones in the body. Today, I'd like to tell you a little more about bones.

The bone I'm pointing to is the human fibula bone. The fibula, you may recall, is one of the bones in your leg.

The outer part of a bone is hard. It is made up of the same stuff as a seashell you might find at the beach. That stuff is called **calcium**.

Do you like milk? Milk and other **dairy** products like cheese have lots of **calcium** in them. They are good for your bones. One way to take good care of your bones is to eat a healthy diet with **dairy** products and other foods that provide **calcium** like beans and green leafy vegetables.

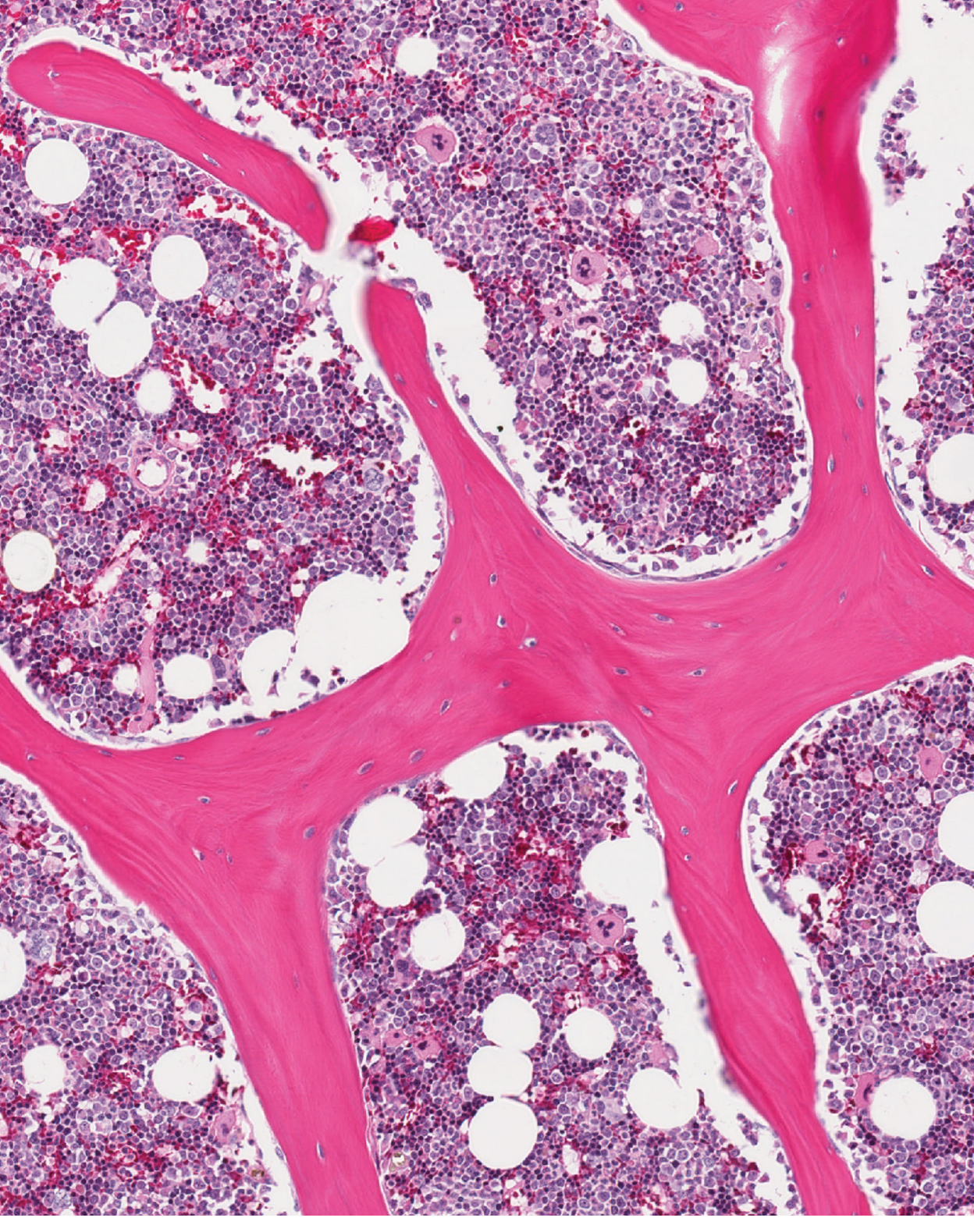


Dr. Welbody points to the fibula.

If you could look inside a bone, you'd see something called bone **marrow**. Since you can't see inside this bone, I'll show you a slide.

This slide shows bone **marrow cells**. I think you may already know a little about **cells**. Is that right? If you look at things with a strong microscope, you can see that many things are made up of tiny **cells**. Your skin is made of **cells**. So are your bones.

Here you can see some bone **marrow cells**. There are millions of **cells** like these inside your bones. The bone **marrow cells** have an important job. They are like little factories. They produce red blood **cells**. Then, the red blood **cells** carry oxygen all around the body.



*A view of bone **marrow cells** through a microscope*

As you get older and taller, your bones grow with you. Bones are strong. They can support a great deal of weight. However, if we put too much pressure on them, or if the pressure comes from the wrong direction, bones can break.

This next slide shows a broken bone. This is a special kind of picture called an **x-ray**.

X-rays are part of the invisible light spectrum. When you aim **x-ray** light at your body, some parts of the body absorb a lot of **x-rays** and some do not. Your bones are hard. They absorb a lot of the **x-ray** light. The soft **tissue** around your bones absorbs less **x-ray** light. That is why doctors like **x-rays**. We can aim **x-rays** at a part of your body and get a picture of the inside of your body. We can use **x-rays** to find out if any bones are broken. You will learn much more about **x-rays** in a later unit about light and sound.



*An **x-ray** image of a broken bone—do you see exactly where the bone is broken?*

Have any of you ever broken a bone?

I fix lots of broken bones each year. Would you like to know how I do it?

I start by taking **x-rays**. That's how I find out if the bone is really broken. If the **x-rays** show that a bone is broken, then I set the bone. That means I put the bone pieces back in the right place. Once the bones are in the right place, I put on a **cast**.

One of the remarkable things about the bones in your body is that they are able to heal themselves. Once a broken bone has been set, it grows back just like it was before it was broken.

Here's a boy I fixed up last summer. He broke one of the bones in his arm. I put the **cast** on to hold the bones in the right place so they would heal. He had to wear the **cast** for two months while the bones healed. Then, I cut the **cast** off for him.



He's just fine now. His bone has healed and his arm is as good as new.

*The **cast** helps the boy's broken arm heal.*

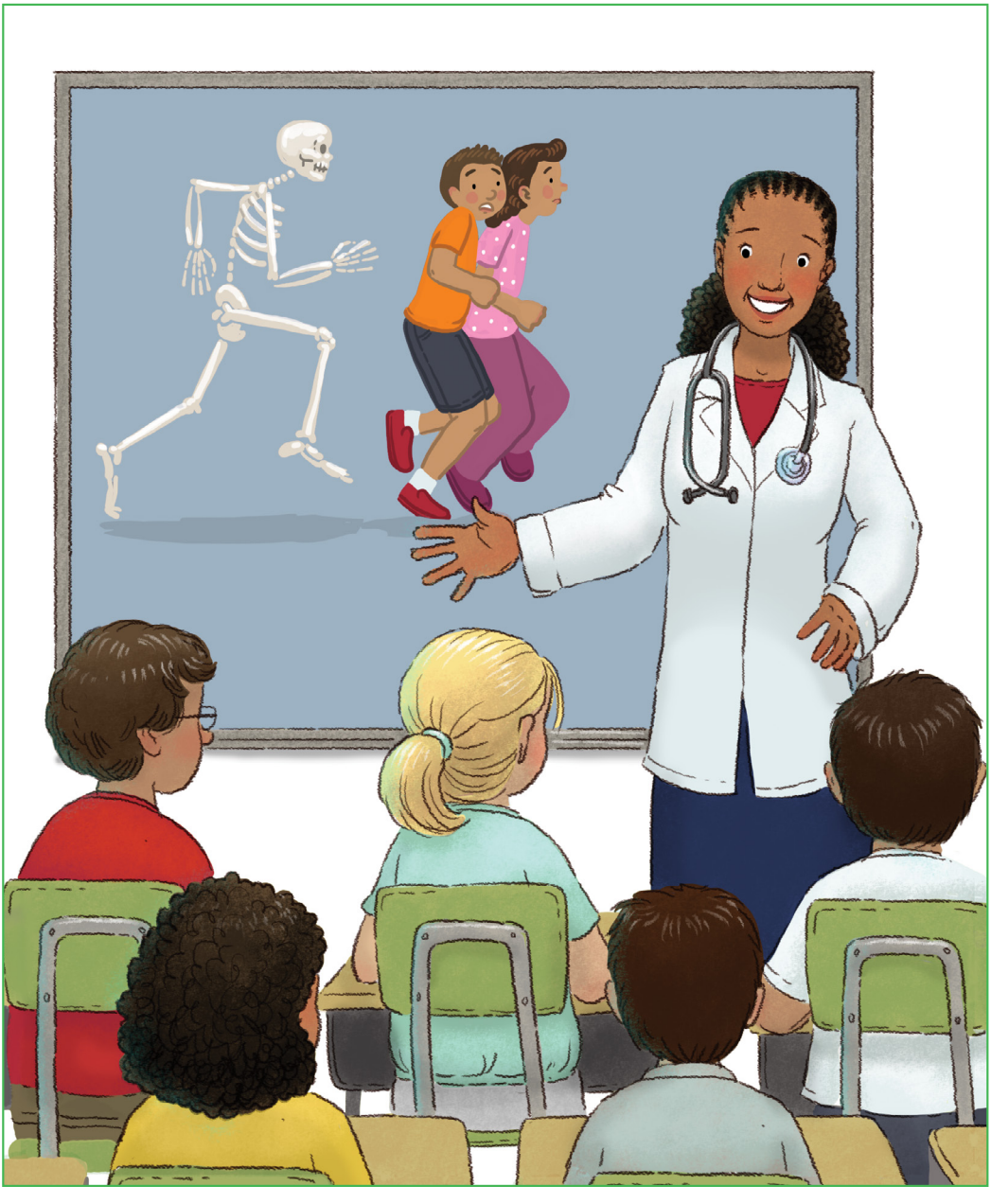
Chapter 3 The Muscular System

Have you ever seen a movie or a TV show in which skeletons chase people? I saw a cartoon like that the other day. These kids were trying to solve a mystery but they were having problems. Every time they went out to look for clues, a skeleton would pop out of a grave and chase them around.

Well, as a doctor, I have to tell you: that's just not very **realistic**. Bones don't move all by themselves. In fact, bones don't go anywhere at all without **muscles**.

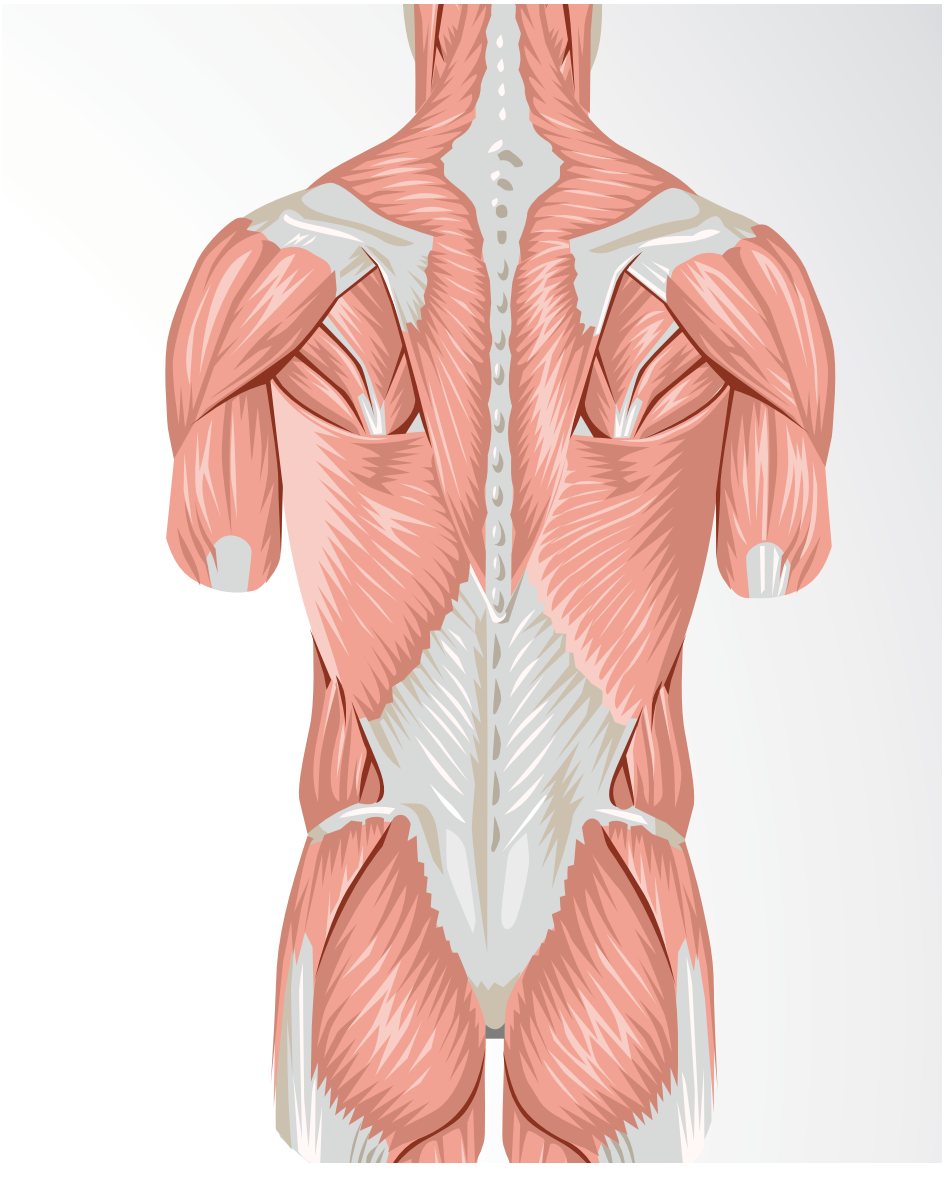
When I bend my arm, I do it by using **muscles**. I tighten the **muscles** in my arm and the **muscles** make the bones and the rest of the arm move.

When you kick a ball, it's the same thing. You tighten the **muscles** in your legs in order to move your leg bones.



Can a skeleton chase you?

This slide shows you some of the **muscles** in the muscular system. You can see that there are lots of **muscles** in our bodies. There are about 650 **muscles** in the human body, in fact. About half of your body's weight comes from **muscles**!



Your body has about 650 ***muscles****.*



***Muscles** help us run.*

Muscles are important to us for many reasons. Can you think of some?

Muscles help us run and jump. They allow us to stand up and sit down. We use **muscles** when we lift heavy objects. We also use them when we chew our food and when we smile. We even use **muscles** when we breathe.

Doctors divide **muscles** into two groups: **voluntary muscles** and **involuntary muscles**. **Voluntary muscles** are **muscles** that you can make move and control. **Involuntary muscles** are **muscles** that you can't control. **Involuntary muscles** work without you even thinking about them. These **muscles** work **automatically**.

The **muscles** that help you move your arms and legs are **voluntary muscles**. When you want to pick up a box, you think about it and then tighten the **muscles** in your arms so you can lift the box. You can also control the **muscles** in your legs when you want to make your body run or jump.



*You move the **voluntary muscles** in your legs to make your body run.*



*A human **stomach***

The **muscles** in your heart, however, are **involuntary muscles**. They keep your heart beating, whether you are awake or asleep. You don't have to think, "It's time to beat again, heart!" These **muscles** work **automatically**.

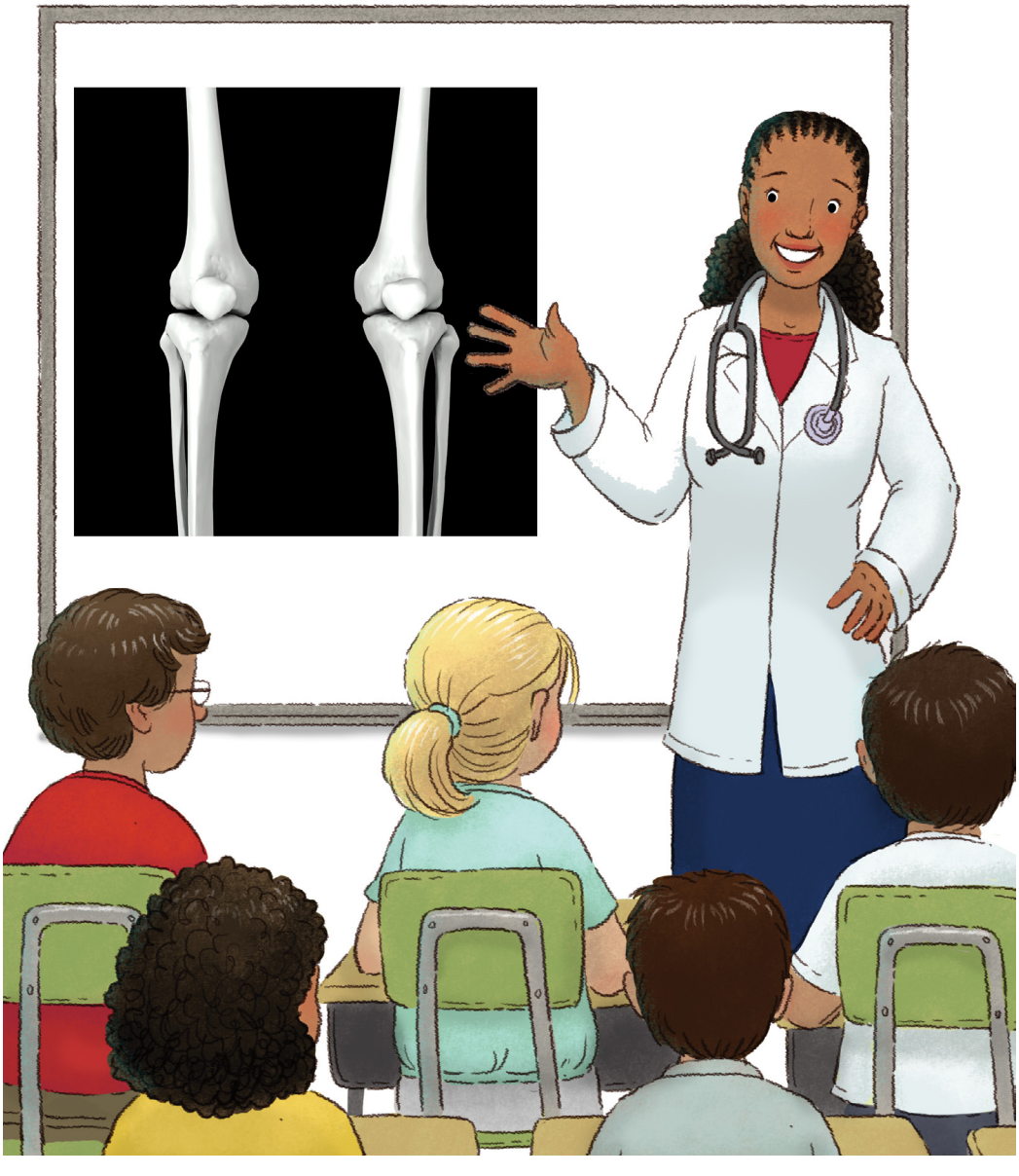
There are **involuntary muscles** in your stomach, as well. Your **stomach** muscles keep mixing and churning to help **digest** your food without you reminding them to do the job.

Chapter 4 Joints and Muscles

Does anyone know what we call the place where two bones come together?

It's called a **joint**.

You have lots of **joints** in your body. Your elbow is a **joint**. So is your shoulder. So is your knee.

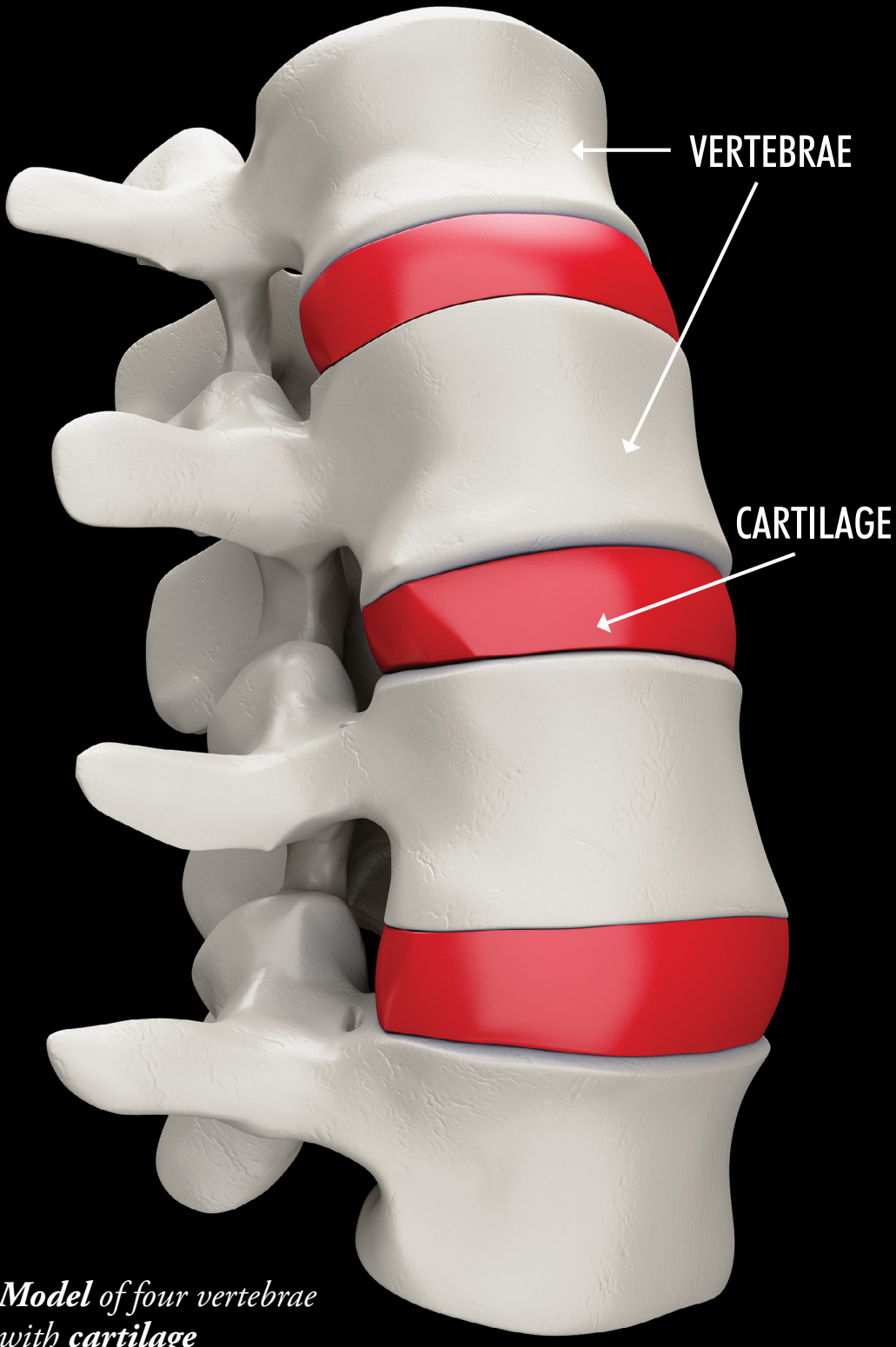


*Dr. Welbody points to an image of knee **joints**.*

Many **joints** are cushioned by **cartilage**. **Cartilage** is a **flexible**, **connective** tissue. It is not as hard as bone, but it is stiffer and less **flexible** than muscle.

Do you remember when we learned about the vertebrae—the bones that make up your spinal column? Well, we have **cartilage** between each of the thirty or so vertebrae in our spinal column. The **cartilage** cushions the vertebrae and keeps them from rubbing against each other. The **cartilage** is shown in red in the **model** on the next page.

You also have **cartilage** in your ears. Grab the top of your ear and bend it down a little. Now, let it go. Do you feel how your ear snaps back into place when you let go of it? It's the **cartilage** that makes your ear do that.

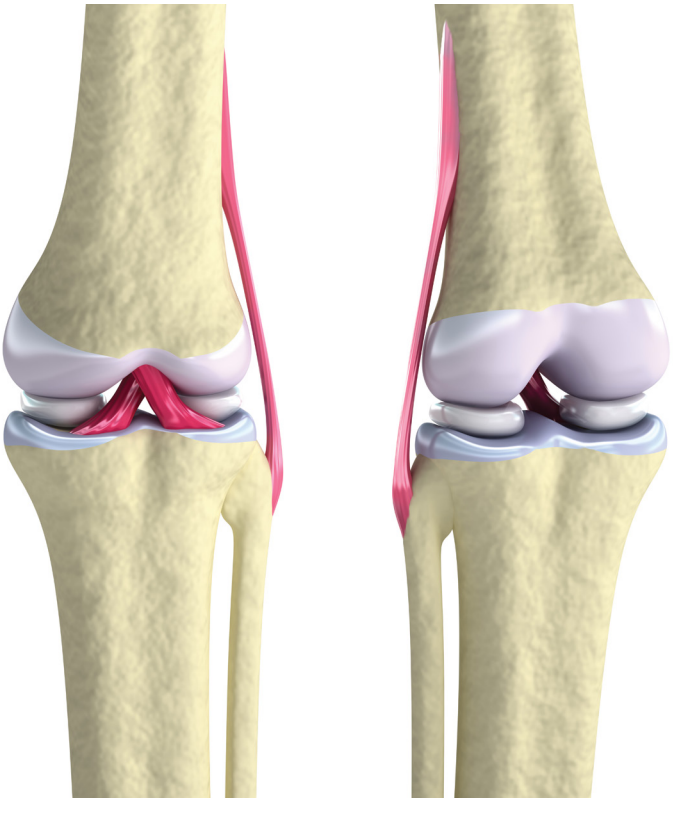


Model** of four vertebrae with **cartilage

Some of the most important tissues in your body are located at the **joints**.

A **ligament** is a kind of tissue that connects one bone with another. Most of your **joints** contain **ligaments**. You have **ligaments** in your knee, in your neck, and in your wrists.

This slide shows **ligaments** in your knee. Can you see how the **ligaments** connect your thigh bone to the bones in your lower leg?



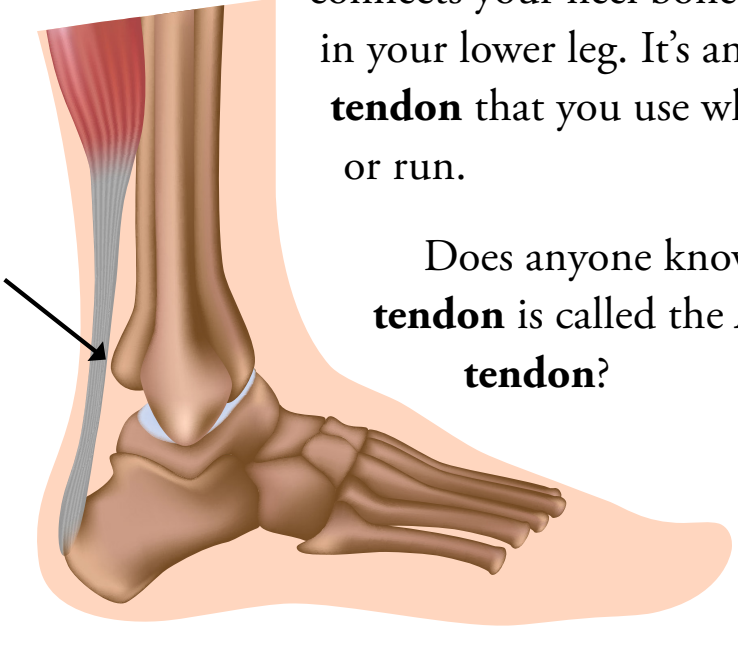
Back view (left) and front view (right) of the right knee showing ***ligaments*** *in red*

Ligaments connect bones to other bones. **Tendons** connect muscles to bones.

I said earlier that the muscular system and the skeletal system are connected. Well, **tendons** link these two systems. **Tendons** connect muscles to bones and allow you to move your bones.

One of the most famous **tendons** in the body is called the **Achilles** [ə-KIL-eez] **tendon**. Does anyone know where the **Achilles tendon** is?

That's right! The **Achilles tendon** is in the back of your leg, just above the heel. The **Achilles tendon** connects your heel bone to the muscles in your lower leg. It's an important **tendon** that you use when you walk or run.



*The **Achilles tendon***

Does anyone know why this **tendon** is called the **Achilles tendon**?

No? Well, then, I guess I had better tell you the story.

The **Achilles tendon** is named for a famous Greek **warrior** named **Achilles**. You may remember hearing about the ancient Greeks when you were in second grade.

When **Achilles** was a baby, his mom tried to make sure that he would never die. She had heard that a person who had been dipped in the River Styx could not be harmed by spears or arrows. She took her son and dipped him in the river. Then, she felt better. She believed that her son was **invulnerable**. Nothing could harm him—or so she thought.

There was just one problem. When she dipped **Achilles** in the river, she held him by his heel. So this heel never got dipped in the river.

Many years later, during the **Trojan** War, a **Trojan warrior** shot an arrow at **Achilles**. The arrow landed right above **Achilles**'**s** heel—the very spot that had not been dipped into the River Styx. **Achilles** died from his wound.

So now you know why the **Achilles tendon** is named for **Achilles**. This **tendon** was the one spot where the mighty **warrior** was **vulnerable** and could be wounded.



Achilles**, the Greek **warrior

Chapter 5 The Nervous System

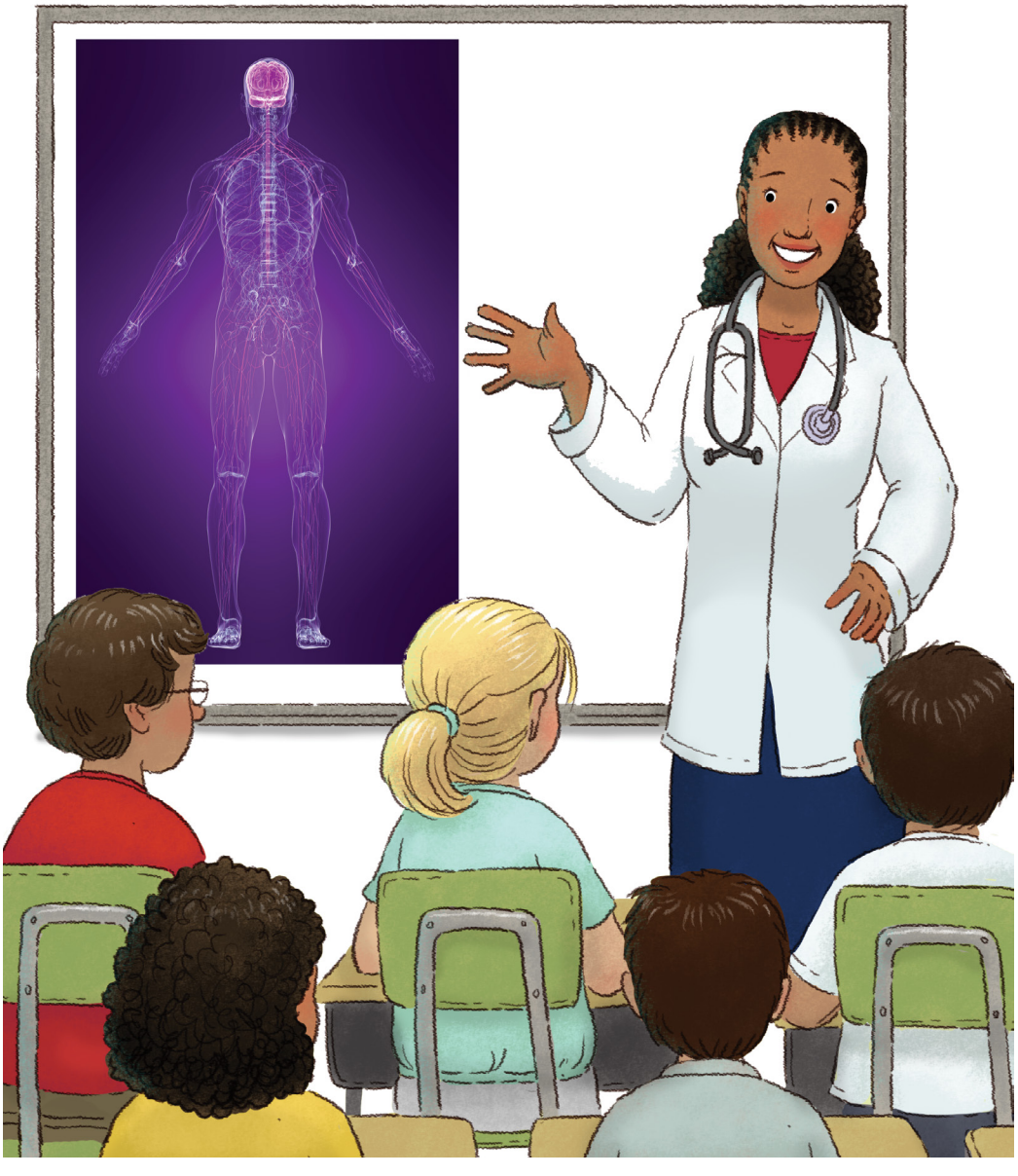
The skeletal system is made up of bones. The muscular system is made up of muscles. The nervous system is made up of—you guessed it—nerves!

You have about 200 bones in your body. You have about 650 muscles to help you move those bones around. How many nerves do you think you have?

Ten? Nope. You have more than that.

Fifty? That's still too low.

You have 100-200 nerves in your body.



Dr. Welbody points to an image of the nervous system.

Your nerves allow you to keep track of what's happening in the world around you. The nerves send messages to the brain. Then, the brain tells your body how to act.

Have you ever walked outside and felt a chill that sent you back inside to get a coat? What happened was the nerves in your skin sent a message to your brain. The message was, "It's cold out here!"

Have you ever touched something hot? Chances are you pulled your hand away pretty quickly. That's because your nerves sent a message to your brain.

Nerves are important for our sense of touch. Without nerves, we couldn't feel heat or cold. We couldn't touch things and find out if they are smooth or rough.

Nerves are important for our other senses, too. Without nerves, we couldn't see or hear. We couldn't smell or taste our food.

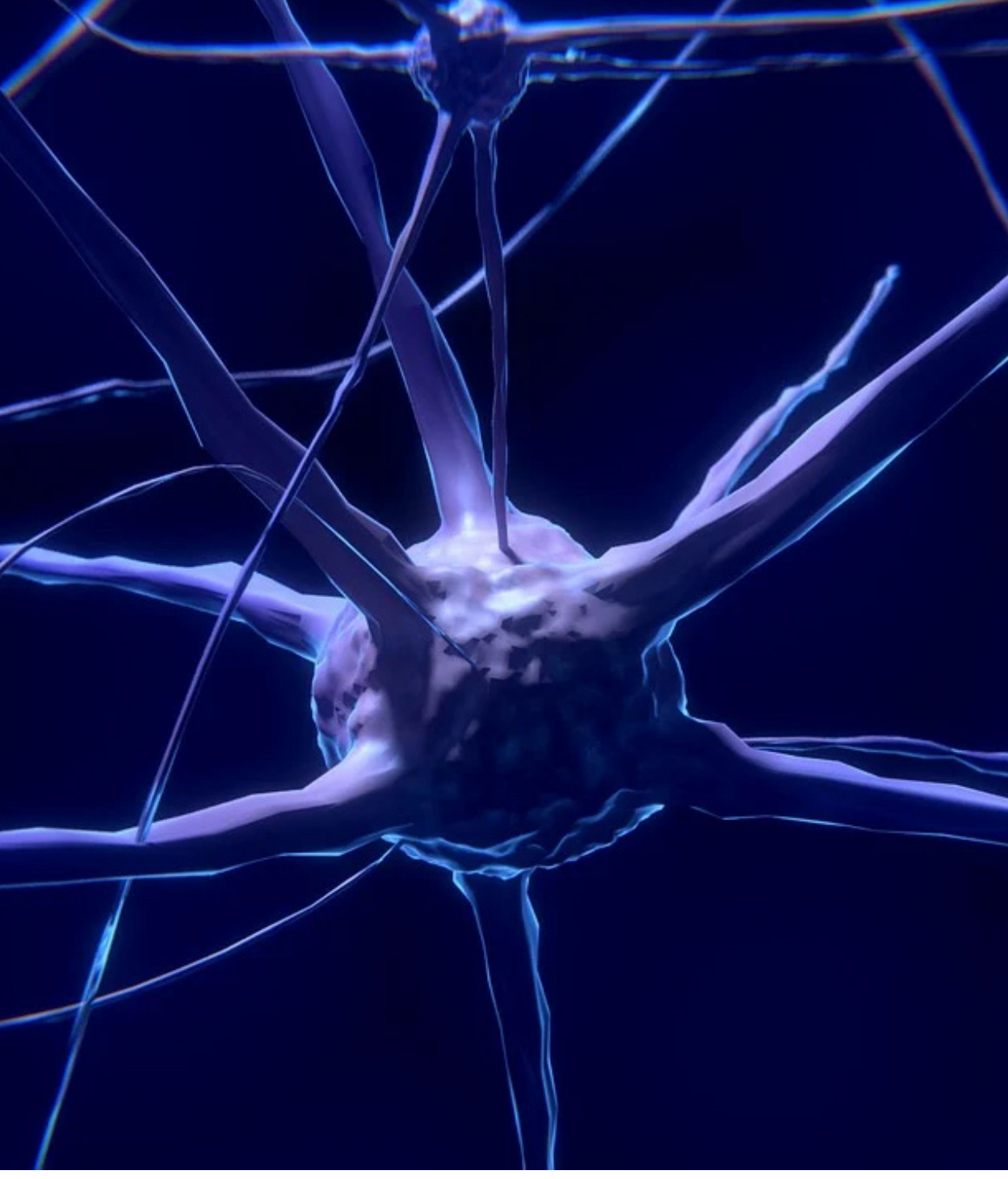


The nervous system with a signal traveling along the nerves to the brain

The nerves in your body are made up of nerve cells. A single nerve contains many nerve cells.

Here is an illustration of nerve cells. You can see that nerve cells have long stringy parts that lead away from the center. The center of the cell is called the **cell body**. The branches of the nerve cell that receive information from other nerve cells are called **dendrites**.

Imagine that you want to send a letter to your aunt who lives in another town. Someone will have to put the letter in a car or truck and drive it to your aunt's house. You might do this yourself. You might pay the post office to do it. When one of the nerves in your body wants to send a message to your brain, it sends the message out along the axons. An axon is a long cable that winds away from from the cell body. The message travels along the axons, much as a car or truck travels along a road. The axons transmit the message and the **dendrites** receive it.



*The stringy parts that lead away from the **cell body** are called **dendrites**.*

Has your family doctor ever tapped you on the knee with a little rubber hammer? Did you ever wonder why he did that?

What your doctor is doing is checking your **reflexes**—which is another way of checking your nerves.

A **reflex** is something the body does without us even thinking about it. If someone jumps out of a closet at you, you may **flinch**. You will tighten up the muscles in your body, just in case the person is trying to hurt you. This is a **reflex**. When you pull away from a hot stove, that is also a **reflex**.

When your doctor taps your knee, he's looking for a **reflex** reaction. If your leg moves a little, that's a sign that your nervous system is working as it should.

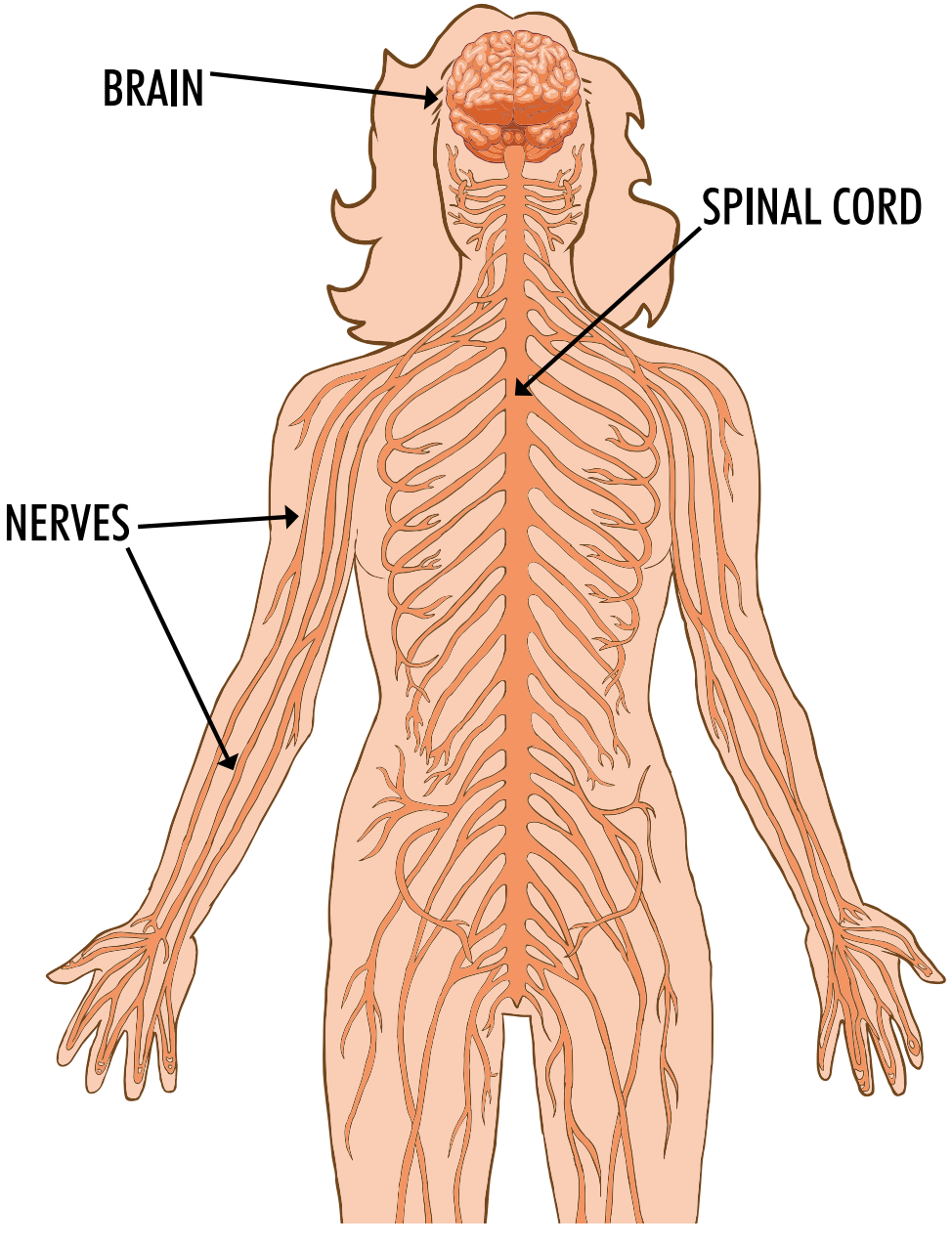


*The doctor checks a boy's **reflexes**, which is another way to check his nerves.*

Chapter 6 The Spinal Cord and Brain

You've got a lot of nerves! Really, you do!

You have nerves in your fingers. You have nerves in your toes. There are nerves all over your body. But there are two parts of your body that are especially important for your nervous system. One is the spinal cord. The other is the brain.



Your brain, spinal cord, and nerves

I told you a little about the spinal cord earlier, when we were looking at the skeletal system. I told you that the bones that make up your spine—the vertebrae—are there to protect your spinal cord. The vertebrae are **hollow** and long strings of nerves run through the **hollow** parts of the bones. The nerves that make up the spinal cord run all the way up your back and neck. They end up in the brain.

If I were to have a serious accident and damage my spinal cord, I might end up **paralyzed**—unable to move my legs and/or my arms. I might need to use a wheelchair to get around, like the boy in this photograph. Some diseases also affect the spinal cord and can result in the use of a wheelchair or powerchair. A powerchair is a wheelchair that is battery powered to assist the person in moving their chair.

You see, the brain uses the spinal cord as a sort of super-highway to send and receive messages to and from the rest of the body. If the spinal cord is broken, or damaged, the messages can't get through to the arms and legs.



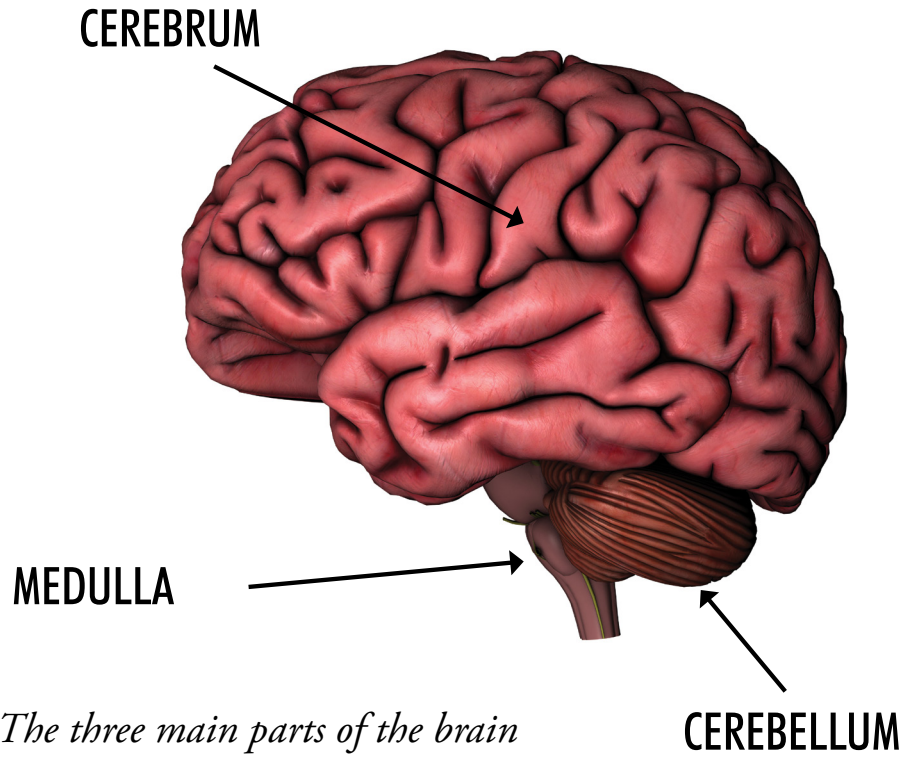
These children have experienced change to their spinal cords, which impacts how they move.

The spinal cord leads right to the center of your nervous system—your brain. It's the brain that receives messages from the nerves. It's the brain that sends messages out to your muscles. Even though the brain weighs only 2–3 pounds, it is the most important organ for life.

The brain is protected by the skull. Inside the skull, there are three layers of fiber and fluid protecting the brain. So, the brain is really well-protected. But it can still be harmed. Ask a football player who's had a **concussion**. Getting a **concussion** is like bruising the brain. Ouch!



The human brain



The three main parts of the brain

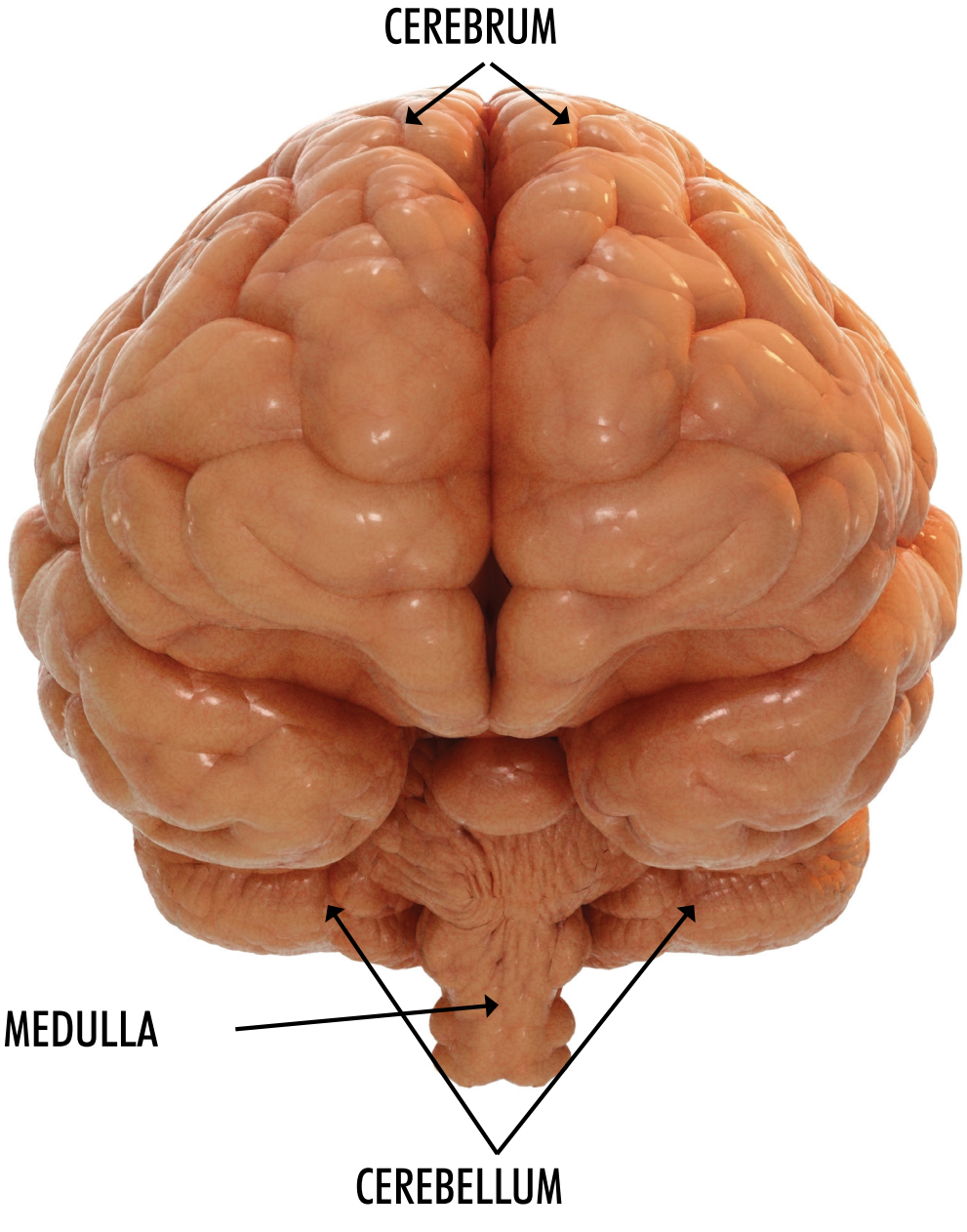
The brain is divided into three main parts: the **medulla**, the **cerebellum**, and the **cerebrum**. Each part has its own job to do.

The **medulla**, or "brain stem," is located at the base of the skull in the back, right where the spinal cord meets the brain.

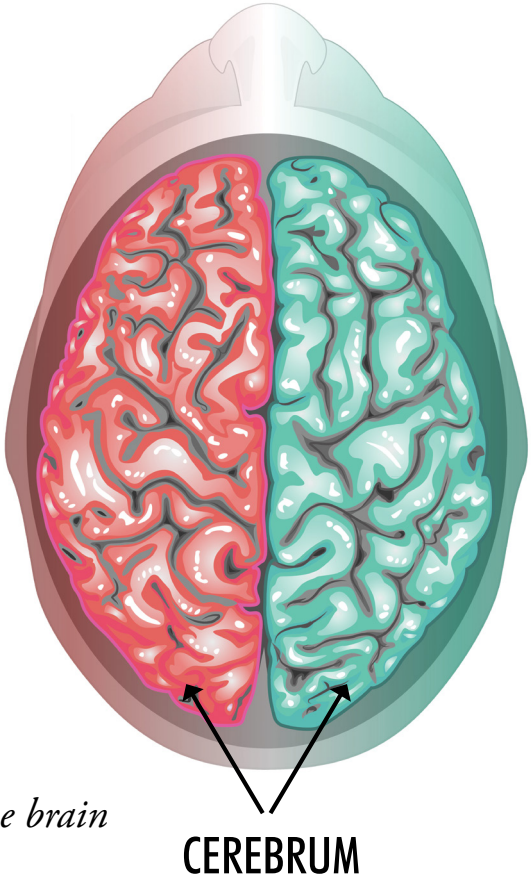
The **medulla** controls the important involuntary actions of the body, like breathing, heartbeat, and digestion.

The **cerebellum** sits right next to the **medulla**. It is divided into two **hemispheres** or halves. The **cerebellum** has several jobs. One of them is to control voluntary movements. That means the **cerebellum** helps you walk, run, and jump.

The two **hemispheres** of the **cerebellum** control different parts of the body. The right **hemisphere** controls movement on the left side of the body. The left **hemisphere** controls movement on the right side. It might seem strange that the left side of the brain controls the right side of the body, but that's just the way we're made.



*The **hemispheres** of the **cerebrum** and the **cerebellum***

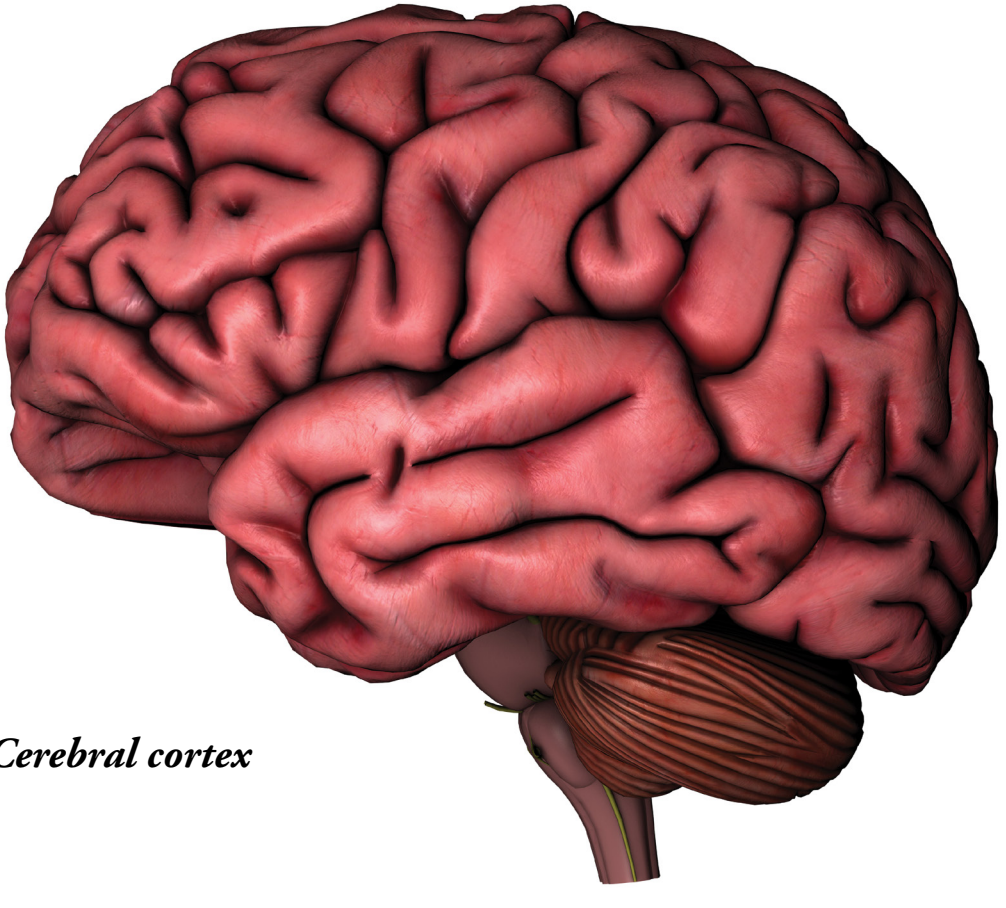


*The **cerebrum** of the brain*

The third part of the brain is the **cerebrum**. The **cerebrum** sits on top of the **cerebellum** and the **medulla**. It is the largest part of the brain.

Each part of the **cerebrum** has a certain job to do. For example, the front part just inside your forehead controls emotions. The very back part just above the brain stem controls the sense of sight. The sense of touch is controlled by a strip of the brain running over the top of your head from ear to ear.

The outside part of the **cerebrum** is called the **cerebral cortex**. The **cerebral cortex** is the wrinkly part of the brain that most people think about when they think of a brain. People sometimes call this part of the brain "the gray matter."



Cerebral cortex

The **cerebrum** is divided into two **hemispheres**, just like the **cerebellum**. Until recently, we did not know much about what the various parts of the **cerebrum** do. But in the past few decades, we have learned a lot.

Scientists now have even more advanced ways than just x-rays to look at and observe different organs in the body, including the brain. They use something called a PET scan to see different parts of the brain work. A scientist may ask the person having the PET scan to do something like talk or blink his or her eyes. When the person performs different actions, different parts of the brain light up on the computer screen. Scientists have learned a lot about what happens where in the brain by looking at PET scans. As you can see from this model of the brain, some of the things we do take place in the left **hemisphere**, while others happen in the right **hemisphere**.

LEFT-BRAIN FUNCTIONS

ANALYTIC THOUGHT

LOGIC

LANGUAGE

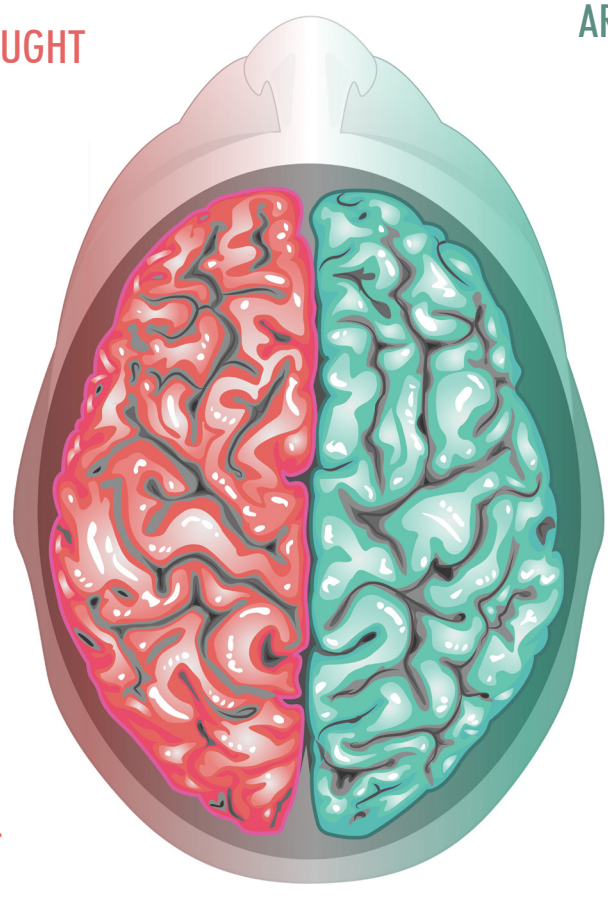
REASONING

SCIENCE AND MATH

WRITING

NUMBER SKILL

RIGHT-HAND CONTROL



RIGHT-BRAIN FUNCTIONS

ART AWARENESS

CREATIVITY

IMAGINATION

INTUITION

INSIGHT

HOLISTIC THOUGHT

MUSIC AWARENESS

3-D FORMS

LEFT-HAND CONTROL

*Things that happen in each **hemisphere** of the **cerebrum***

Chapter 7 Eyes and Vision

For the past few days I have been talking to you about the body and its systems. Your teacher asked me if I could also tell you something about **vision** and hearing.

I told her I could. I know a little about **vision** and a little about hearing, but I am not an expert on either one. So, I told her I would bring in some friends of mine who know more about these subjects.

I have one of those friends with me today. His name is Dr. Kwan Si-Yu. He is a special kind of eye doctor called an optometrist. He can tell you all about the eyes and how they work.



Dr. Welbody introduces Dr. Kwan Si-Yu.

Hello, I am Dr. Kwan Si-Yu. Are you ready to learn all about eyes?

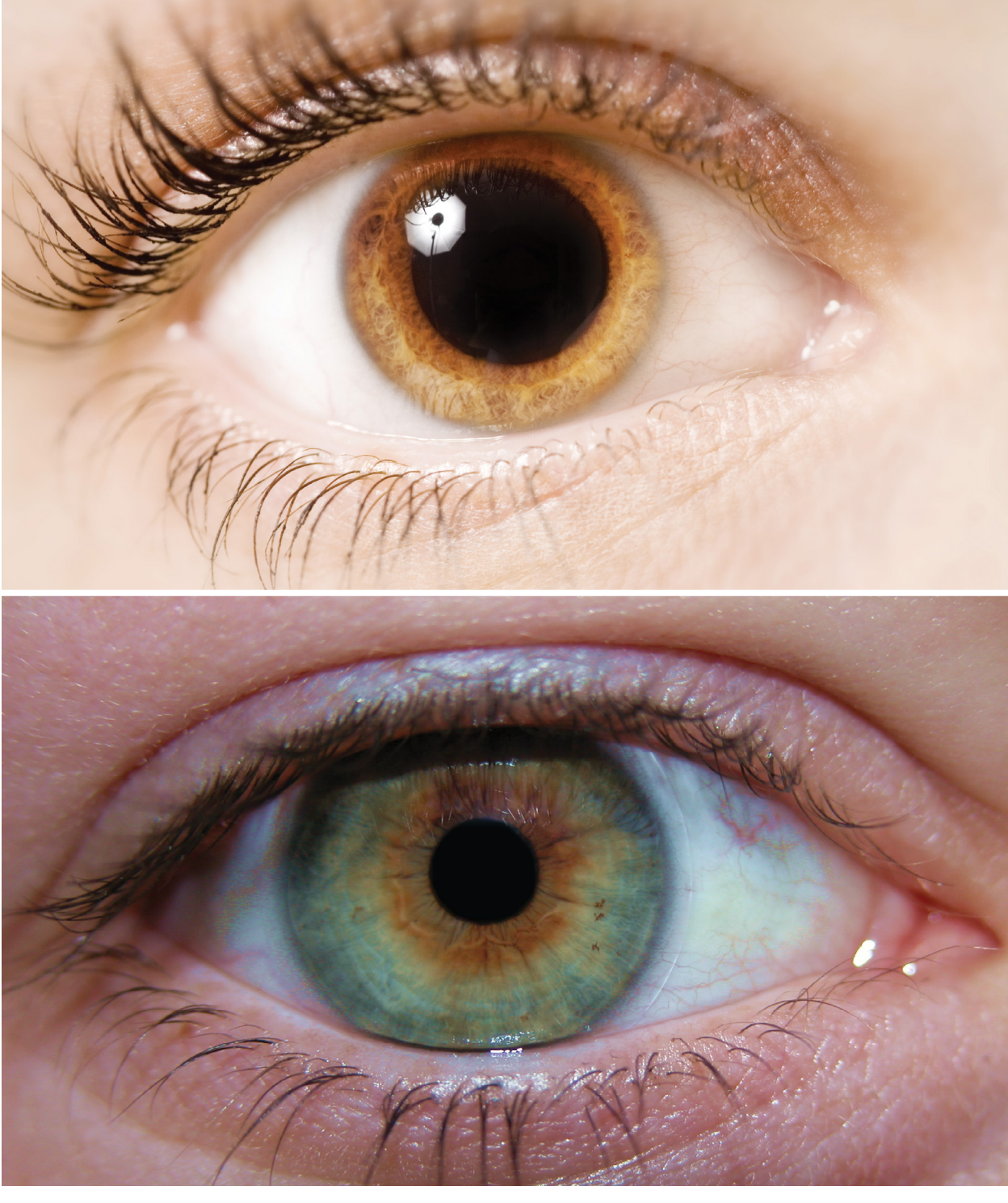
Good!

The human eye has several parts. I'd like to start by showing you two parts you can see easily.

In the images on the right, you can see what eyes look like up close. The **pupil** is the black part in the center of the eye. The **iris** is the colorful part of the eye that surrounds the **pupil**.

The **iris** can be different colors. Some of you may have green eyes or brown eyes. When we say that a person has green eyes or brown eyes, it's his or her **irises** we are talking about.

The **pupil** is not as colorful as the **iris**. It is always black, but it changes size. When it is dark, the **pupil** gets bigger to let more light in. When it is very bright and sunny, the **pupil** shrinks to let less light in. How much light will be let into the inside of your eye depends on the size of the **pupil**.



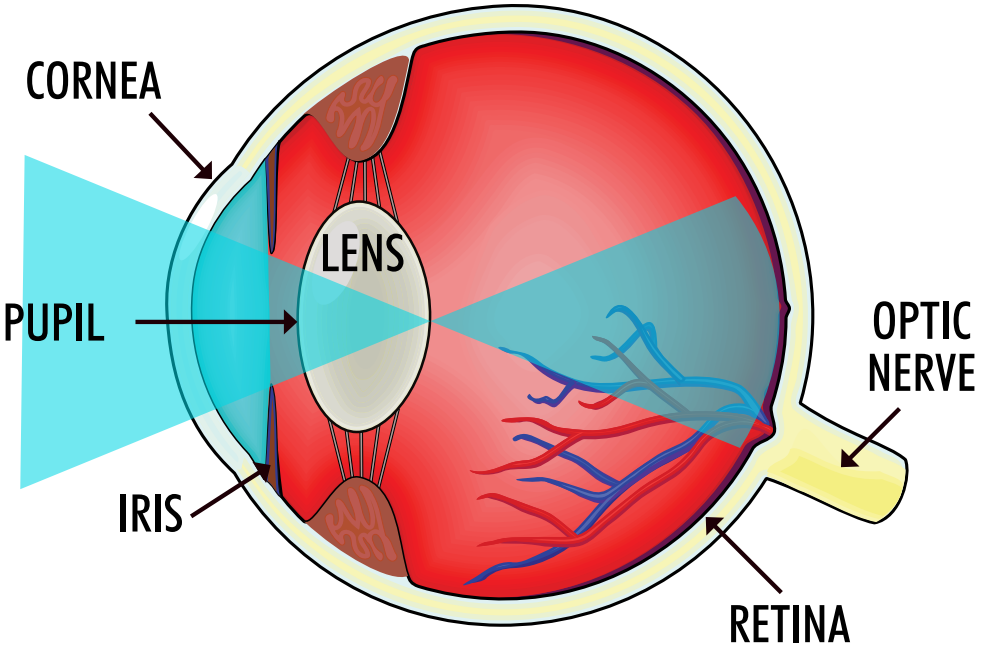
*The top picture shows a large **pupil**, which is letting more light in. The bottom picture shows a small **pupil**, which is letting less light in.*

Now, let's learn about some parts of the eye that you can't see just by looking at a person's face.

The picture on the next page shows some parts of the eye as they would look if you could see inside a person's head. You are looking at them from the side.

You can see the **iris** and the **pupil**. There are also some other parts shown.

- The **cornea** is a thin, clear tissue that covers the colored part of the eye. It helps protect the eye from dirt and germs.
- The **lens** is the part of your eye that focuses light. The **lenses** in your eyes curve outward.
- The **retina** is made of a special kind of tissue that is very sensitive to light. Light from the **lens** falls on the **retina**. Then, nerves in the **retina** send messages to the brain.
- These messages travel down a nerve called the **optic nerve**.



The human eye

Now, let's see how all of these parts work together so you can see things. You may be surprised to learn that the eye does not really see objects. Instead, it sees the light that reflects off objects.

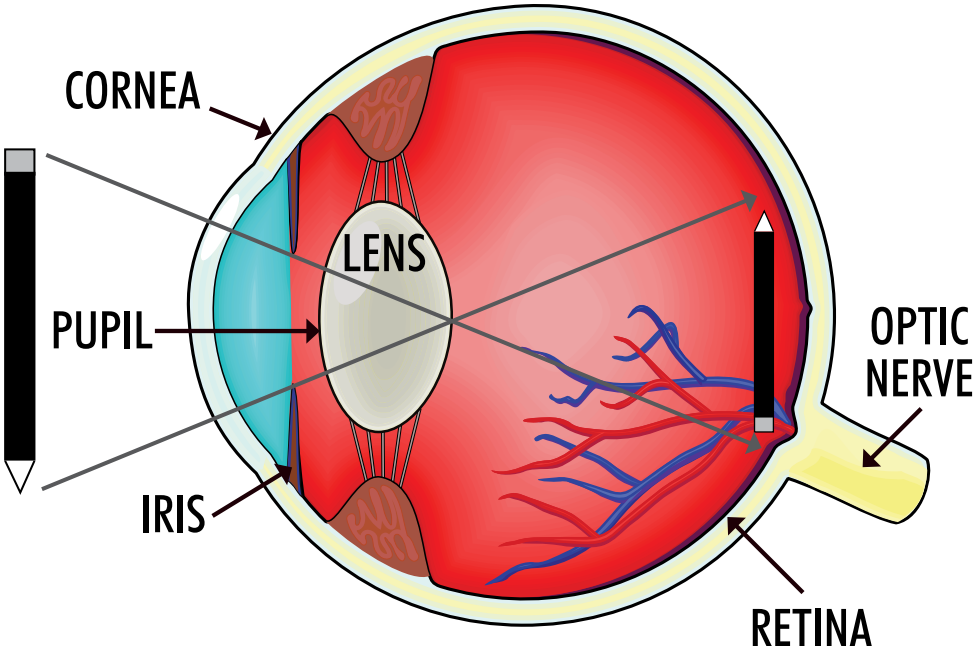
Light passes into the eye—first through the **cornea**, and then through the **pupil**. If it's dark, the **pupil** expands to let more light in. If it's bright, the **pupil** gets smaller to let less light in. When a doctor shines a light in your eyes, she is watching to see if your **pupils** change size.

Next, the light passes through the **lens**, which focuses the light and projects it onto the **retina**.

The **retina** is lined with special cells called **rods and cones**. These are special kinds of nerve cells that sense light. The **rods and cones** send information to the brain, using the **optic nerve**.

All of this happens very quickly—so quickly that it seems like you see things at the exact moment you look at them. In reality, though, you are seeing them a split second later.

The brain combines the information passed through the **optic nerve** of each eye to make one image. That is when you "see" the object.



Your eyes see light reflected off objects.

Chapter 8 Ears and Hearing

Boys and girls, today you are going to learn about the sense of hearing. I'm an expert on eyes and vision, but not on ears and hearing.

That's why I brought in a friend of mine. This is Dr. Audit. She is an ear doctor. She will tell you all sorts of interesting things about your ears!

So please welcome Dr. Kim Audit.

Hi! Can you all hear me?

You can? Well, then, tell your ears thanks! Your ears work for you all day long. They tune into all kinds of sounds. They help you learn during school. They help you stay safe on the playground. When was the last time you thanked your ears for all the help they give you?



Dr. Kwan Si-Yu introduces Dr. Kim Audit.

I'm here to teach you about ears and hearing. But I'd like to start by using this drum to tell you about sound waves. Let me give it a couple of taps.

A drum is just a thin **membrane**, or skin, that's been pulled tight over a frame. When you hit a drum, the **membrane** begins to **vibrate**. To **vibrate** means to move back and forth rapidly. The **vibrations** of the drum create **vibrations** in the air. The **vibrations** in the air are called sound waves!



*Dr. Audit demonstrates **vibration**.*

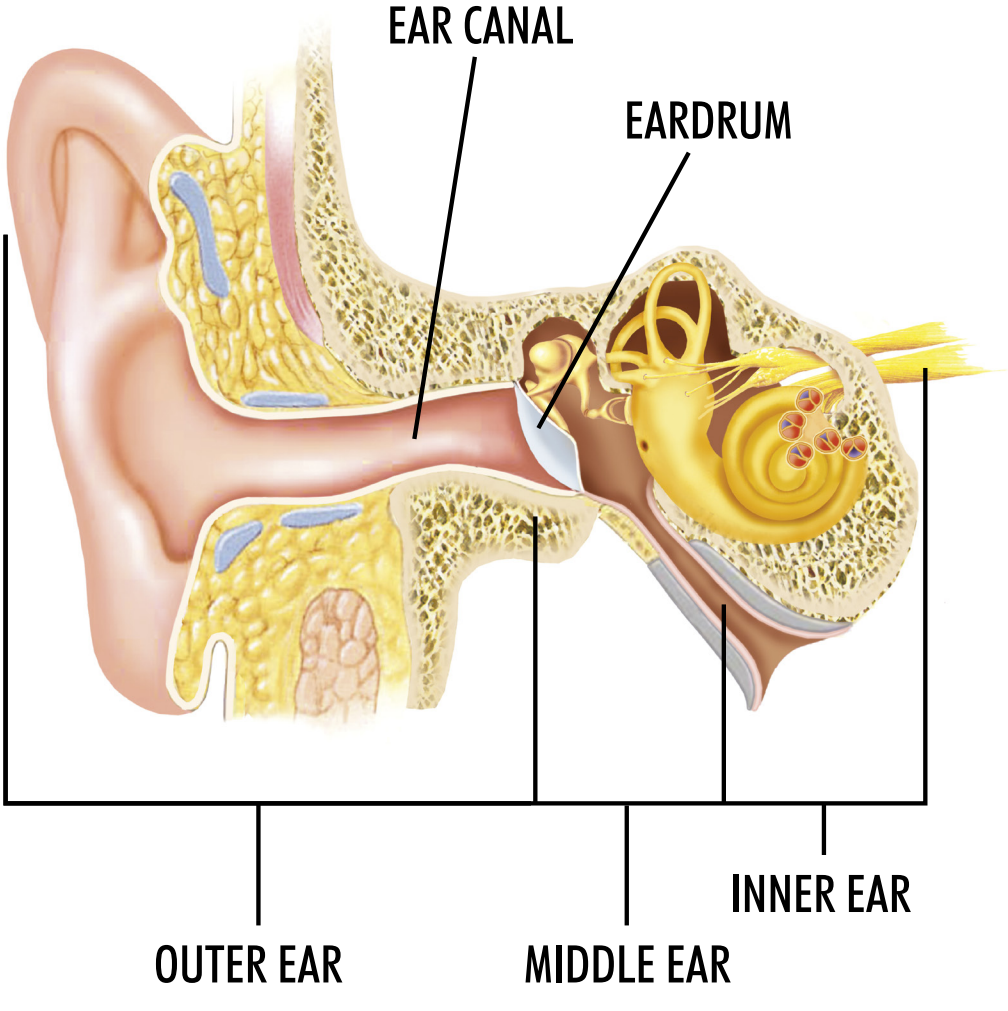
Now back to your ears. Your ears are made up of three parts: the **outer ear**, the **middle ear**, and the **inner ear**.

The part of your ear that you see on the side of your head is called the **outer ear**. The **outer ear** is made of cartilage and fat. The **outer ear** may look funny, but its shape is a good one for catching sounds. That's really the **outer ear's** main job—to catch sounds and guide them into the **middle ear**.

The **outer ear** has an opening in it called the ear canal. The ear canal is a tube that lets sound enter your skull.

The ear canal is lined with hairs and **glands** that produce ear wax. Ear wax helps to protect the ear. It also helps keep germs out of your ears.

The ear canal leads to the **eardrum**. The **eardrum** is a lot like the drum I brought in today. It has a thin **membrane** that is stretched tightly across the ear canal. When sound waves reach the **eardrum**, they make the **eardrum** vibrate.



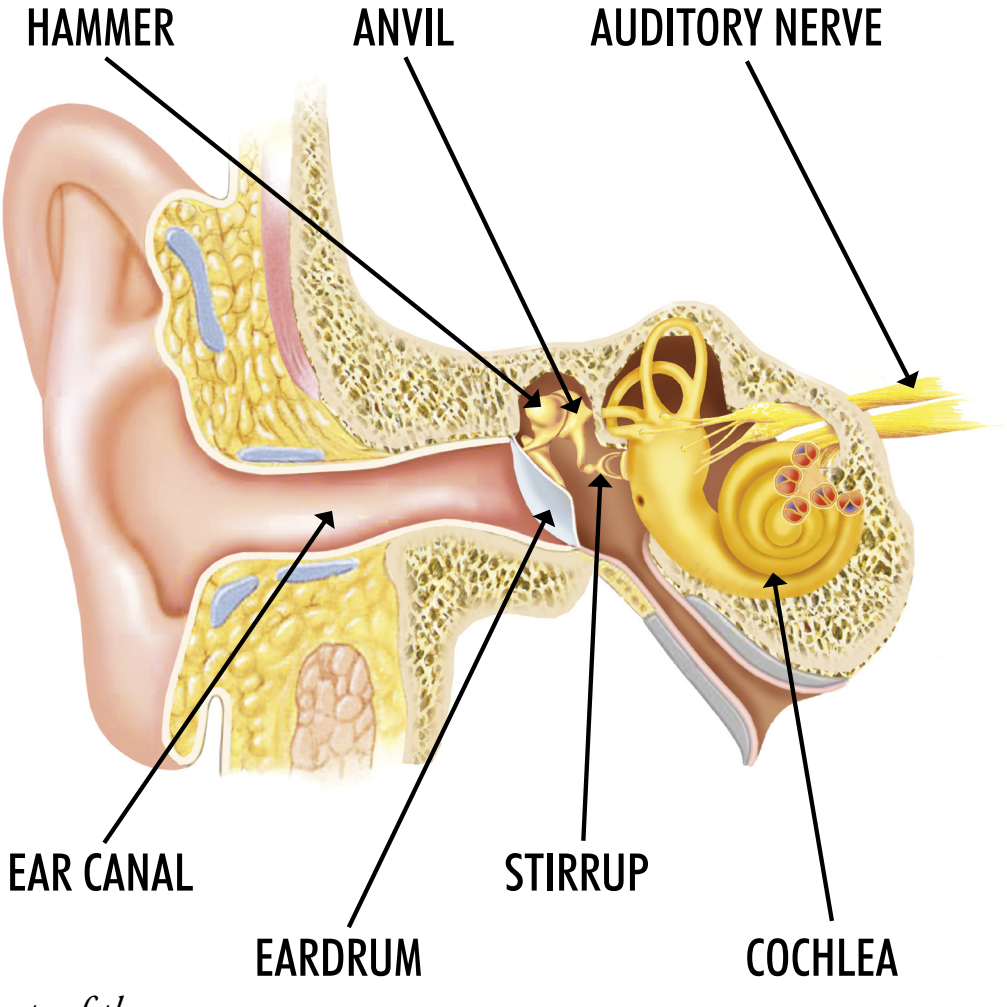
Outer**, **middle**, and **inner ear

The **middle ear** is made up of three small bones with funny names: the hammer, the anvil, and the stirrup. These bones are named for things they look like. One looks like a hammer. Another looks like an anvil—the piece of iron on which a blacksmith bangs hot metal into shape. The last one looks like a stirrup that you put your foot in when you are mounting a horse.

These bones are very tiny. The stirrup is the size of a grain of sand. It is the smallest bone in the body.

All three bones are very **sensitive** to sound waves. They vibrate when they are struck by sound waves and they pass vibrations to a part in the **inner ear** called the **cochlea**.

The **cochlea** is a fluid-filled coil, shaped like a snail's shell. It is lined with hairs, which are connected to nerves. Sound waves from the **middle ear** make these hairs vibrate. Then, the nerves connected to the hairs send messages to the brain through the **auditory nerve**. That's how your ears let you hear what I'm saying.



Parts of the ear

Hearing is pretty amazing if you think about it. When I hit this drum, the sound waves travel across the room. Some of those waves enter your **outer ear** and are guided down the ear canal to your **eardrum**. The sound waves make your **eardrum vibrate**. The vibrating **eardrum** makes the tiny bones in your **middle ear vibrate** and these bones make the tiny hairs in your **cochlea vibrate**. Then, the nerves attached to these hairs send messages to your brain. All of this happens quicker than the time it just took you to read this sentence!



Dr. Audit explains how your ear works.

Chapter 9 Beyond Sight and Sound, Part I

Last time, I told you a little bit about hearing. Earlier, Dr. Si-Yu told you about eyes and vision. Today, I would like you to think about what it would be like if you couldn't hear or couldn't see.

Millions of people live with poor hearing or with no hearing at all. These people are **deaf** or hard of hearing.

Imagine, if you can, what it would be like to be completely **deaf**. How would you know what other people are saying? After all, you could not hear their words.

Many **Deaf** people use sign language. Sign language is a way to communicate without speaking. One person makes signs with her hands that stand for words and letters. The other person sees the signs and understands the message. The two women in this picture are using sign language.



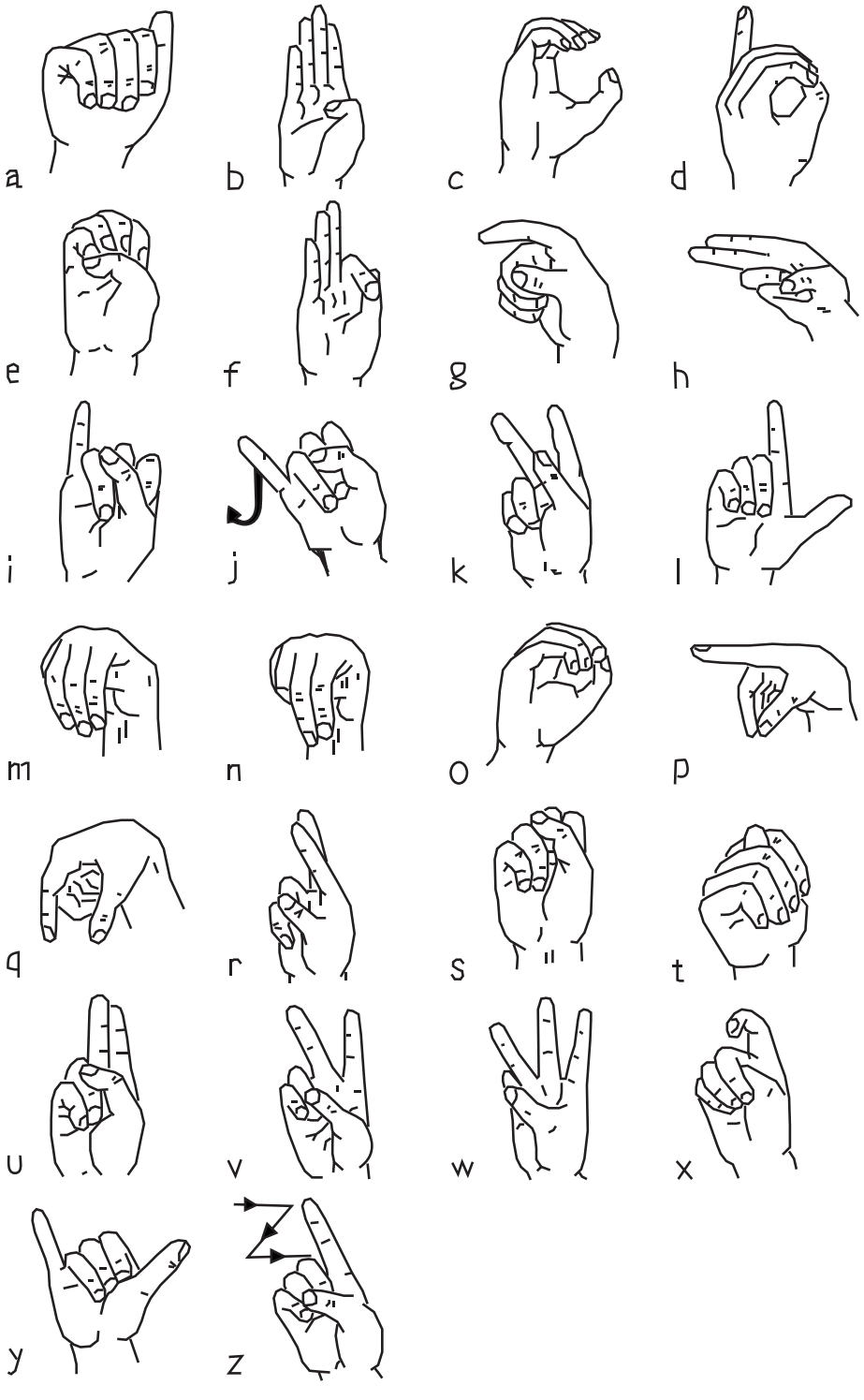
Dr. Audit talks about sign language.

Did you know that there is a **gesture** or sign in American Sign Language for each letter in the alphabet? See if you can spell out your name using the signs shown on the next page.

Sign language is one way **Deaf** people can communicate. There are also other ways. Some **Deaf** people can read lips. That means they carefully watch a person's lips move as he is speaking. They can tell what the person is saying by looking at how his lips are moving.

How? A person's lips take on different shapes and positions as he says different sounds. Try looking in the mirror sometime while you are talking to see how your lips move. Someone who reads lips translates what a person is saying by studying the different shapes and positions of his lips. Isn't that amazing?

It takes much time and practice to learn how to use sign language and how to read lips.



Sign language for each letter of the alphabet

Now, I'd like you to try to think what life would be like if you could not see. What would it be like to be **blind**? How would you find your way around? How would you read?

People who are **blind** find ways to live with their **disability**. Many **blind** and visually impaired people use a cane to help them get around. By tapping in front of them, they can tell where there are walls. They can tell when they need to step up and when they need to step down.



*A **blind** man walks with a special cane.*

Some **blind** and visually impaired people use seeing-eye dogs to help them get around. These dogs are also known as guide dogs. They are specially trained to help **blind** and visually impaired people get from place to place safely.



A guide dog helps a blind person get around.



*A **blind** person reads braille.*

Blind and visually impaired people can also learn to use their other senses to make up for their inability to see. A **blind** and visually impaired person can't tell what you look like, but he or she may be able to recognize you by your voice.

Blind people can also learn to read using a system called braille. In the braille system, raised bumps that a person can feel are used to stand for letters. A **blind** reader touches and runs her fingers over the dots and recognizes letters. Then, she thinks of the sounds the letters stand for and blends the sounds together to read. Like lip reading or using sign language, it takes lots of time and practice to learn how to read using braille.

Chapter 10 Beyond Sight and Sound, Part II

People with disabilities face extra **challenges** in life. However, these disabilities don't keep **determined** people from doing amazing things.

This is a painting of the musician Ray Charles. Ray Charles went **blind** when he was seven years old. He couldn't see, but there was nothing wrong with his ears. He loved music and decided to become a musician. He learned to sing and play the piano. Eventually, he became one of the most popular musicians of his day.

Ray Charles won ten Grammy Awards and made millions of dollars as a singer. He did not let his **disability** hold him back.



Ray Charles

This next image shows a girl named Helen Keller. Helen Keller lost both her sight and her hearing from a serious illness when she was just nineteen months old. She was **deaf** and **blind** for the rest of her life.

As a young girl, Helen Keller could not hear or speak. She learned to communicate a few ideas by making gestures. When she wanted her mother, she would grab and pull her mother to her. When she wanted to be alone, she would push her mom away. She could nod her head to say yes or shake it to say no. When she wanted toast, she would make a gesture as if she was spreading butter on bread.

There were a few ideas she could communicate. Yet there were many things she could not get across with gestures. As a child, she would often try to communicate and fail. Then, she would get angry and cry. Sometimes she would have terrible temper tantrums. She wanted, more than anything, to communicate with people. She was not able to do so.



Helen Keller as a child

Helen's parents were worried about her. They did not know how to help her communicate. Since she was **deaf** and **blind**, she could not attend school. So, her parents searched and found a special teacher who came to live with them. The teacher's name was Annie Sullivan.

Annie Sullivan wanted to teach Helen to understand words but how can you understand words if you can't hear them? Sullivan started by giving Helen a doll to hold. Then, she took Helen by the hand and traced the letters d-o-l-l on her palm. She did this over and over. After a while, Helen learned to write the letters d-o-l-l on a page. She did not know that she had written a word. She did not even know that words existed. But she felt proud that she could imitate what her teacher was doing.

Her teacher, Annie Sullivan, traced more words on Helen's palm. She learned to spell *pin*, *hat*, *cup*, and a few other words. The real **breakthrough** happened when Annie tried to teach Helen the word *water*. Sullivan took Helen outside to a well. She placed one of Helen's hands under the spout and spelled w-a-t-e-r on her other palm. Suddenly, something seemed to click in Helen's head. She understood that w-a-t-e-r meant the "wonderful, cool something" that was flowing over her hand.



Helen Keller with her teacher, Annie Sullivan

Helen soon learned more words. When she was eight, she went to a special school for the **blind**. Sullivan went with her. Later, she went to a school for the **Deaf**. But she didn't stop there. She went on to Radcliffe College, where she became the first **deaf** and **blind** person to receive a college degree.

Helen learned to speak and she learned to read lips with her fingers. She learned to read, using braille. She wrote books, including a biography of her own life, *The Story of My Life*. She was active in politics and fought for women to have the right to vote.

Helen Keller lived a long and productive life. She died in 1968 at the age of 87.

In 2003, the state of Alabama honored Helen Keller by putting an image of her on their state quarter. The quarter pays **tribute** to Helen's **courage** in overcoming her **disabilities** and inspiring millions of people.



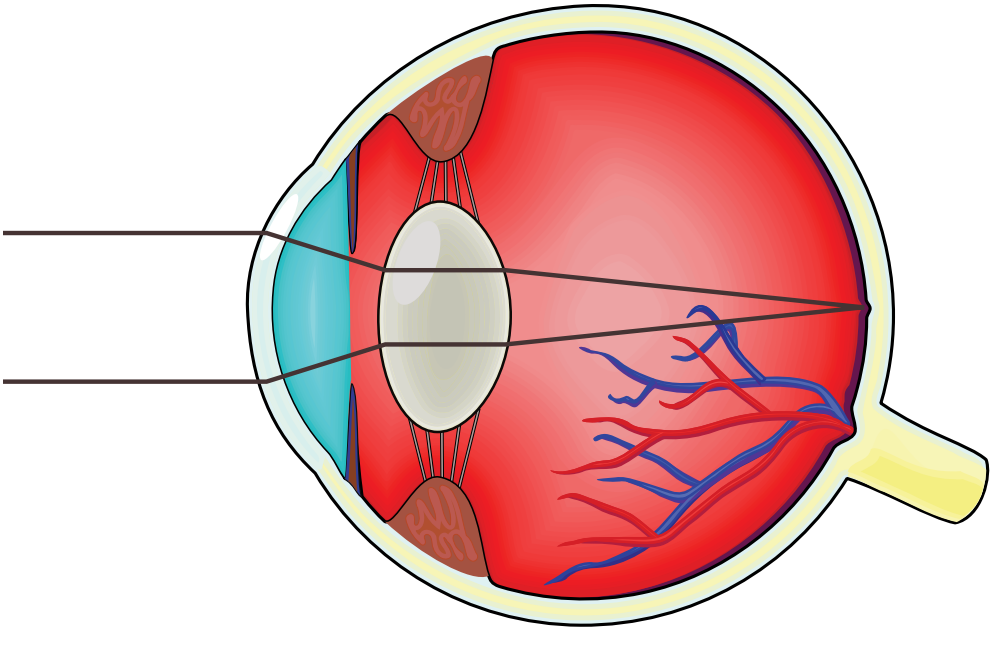
The Alabama state quarter

Chapter 11 Vision Problems, Vision Solutions

Last time, I showed you some parts of the eye and explained how those parts work together to help us see. Today, I want to talk about some things that can go wrong with our vision and also some ways we can fix vision problems.

A lot of vision problems have to do with the lens of the eye. The lens of your eye is curved outward. The lens of your eye bends the light rays closer together to focus the light on the retina.

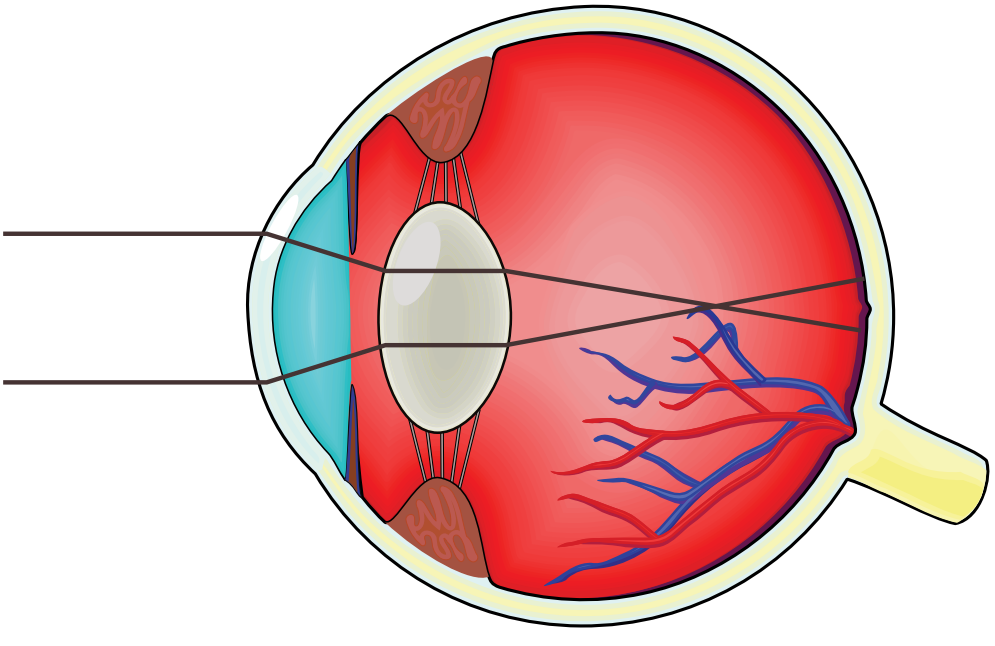
The image on the right shows two rays of light entering the eye as they pass through the cornea and lens. The cornea and the lens bend the light rays so that they meet and touch the retina at the same spot. You have perfect vision.



How your eye bends light when the cornea is shaped correctly

Sometimes, however, the cornea of the eye may not be shaped correctly. When this happens, your vision will not be perfect. This slide shows what happens when a cornea is not shaped correctly. This time, the light rays passing through the lens meet before they touch the retina. Then, they hit different places on the retina. This means that this person is **nearsighted**. She can see things that are close by, but things that are farther away will look blurry and out of focus.

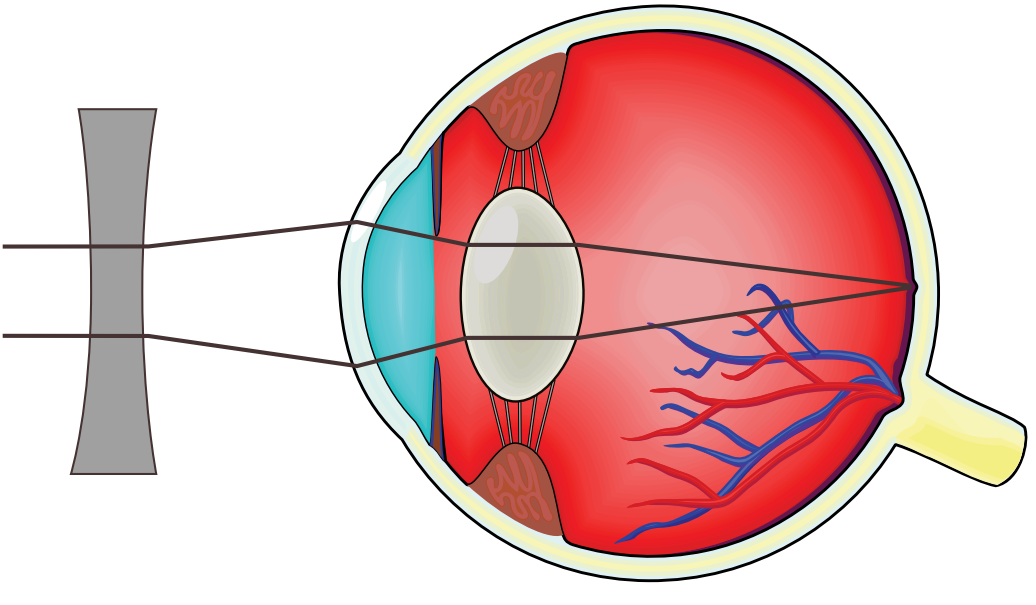
A long time ago, there was no way to help a **nearsighted** person. That is no longer the case. Today, we have several ways to help a person who is **nearsighted**.



How your eye bends light when the cornea is not shaped correctly

An optometrist can examine and measure the lenses of the eyes. If they are not shaped correctly, he can write a **prescription** for a pair of glasses with special lenses. An **optician** then makes these lenses and glasses.

My next slide shows how glasses with special lenses can correct **nearsighted** vision. Again, you can see the two rays of light. But here you can see that a lens that curves inward has been placed in front of the eye. (This lens is in a pair of glasses the person is wearing.) Now, before the light enters the eye, the lens bends the light a little differently. As a result, when the rays pass through the eye's cornea and lens, they now touch the retina at the same spot.



How corrective lenses help your eye bend light correctly

We can make different glasses for lots of different kinds of vision problems. There are lenses that help a **nearsighted** person see things that are far away. There are other kinds of lenses that help a **farsighted** person see things up close.

Do you know anyone who wears **contact lenses**? **Contact lenses** work the same way as glasses. The only difference is that you place the lens in your eye, right on top of your cornea.

In this slide, you can see a girl getting ready to **insert** a **contact lens**. Once she puts it in, it will cover her iris and her pupil. It will be almost invisible. You will not see it unless you look very closely.

*A girl about to **insert** a **contact lens** into her eye*





*The **LASIK** procedure*

There is another way to solve vision problems. It's called **LASIK surgery**. When you have **LASIK surgery**, the doctor uses a **laser beam** to change the shape of the cornea of your eye. Once your cornea is fixed, you may not need to wear glasses or **contact lenses**.

Chapter

12 The Skeletal System

Reader's Theater

Cast



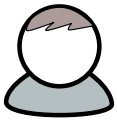
Dr. Welbody



Student 1



Student 2



Student 3



Student 4



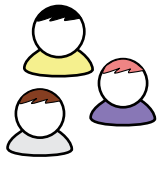
Student 5



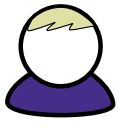
Student 6



Student 7



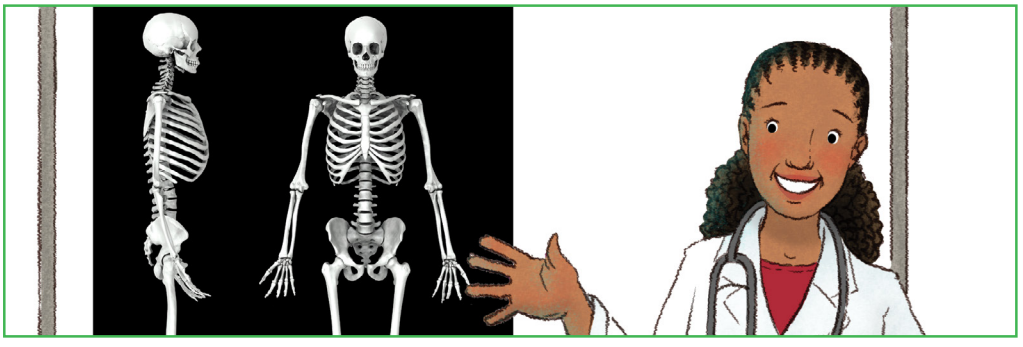
Everyone (the whole class)



Mrs. Bones, teacher



Narrator



Narrator

Welcome to the Human Body Network. Today, we are visiting Mrs. Bones' third-grade class as they learn about the skeletal system.

Mrs. Bones

Good morning, everyone. We have a special visitor today named Dr. Welbody. Some of you may remember her. She visited your classroom when you were in first grade.

Dr. Welbody

Hello! My name is Dr. Welbody. I visited your school a few years ago. We learned about some of the systems that keep your body working.

Everyone

Hello! Hello!



Dr. Welbody

Well, let's begin. The skeletal system is made up of bones. There are more than 200 bones in your body. You kids don't need to be able to name every bone in the body. But you should know the names of some of the most important bones. So let's get started!

Student 1 (tapping her head)

What is the name of the bone that makes up my head?

Dr. Welbody

Good question! Your skull is made up of more than one bone. Doctors call this set of bones the cranium.

Student 2

The cranium? That's a funny name. How will I remember that name?

Dr. Welbody

Try this: The cranium protects your brain, right?



Student 3

I guess so.

Dr. Welbody

And the word cranium sounds like the word brain. The CRAN-ium protects your BRAIN-ium!

Everyone (giggling)

The CRAN-ium protects your BRAIN-ium.

Narrator

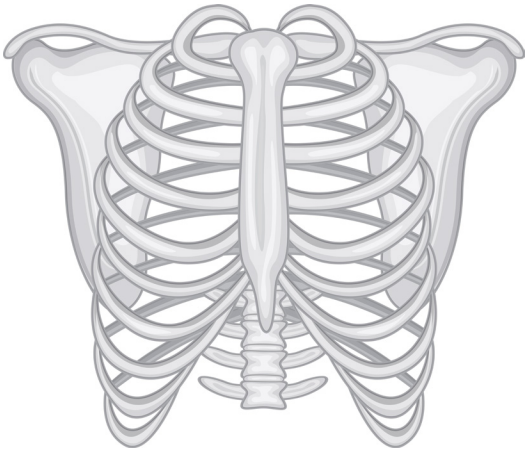
Dr. Welbody and Mrs. Bones are great teachers. The class is learning a lot today!

Dr. Welbody

That was easy!

Student 4 (tapping his chest)

What about this bone right here in the middle of my chest? What is its name?



Dr. Welbody

The sternum. Say it with me—sternum.

Student 5

That's a hard word to remember. Do you have a trick to help us?

Dr. Welbody

Try this poem:

Be glad your sternum's on the inside,

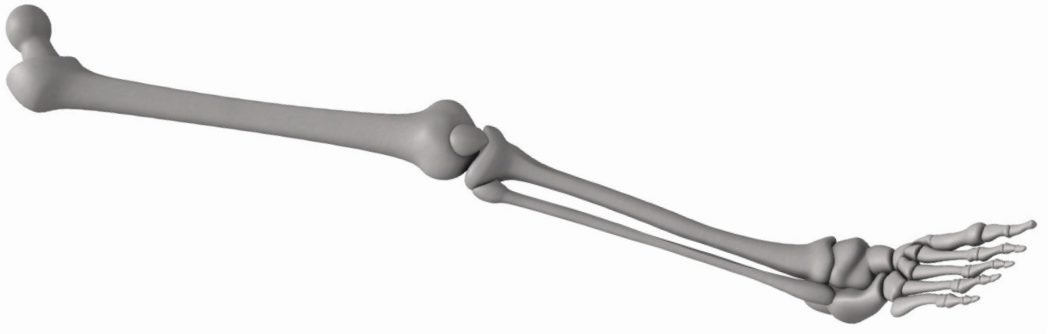
That really is the best.

For if it were on the outside,

You'd have a bony chest!

Everyone (giggling)

Say it again, say it again!



Dr. Welbody and students

Be glad your sternum's on the inside,

That really is the best.

For if it were on the outside,

You'd have a bony chest!

Narrator

I wish I were a third grader today!

Student 6

What about the bones in my legs? What are they called?

Dr. Welbody

The two bones in your lower leg are called the tibia and the fibula. The tibia is the larger of the two.

Student 7

I bet you have a trick for us to help us remember, don't you?



Dr. Welbody (chuckling)

Yes, I do! You see in your reader that one of the bones is larger than the other. Well, here goes—a fib is a little lie and the fibula is the little leg bone. How about that?

Everyone

We loved your visit! Hooray for Dr. Welbody's tricks and for Mrs. Bones' bones!

Narrator

Thanks for tuning into the Human Body Network today. We hope you learned a lot about bones. Tune in again soon!



Appendix: Dr. Welbody's Rhymes for the Human Body Systems

Body

Everybody has a body,

and that body is made of cells.

Cells build tissues, organs, and systems

to keep your body running well.

Skeletal

Without my hidden skeleton

I could not stand up tall,

And so, "Hurray for bones," I say,

Two hundred six in all!

Muscular

I'm glad that I have muscles.

They help me to have fun,

To jump and kick a soccer ball,

To smile and speak and run.

I'm glad that I have muscles,

And glad that you do, too,

So our hearts can beat and stomachs work

Without having anything to do!

Nervous

Without a brain

Where would I be?

I could not move or think or see,

Or write my name or count to three,

In fact I just would not be me!

Let's not forget the important nerves

In every part of my body

That send the messages to my brain.

So I can be carefree!

We humans are really lucky

I am sure that you agree!

Digestive

Chew and swallow, down it goes,

First esophagus, next the stomach, where it slows,

Squeeze and churn, along it flows,

To the small and large intestines' rows.

It is clear without a question,

That the mission is digestion!

Excretory

By way of the kidneys, your blood passes through

Cleaning out waste without ballyhoo.

Skin and sweat glands help out, too

To make sure there are no toxins in you!

Circulatory

My heart is always working

It's busy night and day

It's pumping while I'm sleeping

And while I work and play—

Let's give a cheer for hearts now,

For hearts: HIP, HIP, HOORAY!

Respiratory

Breathe in, breathe out

Inhale, exhale

My lungs expand and contract.

It truly is a wonder that respiration

Is as simple as that.

Glossary for *How Does Your Body Work?*

A

Achilles—a hero of the Trojan War in Greek mythology; he could only be killed by a wound just above his heel

Achilles tendon—the strong tendon joining the muscles in the calf of the leg to the bone of the heel

active—busy

American Sign Language—a kind of sign language used in the United States and Canada

anvil—a small bone in the ear that looks like an anvil and vibrates when sound waves hit the eardrum

auditory nerve—the nerve that sends signals from your ears to your brain about what you hear

automatically—done without thinking about it

B

blind—unable to see

braille—a system of raised bumps that blind people feel with their fingers and use to read and write

breakthrough—a sudden, important change that allows for progress

C

calcium—what your bones are made of

cartilage—a flexible tissue that cushions the joints where your bones meet

cast—a hard covering that holds a broken bone in place while it heals

cell—the tiniest living part of the human body (**cells**)

cell body—the control center of the cell

cerebellum—a part of the brain located under the cerebrum, divided into two halves; it helps with voluntary movement of muscle groups and balance

cerebral cortex—the 'gray matter' of the cerebrum that processes sensory information and controls muscle function

cerebrum—the largest part of the brain, divided into two halves; it sits on top of the cerebellum and controls thoughts, emotions, and all the senses

challenge—a difficult task or problem that requires extra effort (**challenges**)

cochlea—a fluid-filled coil in the inner ear that is lined with hairs that vibrate when sound waves hit the eardrum; the nerves connected to the hairs send messages to the brain that tell you what you are hearing

coil—spiral

college degree—the official document given to someone who has successfully completed a set of classes at a college

concussion—brain injury

connective—linking

contact lens—a thin, plastic disc placed directly on the cornea of the eye to correct vision problems (**contact lenses**)

cope—live with effectively

cornea—a thin, clear tissue that covers the iris, protects the eye from dirt and germs, and focuses light

courage—bravery

cranium—skull

cushion—to protect with something soft (**cushioned**, **cushions**)

D

dairy—made with milk

deaf—unable to hear (**deafness**)

decade—ten years (**decades**)

dendrite—a branch of the nerve cell that receives information from other nerve cells (**dendrites**)

determined—reached a firm decision to do something

digest—to break down food so it can be used by your body (**digesting**)

disability—something that prevents a person from moving easily or acting or thinking in a typical way (**disabilities**)

E

ear canal—ear tube

eardrum—a thin membrane inside the ear that vibrates when sound hits it

eventually—after some time has passed

exist—to be real (**existed**)

expand—to get bigger

F

farsighted—able to see things clearly if they are far away; things that are closer look blurry

fiber—it forms tissue

fibula—the thin, "outside bone" in the lower part of your leg

flexible—bendable

flinch—to draw back suddenly, which is an example of a reflex

fluid—liquid

frame—structure

G

gesture—a movement of a body part to communicate

gland—an organ in the body that makes natural chemicals (**glands**)

Grammy Awards—awards for achievement in the music industry

guide dog—a seeing eye dog (**guide dogs**)

H

hammer—a small bone in the ear that looks like a hammer and vibrates when sound waves hit the eardrum

hemisphere—one half of a round object (**hemispheres**)

hollow—empty inside

I

imitate—to copy

inner ear—the innermost part of the ear that contains the cochlea and auditory nerve

insert—to put in

involuntary—automatic; your heart is an example of an involuntary muscle

invulnerable—safe or protected; opposite of vulnerable

iris—eye color (**irises**)

J

joint—a connection between two bones in your body (**joints**)

L

laser beam—an intense beam of light that can be used for many things including surgery and cutting things

LASIK surgery—an operation during which the doctor uses a laser beam to change the shape of the cornea of the eye to help it focus light better

lens—the clear part at the front of the eye that focuses light on the retina (**lenses**)

ligament—a tissue connecting bones to bones (**ligaments**)

M

marrow—spongy tissue inside bones that creates blood cells

medulla—part of the brain stem

membrane—a thin sheet or layer that covers something

middle ear—the part of the ear that is between the outer and inner ear; it has three small bones that vibrate when struck by sound waves which then pass the vibrations to the inner ear

model—smaller copy

muscle—a tissue that makes it possible to move your body or to move substances within your body like blood and food (**muscles**)

muscular system—your muscles

N

nearsighted—able to see things clearly if they are close by; things that are farther away look blurry

nervous system—the control center of your body made up of the brain, spinal cord, and nerves

O

optic nerve—the nerve that sends messages from your eyes to your brain about what you see

optician—a person who examines eyes, makes glasses, and sells contact lenses

optometrist—a doctor who specializes in caring for eyes and treating vision problems

organ—a part of your body made of cells and tissues that performs a specific job (**organs**)

outer ear—the part of the ear that is visible on the side of the head; its job is to catch sounds and funnel them into the middle ear

overcoming—defeating or successfully dealing with

P

palm—the inside part of a hand between the base of the fingers and the wrist

paralyzed—unable to act, move, or feel a part or parts of the body

pelvis—hip bones

PET scan—specialized imaging method for your body or brain (**PET scans**)

politics—the art or science of government; activities and discussions involving government

prescription—an order for medicine

pupil—eye center (**pupils**)

R

realistic—real, accurate, or true

reflex—reaction (**reflexes**)

retina—the lining at the back of the eye that is very sensitive to light; the nerves in the retina send messages to the brain

rods and cones—special light sensitive cells that line the retina and send signals to the brain through the optic nerve

S

scapula—shoulder blade (**scapulae**)

search—to look carefully and thoroughly for (**searched**)

seemed to click—made sense or worked out

sensitive—responsive

shoulder blade—scapula; you have two of these triangle-shaped bones at the top of your back (**shoulder blades**)

skeletal system—a framework of bones and joints

skull—the group of bones that protect the organs in the head

spout—a pipe that liquid flows out of

sternum—breastbone

stirrup—a small bone in the ear that looks like a stirrup and vibrates when sound waves hit the eardrum

stomach—belly

T

temper tantrum—an angry, uncontrolled outburst by a child or by someone acting childish (**temper tantrums**)

tendon—a tissue connecting muscles to bones (**tendons**)

tibia—shinbone

tissue—a group or layer of cells that work together as a part or organ in your body

tribute—something done to show honor or respect

Trojan—a person born or living in the ancient city of Troy

V

vertebra—a small bone that is part of the spinal column or backbone (**vertebrae**)

vibrate—to move back and forth rapidly (**vibration**, **vibrations**)

vision—the sense of sight, the act of seeing

voluntary—on purpose, not by accident; opposite of involuntary; moving your hand to write with a pencil is an example of voluntary muscle action

vulnerable—weak or in danger

W

warrior—soldier

well—a deep hole dug in the ground to reach water

X

x-ray—a powerful, invisible ray of light that can pass through objects to show the inside, such as the inside of the human body (**x-rays**)

ISBN 979-8-89072-942-2

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Printed in the USA

Bluebonnet Learning
K–5 Reading Language Arts

ENGLISH

HOW DOES YOUR BODY WORK?

GRADE 3 UNIT 3 | READER

EDITION 1

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