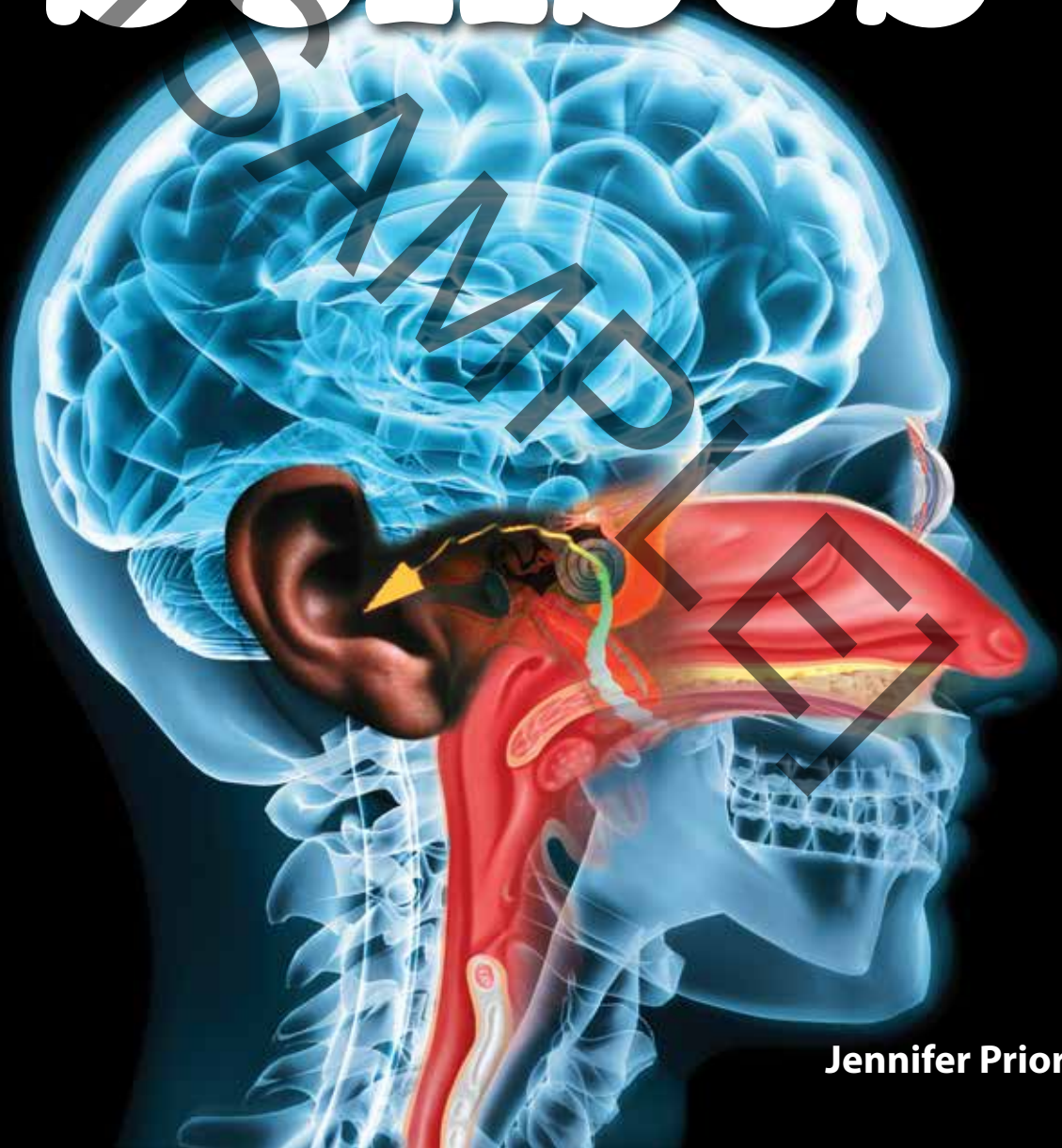


# The Five Senses



Jennifer Prior

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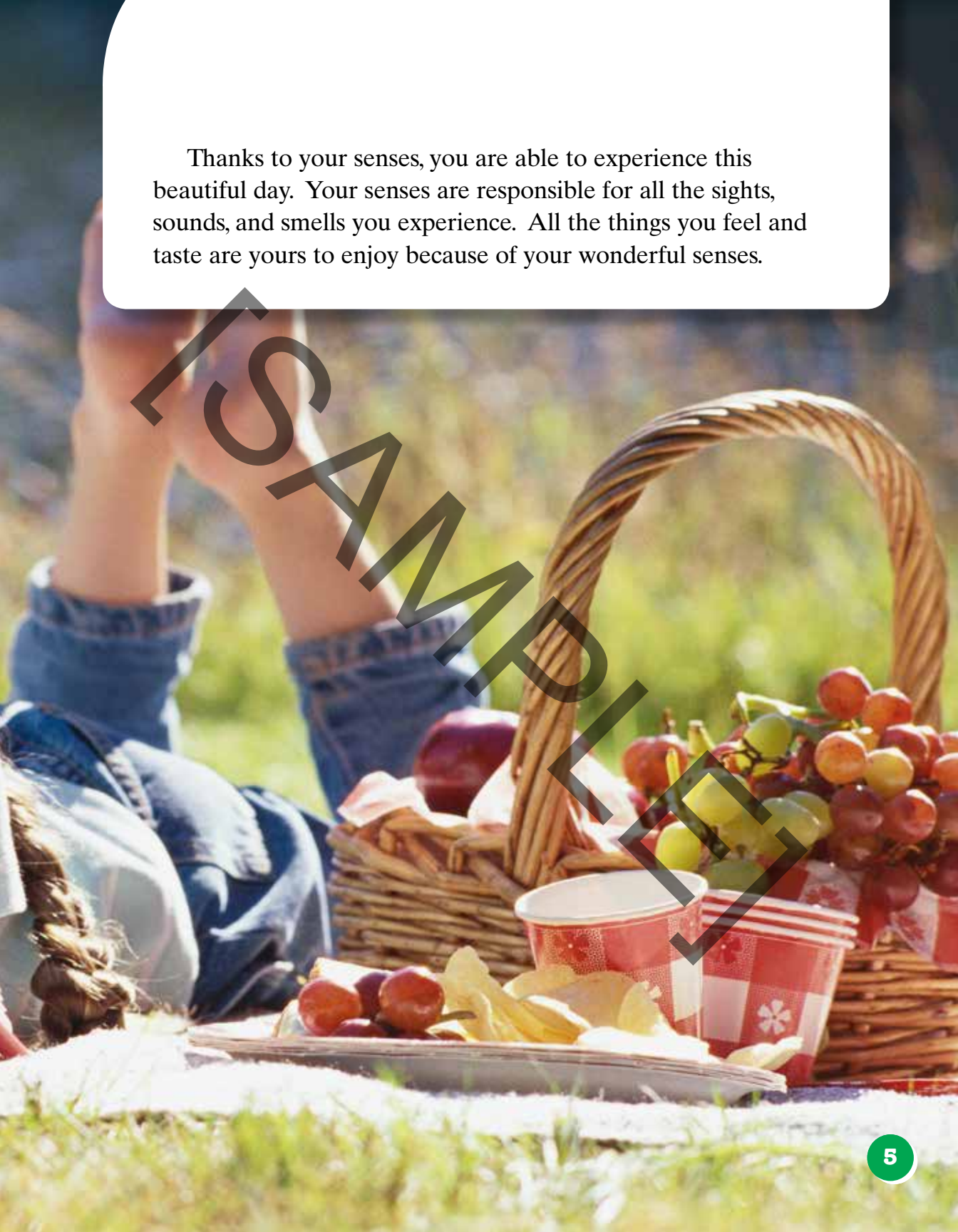


# Your Wonderful Senses

It's a summer day, and you're reading outside drinking lemonade. You taste the sweet juice on your tongue. You see the blue sky. You hear a bird chirping. The smell of fresh grass is in the air. You feel the warmth of the sun on your skin.



Thanks to your senses, you are able to experience this beautiful day. Your senses are responsible for all the sights, sounds, and smells you experience. All the things you feel and taste are yours to enjoy because of your wonderful senses.



# It Begins in the Brain

Your brain helps you make sense of the world. This happens through the senses: sight, sound, smell, taste, and touch.

Your senses help you understand the changes around you. When a traffic signal changes to red, you see it and stop. When the weather turns chilly, you feel it and put on a jacket. You hear noises that tell you someone is coming. You smell smoke, and you know a fire is nearby. You taste something delicious, and you want more.

A young boy with dark hair, wearing a light blue long-sleeved shirt, is holding a brown shoe up to his nose with his right hand. He is looking down at the shoe with a focused expression. The background is a blue gradient with a pattern of light blue circles. A large, faint, diagonal watermark reading 'SAMPLE' is visible across the image.

smell





sound

sight

taste

touch

Whatever you do, all of your senses are at work. What are you seeing, hearing, smelling, touching, and tasting right now?





Your brain takes in information from outside your body. Then it sends messages throughout your body. It can do this because of the nerve cells, called **neurons** (NOOR-ons), in your brain and body.

Neurons carry the information gathered by the senses to the brain. Then the brain interprets this information. Finally, the brain tells the neurons to send messages to the parts of the body that need to respond. This happens instantly. You don't even know it's happening. You are just aware of the results, and your body is moving.

## Neuron

### How Many?

There are 100 billion (100,000,000,000) neurons in the brain. They have 100 trillion (100,000,000,000,000) connections among them!

The nucleus tells the neuron what to do.

Dendrites bring information to the brain.

Axons send information into the body.

## Nervous System

brain

nerves

spinal cord

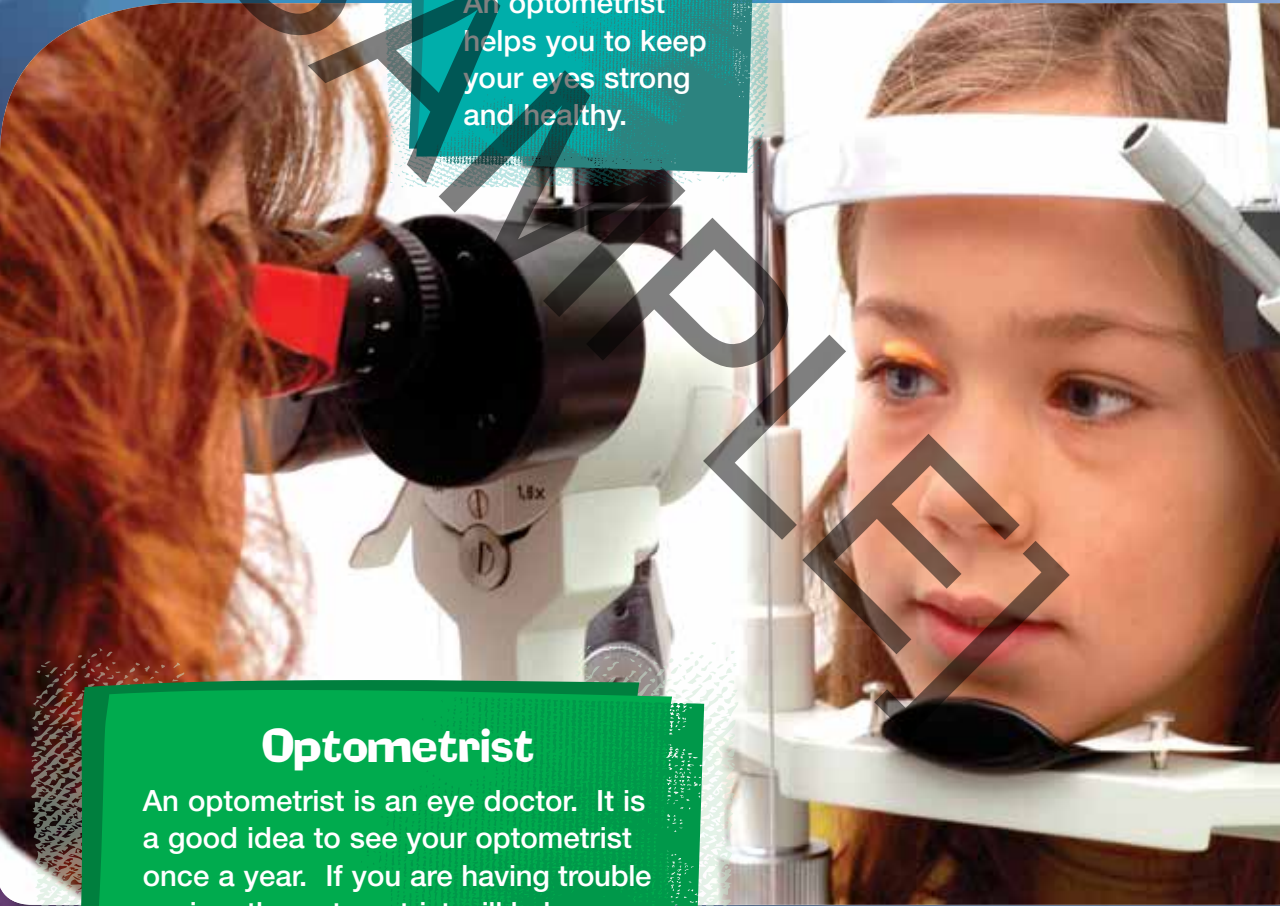
### The Control Center

Your brain is the control center of the body. It sends messages through the nerves to different parts of the body. Each nerve passes the message to the next nerve until it reaches the right place. Have you ever seen a row of dominoes fall one after the other? The brain's messages travel through nerves in much the same way.

# See

Your sense of sight helps you see things in the world around you. Your eyes send messages to your brain, and your brain tells you what you are seeing.

Eyesight is one of the most important ways people survive in the world. Have you ever worn a blindfold? If so, then you know how challenging life can be without sight.



An optometrist helps you to keep your eyes strong and healthy.

## Optometrist

An optometrist is an eye doctor. It is a good idea to see your optometrist once a year. If you are having trouble seeing, the optometrist will help you get eyeglasses or contact lenses so you can have perfect vision.



## Help for the Blind

People who cannot see are blind. People who are blind usually have special help to get around and relate to the world. Some blind people use walking sticks to help them feel the ground and what's around them. Some use guide dogs, which are trained to keep their owners safe. Blind people are able to read through the use of Braille, a type of writing made with raised bumps that can be read with the fingertips.



This specially trained guide dog is helping its blind owner walk safely along the path.



The eye is an amazing structure. The white part of the eye is called the **sclera** (SKLEER-uh). This is a coating that covers most of the eyeball. The **cornea** is part of the sclera. This part is clear and covers the colored part of the eye. The cornea is like a window that lets light into the eyeball.

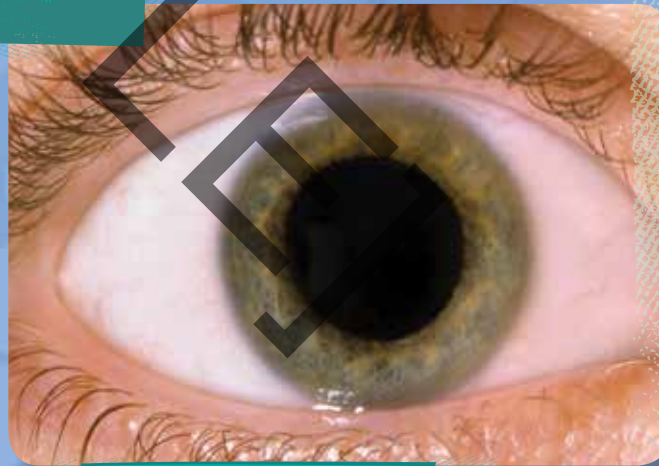
The **iris** and the **pupil** are behind the cornea. The iris is the part that has color. The pupil is the black circle you see in the center of the iris. The iris controls the amount of light that comes through the pupil. When it is dark, the iris makes the pupil bigger to let in more light. When there is bright light, the iris makes the pupil smaller to let in less light.

Light that enters the eye then reaches the **lens**. The lens focuses light on the back of the eyeball, called the **retina**. The retina sends a message to the brain, and the brain tells you what you are seeing.

The amount of available light changes the size of the pupil.

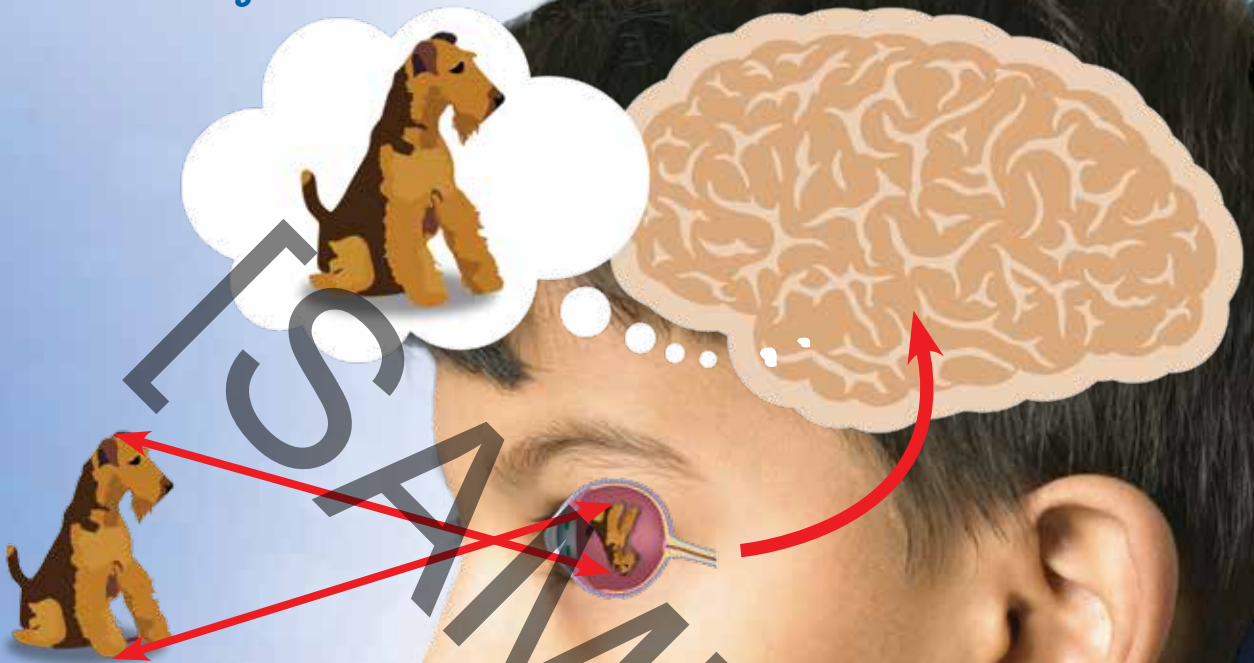


the pupil in more light



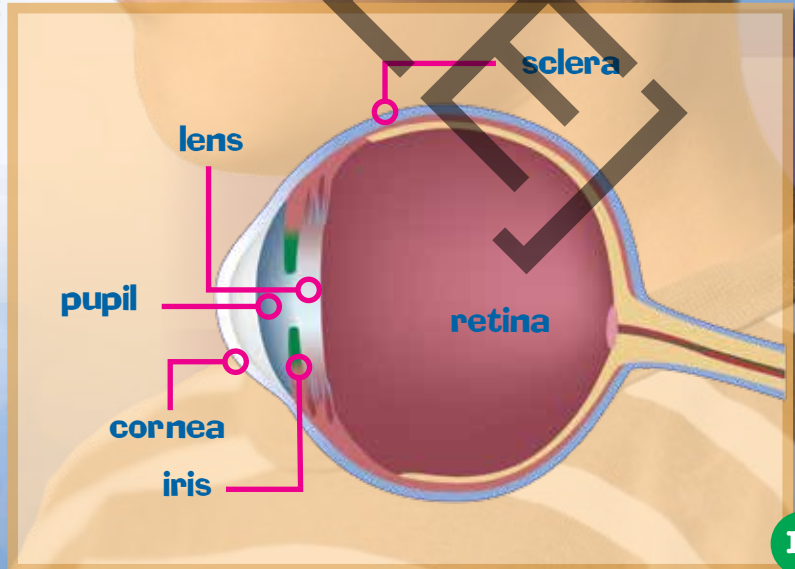
the pupil in less light

## Diagram of the Eye



### Upside Down

Did you know that your eyes see things upside down? It's true! The image is seen upside down, but the brain flips it around so you see it right side up. Amazing!



# Hear

You learn a lot about the world through your ears. You can hear loud noises and very quiet sounds. An alarm or siren warns you when there is danger. The soft buzzing of a bee tells you to watch out!

The ears collect sounds and send messages to the brain. The ear has three parts: the outer ear, the middle ear, and the inner ear.

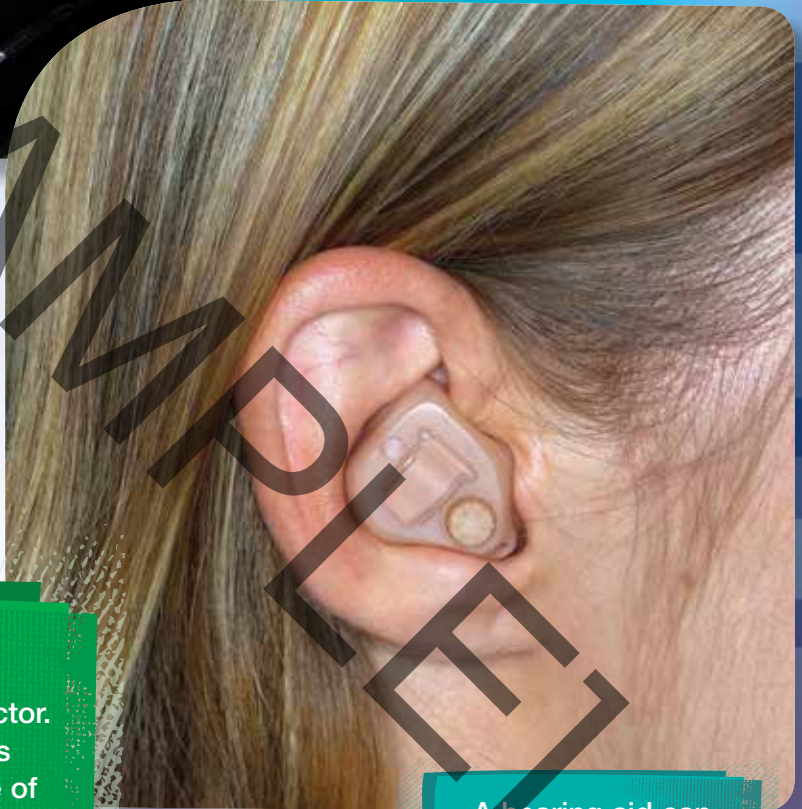


Sounds range from very low buzzes to very loud blasts.





Have you ever noticed how many sounds are going on around you all at once? Just listen!



## Otologist

An otologist is an ear doctor. Otologists check people's hearing and the structure of their ears to be sure everything is in good working order. If someone is having trouble hearing, an otologist can help him or her to correct the problem. Or a person can wear a hearing aid to hear better.

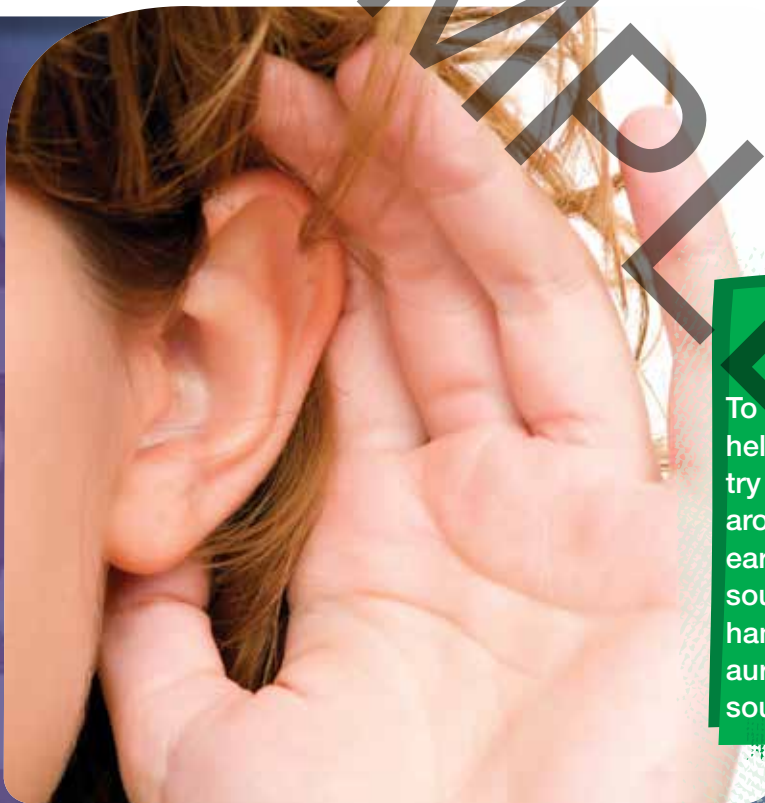
A hearing aid can be worn inside the ear.



The outer ear has two parts: the **auricle** (AWR-i-kuhl) and the **ear canal**. The auricle is the part of the ear that sticks out. You can see this part on your head. The auricle gathers sounds and directs the sounds into the ear. The outer ear also includes the ear canal. That's the part just inside the ear. The ear canal produces **earwax** that keeps dirt from going further into the ear.

The middle ear includes the **eardrum** and small bones called the **hammer**, **anvil**, and **stirrup**. These bones move the **vibrations** from the eardrum to the inner ear. A vibration is a quick motion back and forth. In hearing, it is the motion of sound.

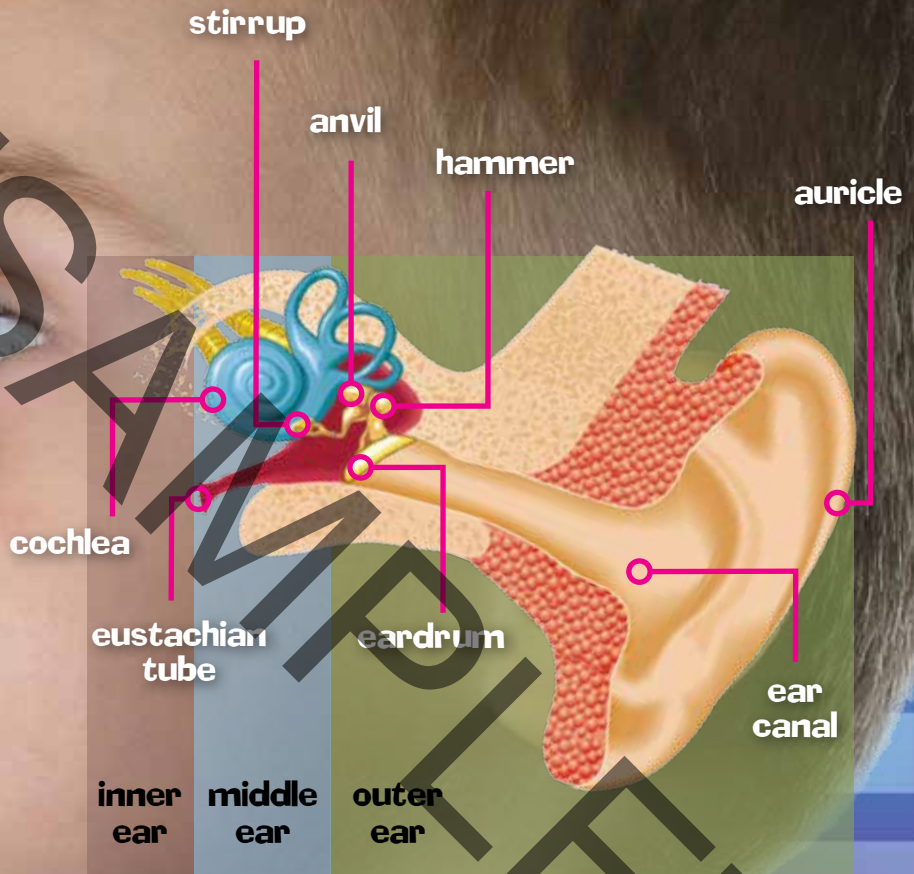
The inner ear contains the **cochlea** (KOK-lee-uh) and the **eustachian** (yoo-STEY-shuhn) **tube**. The cochlea changes the vibrations into electrical impulses that are carried to the brain. The eustachian tube drains fluid down the throat and keeps the pressure in the ears even.



### Try It!

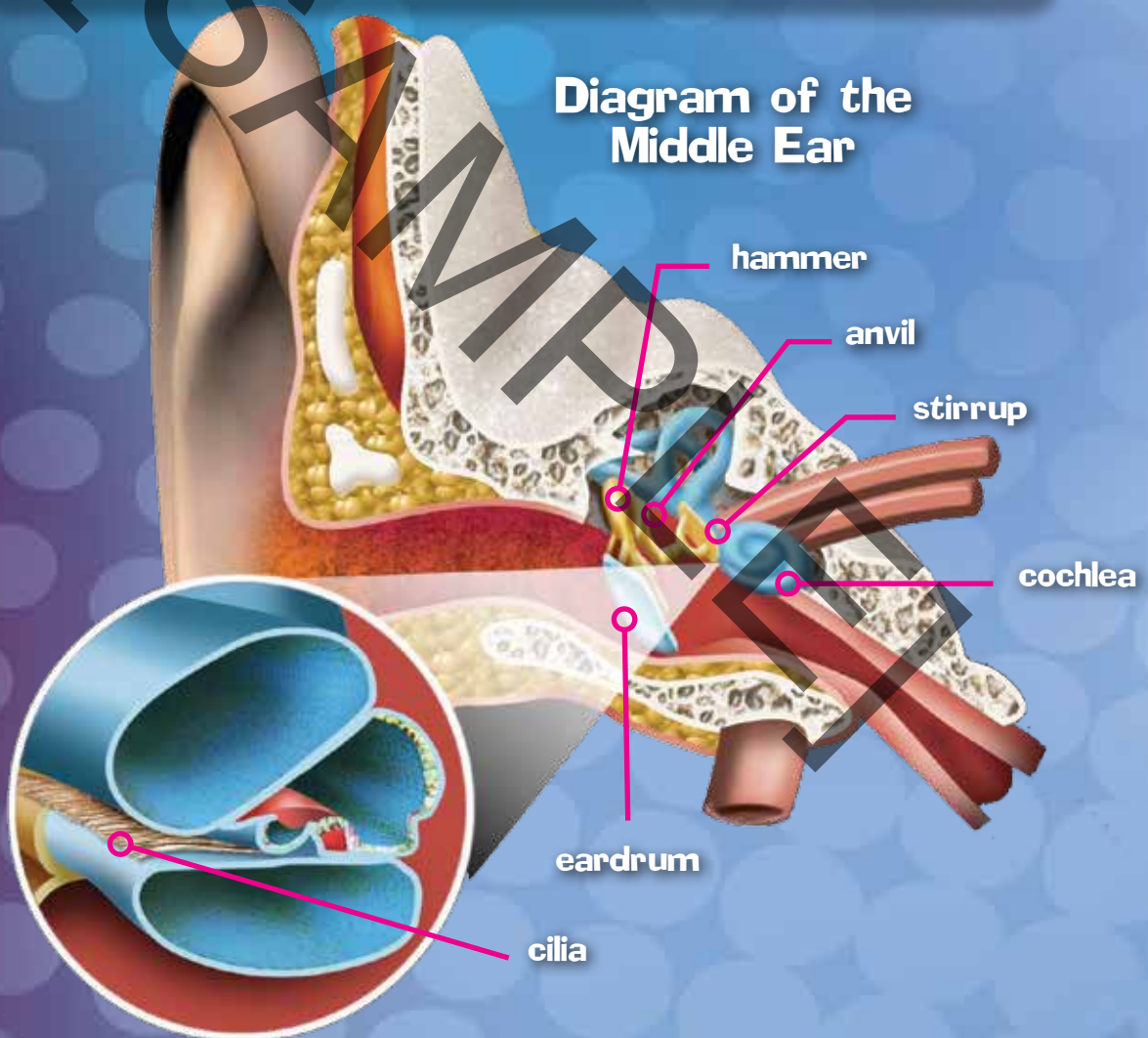
To see how the outer ear helps to gather sounds, try this. Cup your hands around the backs of your ears. Listen. Notice how sounds seem louder. Your hands are making the auricle bigger so more sounds can be gathered.

## Diagram of the Ear

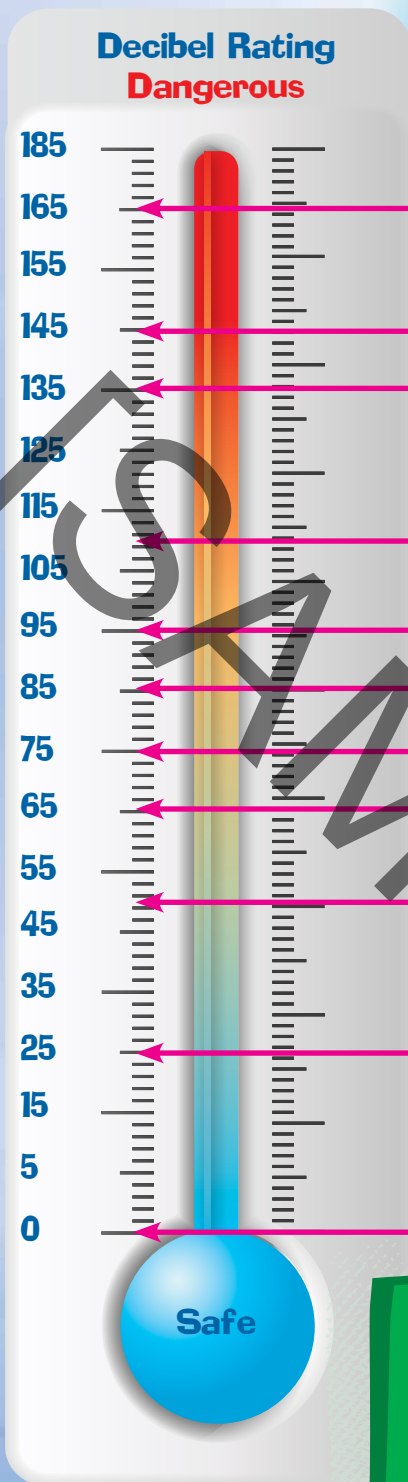


The middle and inner ears are truly amazing. The eardrum of the middle ear is a tight, thin piece of skin. Sounds make the eardrum vibrate. The vibrations then make the tiny bones in the middle ear move. This, in turn, makes the sound travel to the inner ear.

The cochlea of the inner ear is a small tube filled with liquid. The cochlea also has tiny hairs in it, called **cilia** (SIL-ee-uh). The sound vibrations make the hairs move, which sends a message to the brain. The brain tells you what you are hearing.





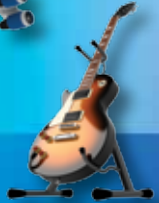


rocket launch



fireworks

jet plane



rock concert



hair dryer

traffic



washing machine

talking

rainfall



whisper

softest sound  
you can hear

## Too Loud!

**Decibels (dB)** measure how loud something is. Anything louder than 80 dB can cause permanent hearing loss. Always wear ear protection when you are around loud noises.

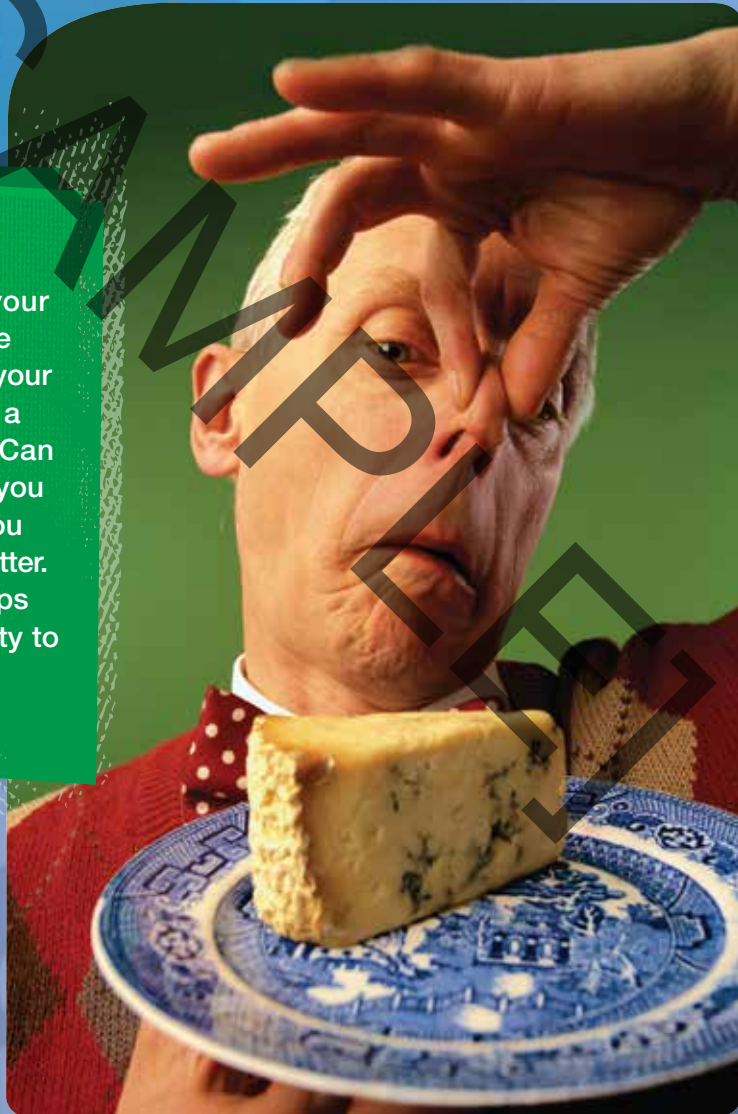


# Smell

You also experience the world around you through your sense of smell. There are nice smells and unpleasant smells. Smells are taken in through the nose, and messages are then sent to the brain.

## Try It!

Did you know that your nose helps you taste food? Try plugging your nose while you take a bite of some food. Can you taste it? When you unplug your nose, you can taste the food better. The smell of food helps to improve your ability to taste it.



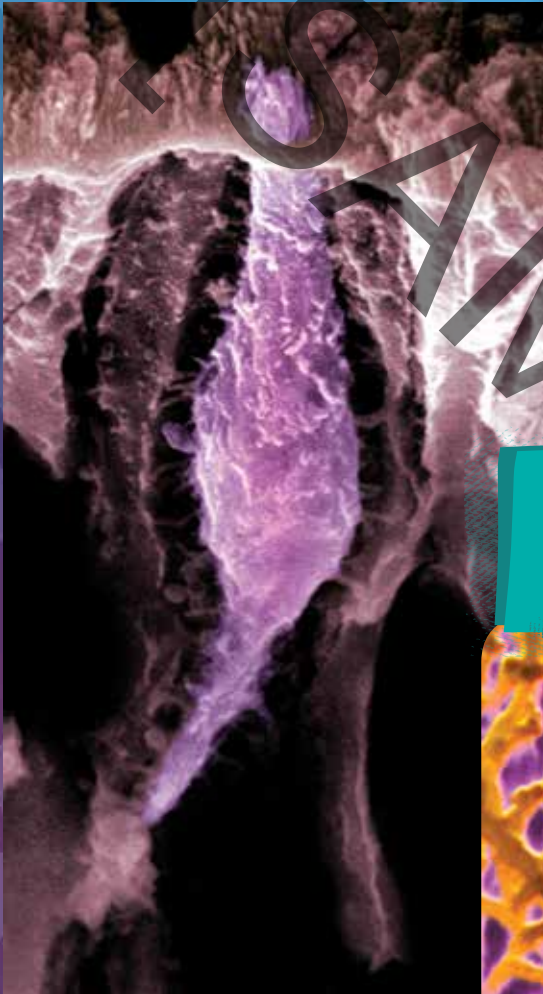


Smell helps us know how something might taste.

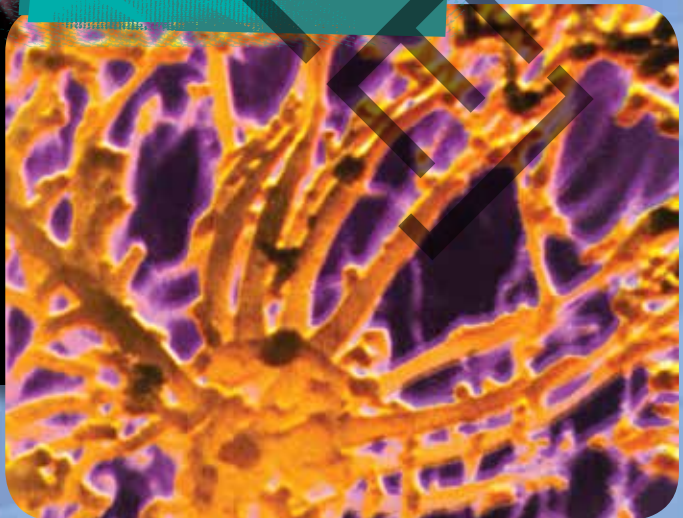




Inside the nose are two holes called **nostrils**. Soft material called **cartilage** separates the nostrils. Behind the nose is a space in the skull. This is called the **nasal cavity**. At the top of the nasal cavity is an organ called the **olfactory bulb**. This is an area of nerve cells with small hairs on them, also called *cilia*. As air passes over the hairs, messages are sent to the brain, and the brain identifies the smell.

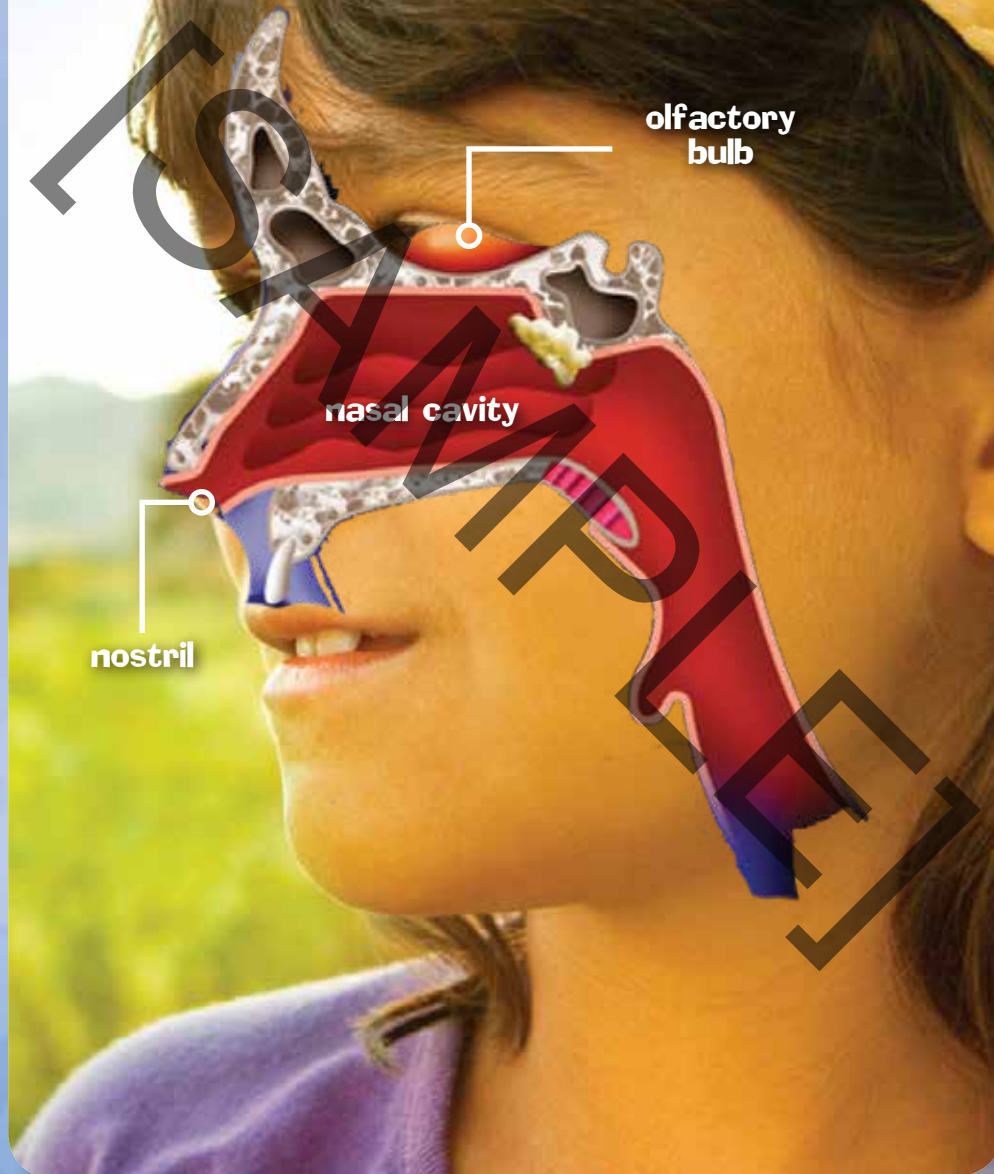


These photos of cilia were taken with a special magnifying camera.





## Diagram of the Nose



# Taste

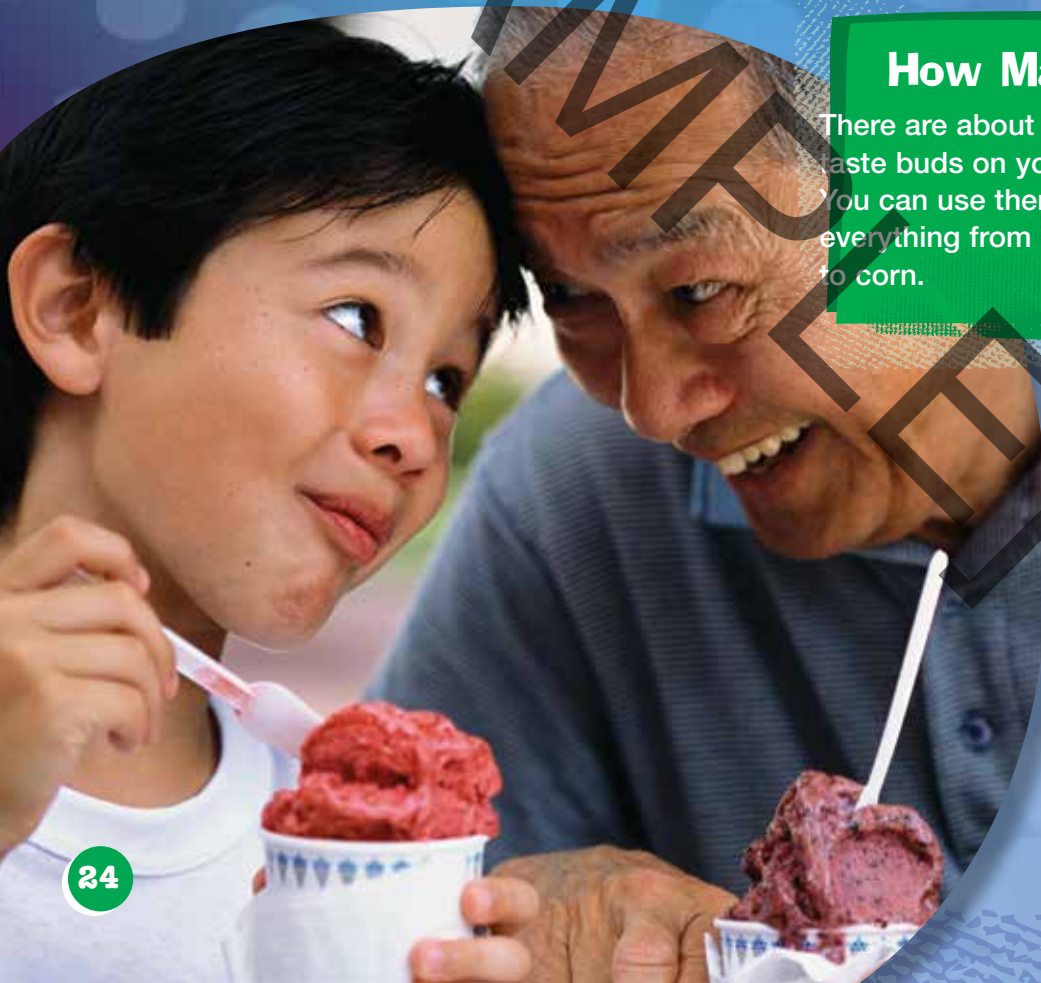
Now you know how you smell your food, but do you know how you taste it?

Have you ever looked at your tongue? The top of it is covered with small bumps. These are called **papillae** (puh-PIL-uh). Papillae hold the taste buds. Taste buds help you taste things that are sour, sweet, bitter, and salty. Each taste bud has tiny hairs that send signals to the brain when you taste something. The brain tells you what the taste is.

Do you prefer salty or sweet? Sour or bitter? Use your papillae to find out!

## How Many?

There are about 10,000 taste buds on your tongue! You can use them to taste everything from ice cream to corn.



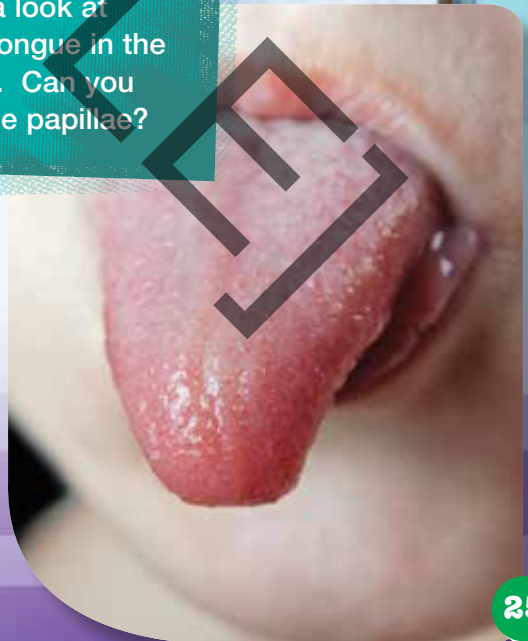




Take a look at your tongue in the mirror. Can you see the papillae?

## Did You Know?

Different areas of your tongue are used as the main stations for sensing different kinds of tastes. You taste salty and sweet mainly at the front tip of the tongue, bitter at the back and back sides, and sour at the sides in the middle and front.





# Touch

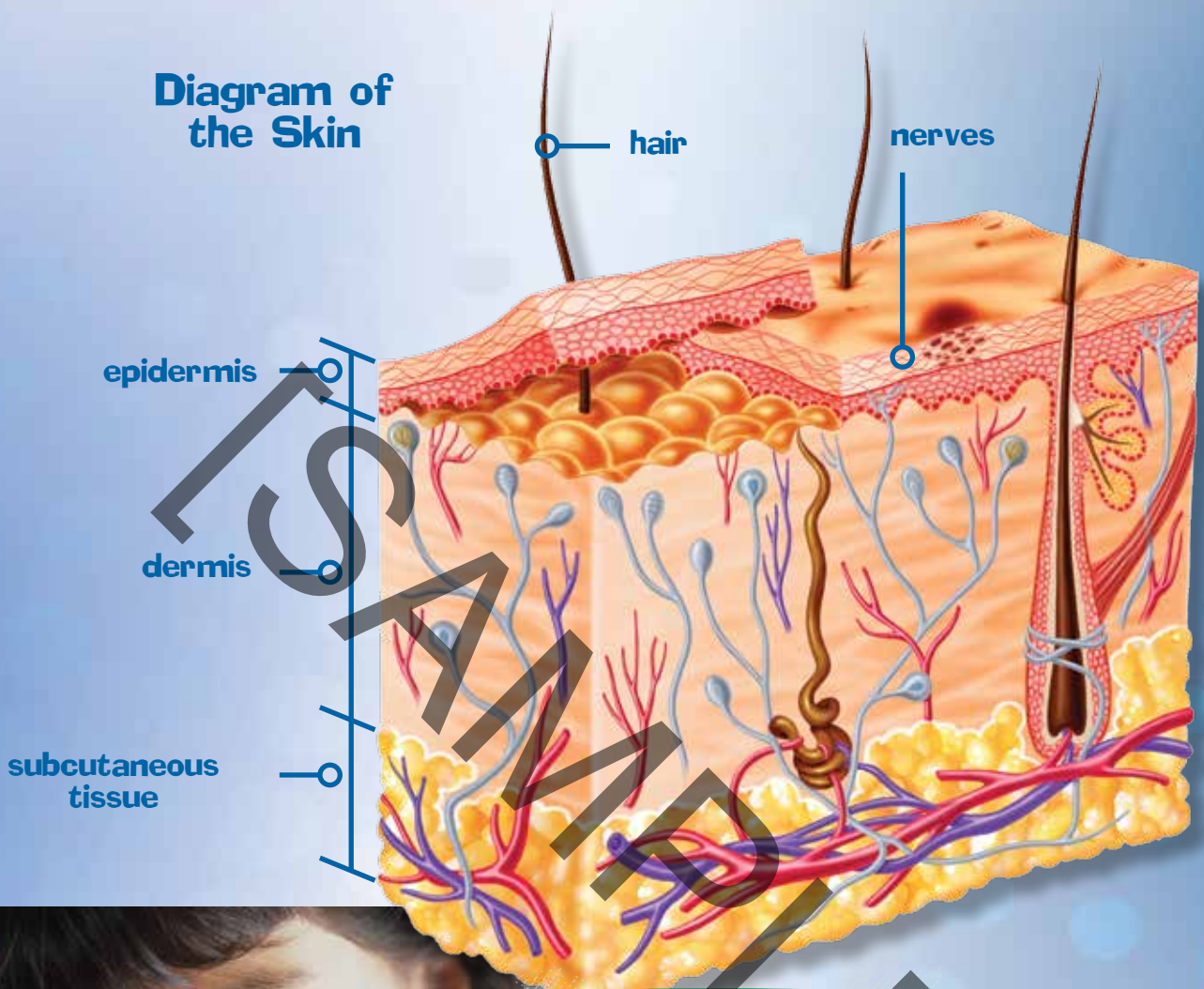
Your skin is the biggest organ in your body. It is largely responsible for the temperature, pain, and pressure you feel. The skin has three layers: the **epidermis**, the **dermis**, and the **subcutaneous** (suhb-kyoo-TEY-nee-us) **layer**.

Your epidermis is showing! The outer layer of skin is the epidermis. Beneath that are the dermis and then the subcutaneous layer. The subcutaneous layer is made of fat.

Your sense of touch happens mostly in the dermis. There are nerve endings there that help make sense of the things you feel. The nerve endings send messages to your brain. Because of this, you know when you touch something hot, rough, or sharp. You can feel the difference between soft and silky or prickly and jagged.



## Diagram of the Skin



The nerve endings in your skin tell your brain when something is soft, smooth, wet, or any other feeling.



# That Makes Sense!

Our senses are amazing. Every day our five senses work together. Have you ever made popcorn? Then you've heard the "Pop! Pop!" sound and smelled the butter. You've seen and felt the kernels in your hand. You have tasted the salty snack in your mouth. Your senses are here for you to use right now. Just take a minute to sense all your surroundings. Because of your senses, the world is yours to enjoy!



**POP!**

**YUM**

**POP!**

**POP!**





Your senses allow you  
to explore the world.



# Glossary

- anvil**—a small bone in the middle ear
- auricle**—the part of the ear you see on the sides of the head
- cartilage**—a tough, rubbery tissue found in various parts of the body
- cilia**—tiny hairlike structures that move
- cochlea**—the liquid-filled tube in the ear
- cornea**—the clear part of the eye that covers the iris and pupil
- decibels**—units of measurement for how loud a noise is
- dermis**—the middle layer of skin where most feeling takes place
- ear canal**—the narrow tubelike passage that allows sound to enter the ear
- eardrum**—the tight, thin piece of skin in the middle ear
- earwax**—the yellowish wax-like substance that lines the ear canal
- epidermis**—the outer layer of skin
- eustachian tube**—a slender tube in the ear that drains fluid and balances pressure between the two ears
- hammer**—a small bone in the middle ear
- iris**—the colored part of the eye
- lens**—the part of the eye that focuses light onto the retina of the eye
- nasal cavity**—the space behind the nose
- neurons**—nerve cells
- nostrils**—the long tubes in the nose
- olfactory bulb**—the area of the nose where the nerves for smelling begin
- papillae**—bumps on the tongue
- pupil**—the black circle in the center of the eye
- retina**—the back part of the eyeball
- sclera**—the white covering of the eyeball
- stirrup**—a small bone in the middle ear
- subcutaneous layer**—the deepest layer of skin, mostly made of fat
- vibrations**—the quick, back-and-forth motions of sound

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**Thank you for helping us  
create a world in which  
children love to learn!**

