READING 2

Before You Read

In small groups or with the whole class, discuss the following questions.

1. What is a map? Why do people need maps?
2. How can scientists study the brains of people?
3. Here are some expressions about the brain. What do you think they mean? "He sure is a brain." "Use your brain." "Some people are brainless."

READING SKILL Previewing

APPLY

With a partner, preview Reading 2 by answering these questions.

1. Look at the title of the article. Do you think the article is about the past, present, or future?
2. Look at the pictures in the reading. How are they different from the pictures in Reading 1?
3. How would you expect brain mapping today to be different from Dr. Gall's brain mapping?

Read

This article is from a science website. Use your dictionary to find the meaning of words you do not know.

BRAIN MAPPING TODAY

In the early 20th century, scientists studied the brain. They studied parts of the brain. They studied how the brain controls human **behavior**. They **wondered** if there was a **link** between the parts of the brain and human **behavior**. They **wondered** if all brains were the same. Scientists had many questions about the brain. However, they could not look inside a living brain. Scientists needed other ways to find the answers. New technology—computers—helped scientists study the brain.

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An **average** human brain has 100 billion cells. The brain is very **complex**. It has many parts. These parts have many different **functions**. Before computers, people did not know how to describe these parts and **functions**. But computers made it **possible**. Computers and electronic scanning[1] machines helped people see how a living brain **functions**. Scanning machines take pictures of the inside of the brain. The pictures appear on a computer screen. Scientists can then see the pictures. They can **analyze** the pictures.

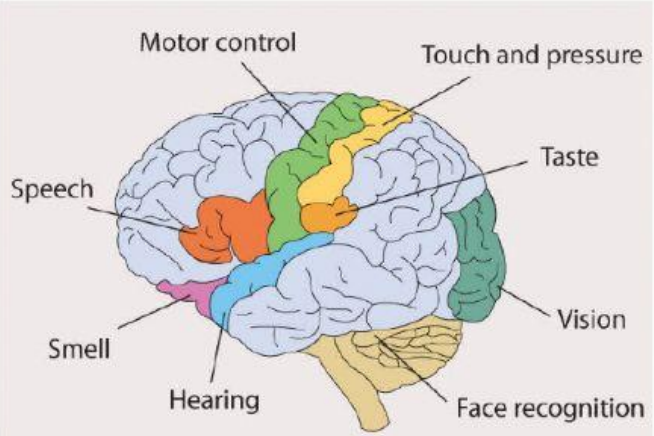
MRI SCANNING

One kind of scanning is MRI. These letters stand for Magnetic Resonance Imaging. MRI uses magnetic forces and radio waves. MRI **creates** computer images, or pictures, of the brain. The process is simple. A person lies on a table. An MRI machine scans his or her head. A computer that is **linked** to the scanner **creates** images. These images show the parts of the brain and their **locations**.

FMRI SCANNING

A **functional** MRI, called an fMRI, works the same way. However, it **creates** images of brain **functions**. For example, an fMRI scan is made while a person is doing an activity. The person can be listening to music or smelling different foods. When the person is doing these things, some areas of the brain are active. The computer images show which areas are active. When an area of the brain is active, more blood flows there. The scan shows this. Then scientists can see which parts of the brain control the different **functions**. For instance, scientists can see which parts control hearing or smell.

Scientists wanted to know what the **average** human brain looked like. They tried to use MRI and fMRI images to **create** a map of the **average** brain. However, brains are



Locations of brain functions



The MRI machine scans a person's brain.

[1] One meaning of the word *scan* is to read something quickly. Another meaning is to use a machine to produce a picture of the inside of a person's body on a computer screen.

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very different. Scientists decided to collect many examples of brains. They thought this was the best way to show the parts of an **average** brain. First they scanned the brains of hundreds of people. They scanned brains of people from all over the world. Then computers **analyzed** the images from the scans. The computers collected measurements of the brain parts. Finally, computers **averaged** the measurements and **created** brain maps.

One map shows the parts of an **average** brain. Other maps show the **locations** of brain **functions**. Memory and speech are two of these **functions**. Special maps show brain images from different kinds of people. For example, there are images from sick and healthy people, male and female people, young and old people.

Doctors around the world can examine these maps online. They can compare these images with brain scans from their own patients. These online maps also help doctors who operate on brains. The doctors can see the exact **location** of important brain parts before they operate.

Brain mapping is a **wonder** of modern technology. It allows scientists to examine living human brains and answer questions about human **behavior.** ■



A doctor studies a brain scan.

Reading Comprehension

Mark each sentence as *T* (True) or *F* (False) according to Reading 2.

___ 1. Scientists used to wonder where the human brain was located.
___ 2. Brain mapping was not possible before computers were invented.
___ 3. Brain functions can be scanned by fMRI machines.
___ 4. All human brains are average.
___ 5. Computers analyze the images created from brain scans.
___ 6. A computer that is linked to the scanner creates images.
___ 7. fMRI scans can change human behavior.
___ 8. MRI scans create computer images of complex brain parts.

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