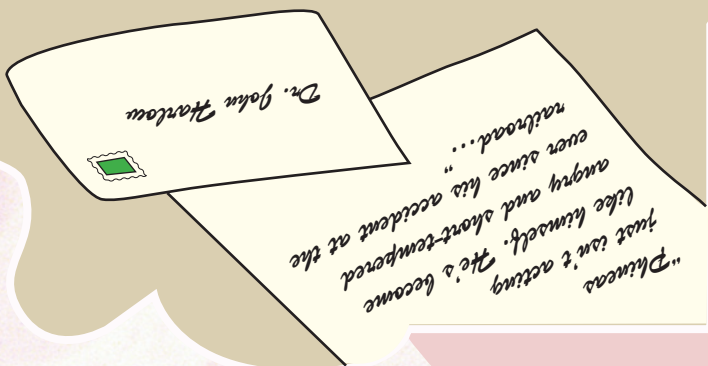
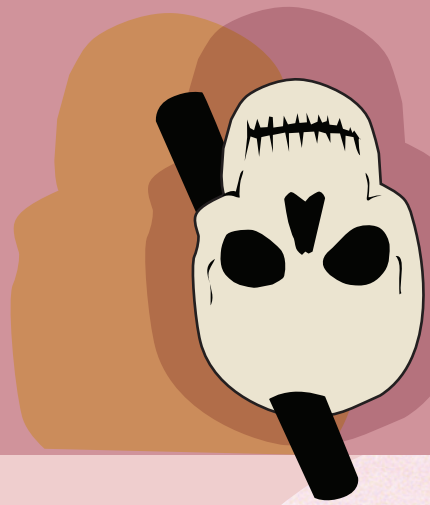




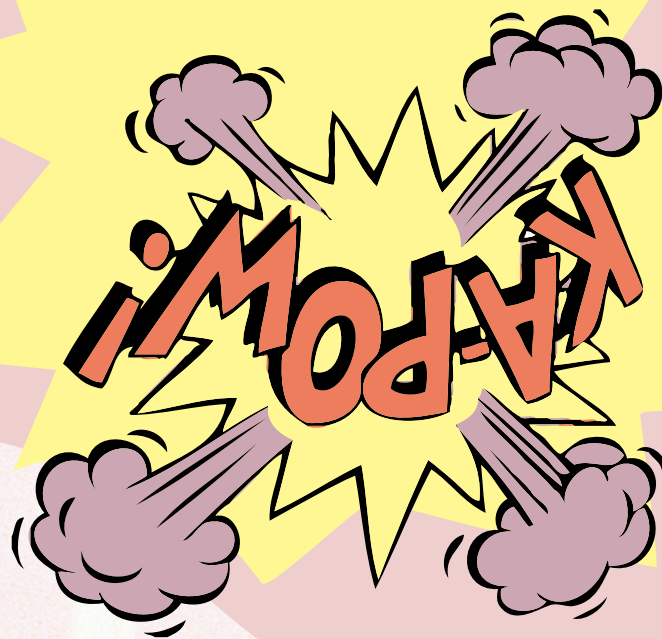
Phineas's brain was damaged in the frontal lobe, the part of the brain that we now know controls reasoning, planning, and decisionmaking. The damage to this part of the brain explained his change in personality and his story helped expand the new field of neurology.



In this image, you can see the exact path of the iron rod through his skull and brain. Amazingly, Phineas survived his accident, but.....

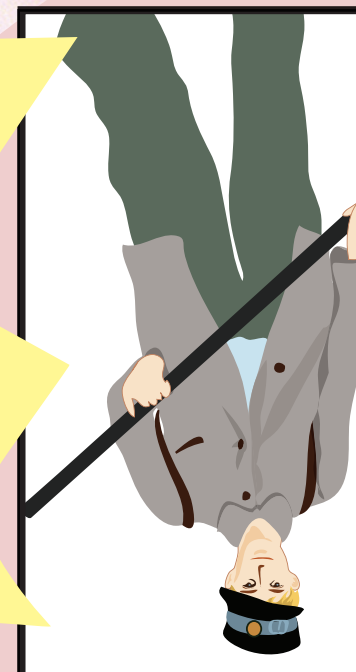


YIKES! Get the doctor! That iron rod went into his cheek, through his brain, and out the middle of his forehead!



1848

Meet Phineas Gage. The year is 1848 and he's helping make way for the new railroad by shattering rock with gunpowder. He uses an iron rod more than 3.5 feet long to pack the gunpowder in.



THE STORY OF PHINEAS

A neuron.

What continues to work even after it's fired?

Memory Lane.

What street does the hippocampus live on?

Science in the Spotlight: The Main Brain

How do you remember the way to school? Why do your eyes blink when you never even think about it? Where do dreams come from? Your brain is in charge of all this, and a whole lot more. The brain controls just about everything we do.

The human brain has several different parts. The largest part is the cerebral cortex, which makes up 75 percent of the brain. It is considered to be the most highly developed part of the brain, and it is what sets humans apart from other animals.

The cerebral cortex is divided into two hemispheres: the left hemisphere and the right hemisphere. Each hemisphere has a different role.

Left Hemisphere
Controls the right side of the body
Analytical

- Controls:
- Mathematical ability
 - Problemsolving and decisionmaking
 - Language

Right Hemisphere
Controls the left side of the body
Artistic

- Controls:
- Abstract thinking
 - Understanding relationships of objects in space, like reading a map

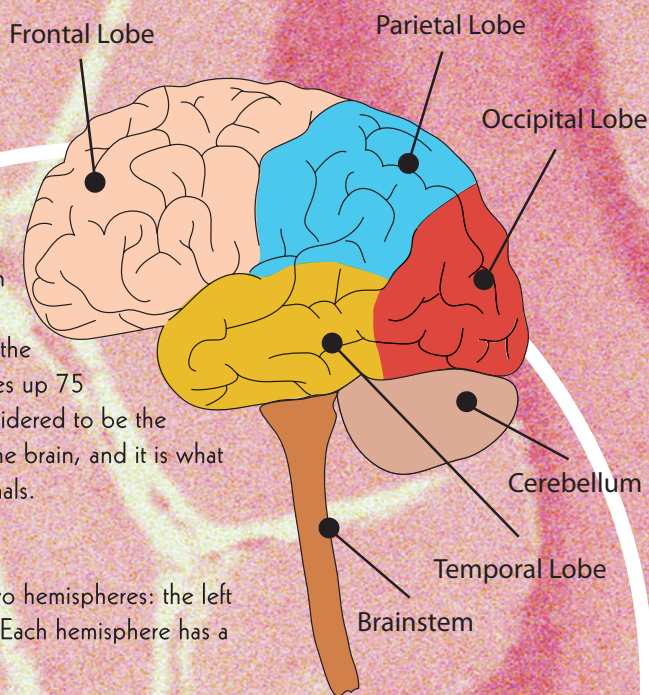


The left and right hemispheres of the brain communicate with one another through the corpus callosum, a bundle of nerves that acts as a bridge connecting the two halves of the brain.

The cerebral cortex is divided into four lobes:

- The **frontal lobe** controls the movements of muscles and higher mental skills, such as problem solving.
- The **parietal lobe** processes sensory information from the body, such as touch, pressure, and pain.
- The **occipital lobe** tells the brain what the eyes are seeing.
- The **temporal lobe** is in charge of making sense of what we hear and integrating information from other senses, such as smell and vision.

Check out the Brain Hemisphere Quiz on the CDROM to test what kind of hemisphere you are!



BP Weekly



the brain AND NERVOUS SYSTEM

NIDA
NATIONAL INSTITUTE
ON DRUG ABUSE

Brain Timeline



100,000 B.C. Ancestors to modern humans had brains weighing only 1 pound.



460-379 B.C. Hippocrates, a Greek physician, states that the brain is the center of intelligence.



Then, for a long time, people did not learn much about the brain:



1573 The first brain dissection is performed in Italy, but not on a living person.

Neurology

1681 The word *neurology* is first used by an English physician to describe issues related to the brain.



1760 Scientists discover that damage to the cerebellum affects motor coordination.



1848 Phineas Gage's brain injury leads to the discovery that the frontal lobe is responsible for reasoning and decisionmaking.



1855 The occipital lobe is found to be essential for vision.



1875 Electrical activity from the brain is recorded.



1936 The first lobotomy (surgical removal of part of the brain) in the United States is performed. Lobotomies were thought to improve difficult mental health issues but are now rarely used.

CAT
MRI
PET

1970s CAT, MRI, and PET imaging techniques were developed. These techniques provide clear images of the brain that are used to diagnose medical problems.



1990s President George H.W. Bush declares this the "decade of the brain" to raise awareness about the importance and benefits of brain research.

TODAY Work continues on understanding the brain and how it is related to many different health and behavior issues, ranging from learning disabilities to substance abuse.

Brain Talk

The weight, in pounds, of an adult human brain.

3

The brain contains special nerve cells responsible for carrying information to and from the body and other parts of the brain. These cells are called neurons. The human brain contains more than 100 billion neurons.

A neuron has three main parts. The cell body directs all the neuron's activities. Dendrites, short branches that extend out from the cell body, receive messages from other neurons and pass them on to the cell body. The axon is a long fiber that transmits messages from the cell body to the dendrites of other neurons or to other tissues in the body, such as muscles. Most neurons have a protective covering called the myelin sheath, which insulates the axon and helps messages travel faster, farther, and more efficiently.

Neurotransmission is the process by which neurons send and receive information. Special chemicals, called neurotransmitters, are released into the space, or synapse, between the axons and dendrites of two neurons. Neurotransmitters from one neuron cross the synapse and bind to receptors on the other neuron. Specific kinds of neurotransmitters are responsible for different things.

25
The number of bones that make up the skull.

The approximate percentage of the body's blood supply that goes to the brain.

15-20

Newborn babies have a "soft spot" on the top of their heads where the skull bones have not yet grown together.

"Neuron" is the scientific name for nerve cells. They often last our whole lives, making them the oldest cells in the body!

The cerebral cortex has to fold over itself many times to fit inside the skull, causing bumps and grooves on the surface of the brain. If the cerebral cortex were spread out, it would cover an entire page of newspaper!

Why was the neuron sent to the principal's office?
Because it had trouble controlling its impulses.

The *limbic system* is the part of the brain that deals with emotions, motivation, and memories. The main structure of the limbic system that is involved with emotions is the *amygdala*. The *hippocampus*, another part of the limbic system, is where short-term memories are made into long-term memories.

The hypothalamus also controls the *pituitary gland*, which plays an important role with the hormones in our bodies. For example, it releases the hormones needed to trigger the onset of puberty, and hormones that keep our blood pressure and the amount of water in our bodies balanced.

The Inside Scoop About the Brain's Insides

The inner brain is located deep inside the brain. The structures of the inner brain control our emotions, moods, memories, and body movements that we don't have to think about (such as eye blinking). Most of these things are *involuntary*, which means that they just happen, thanks to the structures of the inner brain.

What did Parietal say to Frontal?

•no!
I lobe

The *hypothalamus* is only about the size of a pea, but it controls some very important functions of the body! It helps control our body temperature, and it tells us when we are hungry or thirsty. It is responsible for waking us up in the morning, and is involved in emotions, such as happiness and anger.

Which Part Does What?

Each part of the brain has a specific role. See how much you've learned about the different parts of the brain by matching the name of the part to its function below.

- | | |
|----------------------|---|
| 1. Cerebral cortex | a. Involves processing and storing memories |
| 2. Cerebellum | b. Controls artistic expression and spatial relations |
| 3. Brain stem | c. Emotional center of the brain; keeps us safe from danger |
| 4. Pituitary gland | d. Contains the language center of the brain |
| 5. Hypothalamus | e. A bundle of nerves that connects the right and left hemispheres |
| 6. Corpus callosum | f. Too cold? Too hot? The body's internal thermometer will tell you what to do |
| 7. Amygdala | g. Produces hormones and controls metabolism |
| 8. Hippocampus | h. If you want to play a game of catch, you'll need to use this part of the brain |
| 9. Left hemisphere | i. If you think or say it, it starts in this part of the brain |
| 10. Right hemisphere | j. The most primitive part of the brain |

Looking for answers? Go to bottom left of the magazine!