

“Cogito, Ergo Sum”  
“I Think, Therefore I Am”  
Rene Descartes

Me too!



## Brain Science

Our brain functions perfectly well—generally—without our knowing anything about how it works. What use is it to me to know more about it?

**L**et's be clear: Without our brain, we are nothing. It is the source for every thought, every desire, every movement we make. When the brain stops, people are pronounced dead, even if their body can be kept alive. When 17th century philosopher, Rene Descartes, was asked if he could prove that he existed, he said in Latin, “Cogito ergo sum.” (English: “I think, therefore I am.” )

In general, the better our brain works, the better off we are. Just like fixing a motorcycle or baking a pie, knowing how the brain works helps us make it work better. The more we know how our brain works and how we can use it, the smarter we are. And who doesn't want to be smarter?

# Getting to Know Your Brain

**Until a few hundred years ago little was known about the brain. Now we know a lot, but there is still much to discover.**

## A Short History of Brain Research

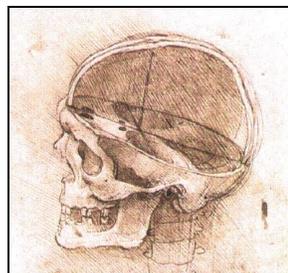
Humans have been messing around with the brain for a very long time. As far back as 7,000 years ago, people from Africa, South America, and Europe were drilling holes through the scalp to release evil spirits.

Of course little was known about the brain at the time. The ancient Egyptians totally got it wrong. They thought the heart was the centre of intelligence. Even the great Greek philosopher, Aristotle, agreed that the heart was our source of intelligence.

It wasn't until the Renaissance (around the 15th century) that Europeans began to understand much more about the brain. One reason for nearly 15 centuries of ignorance, was the Catholic church's ban on human dissection.

Leonardo da Vinci was one of the key Renaissance personalities to study the brain. Leonardo and others were able to identify the structure of the brain in detail. But they didn't really know how the brain worked.

It wasn't until a few hundred years later (1664) that Thomas Willis published a detailed, illustrated description of the brain. He made a few mistakes, but correctly identified



Drawing of skull by Leonardo da Vinci

many of the functions of the brain. He noted that different parts of the brain controlled different body activities.

## Dr. Jekyll and Mr. Hyde



In the mid-1860s scientists realized that the two halves of the brain controlled different tasks. This gave rise to the incorrect idea that dual-personalities could be controlled by separate halves of the brain.

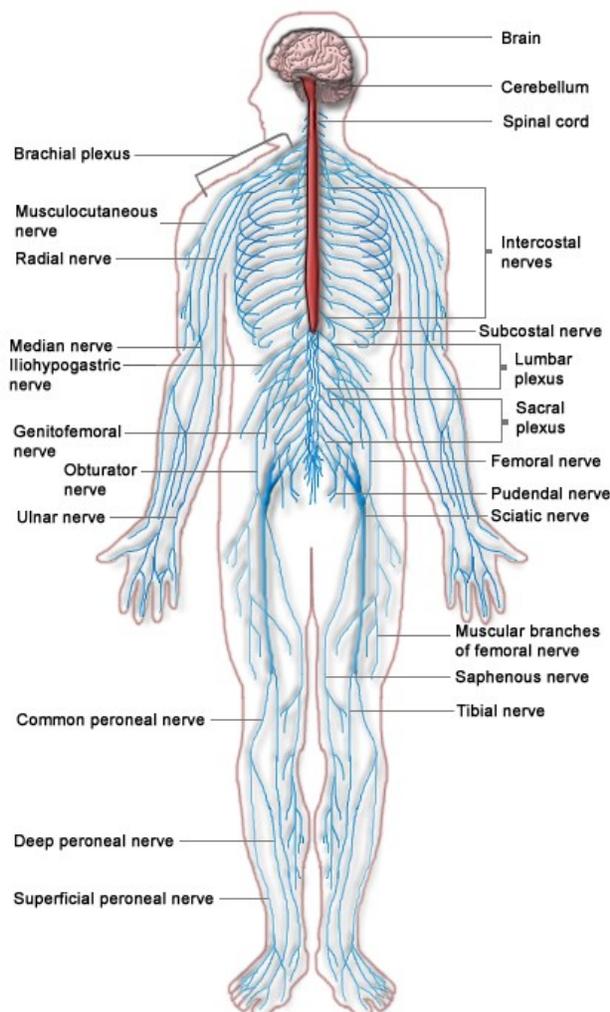
In 1886, author Robert Lewis Stevenson published his novel *The Strange Case of Dr. Jekyll and Mr. Hyde* based on this idea.

Scientists were getting to understand the various functions of the brain. But, they didn't know how information was transmitted. It wasn't until 1889 when Santiago Ramon y Cajal, a Spanish scientist, discovered that the brain and nervous system were made up of many separate cells that transmit information back and forth from the brain throughout the body. These cells are called "neurons." Cajal won the Nobel Prize for Medicine in 1906.

There was still a lot to learn, but by the beginning of the 20th century, our knowledge of how the brain worked had jumped far beyond what was previously understood.

## My Neurons and Why They're So Important

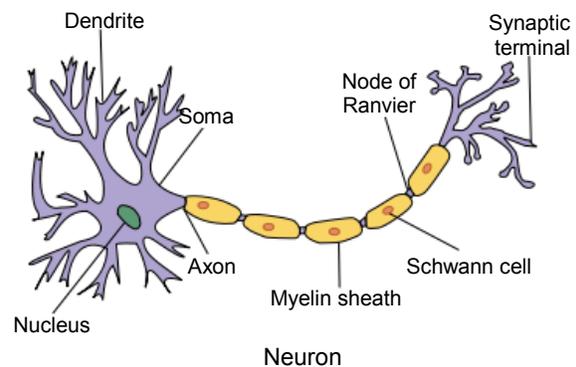
Like the Internet, Neurons (nerve cells) form the communications super-highway throughout our body. Our brain is the central processing unit. The nervous system (shown in blue below) carries information to and from the brain. This is a tree-like structure that goes throughout the body. The brain receives data from this network of cells and then makes decisions based on the data. A nerve cell on the surface of a finger tells the brain it is feeling hot. The brain tells the hand to move quickly away from the hot object. Neurons at work.



## The Remarkable Neuron

There are over 50 kinds of neurons. All neurons are designed for communication but they focus on different areas and tasks. There are neurons that specialize on pain, smell, touch and others that address memory, speech, hearing, planning and many other things.

There are around 100 billion neurons in the central nervous system. They connect with one another in a neural network with limitless connections. The illustration below shows just one neuron.



## How Neurons Communicate

Information flows along the neural network something like electricity flows along a circuit. The **dendrites** (see above) branch out and connect with other neurons. When cells become stimulated (such as being burnt by a hot stove), they send energy along the network. The **nucleus** gathers energy from connecting cells. When the energy is great enough, the nucleus fires a charge to the next neuron through the **synaptic terminal**. Information flows along the neural network to and from the brain at from 1 to 120 meters per second.

## Brain Science | Key Terms

cell	A microscopic component of plant and animal life that supports fundamental life functions.
central processing unit (CPU)	The central component of a computer that exchanges data with the computer's memory and peripherals. Used here as a metaphor because of its similarity with the brain's function.
Cogito, Ergo Sum	In English: "I think, therefore I am." State by Rene Descartes as proof that he exists.
nervous system	A network of specialized cells in animals and humans that communicate information back and forth to the brain from nerve endings throughout the body.
neural network	A network of neurons in the brain that holds memory.
neuron	A cell in the nervous system that transmits information back and forth to the brain from the body's sensors.
Renaissance	A French term meaning "rebirth." It refers to the historical period after the Middle Ages in which there was a rapid growth of science, art and social thought.

## Discussion Points

1. Rene Descartes said, "I think, therefore I am." as proof that he existed. In the age of the Matrix, can you think of any other proof that you actually exist and are not a figment of someone else's imagination?
2. Neurons transmit data back and forth along the central nervous system to your brain. They report data from your senses such as touch, sight, and hearing and give instructions back to your muscles to take action. To use a technology metaphor, we can call the central nervous system the "data super highway." Can you think of other metaphors that would be appropriate?