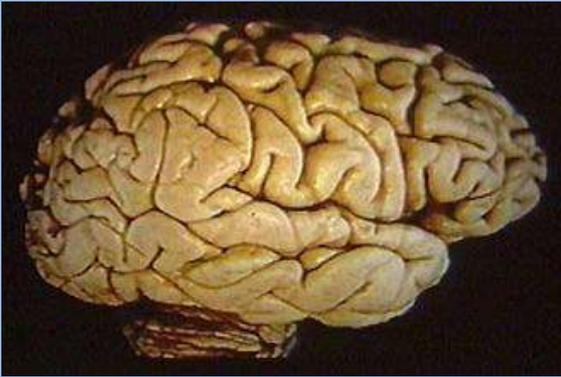


The basics of Brain

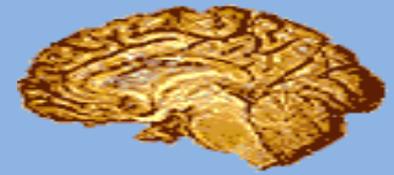
Source: Web-world(sept-oct'12)



- Weighs approximately 3 pounds (1.36kg)
 - Mostly water - 78%
 - Fat - 10%
 - Protein - 8%
- Soft enough to cut with a butter knife
- Resembles with a walnut-fruit
- Outside of the brain
 - Convolution or folds
 - Wrinkles are part of the cerebral cortex
 - Folds allow maximum surface area



The Nervous System



- It makes up critical portion of the nervous system
- Nerve cells connected by nearly 1 million miles of nerve fibers
- It has the largest area of uncommitted cortex of any species giving humans flexibility for learning.
- Brain consumes about 20% of the body's energy .
- The Brain uses about 1/5 of the body's oxygen.
- The Brain gets about 8 gallons (more than 30 liters) of blood each hour (supplying nutrients like glucose, protein, trace elements, and oxygen).
- Brain needs 8-12 glasses of water a day for optimal functioning.

Our Brain

The human brain is called 'amazing' without any doubt because it receives information of various kinds and handles them so quickly.

The information are send and received so quickly that many activities seem to take place within the fraction of a second

The distribution of the information and the corresponding responses are so quick and they are so minuscule that it is just not possible to measure them aptly.

The brain also contains or possesses the human language which is defined as one of the most advanced functions of neurons

The brain also possesses emotions and helps us to create our affective universe around us.

The emotion is core ingredient for our personality that has gradually changed us from barbarian to civilized one.

The emotion, thus, acts as the base for the stabilization of our universe despite all the brutal activities of the world.

The brain also helps us to think, meaning it is responsible for our memory, intelligence, our thoughts.

The brain also controls our autonomic functions such as heart rate, breathing and many such activities.

Finally the brain also controls our immune system, and it also protects us from various viruses.

It also handles the Central Nervous System's input and output.

The brain also contains all the portions of the Nervous System outside of the brain and spinal cord.

The brain also contains **sensory nerves** and **motor nerves**

They are divided into **autonomic nervous system** and **somatic nervous system**.

The Nervous System

The Central Nervous System

The Brain

The Spinal Cord

The peripheral Nervous System

The Somatic Nervous System

The Autonomic Nervous System

The parasympathetic Nervous System

The Sympathetic Nervous System

The personality and emotion in brain: a story of Phineas Gage

Phineas P. Gage was a construction supervisor for the Rutland and Burlington Railroad.

On Sept. 13, 1848, he was working at a site near Cavendish, Vermont.

He had drilled a hole in a rock that was to be removed then filled the hole with blasting powder.

After instructing an assistant to pour sand on top of the powder to cushion it, he turned away briefly.

Unfortunately, the assistant did not follow his directions and when Gage began tamping down the powder with a 13-pound, 3-foot-7-inch iron rod in the next step of the procedure, the powder exploded, shooting the rod clean through his cheek and brain.

The rod was later found 25 feet away, covered with blood and brain tissue.

Surprisingly, Gage, then 25, recovered. But his behavior changed abruptly.

No longer an affable young man, he became fitful, irreverent and profane.

Unable to retain his railroad job because of the personality changes, he took a succession of somewhat menial jobs, including as a stagecoach driver in South America.

He was eventually reunited with his family in San Francisco, where he died some 12 years after the fateful accident.



Figure 6.1

The only known early pictorial representation of Gage
From Windsor 1921, p. 507. Copy by courtesy of Carole Hughes, Dana Medical
Library, University of Vermont, Burlington.

The distortion of the personality of Phineas Gage started a new era in the research direction in the area of ‘psychology’.

This also let the researcher to start a new era in the study of brain and language.

The psychologist Macmillan wrote his book *An Odd Kind of Fame: Stories of Phineas Gage* in 2000 (the only book-length treatment of Gage).

He surveys the whole case (both scientific and popular) and has shown that they are varying and inconsistent, typically exaggerated far beyond the evidence, and often in direct contradiction to the evidence.

Whatever is the truth, as to whether the researchers build up some stories which were not true or they were partially true, but it is a fact that this incident brought a new epoch in the field of the study of brain and its function.

Neurons

The Nervous System is made up in part of neurons

They are held in place by **glial cells**

The Function of Glial Cells:

- Provide neurons with nutrients

- Insulate neurons

- Remove cellular debris when neurons die

The neuron is the basic unit of information processing and the building block of the brain.

It is a cell that receive some soft of stimuli, often know as the signals from other neurons, and responds by either sending the signal or storing it for some muscular activity.

In a way, the neuron is like a digital circuit. It is either on or off. The difference is that it can fire at various rates and thus pass on the subtle differentiated information to other neurons.

Neuron and its structure

1- Dendrites: Dendrites are tree-like extensions at the beginning of a neuron that help increase the surface area of the cell body and are covered with synapses.

They act like antennas for receiving messages and transmitting them to Cell body.

2- The Cell Body: The Cell body is also known as Soma, a word in Greek which means 'body'.

The soma is where the signals from the dendrites are joined and passed on.

The soma and the nucleus do not play an active role in the transmission of the neural signal.

Instead, these two structures serve to maintain the cell and keep the neuron functional. They contain the biochemical machinery to keep the neuron alive.

3- The Axon: The axon is the elongated fiber that extends from the cell body to the terminal endings and transmits the neural signal.

The larger the axon, the faster it transmits information. Some axons are covered with a fatty substance called myelin that acts as an insulator.

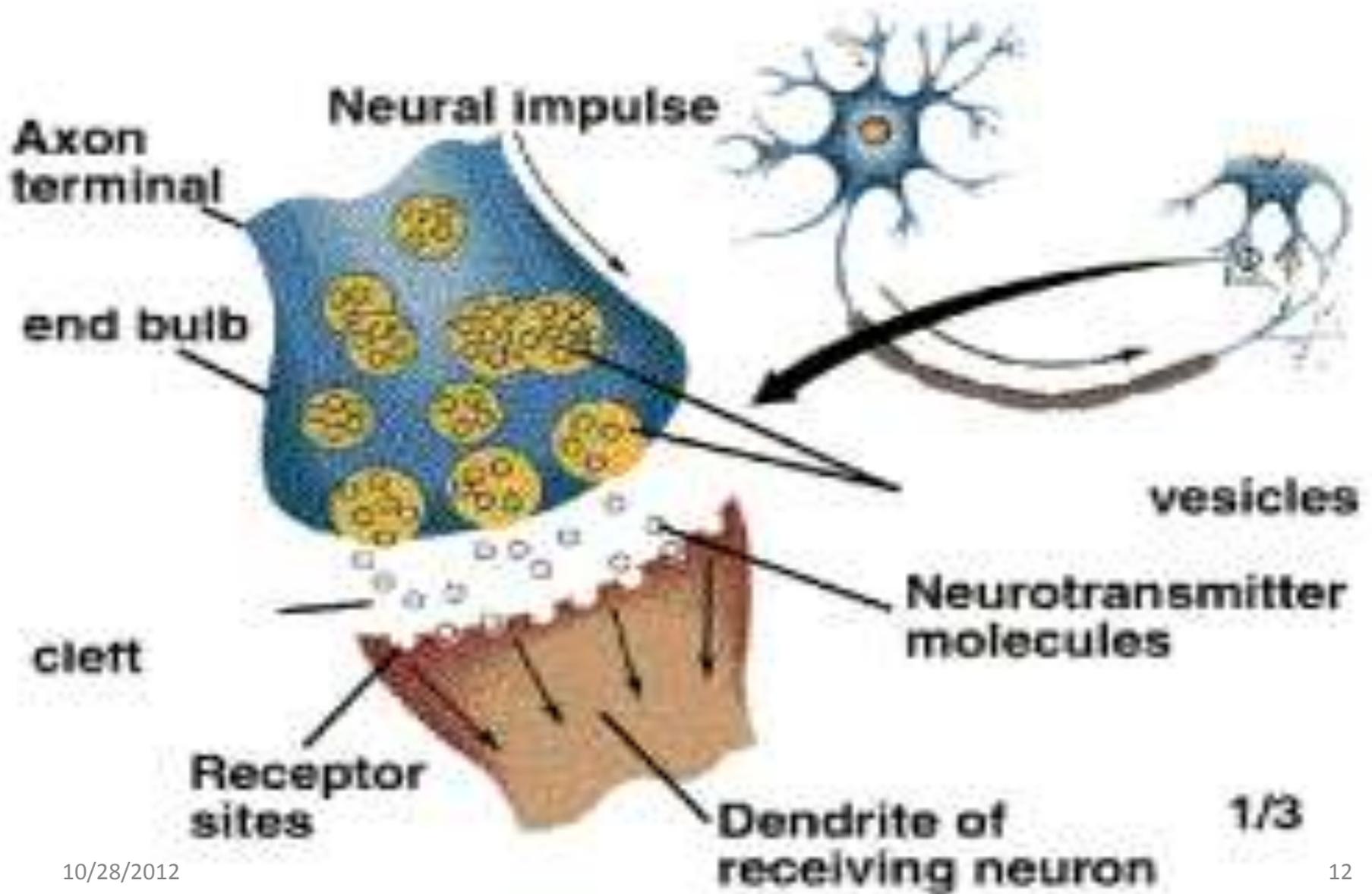
These myelinated axons transmit information much faster than other neurons.

In general it transmits messages away from the cell body to other neurons

The Characteristics of Axon

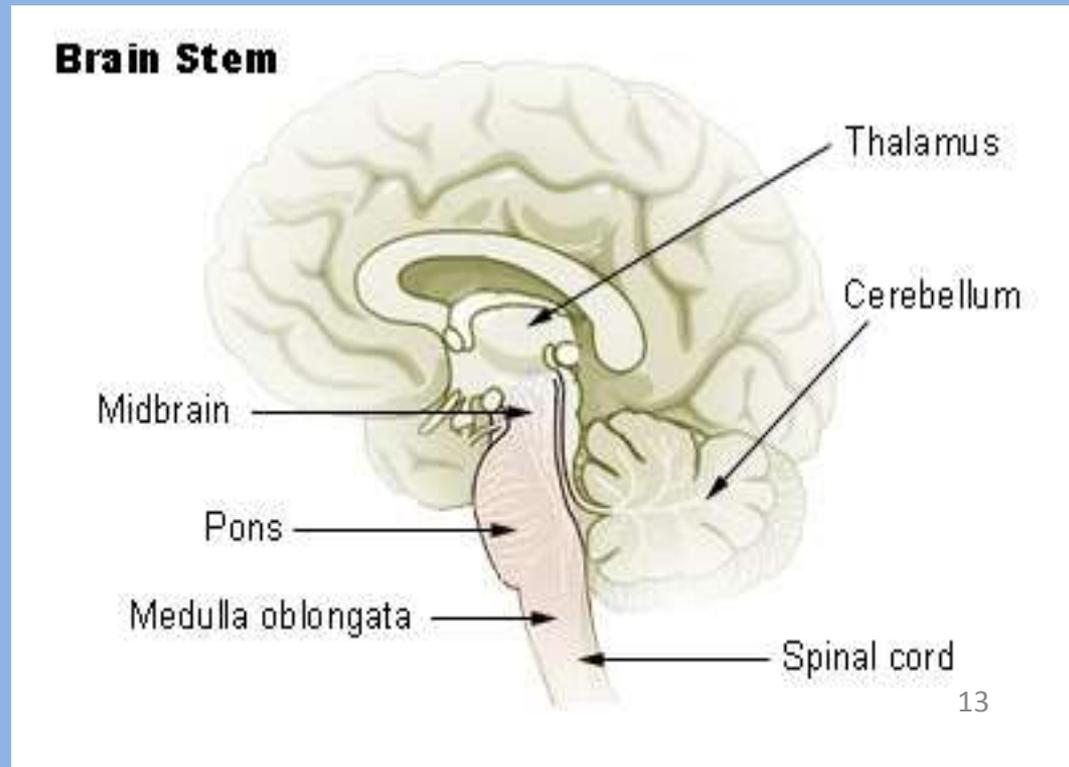
- Most neurons have only one axon
- Transmit information away from the cell body
- May or may not have a myelin covering

The way neurons communicate



The brain

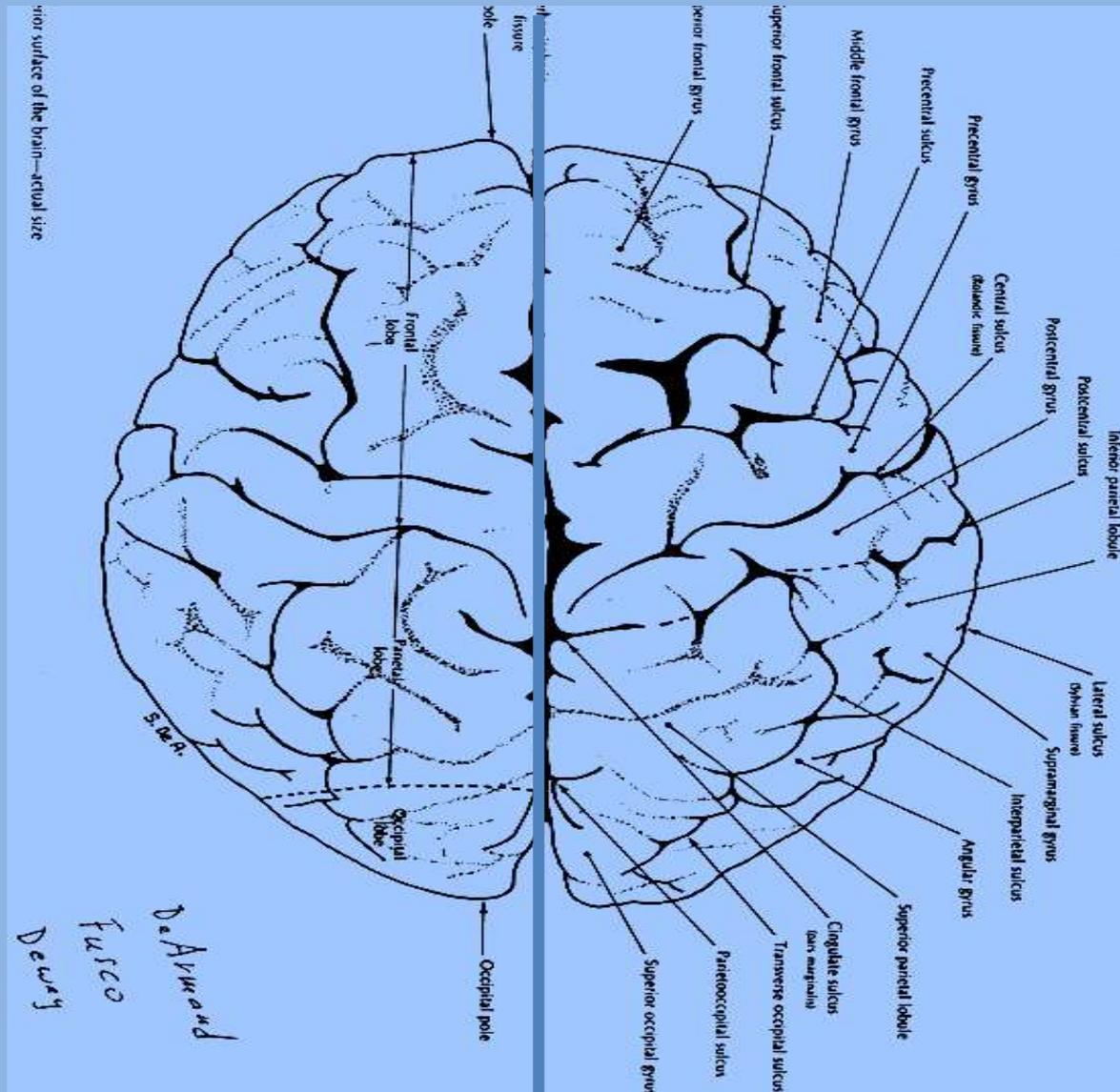
- Medulla
- Pons
- Midbrain
- Thalamus and hypothalamus
- Cerebral hemispheres
 - Cerebral cortex
 - Basal ganglia
 - Basal forebrain nuclei
 - Amygdaloid nucleus



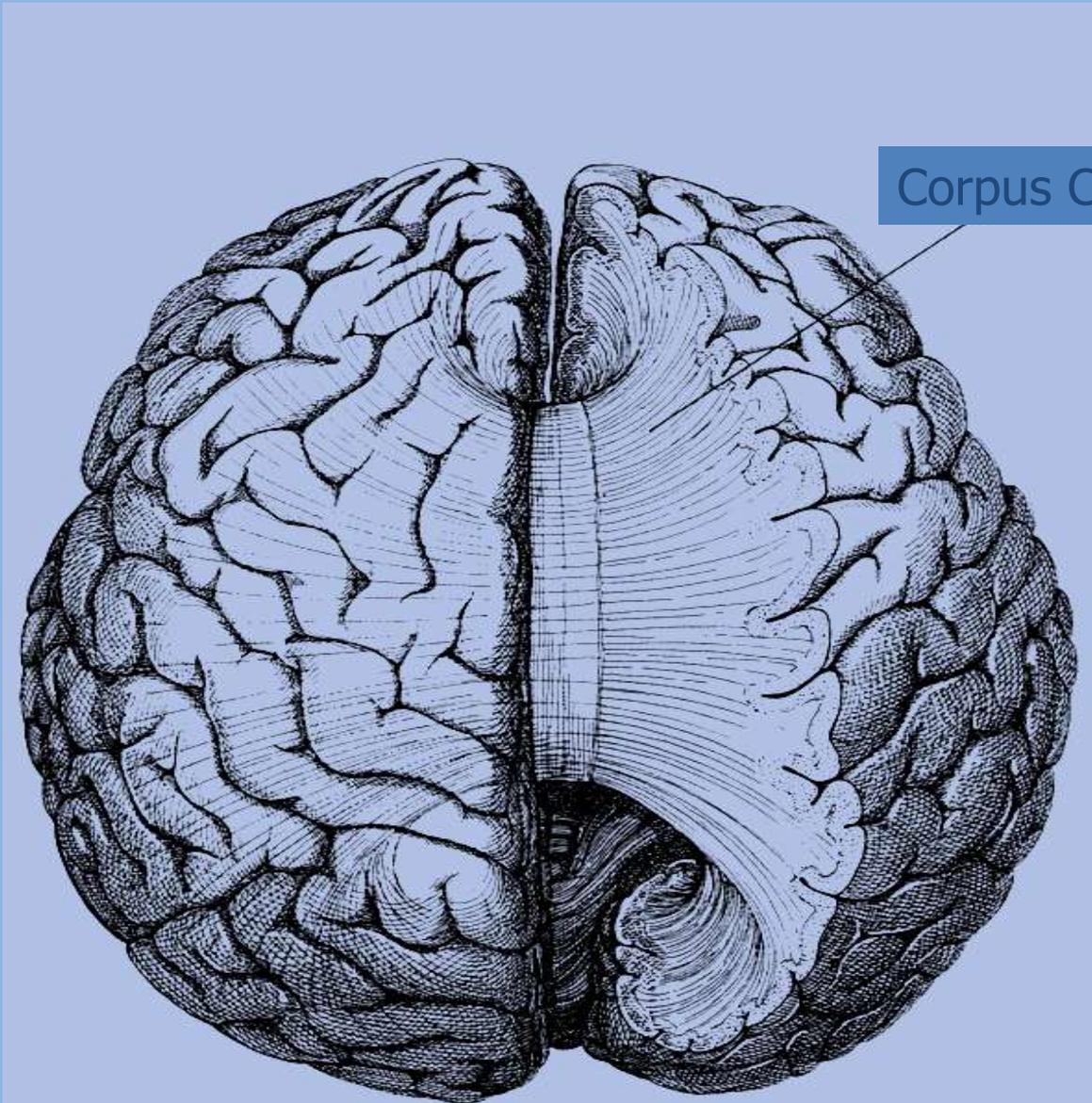
The division of the hemispheres

Left

Right



Corpus Callosum Connects Hemispheres



Corpus Callosum

Corpus Callosum Connects Hemispheres



The brain and its functions

- Locations of various kinds of “information”
 - Visual, auditory, sense of touch, motor, ...
- The brain is a network and it is called a neural-network because it is composed of neurons
 - Neurons are interconnected
 - Axons (with branches)
 - Dendrites (with branches)
 - Neuron helps the activity to travel along neural pathways
 - Cortical neurons are clustered in columns
 - Columns come in different sizes
 - The smallest: mini-column – 70-110 neurons
 - Each mini-column acts as a unit
 - When it becomes active all its neurons are active

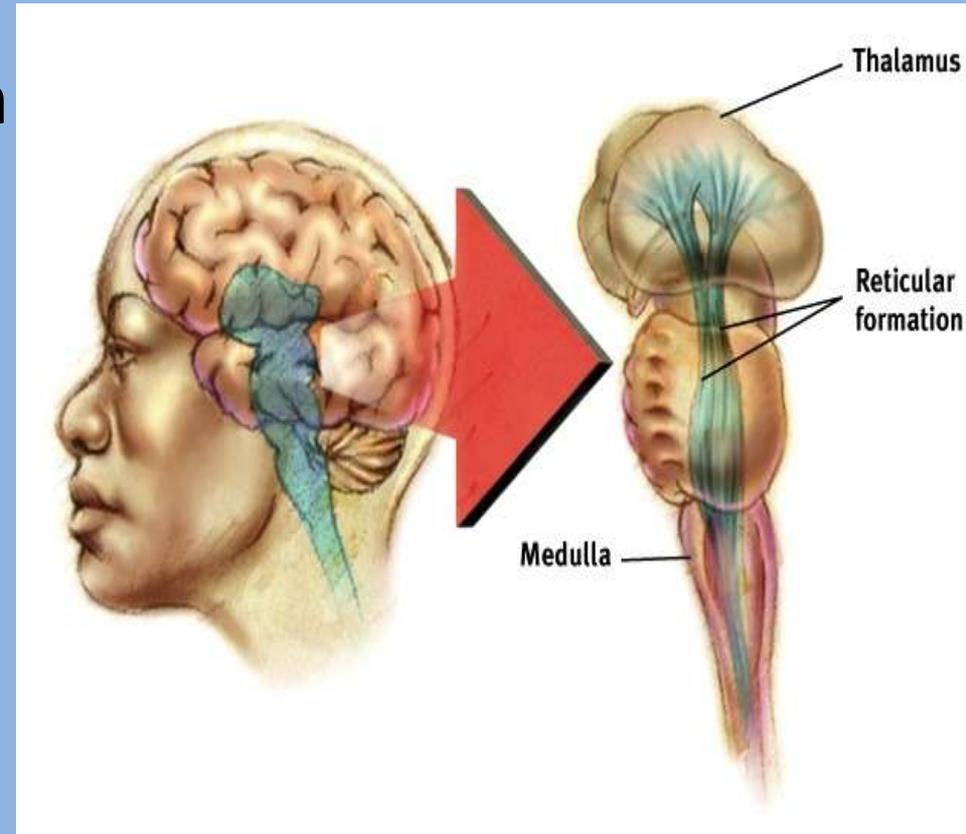
Facts of brain that we know

- Everything that is represented in the brain has the form of a network
 - This is why it is also called the “human information system”
- Therefore a person’s linguistic and conceptual system is a network
 - In a sense that it is the part of the whole information system
- Every lexical entry and every concept is a sub-network
 - Term: *functional web* (Pulvermüller 2002)

The Structure of the Brain

The Thalamus:

- is the brain's sensory switchboard, located on top of the brainstem
- it directs messages to the sensory receiving areas in the cortex and transmits replies to the cerebellum and medulla



The Cerebral Cortex

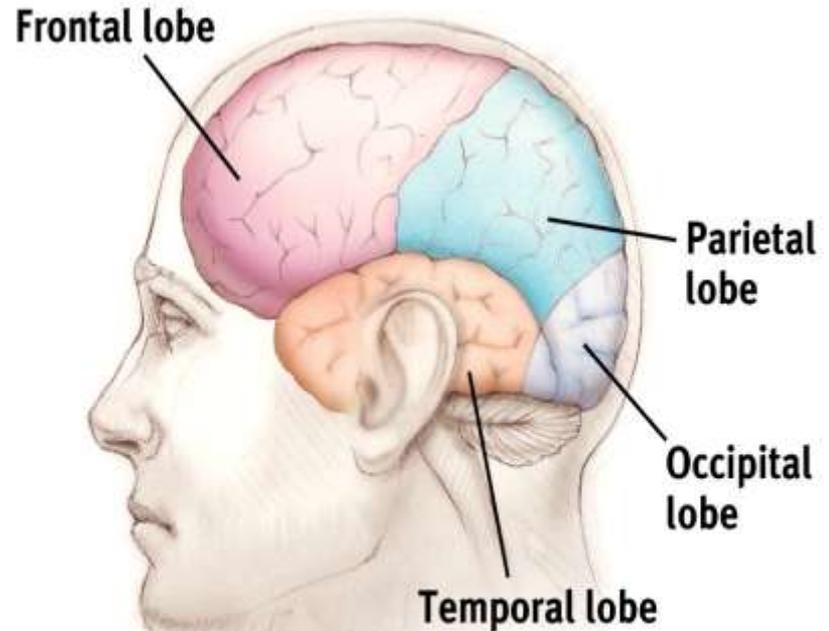
The Cerebral Cortex:

The cerebral cortex is the layer of the brain often referred to as gray matter.

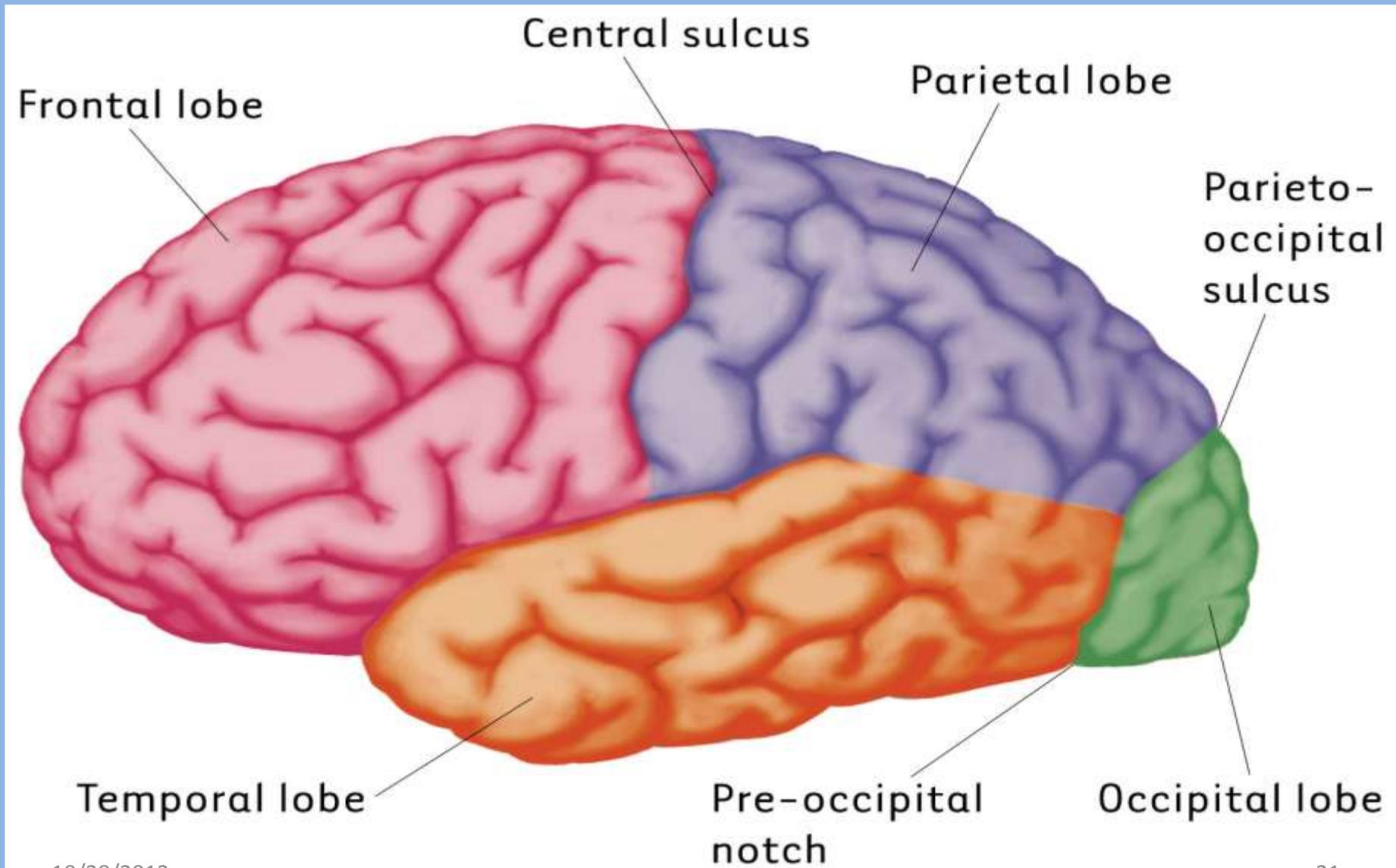
The cortex (thin layer of tissue) is gray because nerves in this area lack the insulation that makes most other parts of the brain appear to be white.

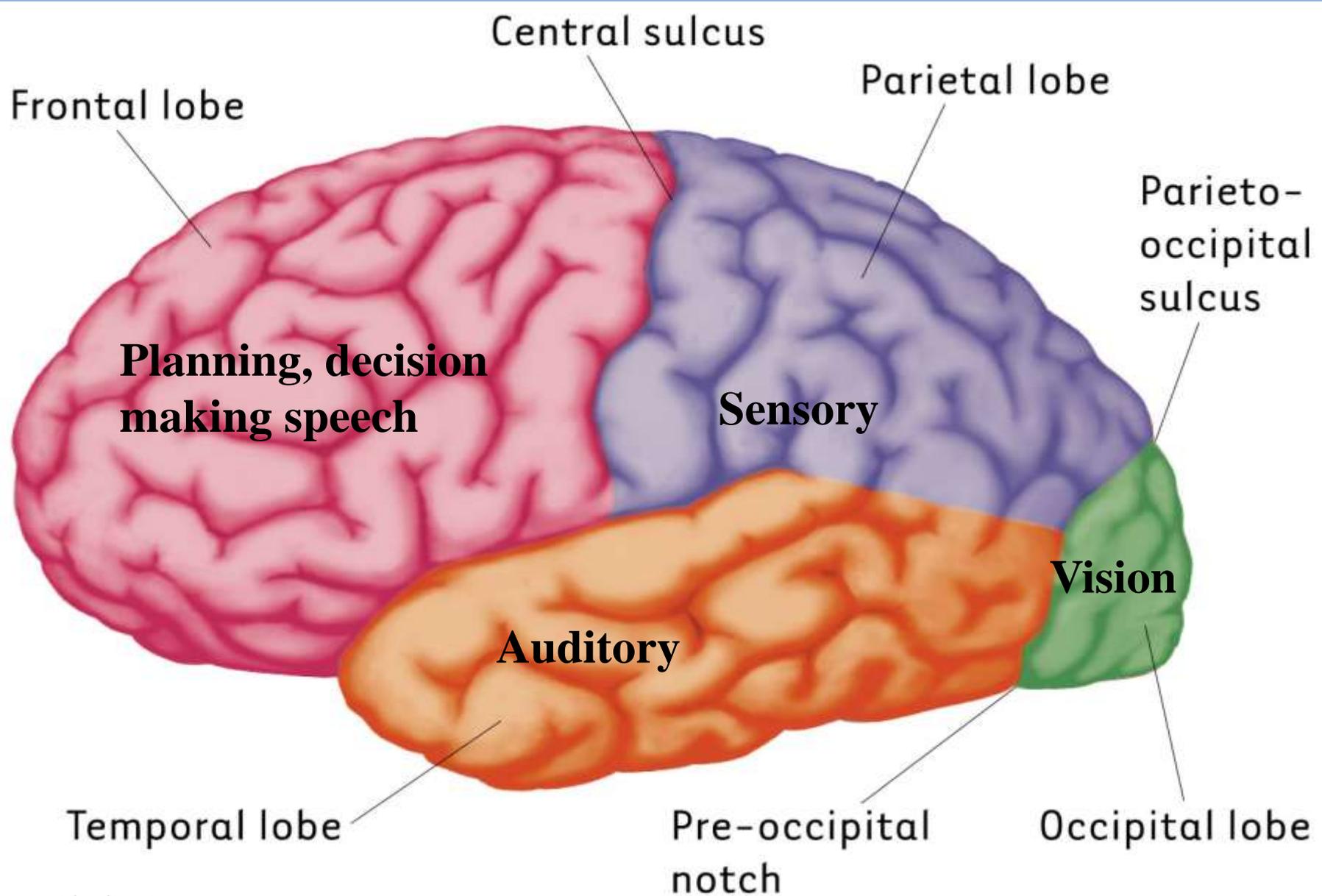
The cortex covers the outer portion of the cerebrum.

The portion of the cortex that covers the cerebrum is called the cerebral cortex.

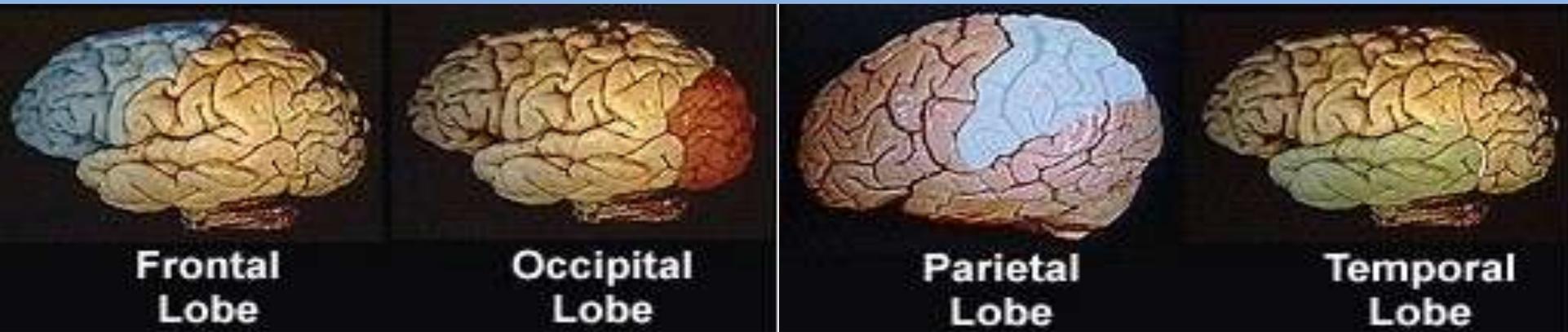


The division of brains into different lobes





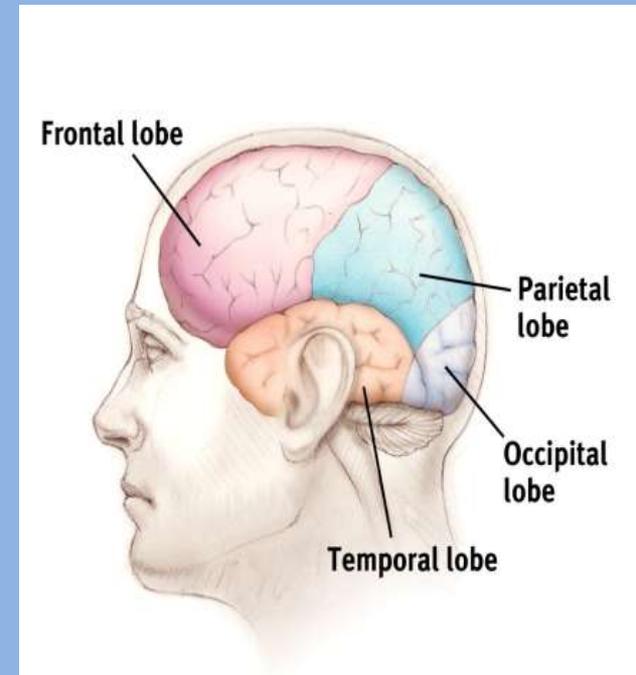
The Cerebral Cortex



- Frontal (Forehead to top) → Motor Cortex
- Occipital (Back) → Visual Cortex
- Parietal (Top to rear) → Sensory Cortex
- Temporal (Above ears) → Auditory Cortex

The Cerebral Cortex

- Frontal Lobes
 - involved in speaking and muscle movements and in making plans and judgments
- Parietal Lobes
 - include the sensory cortex
 - It determines the spatial sense and navigation in particular
 - It handles the knowledge of numbers and their relations, and the manipulation of objects



The Cerebral Cortex

Occipital Lobes

include the visual areas,
which receive visual
information from the
opposite visual field

Temporal Lobes

include the auditory areas,
each of which receives
auditory information
primarily from the opposite
ear

10/28/2012

