

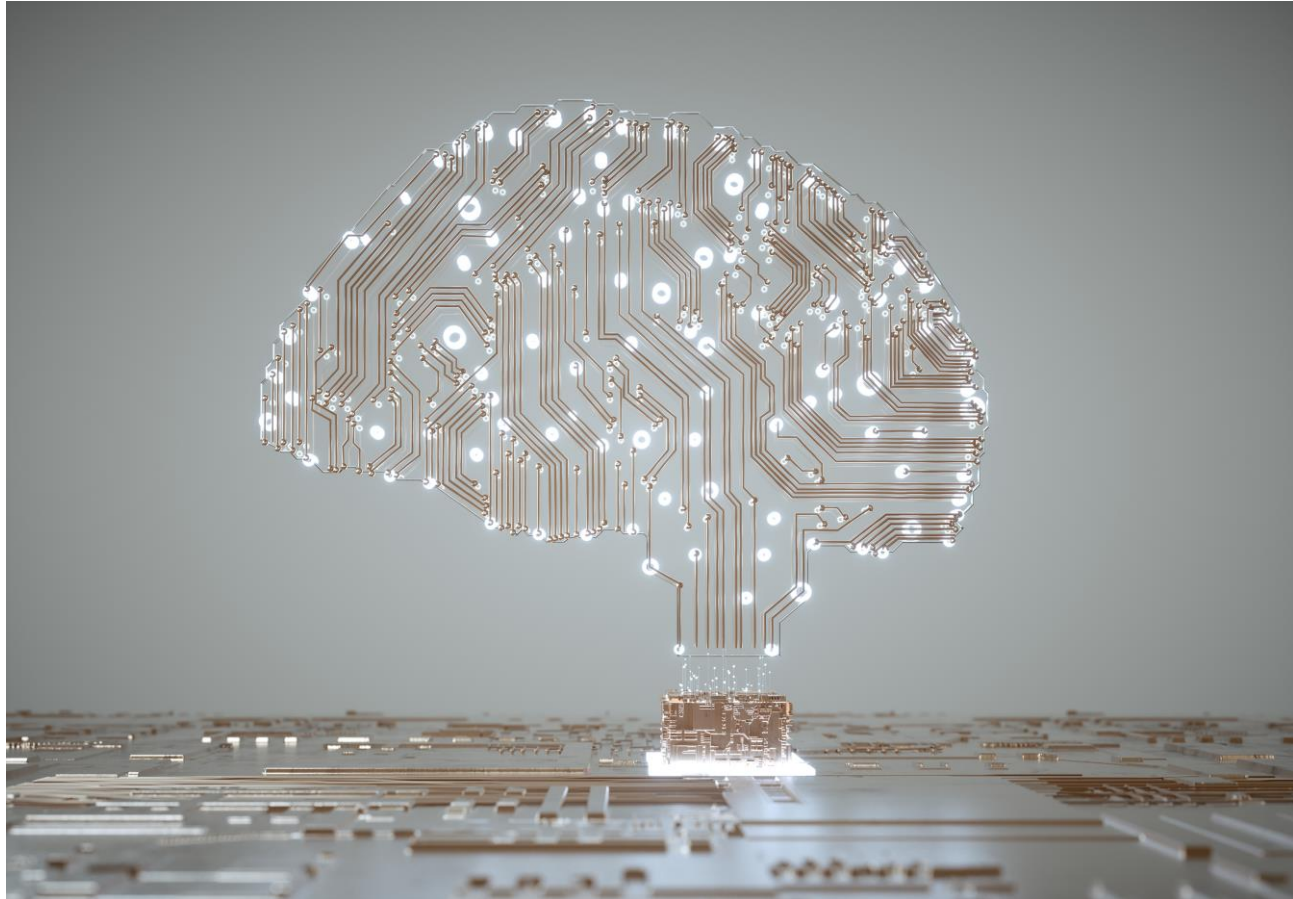
# THE HUMAN BRAIN

By  
Terri Fuentes, RN



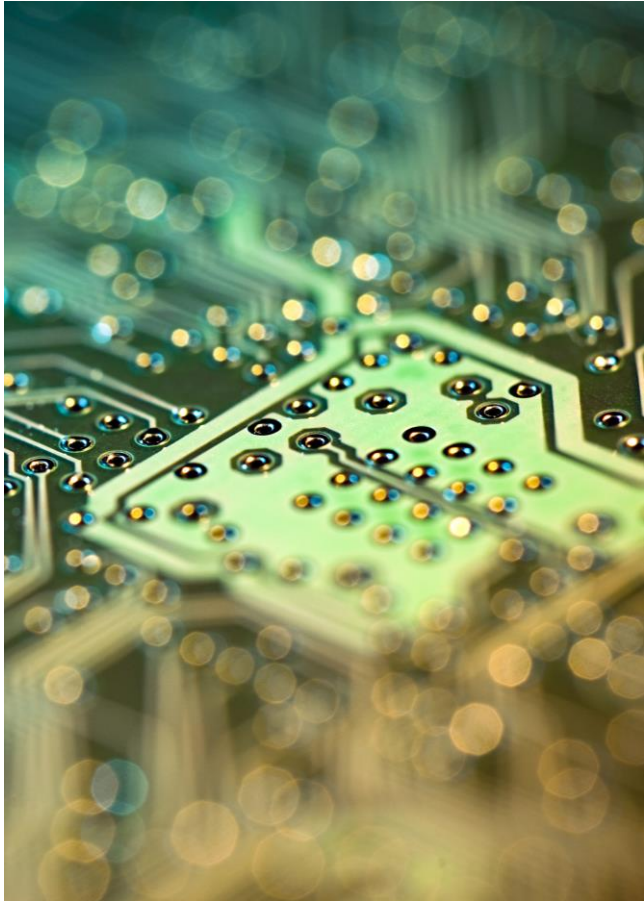
DID YOU KNOW THAT THE STOMACH IS  
SMARTER THAN THE BRAIN?

YES, BECAUSE THE STOMACH WARNS YOU  
WHEN IT'S EMPTY, THE BRAIN DOES NOT!



# CONTENTS

- What is the Brain
- Main parts of the brain
- Hemispheres of the brain
- Lobes of the brain
- Deeper structures of the brain
- Overview of the brain's circulatory system
- Overview of Brain Cells
- Overview of the cranial nerves



## WHAT IS THE BRAIN?

A complex command center

Controls EVERY process that regulates our body

All the qualities and characteristics that make us who and what we are

Together with the spinal cord it is our central nervous system or CNS

An adult brain weighs approximately 3 lbs

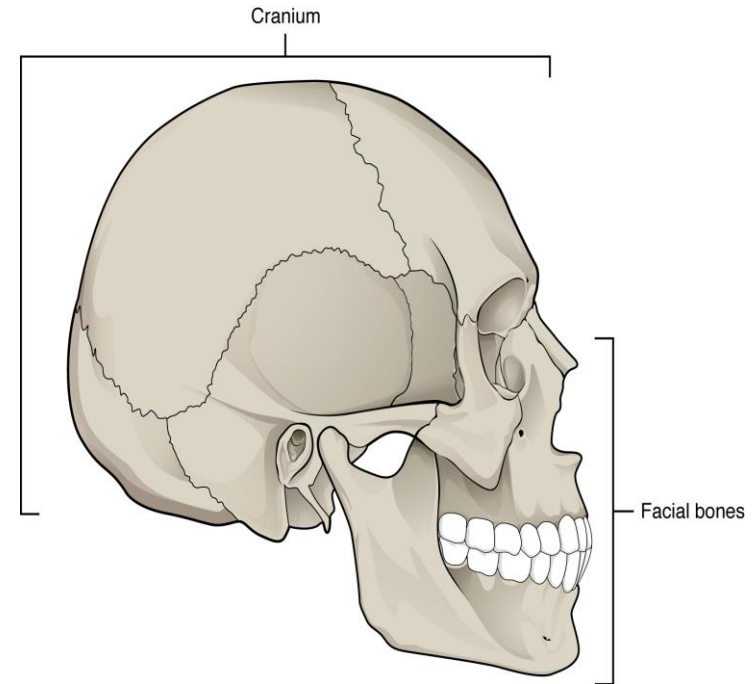
Soft tissue, white & gray matter, neurons, fat, water, salt, protein, carbs

# MAIN PARTS OF THE BRAIN

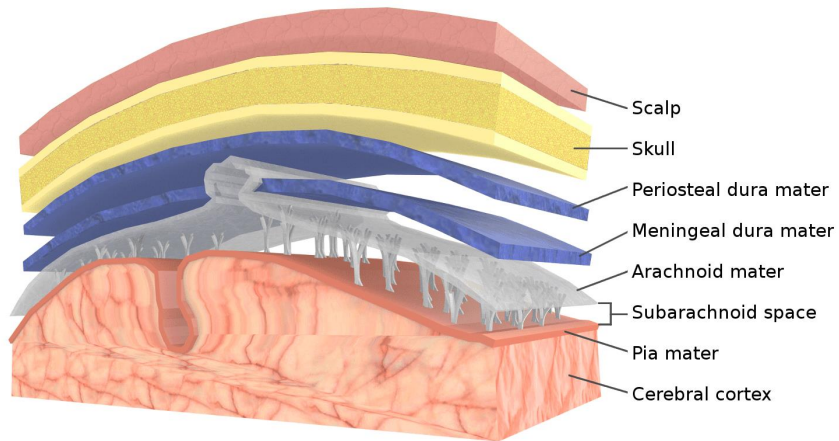
- Skull & Cranium
- The Meninges
- Cerebrum, the cerebral cortex
- The Hemispheres of the brain, right & left
- The four lobes of the brain, frontal, parietal, occipital and temporal
- The cerebellum
- The brainstem
- Ventricles
- The circulation
- Brain cells

# THE SKULL & CRANIUM

- The brain is encased in the skull  
total of 22 (+) bones  
provides surface for the facial muscles  
to attach to
- Protects the brain
- The cranium (part of the skull)  
total of 8 bones  
the brain rests in the cranial cavity



# THE MENINGES



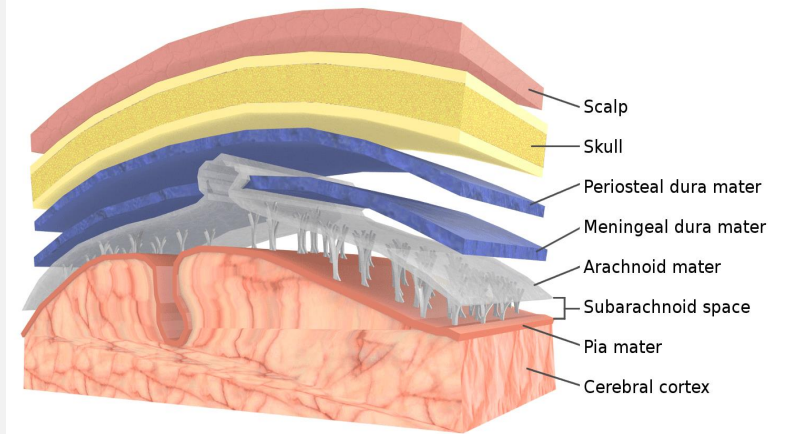
ETB 2016

- 3 layers of membranes that envelope the brain: dura mater, arachnoid mater & the pia mater
- Protect the brain and spinal cord
- Support the brain & blood vessels
- Provides a continuous space between the meninges that cerebrospinal fluid (CSF) passes in & around the brain and spinal cord

# THE MENINGES (Cont.)

## The Spaces Between the Meningeal Layers

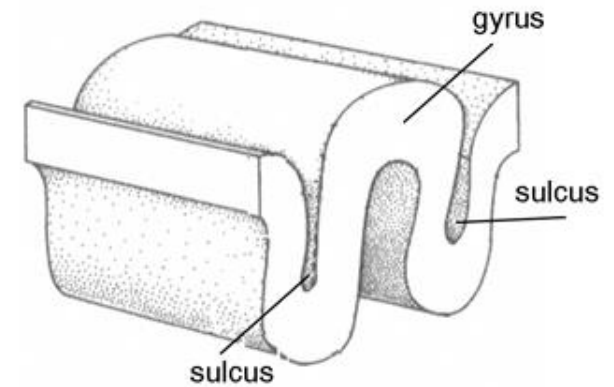
- Epidural space: CSF, fat, blood vessels, lymph, nerve roots
- Medication can be injected, infections can occur here, head injury can cause bleeding
- Subdural space: not really a space, nothing here
- Subarachnoid space: CSF, blood vessels





# THE CEREBRAL CORTEX

- Is the wrinkly gray matter
- The wrinkles increase surface area, increases processing ability
- Thick as 2-3 dimes
- Does most of the processing
- 4 lobes
- 2 hemispheres



# THE BRAIN'S HEMISPHERES

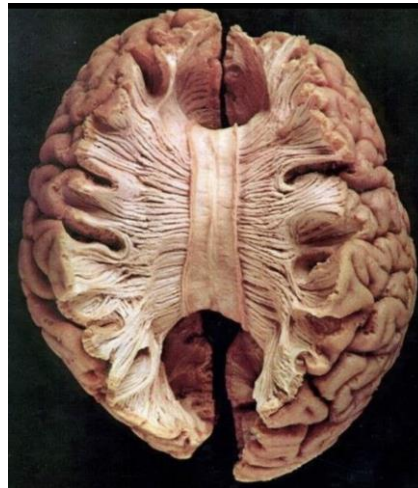
## Left Hemisphere

- Sensory stimulus from *right* side of body
- Motor control of *right* side of body
- Speech, language and comprehension
- Analysis and calculations
- Time and sequencing
- Recognition of words, letters and numbers

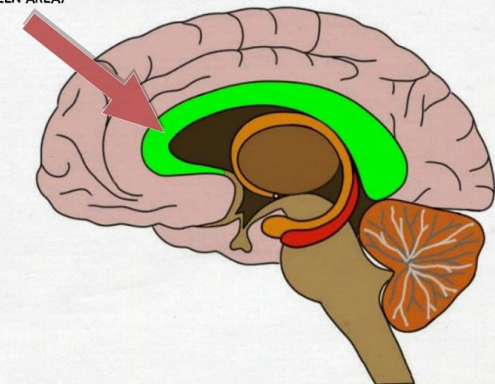


## Right Hemisphere

- Sensory stimulus from *left* side of body
- Motor control of *left* side of body
- Creativity
- Spatial ability
- Context / perception
- Recognition of faces, places and objects



**CORPUS CALLOSUM**  
(WHOLE GREEN AREA)



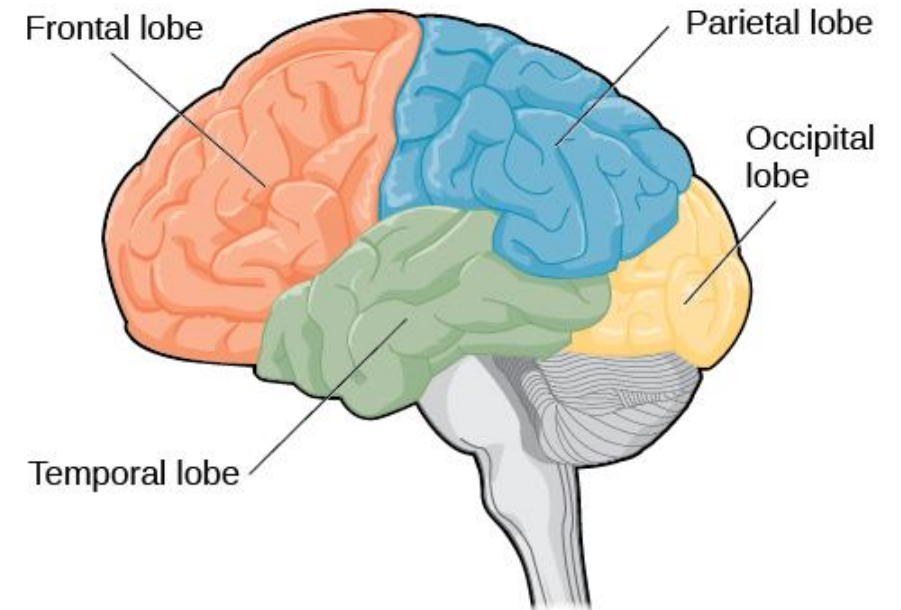
## 4 LOBES OF THE CEREBRAL CORTEX

The frontal lobe

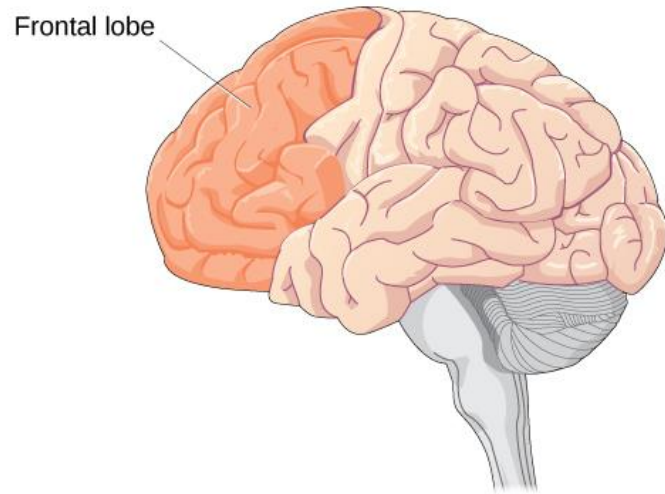
The Parietal lobe

The Occipital lobe

The temporal lobe



## FRONTAL LOBE



- Personality characteristics
- Expressive language
- Decision making, impulse decision regulation
- Assists in recognition of smell
- Voluntary muscle movement, motor skills
- Problem solving, learning and recall
- Memory storage

## FRONTAL LOBE (Cont.)



### Damage in the Frontal lobe

- Personality changes and changes in social skills
- Difficulty paying attention, organizing, planning
- Changes in sexual habits
- Problems with self-control
- Slowness of speech, but does not impact what you say

# THE PARIETAL LOBE

- Center of the cerebrum, behind the frontal lobe
- Processes sensory information – touch, pain, pressure,
- Identify objects, their size, shape and location
- Spatial awareness –where one’s body is in relationship to objects (proprioception)
- Understand spoken language
- Some coordination of hand, arm and eye movement



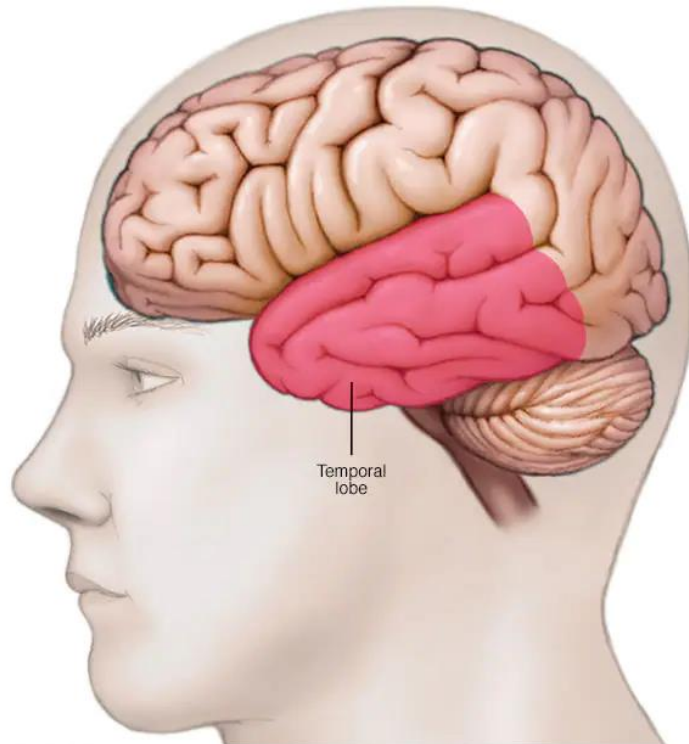
## THE PARIETAL LOBE (Cont.)

### ***Damage to the parietal lobe***

- Difficulty discriminating between sensory information
- Poor hand-eye coordination & balance
- Inability to locate and recognize objects, events, parts of the body and their place in space (spacial awareness)
- Disruption to the ability to read, write & draw, but without impacting the ability to talk and understand speech
- Ability to plan, organize and concentrate impacted
- Difficulty with math, recognizing the difference between right and left



# THE TEMPORAL LOBE

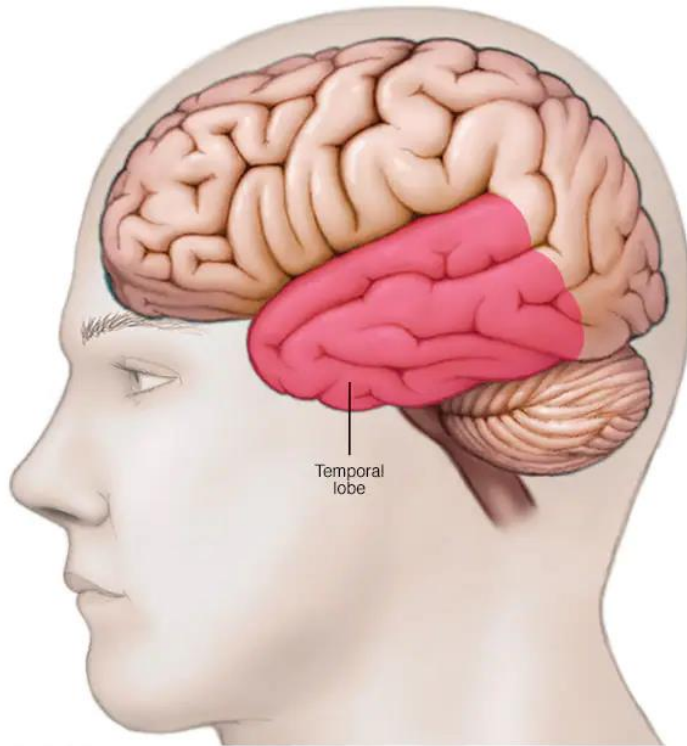


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- Located beneath the frontal and parietal lobes
- Integrates information from the senses, sight & sounds, face recognition, and known objects
- Forming & accessing memories
- Role in the recognition & use of words to communicate, & processing of emotions
- Processes sounds recorded by the ears & accesses secondary areas to further process the information
- Houses structures of the limbic system, olfactory cortex, amygdala & hippocampus



## THE TEMPORAL LOBE (cont.)



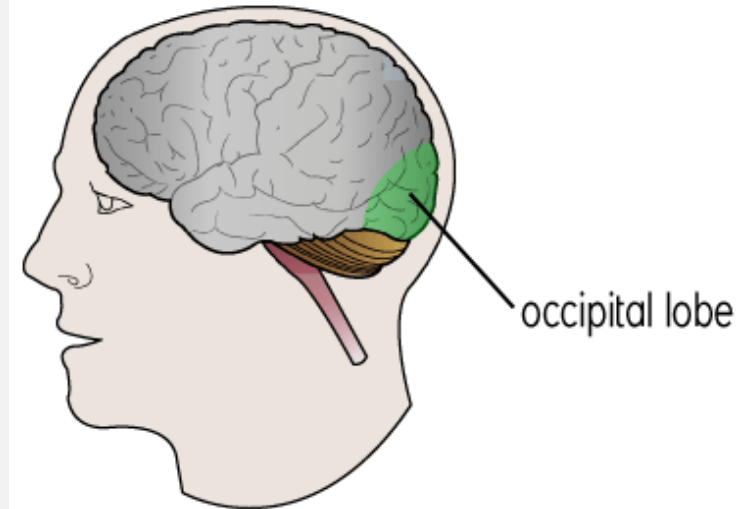
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### **Damage to the temporal lobe:**

- Memory problems
- Changes in understanding & expressing language (speaking)
- Inability to move part of the face, arm or leg
- Difficulty with math or using numbers
- Severe or frequent emotional distress
- Confusion
- Changes in vision
- Seizures

# THE OCCIPITAL LOBE

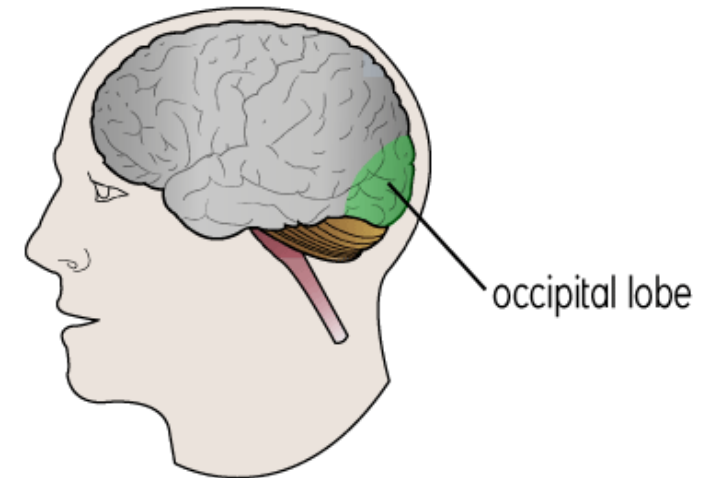
- Located at the back of the head
- Decodes the messages sent by your eyes turns it into information your brain can use
- Works cooperatively with other parts of the brain so you can:
  - “see” and understand shapes, textures and other details of objects in your surroundings
  - differentiate colors and shades (unless you have color blindness)
  - calculate the size and distance of objects to you
  - recognize faces of people you know or have met and
  - other things and objects you have seen before



## THE OCCIPITAL LOBE (Cont.)

### Damage to the Occipital lobe:

- Partial or total vision loss –it can affect the vision in one or both eyes. Your eyes may work just fine, but you're unable to process vision signals
- Word blindness (Alexia) – inability to recognize/read written words
- Motion blind (Akinetopsia) – causes a person to NOT see motion in their visual field
- Balint's syndrome (Simultanagnosia) – makes it impossible to see more than one object at a time





## THE CEREBELLUM

- **Cerebellum mean “little brain”**
- **Well protected at the back of the head beneath the temporal and occipital lobes**
- **Plays a role in virtually all physical movement including motor reflexes**
- **Coordinates all voluntary movements**
- **Responsible for learned movements**
- **Coordinates eye movement**
- **New research into more roles the cerebellum plays (reword this)**

## THE CEREBELLUM CONT'D

### Damage to the Cerebellum:

Uncoordinated movements, tremors

Muscle spasms

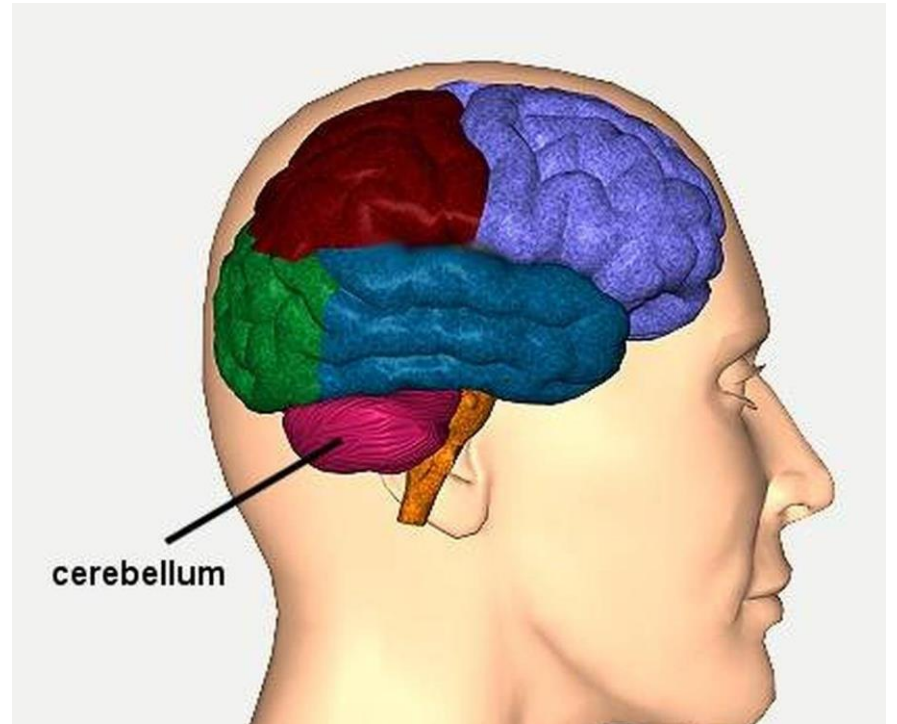
Difficulty walking

Balance problems, vertigo, dizziness

Speech difficulties

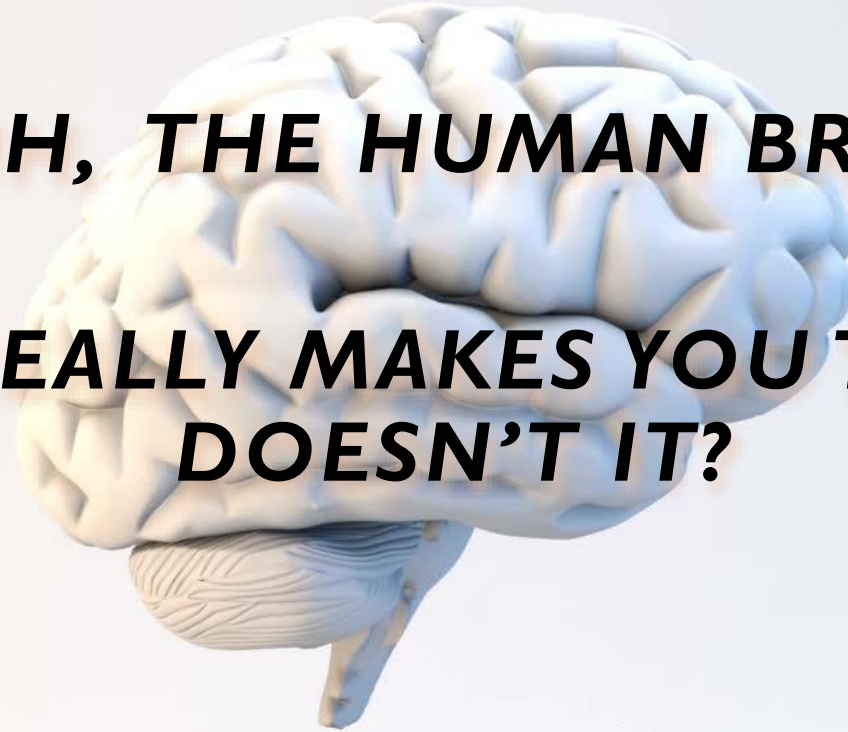
Swallowing difficulties

Involuntary eye movements (nystagmus)



***AHHH, THE HUMAN BRAIN...***

***REALLY MAKES YOU THINK,  
DOESN'T IT?***



# DEEPER STRUCTURES



Hypothalamus



Hippocampus



Brain Stem



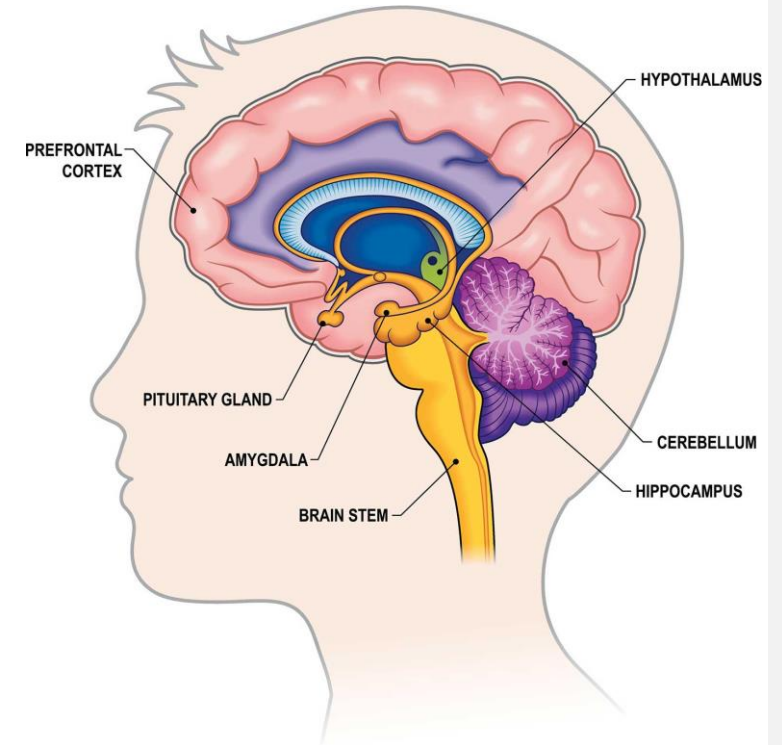
Pineal Gland



Pituitary Gland




Amygdala




## DEEPER STRUCTURES

**Hypothalamus:** Regulates body temperature, synchronizes sleep patterns, manages hunger & thirst, and plays a role in some aspects of memory & emotion.



**Hippocampus:** Located on the underside of each temporal lobe., supports memory, learning, navigation & perception of space. It receives information from the cerebral cortex and may be involved in Alzheimer's disease.




**Brain Stem:** Essential for life, connects the cerebrum with the spinal cord, manages heart rhythm, breathing, blood flow, O<sub>2</sub> & CO<sub>2</sub> levels, reflexive actions i.e., sneezing, coughing, vomiting, swallowing; enables tear production, chewing, blinking, focusing vision, impacts balance, hearing, facial expression, calculating other responses and more.




## MORE ON DEEPER STRUCTURES

**Pineal Gland:** soybean-sized gland at the back of the corpus callosum and above the cerebellum, produces and releases melatonin.

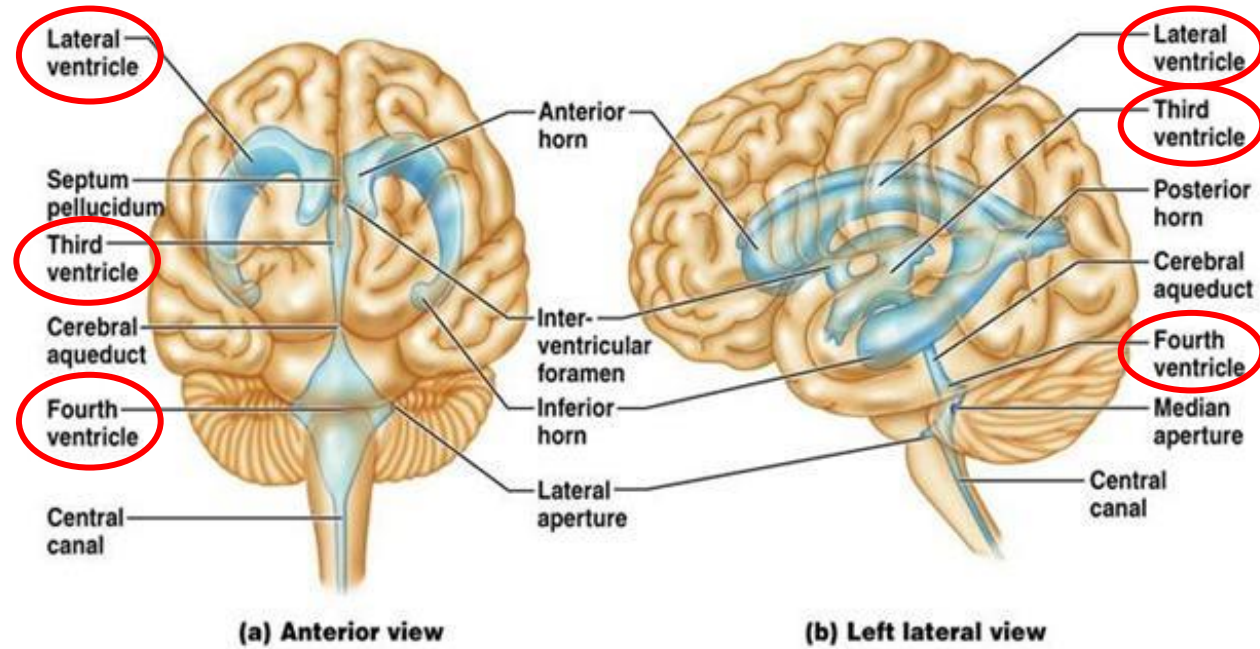


**Pituitary Gland:** it is a pea-sized structure deep in the brain behind the bridge of the nose, governs the function of other glands in the body, regulates flow of hormones from the thyroid, adrenals, ovaries and testicles, receives chemical signals from the hypothalamus through its stalk and blood supply.



**Amygdala:** Almond-shaped structure (x2), one just beneath each hemisphere of the brain, part of the limbic system, it regulates emotion & memory, is associated with the brain's reward system, stress & the "fight or flight" response when a threat is perceived.

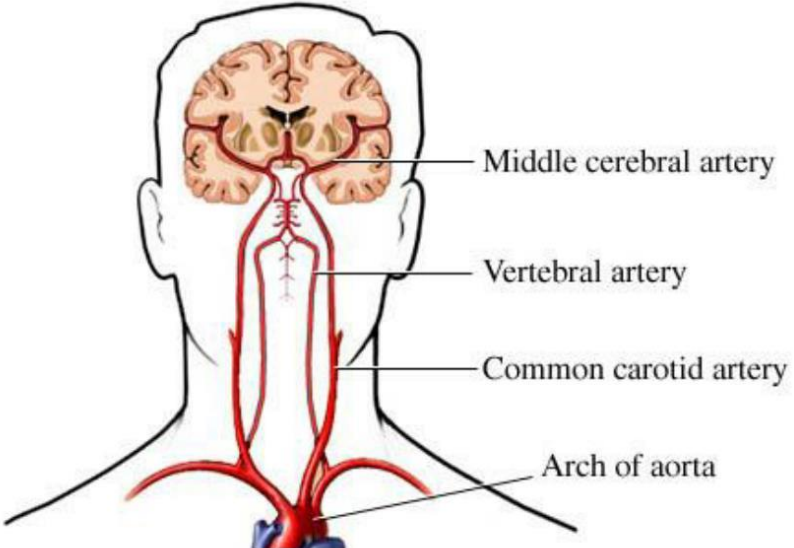
# VENTRICLES OF BRAIN



## WHAT TO KNOW

- The ventricles are open cavities with passageways between them. They open into the spinal canal.
- There are 4 and their job is to make and circulate cerebrospinal fluid (CSF) through the ventricles, the spinal cord and between the meninges.
- Remember, the CSF cushions and protects the brain. Additionally, it washes out waste and provides nutrients.

# The Major Circulation to the Brain



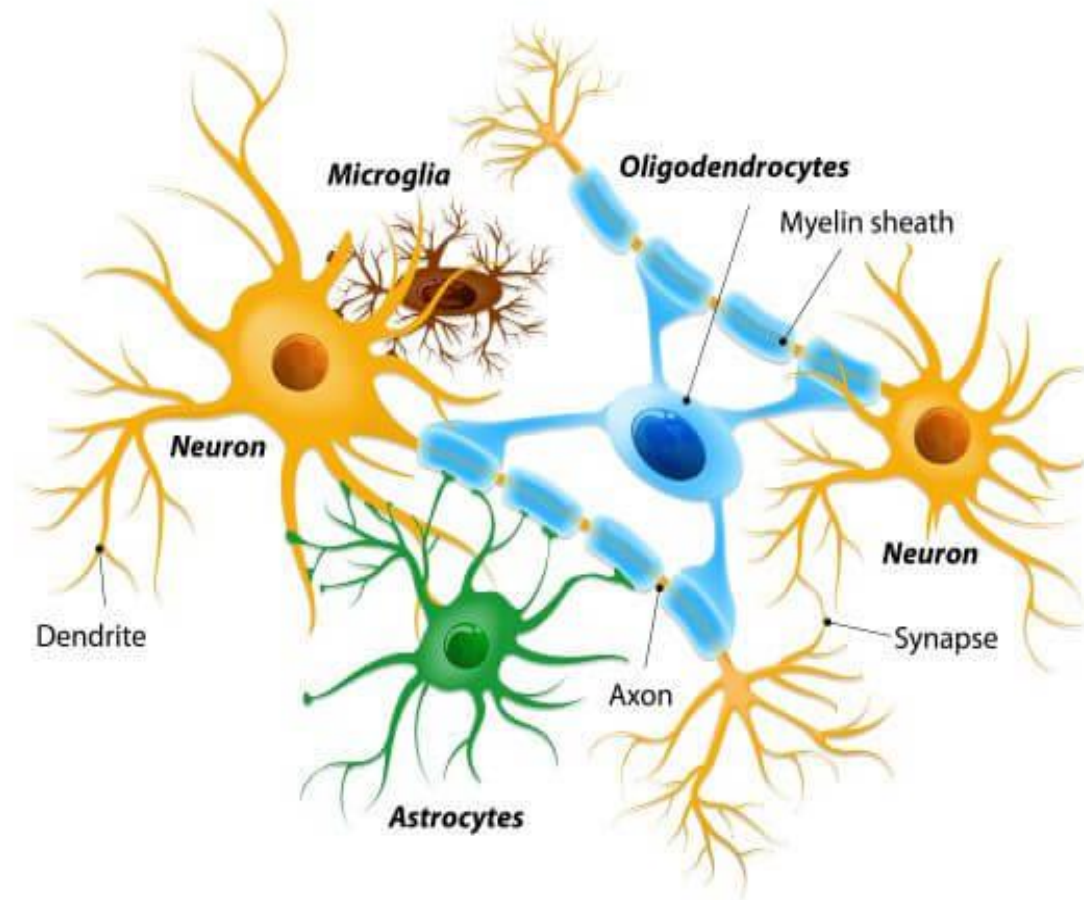
## Stroke in the Middle Cerebral Artery

A diagram illustrating a stroke in the middle cerebral artery. It shows a cross-section of the brain with the following labels:

- Large brain infarct
- Clot lodges in artery, blocks blood flow

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# NEURONS AND NEUROGLIAL CELLS



## NEURONS

- Information carrying cells of the CNS
- Structurally & functionally unique
- Differ in shape, size & structure depending on role & location
- Uses electrical & chemical signals to transmit messages
- Allows us to interact with our environment
- Responsible for all our thoughts, movements, emotions & desires, voluntary and involuntary activities
- Ongoing clinical trials working to learn more and possibly cure diseases & conditions

## GLIAL CELLS

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A non-neuron that works in the CNS

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Supports brain function in the following ways:

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Assist in regulation of metabolism

---

Assist in pH balance

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Assist regulation of neurotransmitter communication between neurons or with muscle fibers

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Assist cleaning up dead neurons

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Assisting axon activity so nerves can communicate properly

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Assist creating myelin – nerve insulation

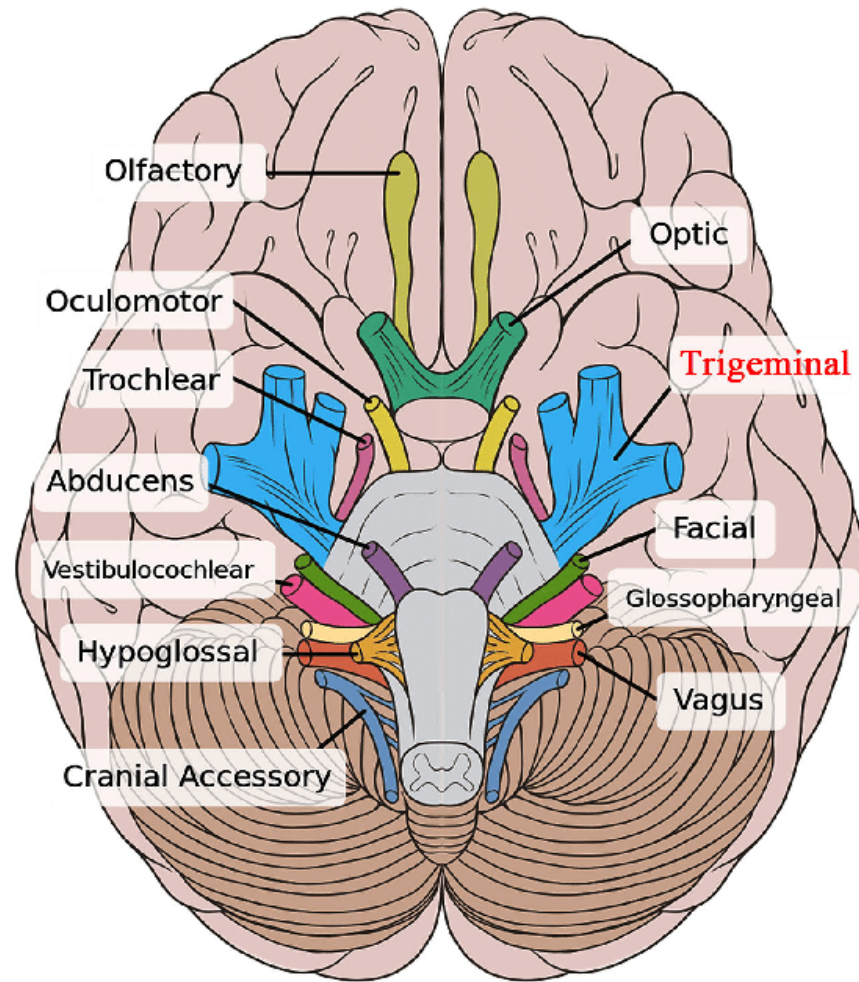
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Some are the brain's immune cells

---

Some help by lining the ventricles and support transport of CSF

THE 12  
CRANIAL  
NERVES



# Cranial Nerves

CN 1: The **olfactory nerve**, which allows for your sense of smell.

CN 2: The **optic nerve** governs eyesight.

CN 3: The **oculomotor nerve** controls pupil response & other motions of the eye.

CN 4: The **trochlear nerve** controls muscles in the eye.

CN 5: The **trigeminal nerve** conveys sensation from the scalp, teeth, jaw, sinuses, parts of the mouth and face to the brain, allows the function of chewing muscles, and much more.

CN 6: The **abducens nerve** innervates some of the muscles in the eye.

CN 7: The **facial nerve** supports face movement, taste, glandular & other functions.

CN 8: The **vestibulocochlear nerve** facilitates balance & hearing.

CN 9: The **glossopharyngeal nerve** allows taste, ear and throat movement, and many more functions.

CN 10: The **vagus nerve** allows sensation around the ear and the digestive system and controls motor activity in the heart, throat and digestive system.

CN 11: The **accessory nerve** innervates specific muscles in the head, neck and shoulder.

CN 12: The **hypoglossal nerve** supplies motor activity to the tongue.



A hand holding a potato is shown at the bottom of the frame. A large, faint thought bubble is superimposed over the potato, containing a question mark. The text is centered within the white area of the thought bubble.

**WHAT GOES THROUGH A POTATO'S BRAIN?**

**TATER THOUGHTS!**



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