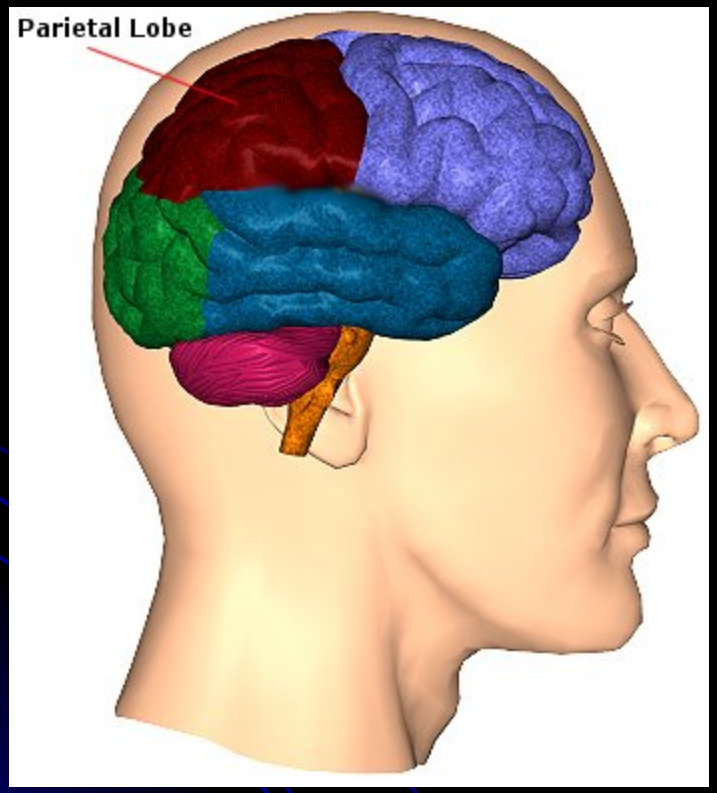
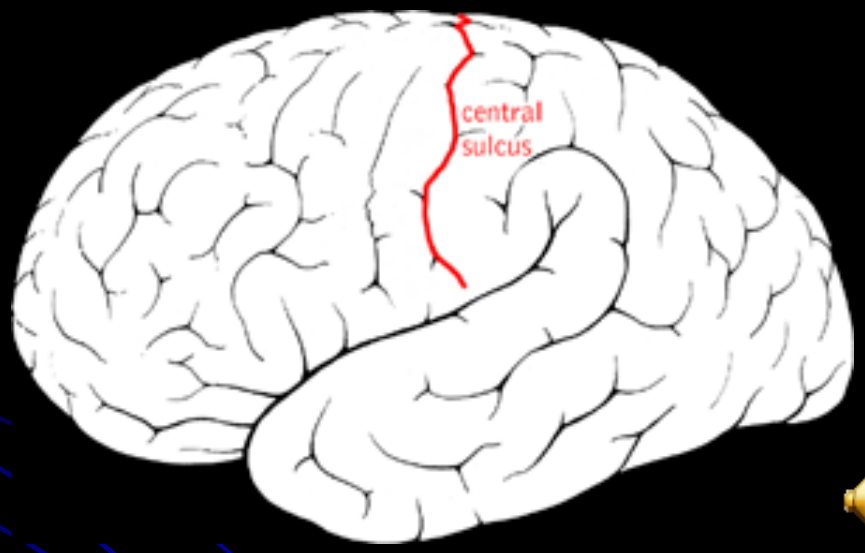
The Parietal Lobes

Functions of the Parietal Lobes



The Parietal Lobes develop at about the age of 5 years. They function to give the individual perspective and to help them understand space, touch, and volume.

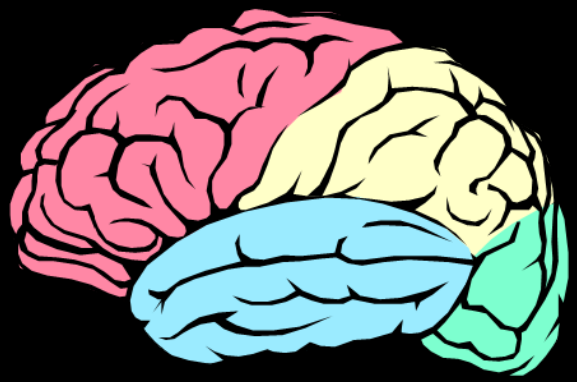


The location of the parietal lobes is delineated by specific landmarks. The central sulcus separates the parietal lobe from the frontal lobe.

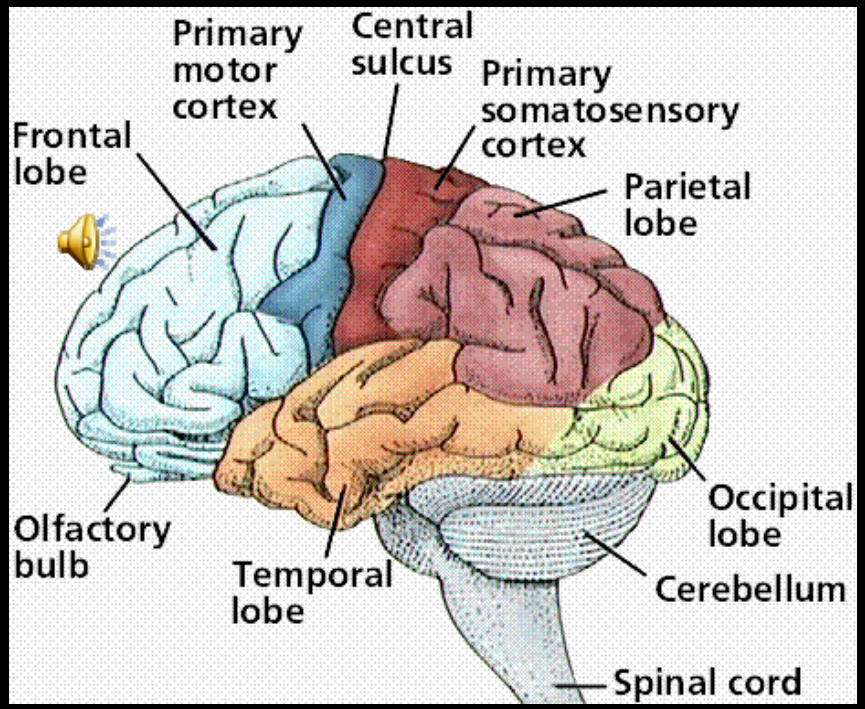
The Central Sulcus

- Is a valley that marks the differenciation between lobes.
- The Central Sulcus is easily identified.
- In addition to marking the perimeter of the lobe the Central Sulcus has specific functions.

The central sulcus is the site of the primary motor cortex. This area controls voluntary movements, primarily fine motor movements such as picking up a dime.

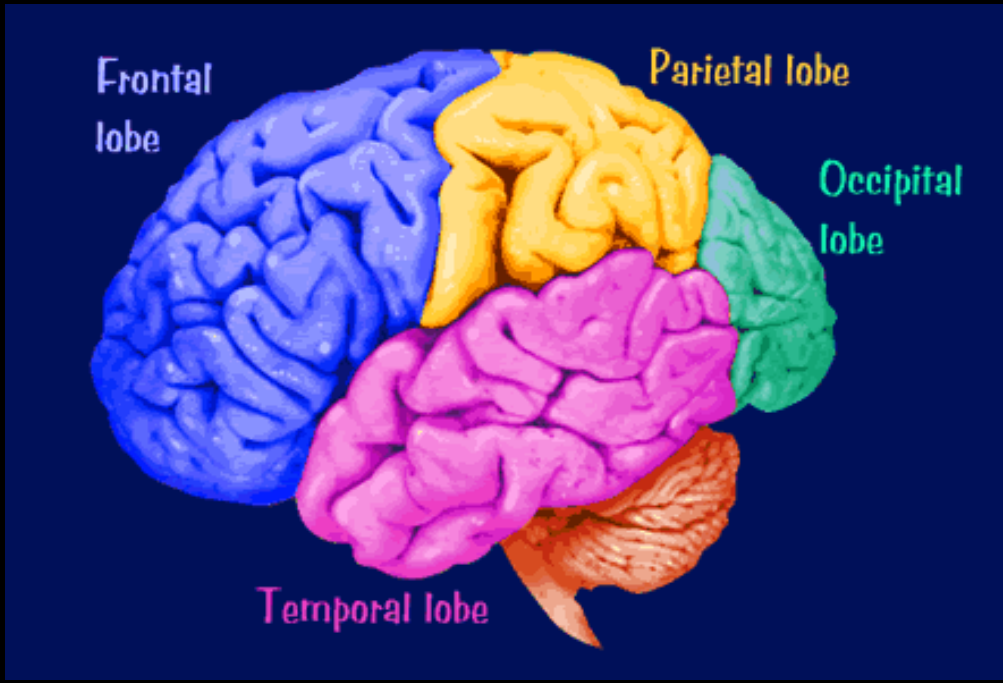


Just as the central sulcus separates the parietal lobe from the frontal lobe, the parieto-occipital sulcus separates the parietal lobe from the occipital lobe.



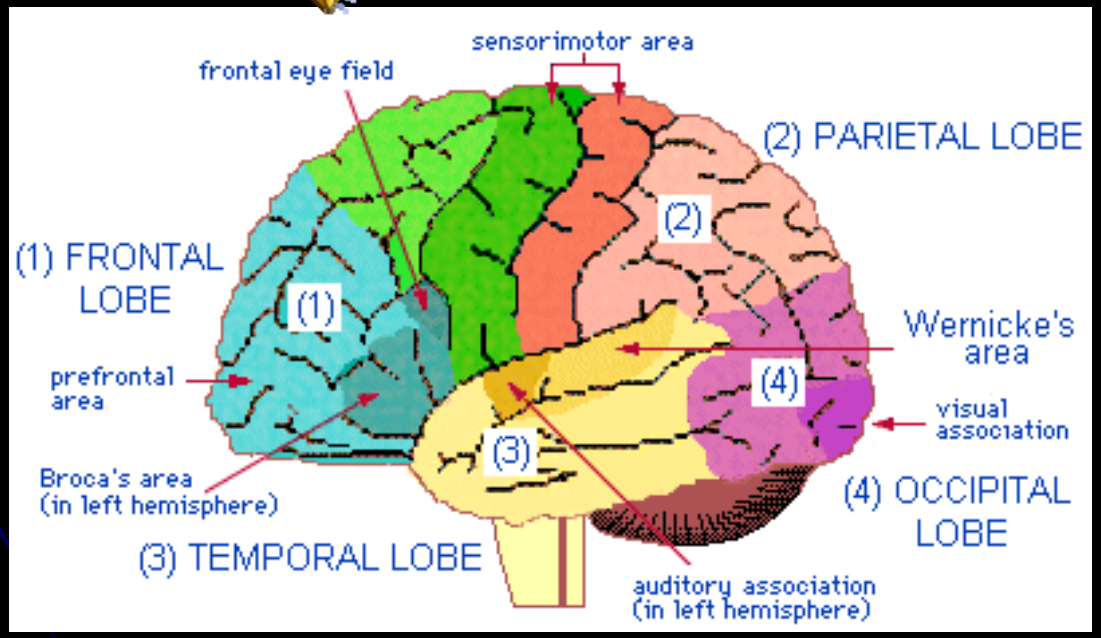
The parietal lobe can be divided into subsections.

They are the superior (top section) parietal lobule, the inferior (lower section) parietal lobule and the intraparietal (middle section) sulcus.



Damage to this lobe can result in a number of difficulties.

Since each area is specific to function, injury to an area will specifically affect that function just as it does in any other cortical (brain) region.



Since the brain is separated into two hemispheres

- There are two parietal lobes. One in the right hemisphere and one in the left.

Damage to the left parietal lobe can result in what is called

"Gerstmann's Syndrome."

This creates right-left confusion, difficulty writing (agraphia) and problems with mathematics (acalculia).

In some individuals it can produce language disorders (aphasia) and the inability to perceive objects (agnosia).

aphasia

- Is the partial or total loss of the ability to articulate ideas or comprehend spoken or written language, resulting from damage to the brain caused by injury, disease, congenital defects, or genetic disposition.

Agnosia

Is the loss of the ability to interpret sensory stimuli, such the inability to understand sounds or interpret images.

There are only a few reports of this syndrome, (sometimes called developmental Gerstmann's syndrome), in children.

Most cases are identified when a child reaches second or third grade which is when they are required to learn cursive writing and math operations.

- Children with this difficulty exhibit poor handwriting and spelling skills, and problems with adding, subtracting, multiplying, and dividing.

- Often this difficulty occurs with mental calculations (mental calculations), and therefore, the child is thought to have difficulty with Working Memory (the ability to make mental calculations mentally). Working Memory is sometimes referred to as Active Memory.

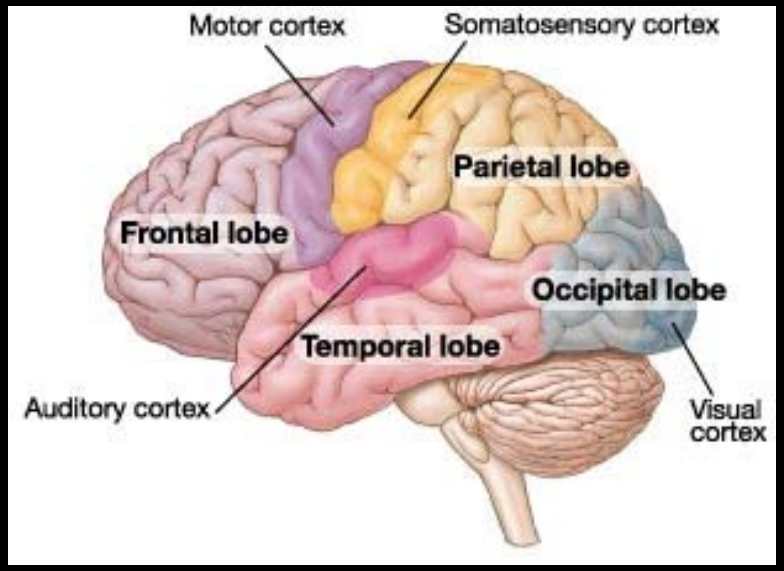
- Sometimes the child has difficulty differentiating right from left
- or discriminating among individual fingers.
- Many children experience constructional apraxia, (an inability to copy simple drawings).
- Frequently, there is an impairment in reading (sound/symbol representations, i.e. What does the vowel “a” sound like?).

This difficulty is not related to IQ. Even children with a high level of intellectual functioning may be affected.

- There is no cure for Gerstmann's Syndrome, [just as there is no “cure” for any cortical organic (brain) disorder].
- Treatment involves identifying specific recommendations or remediative techniques that address difficulties.
- Treatment is symptomatic and supportive.

- Occupational and speech therapies diminish dysgraphia (difficulty writing) and apraxia (difficulty with spatial relations).
- Calculators and word processors may help school children cope with symptoms.

- In adults, the syndrome may occur after a stroke or if there is an insult (injury) resulting in damage to the parietal lobe.
- Many adults experience aphasia, (difficulty in expressing oneself when speaking, in understanding speech, or in reading and writing) as they get older.



- In adults, especially adults who experience a cortical insult (brain injury), many of the symptoms diminish over time.
- With children symptoms may diminish over time but not as remarkably. Most children probably do not overcome their deficits, but learn to adjust to them.

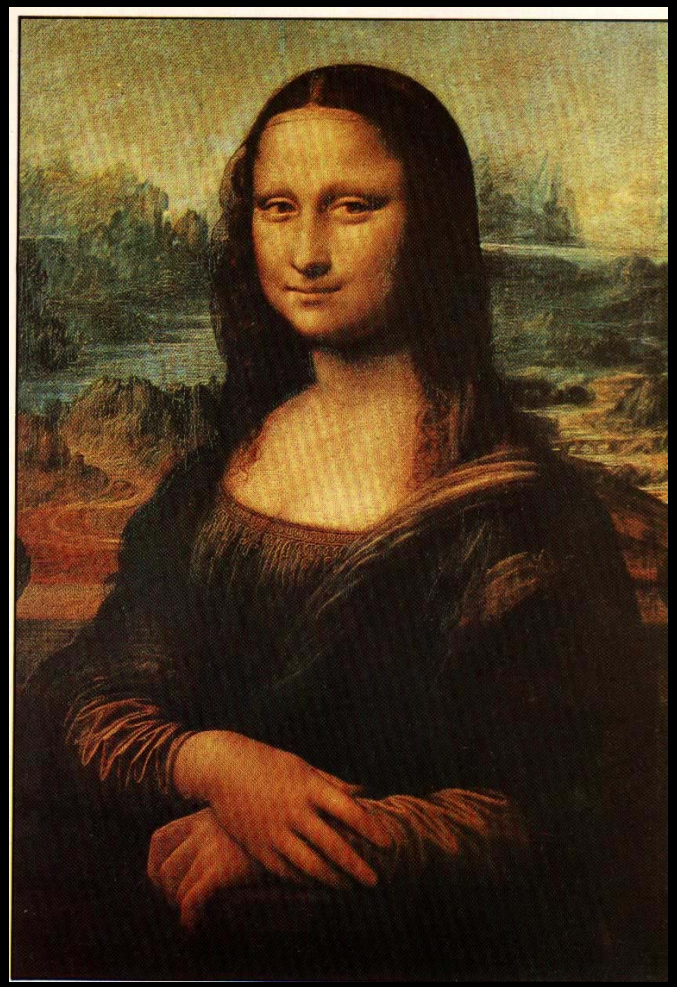
- The reason for this is that with an acquired difficulty, the individual has already learned specific information, and it is possible that when the brain heals from the injury, the function will return or the individual will find a different way to accomplish the task.
- In children the information was never acquired, and healing is less likely to take place with a congenital difficulty (difficulty present at birth).

- Injuries may involve sensation (touch) and perception (or the integration of sensory input), primarily with the visual system.

For Example…

You have definitely seen this painting previously.
Can you identify the artist?

This was actually the sketch for the hands on the Mona Lisa by DaVinci.

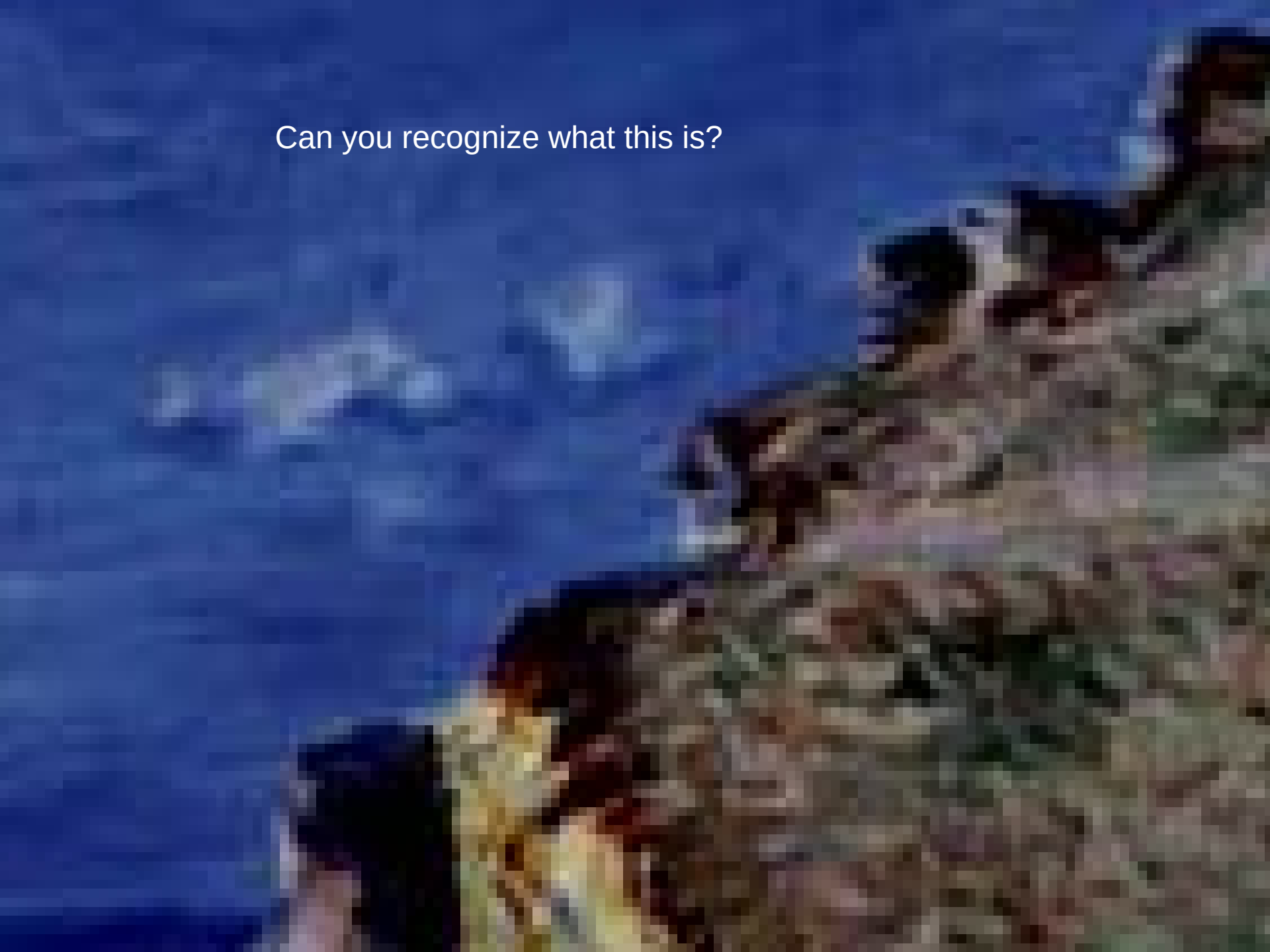


The same process occurs when you come to an intersection

- If you normally approach it from one direction, and suddenly come to it from a different direction, would you recognize it?

- An individual with parietal lobe difficulty would have problems in this area.

The first function of the pariental lobes integrates sensory information to form a single perception (cognition).


Can you recognize what this is?

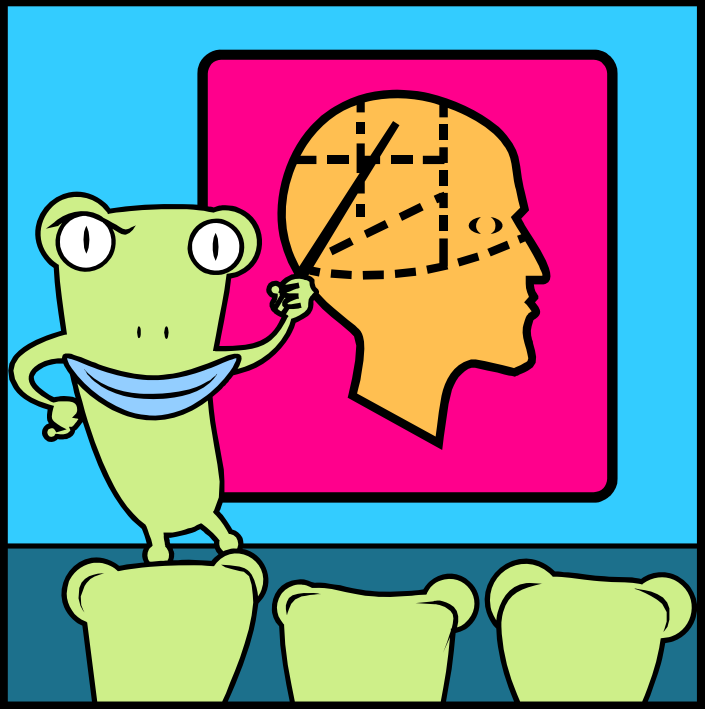
Claude Monet(mow-NAY)
French, 1840-1926
The Cliff at Fécamp, 1881

The Impressionists put many dots of paint together. If the viewer stands close to the painting, the object is hard to decipher.

© City of Aberdeen Art Gallery and Museums Collections

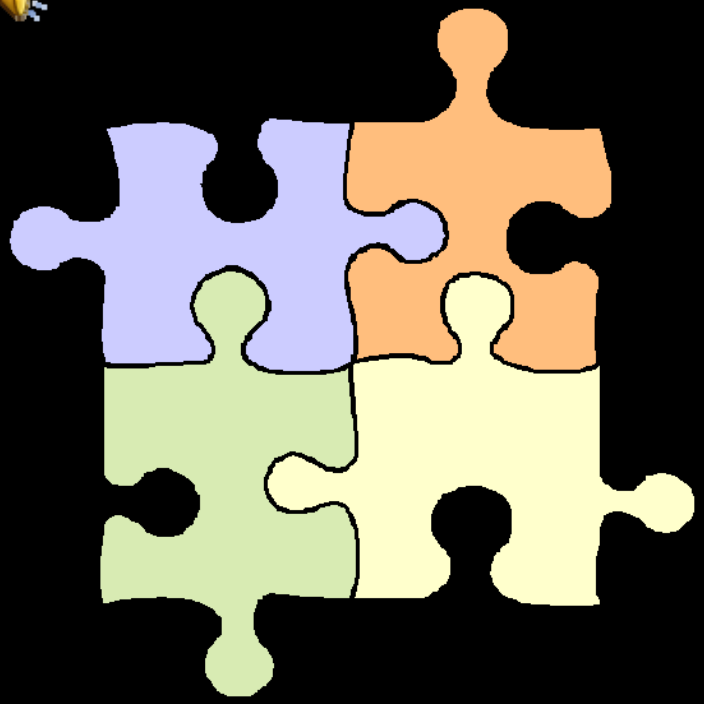
The parietal lobes
help us see one thing
In relation to the whole,
just as stepping back
helps us see that all the
dots represent an object.

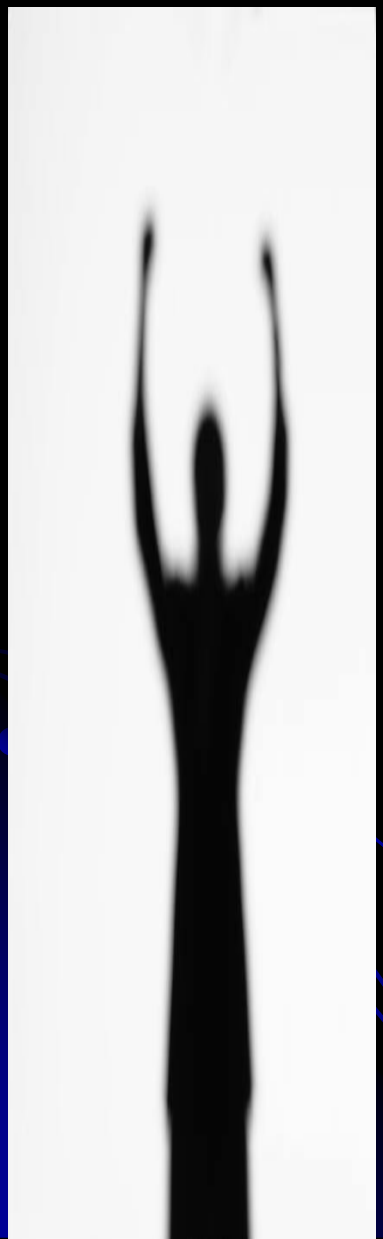
The second function of the right parietal lobe helps the individual construct a spatial coordinate system which represents the world around us.



Like understanding where we are when we approach an intersection from a different position.

Or understanding what the parts of a puzzle represent so that we can put them together in the right position.





Individuals with damage to the parietal lobes often show striking deficits such as abnormalities in body image and spatial relations (Kandel, Schwartz & Jessel, 1991).

Individuals with
Parietal lobe damage
Will not see parts
Of an individual.

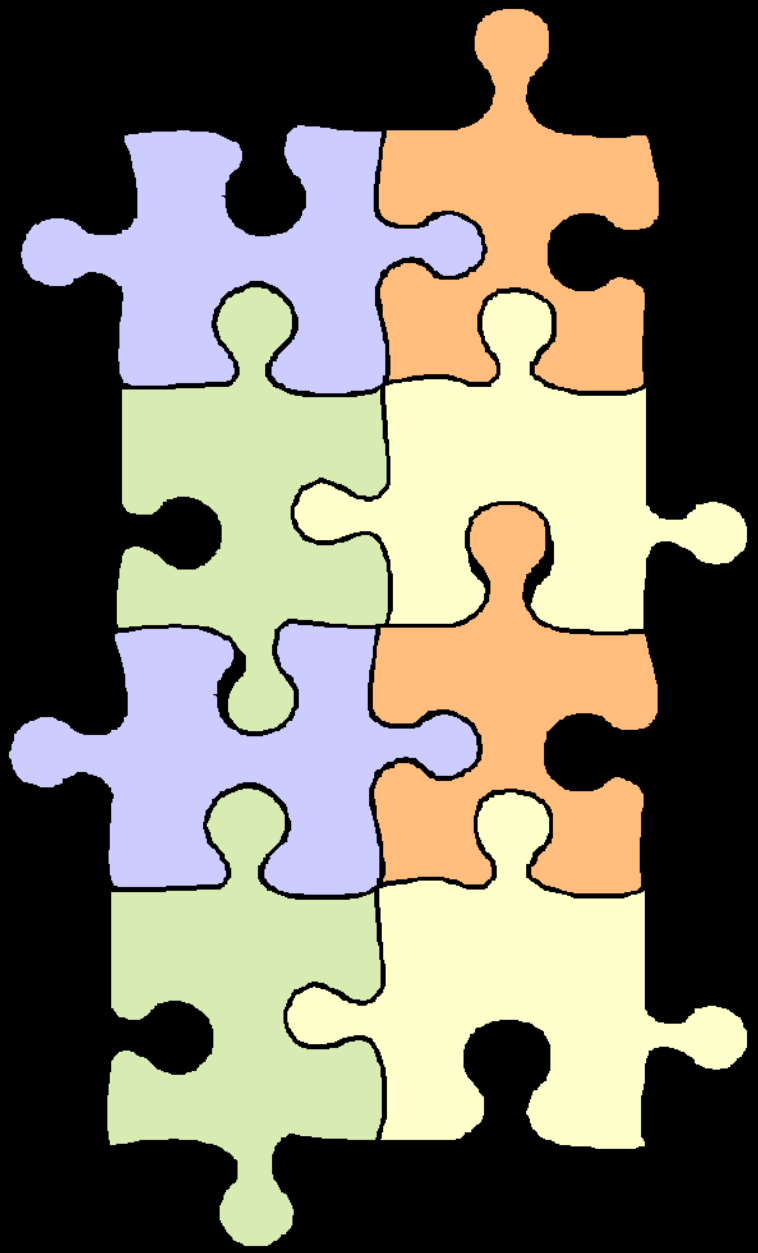
Or not see parts of them
Selves and therefore
Neglect grooming,
Often this manifests on
One side of their body.

To review…
Parietal Lobe Difficulty Manifests As:

- **Gerstmann's syndrome** which is a neurological disorder characterized by four primary symptoms:
- Agraphia/dysgraphia (difficulty writing)
- Acalculia/dyscalculia (difficulty with math)
- Finger agnosia (difficulty with finger identification)
- **Left-right disorientation**

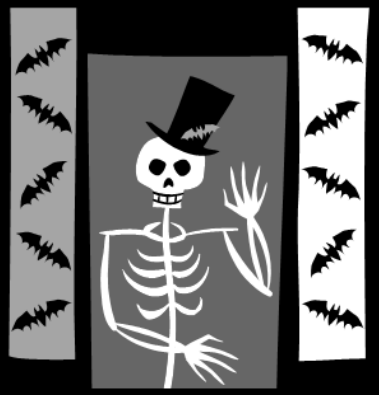
Damage to the right parietal lobe can result in neglecting part of the body or space (contralateral neglect), which can impair many self-care skills such as dressing and washing.

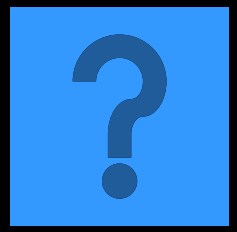
Right side damage can also cause difficulty in making things (constructional apraxia), denial of deficits (anosagnosia) and poor drawing ability. The individual typically has difficulty putting together puzzles.



- The right parietal-temporal lobe is concerned with non-verbal memory.

What do these symbols mean?





- Right parietal-temporal lesions can also create significant changes in personality.

People who have left parietal lobe damage have difficulty with spatial language.

- The lamp is on top of the table.
- The dog is under the couch.
- Go under the over pass.
- Make a quick left after you pass the gas station on the right.

Left parietal-temporal lesions can effect verbal memory and the ability to recall strings of digits (Warrington & Weiskrantz, 1977).

Bi-lateral damage (significant lesions to both sides) can cause "Balint's Syndrome," a visual attention and motor syndrome.

The symptoms of this syndrome include an inability to voluntarily control gaze (ocular apraxia). This is the inability to control eye movement, difficulty integrating components of a visual scene (simultanagnosia), the inability to integrate several visual stimuli at once, and difficulty accurately reaching for an object with visual guidance (optic ataxia) (Westmoreland et al., 1994).

As mentioned in the introduction to these presentations…

- Deficits between lobes also create significant difficulty in specific tasks.

For Example…

- Specific deficits (primarily to memory and personality) occur when there is damage to areas *between* the parietal and temporal lobes.

Remediation of Parietal Lobe Difficulty

- Parietal lobe difficulty is often difficult to remediate.
- Techniques include grounding so that the individual can learn to orient.
- For example, wearing a ring on your left hand will tell you where left is.

Individuals with Parietal Lobe difficulty often have trouble with directions.

- Using a GPS system can be helpful.
- So can giving directions with landmarks (turn right at the gas station).
- If arriving on time is particularly important taking a dry run or leaving plenty of time to arrive may be critical.

Individuals with sound/symbol difficulty

- Can learn word recognition instead of trying to “sound out” words
- Can write the phonetic pronunciation next to the word to help remember how it is properly pronounced
- Can relate it to another word which is pronounable
- Can practice what needs to be read orally before having to read it orally to others.

Specific Difficulties Can Be Addressed Individually

- A learning specialist or cognitive therapist can usually devise methods for helping the individual function more adequately based on specific difficulties.
- Obviously the more difficulties and the more cortical regions involved, the harder it is to find successful remediative techniques.

However…

- Almost all individuals can find some relief by using specific techniques.
- But these techniques do not work “overnight”
- They take practice and patience.

The David Program

LaSalle College High School

This presentation has been compiled by:

Jo Ann Curcio Cohen, Ph.D.
Licensed Psychologist

Learning Specialist

LaSalle College High School