
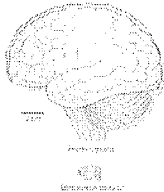




Ms. Carey  
**Unit 3: Structures of the Brain**  
 AP Psychology  
 Modules 11-13

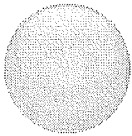
**THE BRAIN**

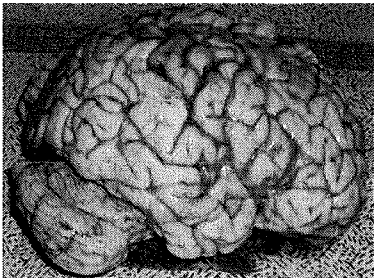
**SMALLEST BRAIN?**  
 MOUSE LEMUR  
 (*MICROCEBUS MURINUS*) OF  
 MADAGASCAR: 0.004 POUNDS

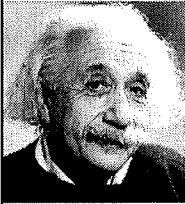



**HUMAN BRAIN WEIGHS  
 APPROXIMATELY 3 POUNDS!**




*And looks remarkably like a  
 cauliflower!*




**ALBERT EINSTEIN'S BRAIN...  
 SMARTEST BRAIN IN THE WORLD?**

**BUT WAIT!  
 WORLD'S LARGEST ANIMAL BRAIN:  
 A SPERM WHALE!  
 17.5 POUNDS!**




*That's a big brain!*




ON APRIL 18, 1955, ALBERT EINSTEIN, ONE OF THE MOST BRILLIANT SCIENTISTS WHO EVER LIVED, DIED OF HEART FAILURE IN A PRINCETON, NEW JERSEY, HOSPITAL. WHAT HAPPENED RIGHT AFTER THAT IS PRETTY HARD TO BELIEVE.

**THOMAS HARVEY**, THE PATHOLOGIST ON CALL THAT NIGHT, BEGAN EINSTEIN'S AUTOPSY. AS A PATHOLOGIST, HIS ONLY JOB WAS TO DETERMINE THE CAUSE OF DEATH. INSTEAD, WITHOUT PERMISSION, HARVEY CUT OUT EINSTEIN'S BRAIN, PLUNKED IT IN A JAR FULL OF FORMALIN, AND TOOK IT TO HIS HOME OFFICE.

**YEAH, HE STOLE EINSTEIN'S BRAIN.**





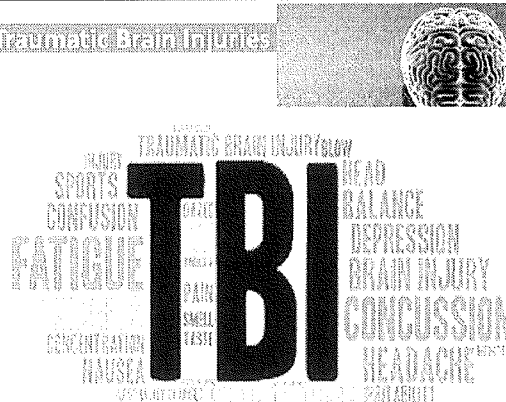
HARVEY REMOVED AND WEIGHED THE BRAIN AT 1230G. THEN, TOOK IT TO A LAB AT THE UNIVERSITY OF PENNSYLVANIA WHERE HE DISSECTED EINSTEIN'S BRAIN INTO SEVERAL PIECES; SOME OF THE PIECES HE KEPT TO HIMSELF WHILE OTHERS WERE GIVEN TO LEADING PATHOLOGISTS.

HARVEY INJECTED 50% FORMALIN THROUGH THE INTERNAL CAROTID ARTERIES AND AFTERWARDS SUSPENDED THE INTACT BRAIN IN 10% FORMALIN.

HARVEY PHOTOGRAPHED THE BRAIN FROM MANY ANGLES. HE THEN DISSECTED IT INTO ABOUT **240 BLOCKS** (EACH ABOUT 1 CM<sup>3</sup>) AND ENCASED THE SEGMENTS IN A PLASTIC-LIKE MATERIAL CALLED COLLODION.

HARVEY ALSO **REMOVED EINSTEIN'S EYES**, AND GAVE THEM TO HENRY ABRAMS, EINSTEIN'S OPHTHALMOLOGIST.

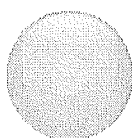
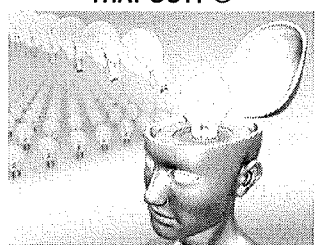
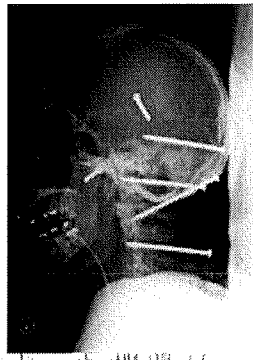
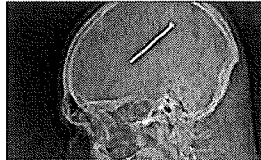
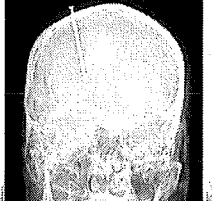
Tramatic Brain Injuries



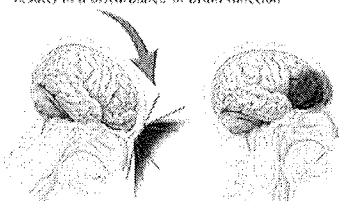
**TBI**

TRAUMATIC BRAIN INJURY, blow, HEAD, BALANCE, DEPRESSION, BRAIN INJURY, CONCUSSION, HEADACHE, FATIGUE, CONFUSION, SPORTS, NAUSEA, CONCENTRATION, RAIN, SMELL, TASTE, HEAD, BALANCE, DEPRESSION, BRAIN INJURY, CONCUSSION, HEADACHE

**THE BRAIN AS A LIGHTBULB??**  
 WHAT **BRIGHT** PERSON FIGURED THAT OUT? 😊


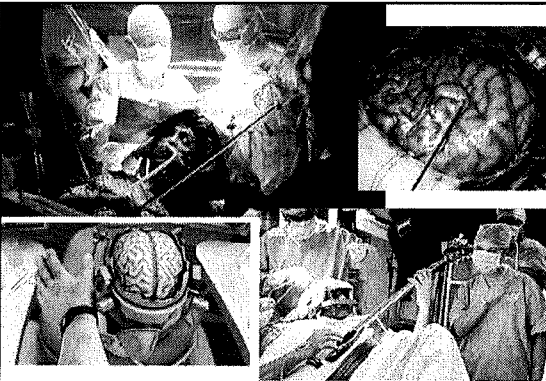






A concussion is a violent jarring or shaking that results in a disturbance of brain function

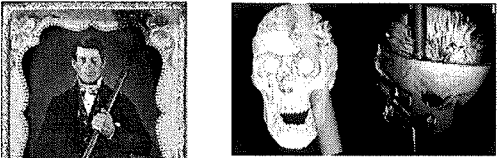


**But how does damage to the brain impact human behaviour?**

**Concussions?**

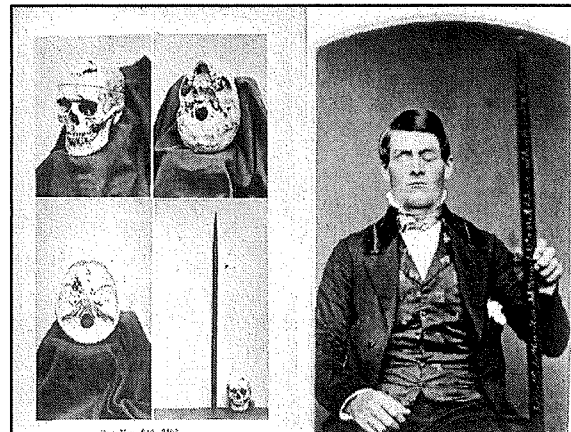



**Open Skull Brain Surgery... while awake?!?**




**PHINEAS GAGE...  
METAL POLE IN HIS BRAIN... OUCH!**

On September 13, 1848, the then 25-year-old Gage was working as the foreman of a crew preparing a railroad bed near Cavendish, Vermont. He was using an iron tamping rod to pack explosive powder into a hole. Unfortunately, the powder detonated, sending the 43 inch long and 1.25 inch diameter rod hurtling upward. The rod penetrated Gage's left cheek, tore through his brain, and exited his skull before reportedly landing some 80 feet away.

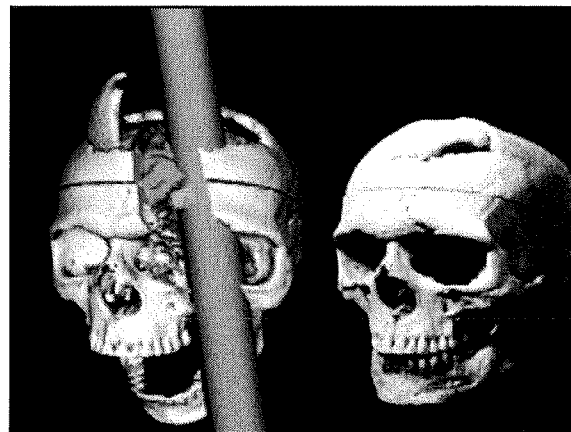



**PHINEAS GAGE...**



Shockingly Gage not only survived the initial injury but was able to speak and walk to a nearby cart so he could be taken into town to be seen by a doctor Dr. Edward H. Williams, the first physician to respond later described what he found:

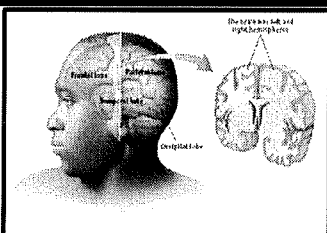
*"I first noticed the wound upon the head before I alighted from my carriage, the pulsations of the brain being very distinct. Mr. Gage, during the time I was examining this wound, was relating the manner in which he was injured to the bystanders. I did not believe Mr. Gage's statement at that time, but thought he was deceived. Mr. Gage persisted in saying that the bar went through his head... Mr. G. got up and vomited; the effort of vomiting pressed out about half a teacupful of the brain, which fell upon the floor."*

**PHINEAS GAGE...**

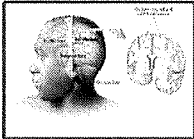
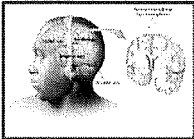
Unable to return to his railroad job, Gage held a series of jobs including work in a livery stable, a stagecoach driver in Chile and farm work in California. Popular reports of Gage often depict him as a hardworking, pleasant man prior to the accident. Post-accident, these reports describe him as a changed man, suggesting that the injury had transformed him into a surly, aggressive drunkard who was unable to hold down a job.... His entire personality and behavior changed and his family claimed he was not the same person. Perhaps it was because his brain had been seared by an iron rod...

**What four lobes make up the cerebral cortex?**


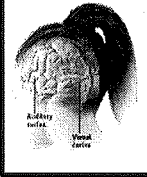


- **frontal lobe, parietal lobe, temporal lobe and occipital lobe**
  - located in both right and left hemispheres

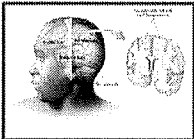
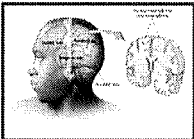
### What are the functions of the frontal and parietal lobes?

<b>frontal lobes</b>	<b>parietal lobes</b>
	
Involved in speaking, motor movements, judgment and decision-making.	Receives and processes sensory input for touch and body position.

### What are the functions of the auditory and visual cortex?

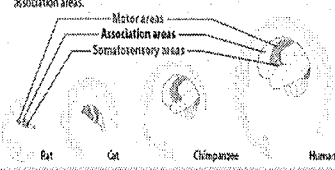
<b>auditory cortex</b>	<b>visual cortex</b>
	
receives information from the ears	receives information from the eyes

### What are the functions of the temporal and occipital lobes?

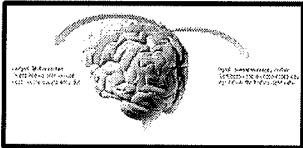
<b>temporal lobes</b>	<b>occipital lobes</b>
	
Each lobe receives auditory information, primarily from opposite ear.	Each lobe receives visual information, primarily from opposite visual field.

### Do we really use only 10% of our brain?

- Electrically probing an association area leads to no observable response.
- This vast association area "silence" has led to the false claim that we really use only 10 percent of our brain— "one of the hardest words in the garden of psychology."<sup>1</sup>
- Is there really a 90 percent chance that a bullet to your brain would land in an unused area? **No.**
- Brain-damaged animals and humans bear witness: Association areas interpret, integrate, and act on sensory information and link it with stored memories. More intelligent animals have larger association areas.



### What are the functions of the motor and somatosensory cortex?

<b>motor cortex</b>	<b>somatosensory cortex</b>
	
controls voluntary movements	registers information from the skin senses and body movement


### What are the Association areas?

- Most of the brain's cortex which integrates information involved in learning, remembering, thinking, and other higher-level functions.
- Attention is shifted, planning occurs.
- Not specifically devoted to motor or sensory cortex functions.

**Let's look at the research on association areas...**



- The *prefrontal cortex* in the forward part of the frontal lobes enables judgment, planning, and processing of new memories  
*(de la Vega et al., 2016).*
- People with damaged frontal lobes may have high intelligence test scores and great cake-baking skills. Yet they would not be able to plan ahead to *begin* baking a cake for a birthday party  
*(Huey et al., 2006).*
- And if they did begin to bake, they might forget the recipe.  
*(MacPherson et al., 2016).*

**How does our brain adjust to new experiences?**



- **plasticity:** the brain's ability to change, especially during childhood, by reorganizing after damage or by building new pathways based on experience

**The case of Phineas Gage**

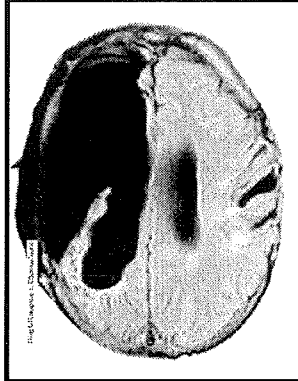



A tamping iron accident damaged neural tracks in his frontal lobe.

His frontal lobes could no longer filter emotional reactions from the limbic system.

**How does plasticity work?**


In this image, most of the right hemisphere of a young girl's brain has been removed due to chronic seizures that threatened her life.



**What are Broca's and Wernicke's areas?**

Broca's area	Wernicke's area
language center located in the left frontal lobe	language center located in the left temporal lobe
involved in expressive language	involved in receptive language

**What is Neurogenesis?**



- Although the brain often attempts self-repair by reorganizing existing tissue, it sometimes attempts to mend itself through **neurogenesis**—producing new neurons.