

Brain parts

PSY 200
 Greg Francis
 Lecture 02

What's the deal with left and right brains?

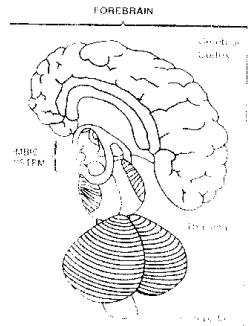
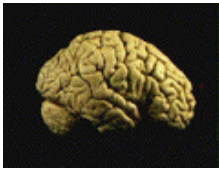
The brain

- The source of cognition (consider transplant!)
- Weighs about 3 pounds
- Damage to some parts result in immediate death or disability
- Damage to other parts seems to have no effect!
- What brain parts are important to cognition?
- How do we discover the role of each brain part?



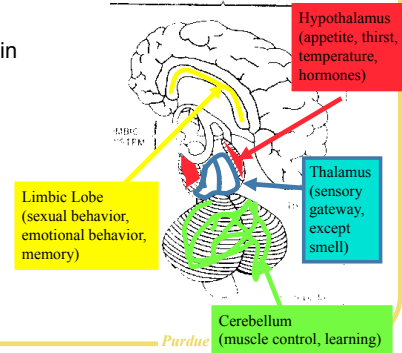
The brain

- Fore-brain
 - ♦ cortex
- Hind-brain
 - ♦ brain stem



The brain

- Hind-brain
 - ♦ (brain stem)



Fore-brain

- Cortex
- Similar to a thick, crumpled newspaper page
- Grooves (fissures or sulci) separate regions



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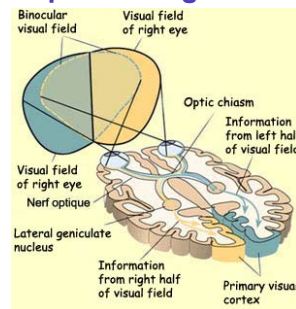
Contralateral processing

- Processing in the brain is done on the opposite side of your organs
- Control of your *right* arm is from the *left* side of your brain
- Information from your *left* field of view goes to the *right* side of your brain

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Contralateral processing

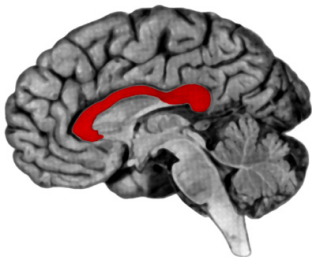
- Neural fibers from the eye cross on way to cortex



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Contralateral processing

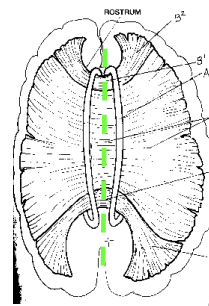
- Brain hemispheres are connected by a mass of neural fibers called the *corpus callosum*



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Cut corpus callosum

- Behavior changes very little
- Subtle effects

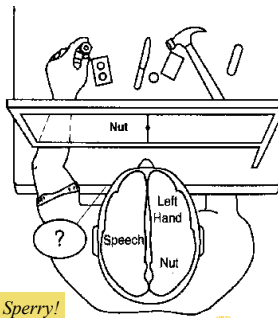


<http://www.youtube.com/watch?v=ZMLzP1VCANo>

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Brain sides

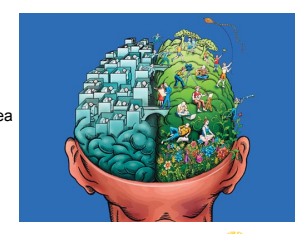
- If "nut" flashes on left screen
 - subject cannot name it
 - subject can pick up nut with left hand
- If "nut" flashes on right side
 - subject can name it
 - subject cannot pick up nut with left hand until he says "nut" out loud



1981 Nobel Prize for Roger Sperry!
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Brain sides

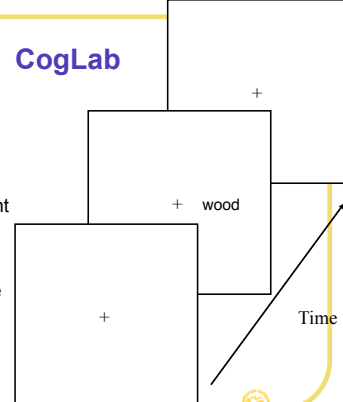
- Results led to further study and common belief that
 - Left side: language, analytical, classification, Western rationalization
 - Right side: art, music, recognition of faces and shapes, Eastern mysticism
- Vast oversimplification
 - in a normal brain, both sides are involved in many tasks
- Results *do* support the idea that different parts of the brain are involved in different cognitive tasks (*modularity hypothesis*)



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CogLab

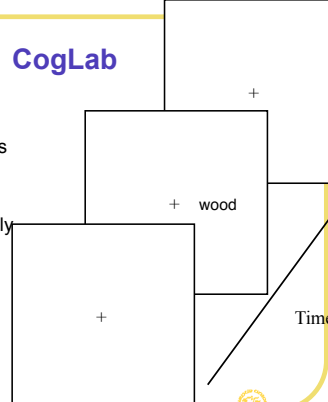
- In the CogLab experiment *Brain asymmetry*
- You stared at a central fixation point
- A word was presented to either the left or right side of fixation



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CogLab

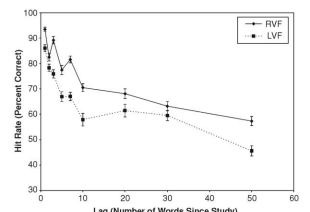
- Your task was to judge whether the presented word was "old" (seen on an earlier trial) or "new" (not previously seen in this experiment)



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CogLab

- Federmeier & Benjamin (2005) found better memory performance for words presented in the right visual field
- Words in the right visual field go to the left hemisphere
 - Which is known to be specialized for language



Lag (Number of Words Since Study)	RVF Hit Rate (%)	LVF Hit Rate (%)
0	95	85
5	85	75
10	75	65
20	70	60
30	65	55
40	60	50
50	55	45

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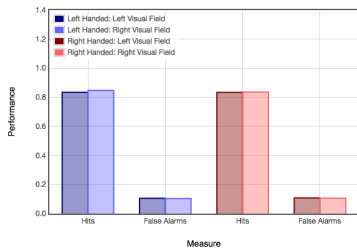
CogLab

- Other explanations than hemispheric specialization
 - Reading goes from left to right, from fixation to right visual field
 - Perceptual advantage to right visual field?
 - Attentional advantage to right visual field?
- It is difficult to come up with an experiment that isolates hemispheric specialization

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CogLab Data

- Global (13,231 right-handed participants; 1383 left-handed participants)
- No effect: maybe participants are unable to fixate?

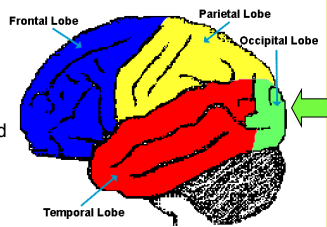


Anatomy

- The cortex contains large fissures that separate five major areas
 - Limbic (already discussed)
 - Occipital
 - Parietal
 - Temporal
 - Frontal
- Each has distinct properties

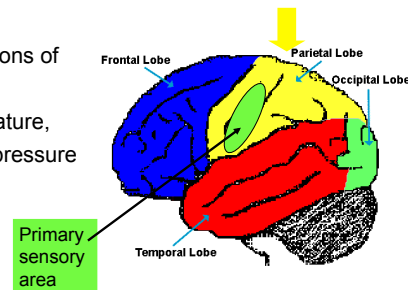
Occipital lobe

- Receives information from the eye
 - Most investigated area of the brain



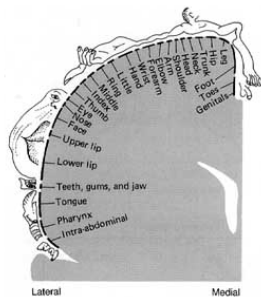
Parietal lobe

- Sensations of pain, temperature, touch, pressure



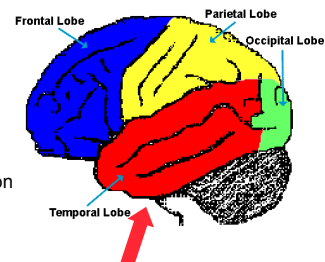
Parietal lobe

- Primary sensory area
 - sensitivity involves disproportionate areas of the brain, relative to size of body part



Temporal lobe

- Hearing
 - speech (left)
 - music (right)
- Memory and attention
 - visual recognition



Frontal lobe

- Largest part of cortex
 - planning
 - prediction
 - motor area
 - speech area

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Brodmann areas

- Divide lobes into areas
- e.g. Brodmann
 - Area 1, Area 12, ... Area 200
 - Some special names: V1, V2, V3,...

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Area function

- Can partly identify function by looking at nerves coming in and out of area
- Pathways through areas seem to be involved in different kinds of cognitive tasks

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Brain layers

- There is order and function even within an area
- The cortex is a *sheet* of neurons
- In its thickness are 6 layers of neurons
 - numbered 1-6
 - sometimes include subdivisions (4a, 4b, 4ca, 4cb, ...)

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Conclusions

- Lots of research in this area
- New brain regions are being mapped out daily with ever increasing resolution
- Cognitive neuroscience relies strongly on the “modularity hypothesis”
- Putting everything together is very difficult

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Next time

- Brain scans
- EEG recordings
- MRI scans
- PET scans
- Functional MRI
- *How to study the brain without killing someone.*

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