

Science of Psychology

PSY W1001 Section 2
MW 8:40-9:55 Fall 2012



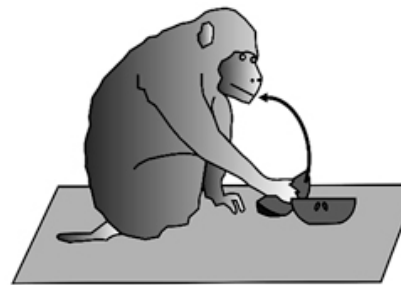
Wednesday, September 12
Behavioral
Neuroscience

Announcements

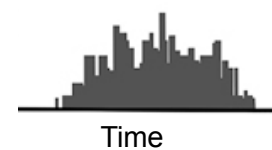
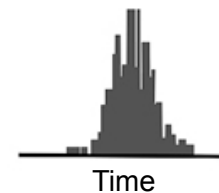
- Mark your calendars
 - Psychology Department Colloquium
 - September 19th – Malcolm Gladwell
 - Check the Psychology Department website for information about upcoming talks, locations and times.
- Experimental Participation
 - Don't ask me – I really really really don't know.
- Any questions from last lecture?

Why do neurons matter?

- Mirror Neurons
 - Basis for empathy?

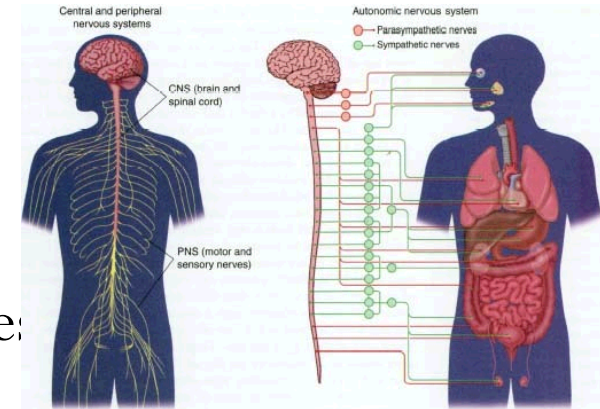


Number of Action Potentials



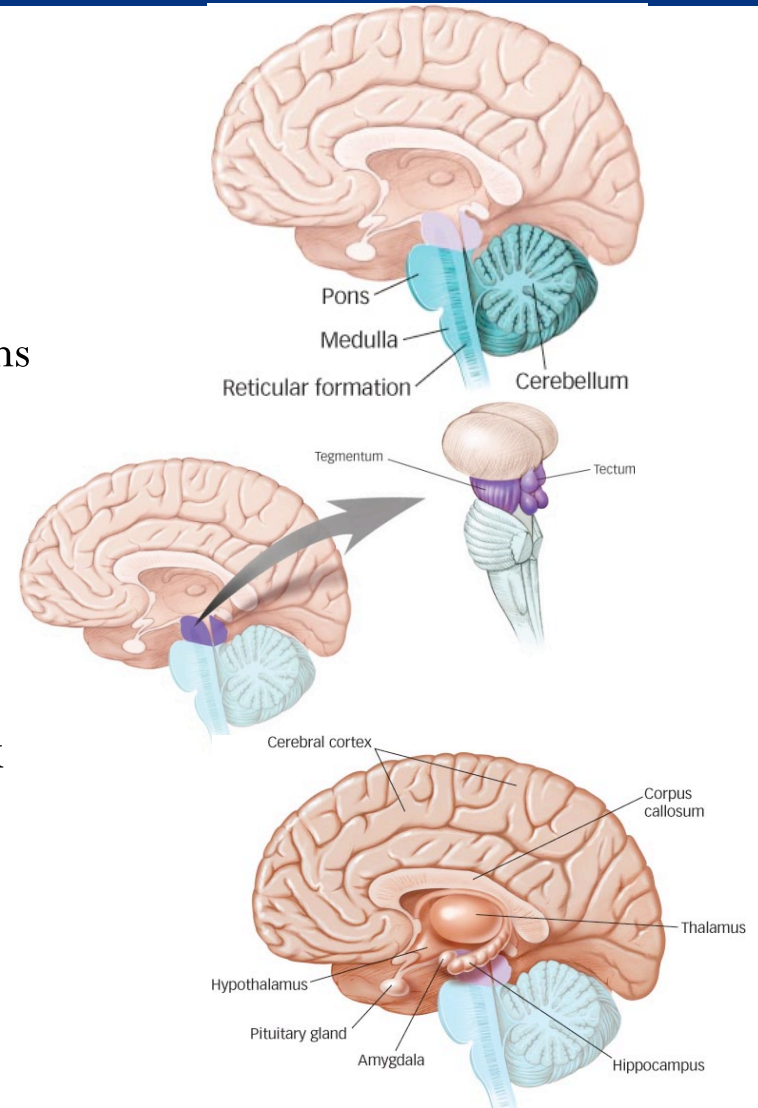
The Organization of the Nervous System

- Central nervous system (CNS)
 - Brain and the spinal cord
- Peripheral nervous system(PNS)
 - Connects the CNS to organs and muscles
 - Somatic nervous system:
 - conveys information into and out of the CNS
 - Autonomic nervous systems (ANS)
 - carries involuntary and automatic commands that control blood vessels, body organs, and glands
 - Sympathetic nervous system (fight or flight)
 - » prepares the body for action in threatening situations
 - Parasympathetic nervous system (rest and digest)
 - » helps the body return to a normal resting state



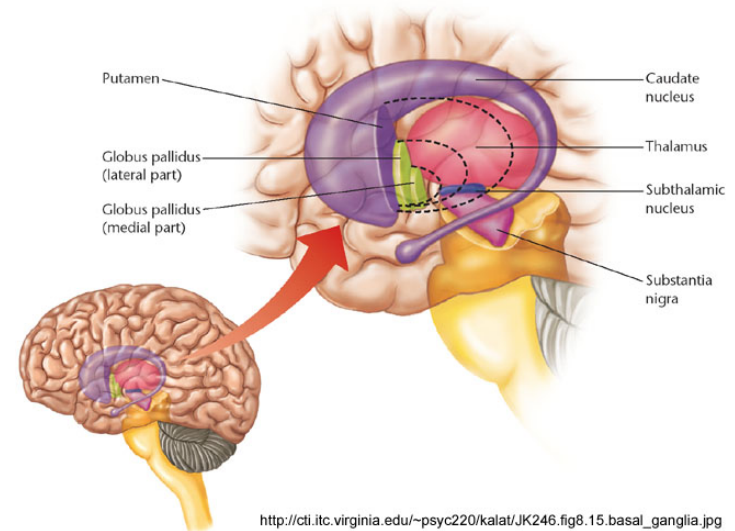
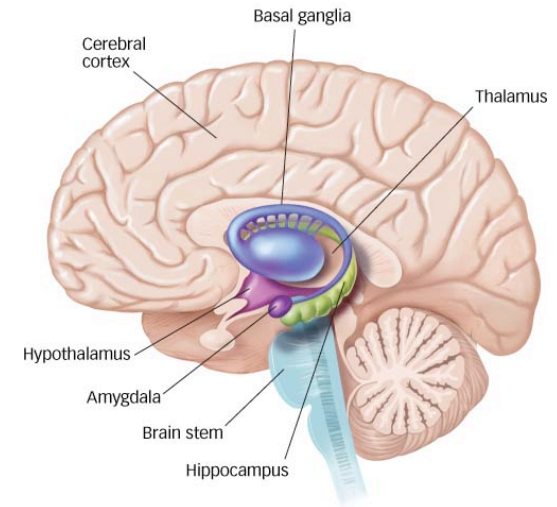
Three major divisions of the brain

- Hindbrain:
 - coordinates information coming into and out of the spinal cord, and controls the basic functions of life
 - Medulla, reticular formation, cerebellum, pons
- Midbrain
 - important for orientation and movement
 - Tectum, tegmentum
- Forebrain:
 - highest level of brain; critical for complex cognitive, emotional, sensory, and motor functions
 - Cerebral cortex, subcortical structures



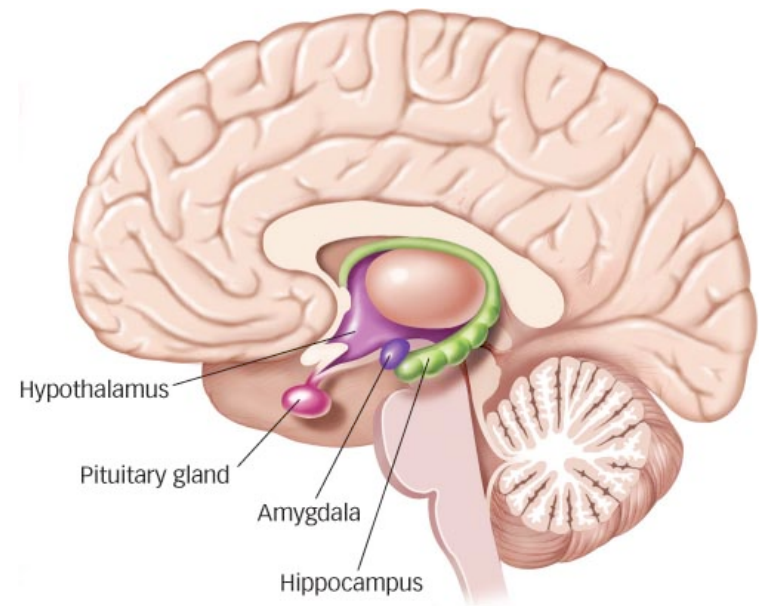
Subcortical Structures

- Basal Ganglia
 - Caudate, Putamen, Globus Pallidus, Subthalamic Nucleus, Substantia Nigra
 - Parkinson's Disease
- Hippocampus
 - Memory, integration
- Thalamus
 - Sensory relay



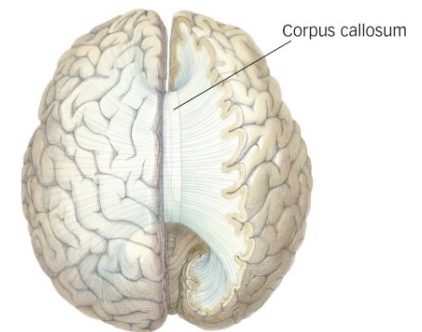
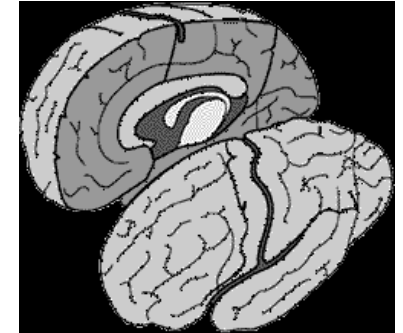
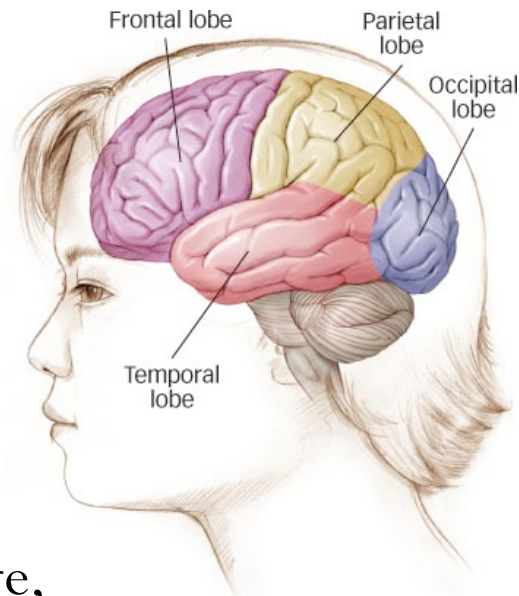
The Limbic System

- Limbic system
 - motivation, emotion, learning, and memory
 - Hypothalamus
 - regulates body temperature, hunger, thirst, and sexual behavior
 - Amygdala
 - Hippocampus
 - Also other structures...



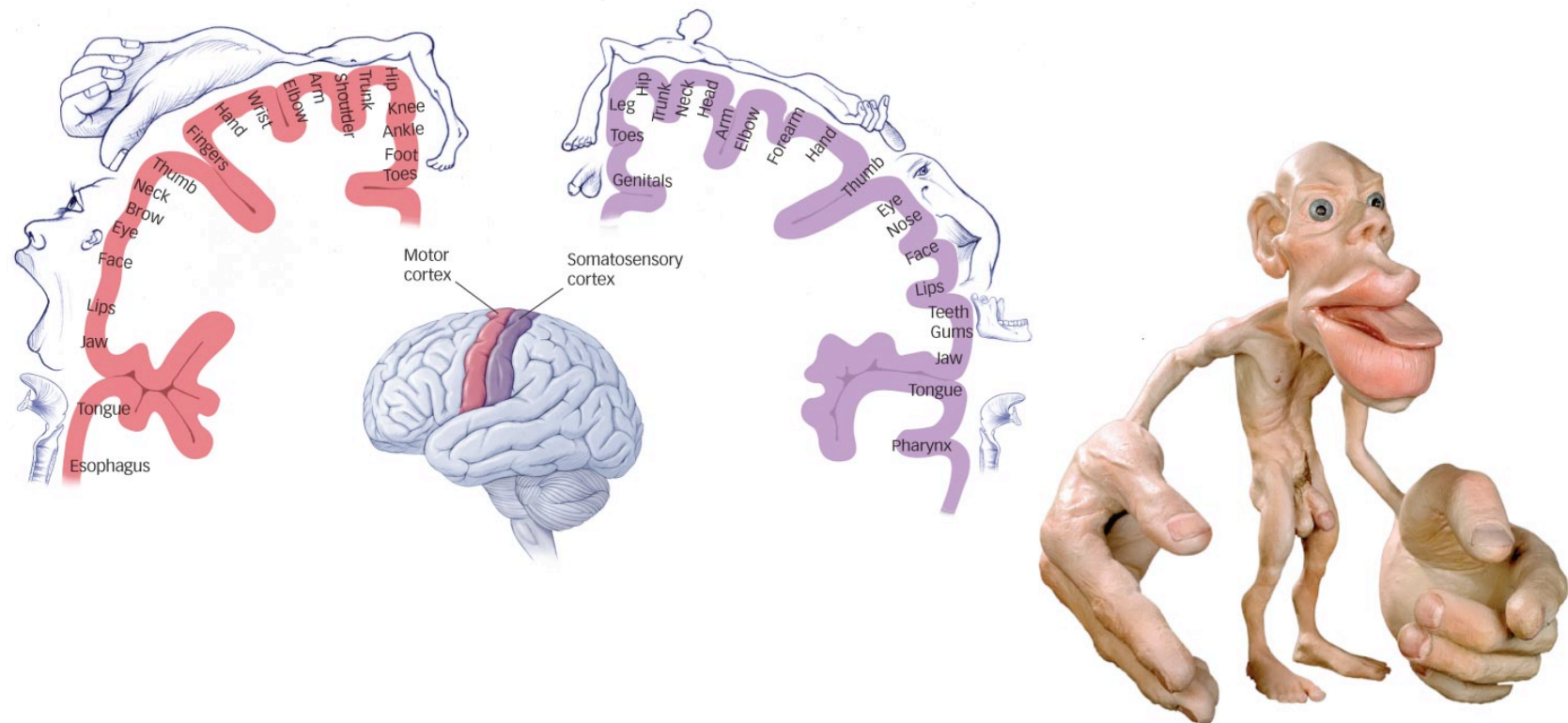
Cerebral Cortex and Lobes

- Frontal
 - Judgment, decision. Motor planning, language
- Parietal
 - Motor, motion perception,
- Occipital
 - Vision
- Temporal
 - Object recognition, language, hearing



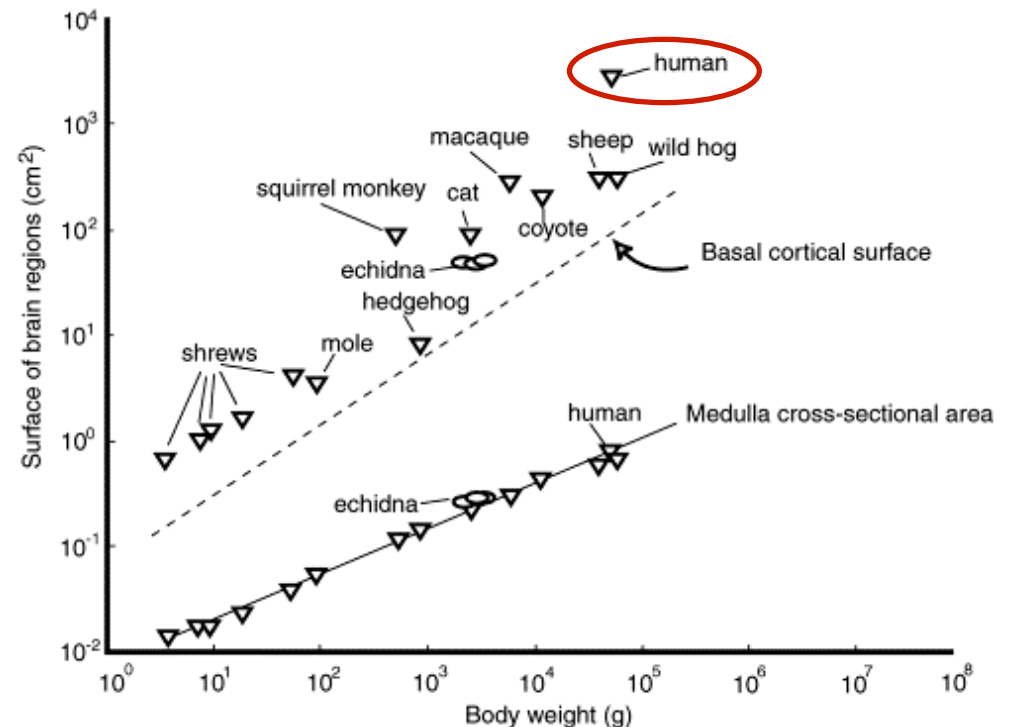
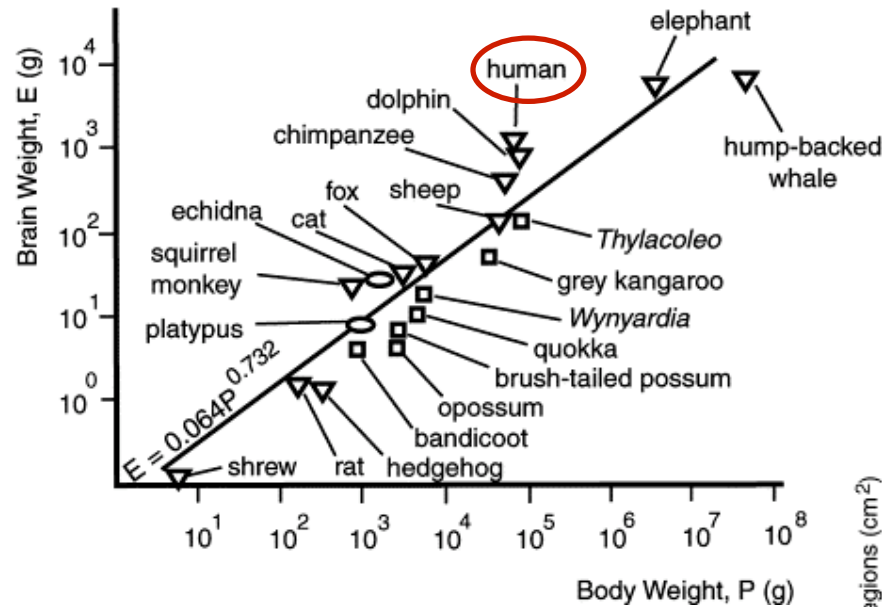
Size matters....but not the way you think

- Somatosensory and Motor Cortices



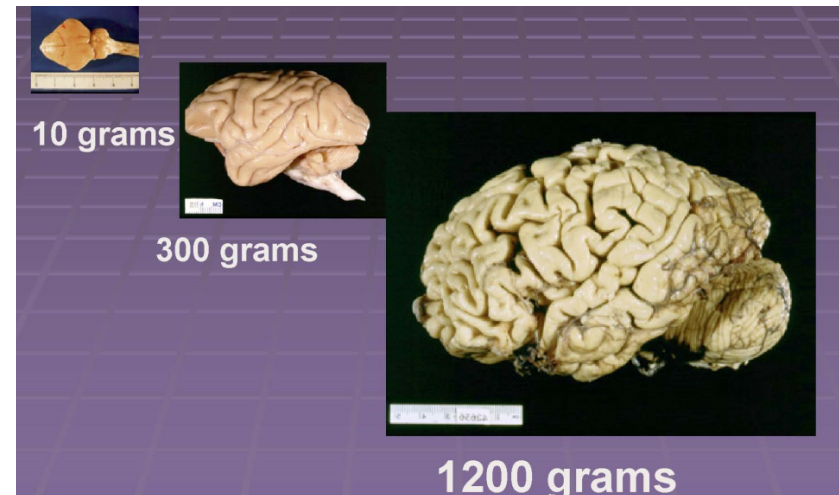
Who's the smartest of them all? (we are, of course)

Hassiotis, Paxinos and Ashwell, 2003



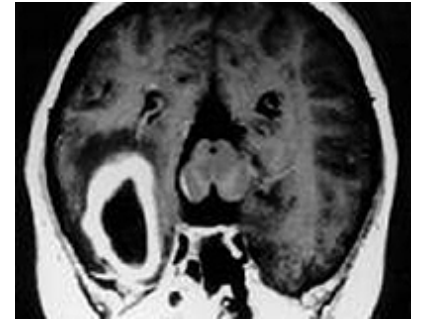
Research in Neuroscience

- Combination of animal and human studies
- Brains are strikingly similar across species
 - Rat brain has basically the same structures as a human brain
 - Invasive methods can be used in animal studies
 - Lesion (destroy) small areas of the brain
 - Apply drugs with specific pharmacological actions and observe resultant behavior
- Recent advances allow more human brain research



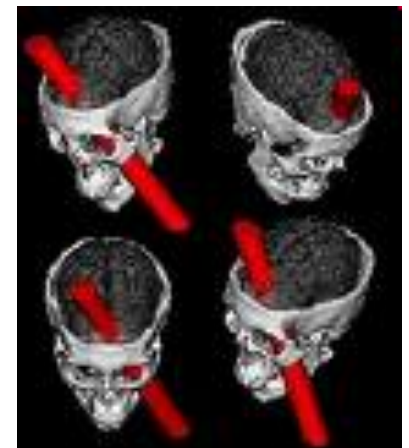
Studying damaged human brains

- Studying brains with specific injury
 - Traumatic brain injury can result in specific damage
 - Stroke can destroy or impair areas of the brain
 - We can begin to infer functions of these areas based on abilities lost after injury
- Not a specific method
 - Injury doesn't respect structural boundaries



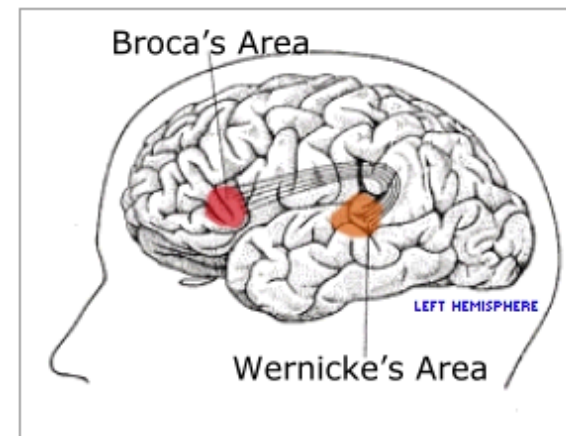
Classic Trauma Case

- Phineas Gage
 - Reports of dramatic personality change
 - Possibly a function of inability to plan and execute non-risky decisions
- *For an alternative view of the case of Phineas Gage, see the supplemental reading posted on Courseworks*



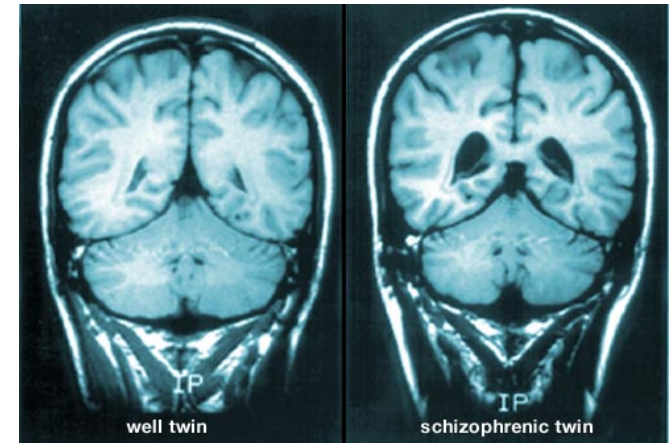
Other Classic Findings

- Language and the Brain
 - Wernicke's (language comprehension) and Broca's (language production) areas



Studying intact human brains

- Structural methods
 - Can correlate different size brain areas with different behavior
 - Larger lateral ventricles in patients with schizophrenia
 - Larger hippocampus in London cab drivers
 - *Caveat: These are correlations!!*
- Functional methods
 - Can correlate activity in specific brain areas with behavior
 - Good for cognitive tasks
 - Not good for motor tasks
 - Still Correlations!!
 - Mirror neuron studies in humans



A few notes

- Be on time
 - But, if you are a few minutes late, please sit at the edges – don't disrupt others
- Latecomers
 - Always get notes, especially check if there have been important announcements made at the beginning of lecture
- Classroom etiquette
 - Cell phones silent in the lecture, computers only for notes
 - Empty your own trash
 - Do not leave before 9:55 unless the lecture is over.

Study Questions

- Compare and contrast the CNS and PNS.
- You should be able to identify each of the brain structures discussed in lecture, and identify them correctly on a diagram.
- What area(s) and neurotransmitter(s) are affected by Parkinson's Disease?
- What is the Hypothalamus?
- Who was Phineas Gage? Did Gage suffer from the personality changes that are attributed to him? What is the evidence for your answer to the previous question? (hint: you will need the supplemental reading to accurately answer this question)
- Using examples such as Phineas Gage and the findings of Paul Broca, explain the concept of localized function in the brain is scientifically supported.
- Does size matter when it comes to the brain? Why or why not? Use evidence to support your answer.

More Questions

- How can we study the human brain? Include specifics on the methods, the strengths and the weaknesses of each method.
- Is it valid to study brain function by studying the behavior of people who suffered brain injury? Why and why not?