Lesion Methodology
- Logic of subtraction:
  - brain damage leads to loss of specific functioning
  - patterns across many patients provides evidence for function in that brain area

First Written Brain Reference was by Egyptian field doctor
- Noted “gyri” and “sulci”
- Meninges
- Cerebral spinal fluid
- Reported case studies of speech production aphasia

Central Question in Neuropsychology:
- What is the connection between human brain and behavior?
- Is behavior located in specific regions of the brain or does it arise out of interactions all throughout the brain
  - Strong localizationist view (Gall and Spurzheim)
  - Reaction against localizationist view (Flourens)
    - Aggregate Field View
- Lesion Methodology
  - Damage are responsible for certain behavior => problems in behavior
- Related Evidence
  - Ramon y Cajal: neuron doctrine
  - Sherrington: Synapse
  - Brodmann’s cortical areas
    - Different parts of brain have different type of cells
    - Mapped 42 distinct brain areas

Neurobiology of memory (brain systems that mediate memory)
- Working memory
  - Limited capacity
  - Information can be held for several minutes with rehearsal
- Long-term memory
  - Very large capacity
  - Essentially infinite duration
  - Declarative
    - Semantic memory
      - Factual gen. knowledge
    - Episodic memory
      - Autobiographical
• Nondeclarative
  o Procedural memory

o Medial Temporal Lobe
  • Damage => inability to form new declarative memories
  • Anterograde amnesia
  • Patient HM had medial temporal lobe removed
    o No new semantic or episodic memory
  • Medial Temporal lobe forms memory, but does not store

o Review Broca’s and Wernicke’s aphasia

o Visual Agnosia
  • Inability to recognize visual object
    o Aperceptive
      o Difficulty forming a percept
    o Associative
      o Perceptual info cannot be linked to stored knowledge

o Pre- or Perinatal Brain Damage
  • (in case of damage to language processing areas) deficits noticed early on (delays in use of complex language) – but other brain areas eventually compensate and result in normal development
  • Believed that right hemisphere compensates for damage in left

Jaime Pineda – Mu Rhythms and Mirror Neurons

  o Neural mechanisms that may underly empathy, theory of mind, language, understanding actions/intentions, simulation…
  o Classic Explanation for understanding others’ behavior
    o Theory-Theory
      • Dfd
      • Dfd
    Vs.

  o Simulation Theory (new perspective)
    o Map visual information onto motor representations of same actions
      • Mirror neurons
      • Mu rhythm
        • Electrophysiology measure (EEG) that is suppressed when mirror neurons are active
        • Below is the basic network of mirror neuron system
Dysfunctional system => problems in understanding others’ actions – also effects social perceptions
• Only necessary for one of the parts to malfunction

Biological Motion
• Only sparse information necessary to recover object info
  o Complex inferences regarding gender, activity, and emotion
• An area in superior temporal sulcus (STS) responds to biological motion – also some response in frontal cortex, SMA, insula, thalamus, and amygdale
• STS processes analysis of intentions of others and social signals

History
• Rizzolati first to observer mirror neurons
  o Same neurons (in F5) that fired when monkey reached for peanuts fired when monkey observed someone else reach for peanuts
    ▪ Only for biological agent
    ▪ Only for goal-directed action
    ▪ Did not fire as much as for individual actions
      • Self vs. others
    ▪ But will fire for grasping even if nothing is grasped
      • Intention is very important for mirror neurons – “coding intentionality”

Within set of cells
• Map percept => Action
  o Congruent cells
    ▪ Perception same as action
  o Logically related cells
    ▪ Not a one-to-one action

Properties of system
• Experiment show that actions that involve more social interactions result in greater firing of mirror neurons

• Autism – dysfunctional mirror neuron system?
  • Impaired social interactions, delayed abnormal language dev., impaired imagination…
  • Unknown underlying mechanism
    ○ Experiment
      ▪ Temporary inhibition of cells that cause mu rhythm cause autistic-like symptoms

• Training mu rhythm?
  ○ Autistic children receive training to “exercise” mu rhythm (biofeedback)
    ▪ Show greater mu suppression