Memory III

- Memory Neural Structures:
  - Sensory Cortices: Long-Term Memory
  - Prefrontal Cortex: Working memory
    - Delayed non-match-to-sample tasks
    - Delayed match-to-sample tasks
    - Different kinds of working memories

- Delayed Non-Matching-to-Sample
  - The monkey moves the sample object to obtain food from the well
  - They need to pick the unknown to get food

- Matching-to-Sample
  - Different kinds of working memory (i.e. verbal, nonverbal)
  - Pick the thing that matches

- Memory: Neural Structures
  - Basal Ganglia, cerebellum: Motor memory
    - Instrumental conditioning
  - Hippocampus: Short-term memory
    - Classical conditioning
    - Hippocampus: spatial learning & spatial memory
    - The right hippocampus is primarily activated & is larger in (London) taxi drivers

- Spatial Learning: The Rat Mazes
  - Positive reinforcement

- Hippocampus & the Milk Maze
  - Hippocampus is involved in relational learning, but not much in S-R (stimulus-response) tasks

- Watermaze: Cortex vs. Hippocampus
  - Lidocaine= local anesthetic
  - Hippocampus is involved in the acquisition & consolidation of new memories
  - Cortex is involved in the storage of long-term memories

- Memory Reconsolidation
  - A reminder of a consolidated memory moves the memory back to the hippocampus
  - New memories are stored relative to old memories
  - Hippocampal memories are susceptible to interferences

- Learning in the Hippocampus
• Behavioral evidences:
  ■ Watermaze: lesion studies, temporary in activation studies
  ■ Reconsolidation: long-term memories can be changed
• Neurophysiological evidences:
  ■ Rats: place cells & spatial receptive fields
  ■ Monkeys: spatial view cells: cells that respond to places currently being viewed
• Memory: Damages & Deficits
  ○ Amnesia: Anterograde & Retrograde (forward vs. backward)
  ○ Retrograde: can't remember events before brain damage
  ○ Anterograde: can't remember events that occur after brain damage
• Anterograde Amnesia
  ○ Anterograde amnesia due to neurochemical damage: Korsakoff's Syndrome. Alcoholism & thiamine (vitamin B1) deficiency
  ○ Anterograde amnesia due to temporal lobe damage: Patient H.M. Intact perceptual, sensory-motor, motor learning. No consolidation
  ○ Coping: record in writing, on tape
• Testing H.M.
  ○ Motor Learning, letter test
    ■ HM: no motor learning deficits
  ○ Perceptual learning for known (in memory) objects, incomplete picture test
    ■ Normally, the hippocampus helps complete memories when it's degraded. In HM, memory completion is impaired
• Memory Consolidation: The circuit
  ○ Sensory inputs → perirhinal cortex & parahippocampal cortex → entorhinal cortex → hippocampus (not if they have anterograde amnesia) → cortex (long-term memory)
• Concussion Induced Amnesia
  ○ Amnesia can be induced: Traumatic Brain Injury, Concussion
  ○ 1. Blow to the head
  ○ 2. Period of confusion
  ○ 3. Retrograde amnesia for events that occurred during the period just before the blow & anterograde amnesia for events that occurred during the period of confusion
• Memory
  ○ Memory can be genetic: Phylogenetic Memory
    ■ Young birds (hatchlings) & birds of prey
    ■ Monkeys & snakes
    ■ Humans (?)
    ■ Note: brain continues to develop until at least 10 years old (some evidence until 20)
  ○ Memory can be improved
- Training 7 → 79 (π → 40,000)
- Chunking or associations
- Procedure
- Christopher, the savant, IQ about 50
- Knew about a dozen plus languages

  - Memory can be lost
    - Amnesia
    - Forgetting
    - Aging
    - False memories