Memory Structures

- Neural structures
  - Sensory corticles: long term memory
    - Perceptual learning
    - Visual stimuli ex, faces
    - Spatial vs. Object memory
      - “What “(ventral) which is object memory and “where” (dorsal) which is spatial
      - Association cortex
  - Prefrontal cortex: working memory
    - Delayed non match to sample task
      - The monkey moves sample object to obtain food from the well beneath it
      - A screen is lowered in front of monkey
    - Delayed non match to sample task
      - Typical matching game
        - Verbal and nonverbal associated with two different types of memory
        - Nonverbal: shapes
        - Verbal: letters
    - Different kinds of working memory
  - Basal Ganglia, cerebellum: motor memory 12.28
    - Instrumental conditioning: praise or punishment
  - Hippocampus: short term memory
    - Classical conditioning
      - Hippocampus: spatial learning and spatial memory
        - Right hippocampus is primarily activated
        - Right hippocampus is larger in (London) taxi drivers
        - Ex. The Rat maze given positive reinforcement
        - Ex. Hippocampus and the milk maze 12.28
          - Hippocampus involved in relational learning, not (much) in S-R tasks
        - Water maze: cortex vs. hippocampus experiment 12.31
          - Hippocampus involved in acquisition and consolidation of new memories
          - Cortex involved in storage of long-term memories
  - Memory reconsolidation 12.32
    - 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 hippocampus 12.29
    - Behavioral evidence: what animal is doing
      - Water maze: lesions studies, temporary inactivation studies
      - Reconsolidation: long term memories can be changed
    - Neurophysiological evidence: biological
      - Rates: place cells and spatial receptive fields
- Monkeys: spatial view cells: cells that respond to places currently being viewed

- Memory: damages and deficits 12.21

- Amnesia
  - Anterograde and retrograde
    - Retrograde: cannot remember events prior to brain damage
    - Anterograde: cannot remember later events occurs 12.22
      - Typically die to neurochemical damage: Korsakoff's syndrome
      - Caused by alcoholism and thiamine (vitamin B1) deficiency
      - Confabulations: make up stories and information but not from memory
    - Due to temporal lobe damage: Patient H.M.
      - Intact perceptual, sensory-motor, motor learning, but had no consolidation
      - Coping: recording in writing or on tape

- Testing H.M. 12.23 AAND 12.24
  - Motor learning
    - H.M. had no motor learning deficits so had no issues with this test
  - Perceptual learning for known (i.e., in memory) objects
    - Incomplete picture test
      - Normally the hippocampus helps 'complete' memories when it is degraded (ex. Set 3)
    - In H.M. memory completion is impaired

- Memory consolidation; the circuit 12.25
  - Sensory input -> perirhinal cortex and parahippocampal cortex -> entorhinal cortex -> hippocampus (short term memories) -> cortex (long term memories)
  - Anterograde amnesia in before moves into the hippocampus

- Concussion induced amnesia
  - Blow to the head producing coma
  - When victim regains consciousness, there is period of confusion
  - When period of confusion ends, you have retrograde amnesia for events that occurred during the period just before the blow and anterograde amnesia for events that occurred during the period of confusion
  - Amnesia can be induced by traumatic brain injury, concussion

- Memory can also be genetic
  - Phylogenetic memory
    - Young birds (hatchlings) and birds of prey
      - Some memory can be genetic
    - Monkeys’ vs snakes
      - Even if never seen a snake, still terrified of them
    - Humans and snakes
      - Can learn not be scared when seeing snakes so not sure if this is genetic
    - Brain continues to develop until at least 10 yo (some evidence up to 20 yo)

- Memory can be improved
  - Training
- Can move from 7-79 things to remember
- 40,000 units of pie
  - Chunking or associations
  - Procedure
  - Christopher, the "idiot savant"
    - Autistic kid with an IQ of ~50 but had insane ability to remember languages (12+)
- Memory can be lost
  - Amnesia, forgetting, ageing and false memories