Lecture 11/8/16 - MEMORY

- Memory
  - Kinds
    - Short Term Memory
      - Immediate forms of memory, not all memory items are necessarily useful.
      - Limited
      - Object dependent
      - State dependent
      - Short-lived
    - Working Memory
      - Memory for immediate use
    - Long Term Memory
      - Declarative (explicit) ‘Remembering’
        - Semantic
          - Facts
        - Episodic
          - ‘When’ or order of events
      - Non-Declarative (implicit) ‘Knowing’
        - Skill habits
        - Priming
        - Simple classical conditioning

- Overview
  - The Memory Processes
    - Stimuli -> encoding -> storage -> retrieval
  - Learning
    - Perceptual (sensory) learning
      - Recognition, modality specific (visual, auditory)
    - Stimulus response learning
      - Classical conditioning
      - Instrumental (operant) conditioning:
        - Action-response learning, reinforcement
      - Motor learning:
        - Playing piano, modality specific
    - Relational learning
      - Spatial learning
    - Meta-learning
      - Learning to learn
Perceptual Learning
- Identify and categorize objects using ‘perception’
- Learning about objects, no associations with actions
- Example
  - Vision: inferior temporal cortex: faces and objects
  - Areas involved in perception are also involved in (perceptual) memory

Classical Conditioning of a Reflex
- The Hebb Learning Rule
  - If presynaptic and postsynaptic sites are active at the same time, the synapse is strengthened.
  - Figure 12.1

Classical Conditioning
- Not just about food...
- Different kinds of classical conditioning involve different kinds of brain areas
- Figure 12.16
- Conditioned emotional responses:
  - Hypothalamus, midbrain, pons, and medulla
- After conditioning, memory can be ‘unconditioned’:
  - Extinction
- Repeated presentations of the conditioned stimulus alone leads to extinction
- PTSD:
  - Deficit in extinction?

Instrumental Conditioning
- Definition: learning an association between an action and its consequence.
- How we learn from doing things
- Need a reinforcing or punishing stimulus
- Example in rat: lever pressing
- Figure 12.2
  - Association between a response and stimulus
  - (Recall... classical conditioning: association between 2 stimuli)
  - Instrumental conditioning:
    - Animal has to perform an action
- Basal Ganglia (BG)
  - Transcortical:
    - ‘Instruction’ learning
  - Basal Ganglia:
    - Automatic behaviors
  - Behaviors initially use the transcortical pathway, then later use the basal ganglia pathway
  - Parkinson’s disease:
    - Basal Ganglia deficit -> problem with implicit memory
- Sensory cortices -> transcortical -> motor cortices