Introduction - Child's garden of learning

Change in behavior or behavioral propensity induced by experience

Continuum with development - critical periods (vision, language, neuron and synapse elimination in motor neuron, motor system)

Categories of learning

I. Non-associative

   Habituation
   Sensitization

II. Associative

   A. Procedural

      1. Classical - Pavlovian - (like with the dog)

         Pretest:  (US $\rightarrow$ R)
                    (CS -/-$\rightarrow$ R)

         Train:    CS + US

         Test:     CS $\rightarrow$ R

         Reinforcement - (Biologically relevant stimulus)
         \hspace{1em} 2$^o$ order conditioning

      2. Operant conditioning

         Closed loop from environment
         Positive feedback

         Thorndike Skinner - bar pressing

      3. Higher order learning - insight learning, etc.

   B. Declarative learning

      (H.M. - fact vs. skill, knowing that vs. knowing how)

      There are animal models of declarative memory:
1. Monkeys - Mishkin - Delayed non-match to sample

2. Mice -
   a. Morris - Water maze
   b. Context-dependent fear conditioning

Simplified circuit

Pavlov's dog + Hebbian synapse

Eye (US -> mouth)
BA - functional synapse all the time

CA
Ear (CS -> mouth)

Hebbian synapse - CA gets stronger if presynaptic input C fires
when postsynaptic cell A fires

∃ 2 nonlinear molecules
Scientists found Hebbian synapse in the hippocampus

Nonassociative          Associative
  |                        |
  Habituation             Sensitization

Procedural               Declarative
  |                        |
  Classical               Operant

HM - Declarative memory requires hippocampus and temporal lobes. Procedural memory does not.

C. Kinetic issues in learning

1. Order dependence
   CS and then UCS
   Lack of backwards conditioning

2. Garcia - toxophobic conditioning
   Long-delay learning
   (trace conditioning)

3. Declarative learning - not necessarily order dependent
   NMDA receptor - probably not order dependent

D. Kinetic issues in memory

STM → → LTM

Three operational definitions of LTM

1. Memory over a day

2. Consolidated memory

   ECS - resistant
   Concussion resistant
   Anesthesia resistant (ARM)

3. Protein synthesis-dependent memory (VLTM)
   Fly mutants and ARM