The Perspective of Learning Theory:

- Philosophers thought learning was the process of association
- Learning Theorists believe that complex tasks are simply combinations of simpler ones
  - They also agree that using simpler organisms for tests can help us understand more complex organisms

Habituation:

- Habituation – Decline in an organism’s response to a stimulus once the stimulus has become familiar
- Dishabituation – An increase in responding, caused by a change in something familiar

Classical Conditioning:

- Pavlov’s dogs – Dogs were conditioned to salivated to untraditional stimuli
  - Ring bell and then feed the dog
- Unconditioned response (UR) – Biologically determined reflex triggered by a certain stimulus independent of any learning
- Unconditioned stimulus (US) – Trigger for unconditioned response
- Conditioned response (CR) – Product of learning that is similar to an unconditioned response but refers to a once neutral stimulus
- Conditioned stimulus (CS) – Stimulus that’s initially neutral but becomes associated with the unconditioned stimulus during an experiment
- Classical conditioning (Pavlovian conditioning) – A form of learning in which one stimulus is paired with another so that the organism learns a relationship between the stimuli
- Conditioned stimulus does not elicit a conditioned response initially
  - After several pairings with the unconditioned stimulus, it triggers a conditioned response
- Second-order conditioning – A procedure in which a neutral stimulus is paired with some already established conditioned stimulus
  - Can cause phobias
- The conditioned response will disappear if the conditioned stimulus is presented several times by itself without the unconditioned stimulus
- Extinction – Undoing of a previously learned response so that the response is no longer produced
- Even with much time-delay, extinction probably won’t occur because classically conditioned responses are not forgotten quickly
- If an organism is conditioned, unconditioned, and then reconditioned, the rate of reconditioning is much faster than the initial rate of conditioning
  - This means that extinction does not remove the memory of the conditioned stimulus altogether
- Spontaneous recovery – The reappearance of an extinguished response after a period in which no further conditioning trials have been presented with a weaker (but existent) conditioned response
- Stimulus generalization – Response to a range of stimuli provided that the stimuli are similar enough to the original conditioned stimulus
- Generalization gradient – Difference between a new stimulus and the original conditioned stimulus in strength
  - The peak is when the stimulus is identical and it gets weaker and weaker as the stimulus differs more
- Discriminate – Respond in a way that’s guided by the stimuli in your view
- CS* is the original conditioned stimulus that was paired with the unconditioned stimulus
- CS* is a newly introduced conditioned stimulus that does not produce a conditioned response or at first does due to generalization but eventually does not due to discrimination
- After a discrimination experiment, a CS* will take on the opposite response of a CS+ by associating the CS* to no unconditioned response
  - Therefore, the CS* will produce the opposite effect of a CS+
    - This means the CS* takes on the role as an inhibitor
      - CS* makes the response less likely than whatever was produced by the CS+
- If the conditioned stimulus is paired with the unconditioned stimulus with less delay, the conditioning will be more effective
  - Contrarily, too short of a stimulus (simultaneous) can be counter-productive
Presenting the unconditioned stimulus before the conditioned stimulus is even worse

- Forward pairing – Positive intervals and correlation
- Backward pairing – Negative intervals and no correlation
- Contiguity – The pairing of the conditioned stimulus and unconditioned stimulus close in time
- Contingency – The relations among stimuli that allow us to anticipate upcoming events
  - This is what is key since non-changing elements are ignored as stimuli
- Organisms can be conditioned to imperfect predictors too
- Poor contingency (more random) can cause increased fear when compared to more contingent stimuli
- If a surprise or change happens with a conditioned stimulus, the organism can expect a certain outcome and then adjust based on if it was what was expected (no change), less than expected (decrease expectations), or more than expected (increase expectations)
- Blocking effect – A result showing that an animal learns nothing about a stimulus if the stimulus provides no new information
  - Learning depends on surprise and the informational value of a stimulus
  - Pairing redundant information with a conditioned stimulus will do nothing when the conditioned stimulus is removed with only the redundant part left
- The conditioned response is frequently different from the unconditioned response in that the conditioned response is the result of an animal preparing for an unconditioned stimulus
- Drug tolerance – A decrease in the response to a drug from continued use
- Drug dependence and cravings – An inability to function without the drug and an overwhelming desire for yet another dose
  - Cravings are associated with other effects
- Homeostasis – Stable environment
- Compensatory response – A conditioned response that compensates (does the opposite) for the effects of the upcoming unconditioned stimulus
- Systematic Desensitization
  - Extinction of classically conditioned fear response through harmless exposure to feared stimulus
  - Classical conditioning of a new response, such as relaxation, to feared stimulus

Instrumental Conditioning (Operant Conditioning):

- Instrumental conditioning (operant conditioning) – A form of learning in which the participant receives a reinforcer only after performing the desired response, and thereby learns a relationship between the response and the reinforcer
  - Key Difference: Operant conditioning is voluntary
- Thorndike – Did experiments with cats and puzzles to see learning process
- Law of effect – Thorndike’s theory that a response followed by a reward will be strengthened, whereas a response followed by no reward (or punishment) will be weakened
- Operant – An instrumental response that is defined by its effect on the environment in Skinner’s system
- Response rate – Amount of actions per unit of time
- Reinforcer – A stimulus delivered after a response that makes the response more likely in the future
  - Can be in the form of something beneficial or the removal of something bad
- Discriminative stimuli – External events in instrumental conditioning
- S+ is a positive discriminative stimulus and S– is a negative one
- The S+ tells the animal about the impact of its behavior while a CS+ tells the animal that the unconditioned stimulus is inevitably coming
- The S– tells the animal something about its behavior while a CS– tells the animal that the unconditioned stimulus is inevitably not coming
- Generalization gradients are similar with instrumental conditioning as they would be with classical conditioning
- Shaping – The process of eliciting a desired response by rewarding behaviors that are increasingly similar to that response done with successive approximations
- Primary reinforcers – Food, water, escape from predators, etc. (essentials)
- Social reinforcers – Smile, praise, etc.
Andrew Rosen

- Conditioned reinforcer – Initially neutral stimuli that come to act as reinforcers because they have been repeatedly paired with some other established reinforcer
- Reinforcements generally are identified after the fact
- Behavioral contrast – The response pattern in which an organism evaluates a reward relative to other available rewards or those that have been available recently
  - Alternate theory: If play occurs and the reward makes play become work, a removal of the reward that caused this change will make the play activity no longer worth it
- Partial reinforcement – A learning condition in which only some of the organism’s responses are reinforced
- Schedules of reinforcement – The rules about how often and under what conditions a response will be reinforced
- Ratio schedule – A pattern of delivering reinforcements only after a certain number of responses
  - Can be fixed or variable
    - “Fixed-ratio 2” (FR 2) schedule would mean two responses are required for each reinforcement
    - “Variable-ratio 10” (VR 10) would mean 10 responses are required on average to get a reward
- Interval schedule – A pattern of delivering reinforcements only after a certain amount of time has passed
  - “Fixed-interval 3-minute” (FI 3-minute) would mean responses made during the 3-minute interval aren’t reinforced but the first response after the three minutes will earn a reward
  - “Variable-interval 8-minute” (VI 8-minute) would mean reinforcement is available on average after 8 minutes, but the exact interval required varies from trial to trial
- Latent learning – Learning that occurs without a corresponding change in behavior
  - Edward Tolman founded this theory
- Learned helplessness – An acquired sense that one has lost control over one’s environment, with the sad consequence that one gives up trying
  - Martin Seligman was one of the discoverers of this
    - Believed depression in humans is analogous to this

Observational Learning:

- Observational learning – A process of watching others behave and learning from example
- Vicarious conditioning – A form of learning in which the learner acquires a conditioned response merely by observing another participant being conditioned
- Mirror neurons – Neurons that fire whenever an animal performs an action and also whenever the animal watches another performing the same action
  - Located in the frontal lobe near the motor cortex
- Mimicry – Duplicating other actions to the best of one’s ability

Varieties of Learning:

- There are some biological constraints on species’ learning
- Taste aversion learning – Learning in which an organism learns to avoid a taste after just one pairing of that taste with illness
  - Form of classical conditioning with one-trial learning
    - Time delays can be quite large in taste aversion learning unlike traditional classical conditioning
- Prepared learning – Learning that occurs without extensive training because of an evolved predisposition to the behavior
- Learning must be describe on a case-to-case basis because different species have different types of learning due to biological factors

The Neural Basis of Learning:

- Neural plasticity – The capacity for neurons to change the way they function as a result of experience
  - Changes at the synapse
    - Can send stronger signals
    - Can become more sensitive to signals
    - Can create new connections (synapses)
- Presynaptic facilitation – An increase in the neural signal (release of neurotransmitter) being sent
Andrew Rosen

- Famous case with the Aplysia mollusk
  - Long-term potentiation (LTP) – A long-lasting increase in a neuron’s response to specific inputs caused by a repeated stimulation
    - The spread of potentiation is activity dependent
  - Dendrites can grow new dendritic spines (receiving stations) in response to learning