Basic Processes (Shettleworth Chapt 2)

1. Perception
2. Memory
3. Associative Learning
4. Discrimination, Classification & Concepts

Perception: An example of testing in animals

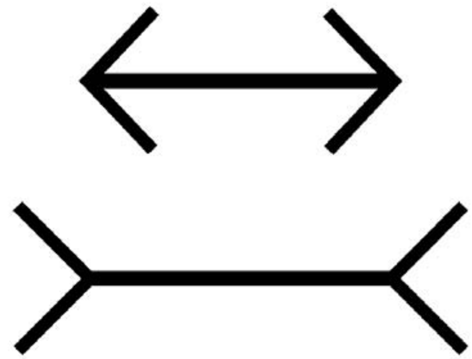
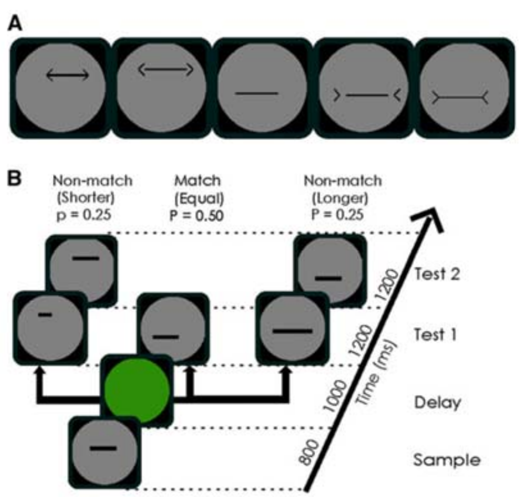
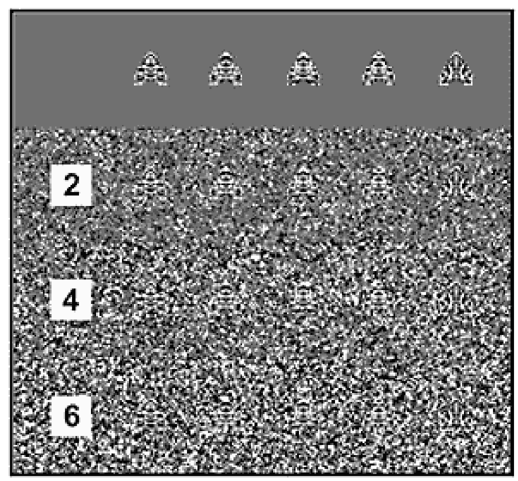


Fig. 1 The Müller-Lyer illusion. The perception of the length of a line is distorted by the presence of *outward* or *inward pointing arrow* heads at the ends of the line. The *upper line* is perceived as being shorter than the *bottom line*, although the two lines are equal in length

Tudusciuc & Nieder: Comparison of length judgments and the Müller-Lyer illusion in monkeys and humans. *Brain Research* 2010.



Another example: Search Image in Blue Jays (Bond & Kamil)

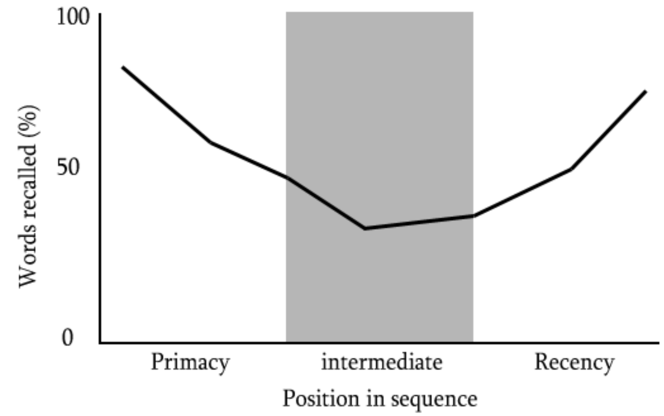


Five digital moths displayed on a uniform gray background (top) and on three different levels of cryptic background. With practice, most blue jays have little difficulty detecting moths even at Level 6, though their performance generally declines at higher crypticities.

Another example: Search Image in Blue Jays (Bond & Kamil)

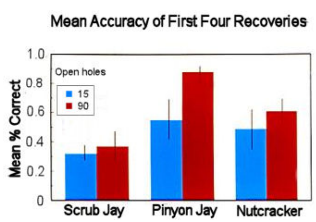
Moths are presented one at a time to blue jay. In each trial there either is or is not one moth image imbedded in one of the fields of cryptic background. If the bird finds a moth, it pecks it, the peck is detected by an infra-red touch screen, and the bird is rewarded with food. If the bird does not find a moth, it pecks the green circle, in which case the next trial begins immediately. The bird is never informed if it overlooked a moth, and if it pecks an area with no moth present, the time to the next trial is substantially delayed ('time out').

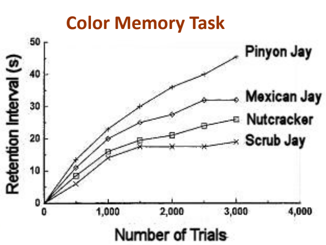
Memory: A 'classic' effect – the serial position effect



Classic finding from human experimental psychology studies – parallel results obtained with animals

Memory: Comparative Studies (Balda & Kamil)





Memory: Metacognition

(Experiment really badly explained.)

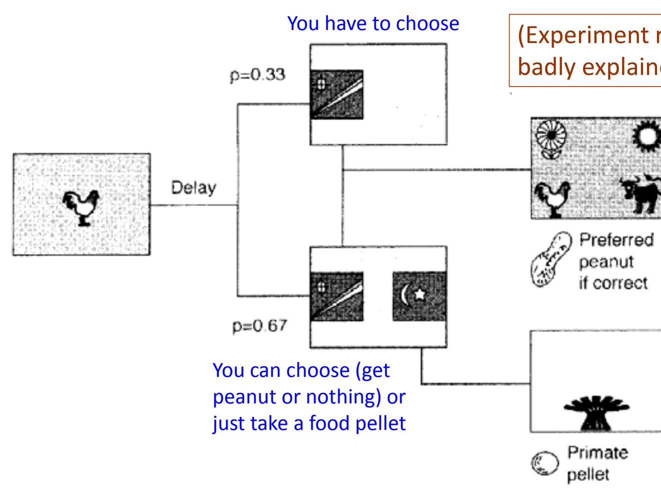


Fig. 2.5 Shettleworth Hampton 2001

Associative Learning

- Associative learning = Learning resulting from exposure to relationships among events.
- Theoretically = formation of associations, or neural connections, between representations of events.
- Includes both classical (Pavlovian) conditioning and operant (instrumental) conditioning.
- "Morgan's Canon dictates explaining any novel example of learning as associative".

Associative Learning

Classical Conditioning (Pavlov)	Operant (Instrumental) Conditioning (Skinner)
Unconditioned Stimulus (food) → Unconditioned Response (salivation)	Response (press lever) → Stimulus (reward) (food)
Unconditioned Stimulus (food), Conditioned Stimulus (bell) → Unconditioned Response (salivation)	TIME
Conditioned Stimulus (bell) → Conditioned Response (salivation)	Conditioned Response (press lever) → ConditionedStimulus (Reward)(food)
In classical conditioning, a neutral stimulus becomes associated with a reflex. The bell, a neutral stimulus, becomes associated with the reflex of salivation.	In operant conditioning, the learner "operates" on the environment and receives a reward for certain behavior (operations). Eventually the bond between the operation (pressing the lever) and the reward stimulus (food) is established.

Associative Learning

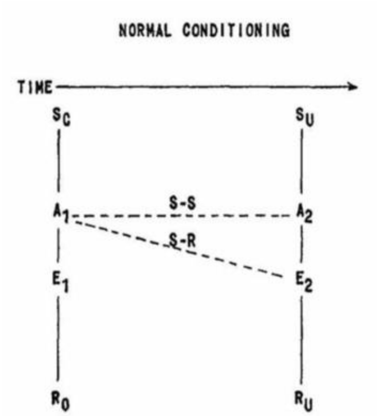


FIG. 3. Schematic representation of the classical conditioned response showing by means of the broken lines the two possible hypothetical associations (*S–S* or *S–R*).

Kenneth W. Spence
(1907 - 1967)

Student of Hull, switched the focus from S-R relationships to S-S relationships but without any explicit reference to cognitive concepts

Associative Learning – Rescorla-Wagner model

A stimulus-stimulus model. Accounts for *blocking* and *overshadowing. "*Shows how excitatory and inhibitory associations can produce behavior that tracks the causal structure of the world without representing it". (i.e., a non-cognitive model).

On a learning trial in which a compound stimulus, AX , is followed by US1, the rules for change in associative strength of A and X are:

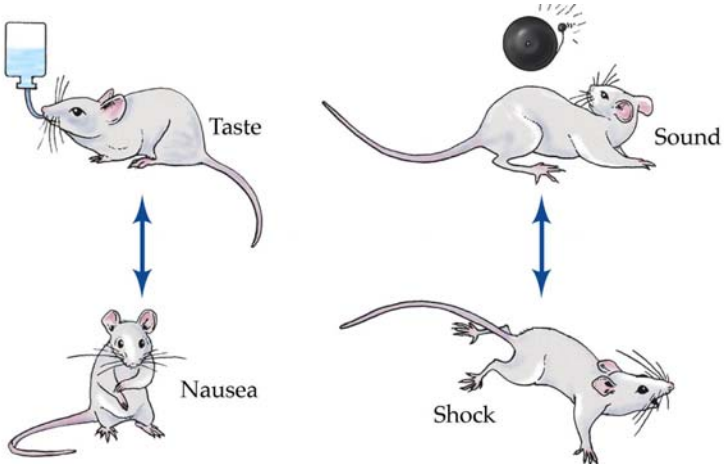
$$\Delta V_A=[\alpha_A\beta_1](\lambda_1-V_{AX}) \quad \text{and}$$

$$\Delta V_X=[\alpha_X\beta_1](\lambda_1-V_{AX}) \quad \text{where}$$

$$V_{AX} = V_A + V_X \text{ .}$$

λ_1 is the maximum conditioning US_1 can produce; it represents the limit of learning. α and β are rate parameters dependent, respectively, on the CS and US. They are viewed as having fixed values based on the physical properties of the particular CS and US. On any given trial the current associative strength, V_{AX} , is compared with λ and the difference is treated like an error to be corrected; this happens by producing a change in associative strength (ΔV) accordingly.

But don't forget: Constraints on Associative Learning

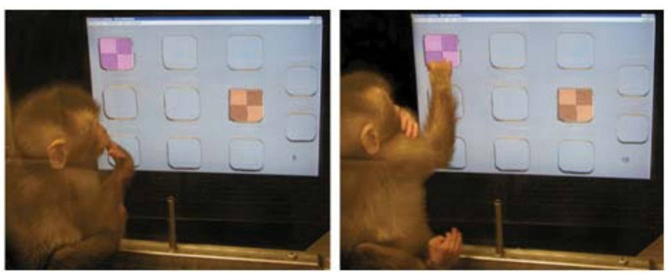


One example (Garcia 1976)

Associative Learning: Applying Morgan's Canon

My brilliant dog Mollie provides a good story of apparent reasoning and planning, but does it hold up when we apply Morgan's canon?… i.e., can it be explained in terms of simple learning?

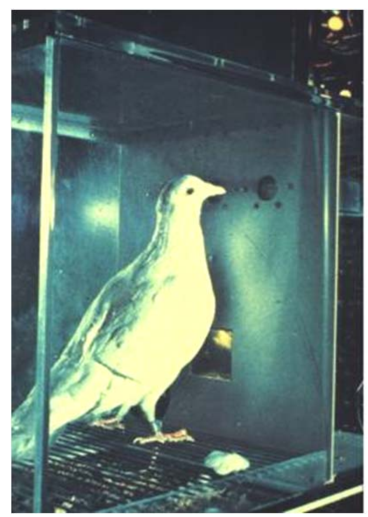
Discrimination, Classification & Concepts

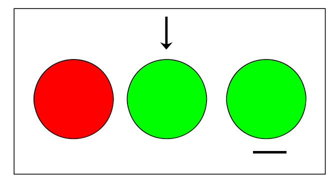


Discrimination Learning in Operant Conditioning

- Press panel, get food.
- Purple panel signals food available, orange panel that it's not.
- Animal still controls response, it is *emitted* not *elicited.*
- S – S relationship: Blue panel signals (availability of) food

Methods used heavily in studying concept learning





Concept Learning

Match to Sample: Color comes up on center key, goes off, then colors on two side keys come up – pigeon's task is to pick the same color (match) that was on the center key (sample)