

ANBI 159: Biological and cultural perspectives on intelligence

Lecture 8: Some learning, some Theory of Mind

<http://www.cbsnews.com/video/watch/?id=4696315n>

Does friendship imply mind/intelligence? Does ability to form friendship across taxa imply intelligent flexibility, or bad wiring? What's the mental experience of "concern"?

<http://weber.ucsd.edu/~jmoore/courses/>

Expectation or 'merely' association?

*Garcia effect*

Taste aversion learning in rats:

give unfamiliar tasting food, laced with either

- (a) something makes barf *immediately*, or
- (b) lithium chloride, makes vomit > hour later.

Clearly, pairing of (-) stimulus immediately after new taste (CS (flavor) and UCS (barf) *close in time*) should make easy to learn avoid;

after hour gone by (*long delay*) learning difficult.

Right?

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Same based on **color** (not taste): can't learn **aversion unless** pair negative stimulus *closely* in time--buzzer--and then it's repeated trials, just like any other 'normal' conditioning. **WHAT GIVES?**

Expectation or 'merely' association? Win-shift

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Expectation or 'merely' association? **Win-shift**

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They can do it (think hummingbird feeders) but WAY slow. Why??

## Humans are constrained generalists

Human show species-specific [general] learning: we generalists but constrained. 2 ways [are others]:

- 1) perceptual & cognitive **limits**  
 can't see UV light, echolocate well, etc.  
 pigeons better detailed visual memory  
 (recall 80 slides, seen once);  
 rats can have better cog maps.
- 2) we **constrained to complexity**: we **cannot see the world as does a clam**. We are stuck with emergent properties not sum of "parts"

Perhaps we so stuck with emergent properties because it is minds that create realities

## Humans are constrained generalists

Minds create realities

**sea slug** carves world into few simple categories: dark/light, chemical gradients, few others -- literally makes a simple reality out of subset of the physical world

**frog** adds 'bug detectors' and vertical/horizontal surface detectors (plants, water); etc -- but cannot distinguish different objects much larger than self - simply has "bigger moving object/danger"

**primate** has huge number of categories... color & 3D vision, cross-modal representations, etc.

and with each, have greater repertoire of actions possible. **Reasonable; wouldn't expect perceive things can't respond to, or vice versa.**

## Definition of intelligence (1 of them...)

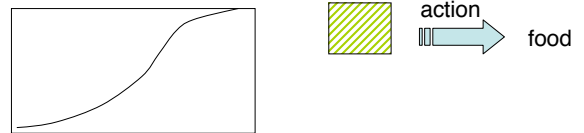
Given variation in realities, consider **variability of repertoire**, where "variability" =

- 1) complex reality (perception and range of possible action), **and**
- 2) **flexibility** **But as usual, there's a wrinkle, which I'll get to...**  
 (i.e. **ability of interaction between organization/perception and action**)  
 to determine which discriminations (E-E relations) combined with which actions yield most desirable outcomes.

Flexibility can be seen in lab: transfer = reduction in # trials required to reach criterion of success (**learn how to learn**)

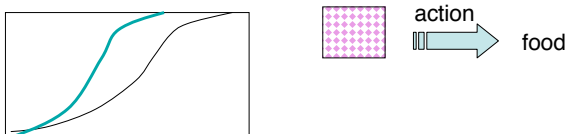
## Learn how to learn

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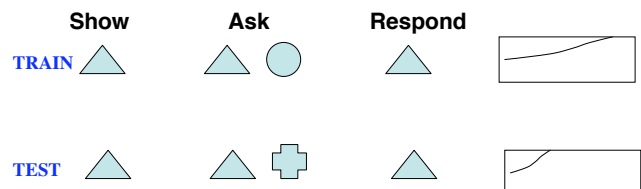


Recognize pattern, apply (or inhibit) response to **similar situations**.

## Similarity: Monkeys pretty good ...

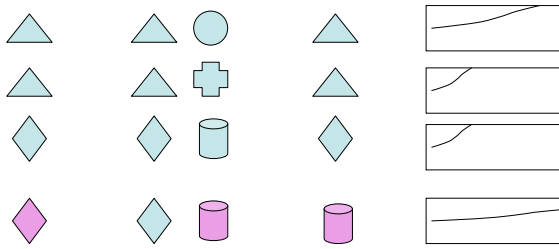
Train vertebrates to respond to **similarity** via match to sample

Can learn to ignore color differences, focus on shape - **relevant parameter**. Monkeys can learn one-trial success with such paradigm - ie, they get it right every transfer, first time. *Pigeons never quite make it...*



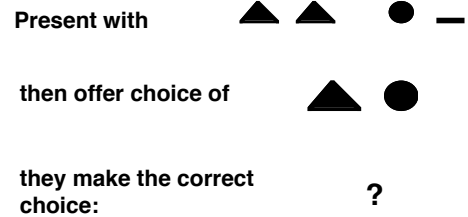
### Similarity: Monkeys pretty good ...

Now - if rule is based on shape, and try to change dimension of importance to color, is *difficult even for monkeys*.



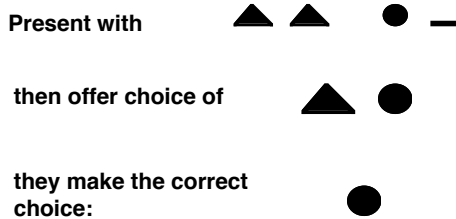
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Apes, parrots, dolphins - more flexible yet --ignore perceptual dimensions altogether and get concept of "sameness", allowing solve **analogies**:



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### Similarity: Categories

This flexibility could allow single stimulus (eg, another ape) to be categorized *not only perceptually* (hairy, scar on cheek) but *also by concepts* (subordinate to me; dominant to X, is now looking at me; mother of Z, etc.

By adding language humans can create and manipulate yet more such realities, both possible and impossible.

Patience, the wrinkle will come ..

### Categories in the wild?

Do any animals categorize novel objects in the wild?

Figan, displays, and, um, privates...



Mitani and van Kesteren (1990) to help him take over as dominant male (page 111). Copyright National Geographic Society



### Categories in the wild?

Do any animals categorize novel objects in the wild?

- (a) picked me out as the newcomer in group;
- (b) attempted effective attention-getting display;
- (c) when it failed, he gave up.

This seems complex, insightful, "intelligent". But was it?



## Categories in the wild? *That wrinkle...*

At base, simple Stimulus-Response conditioning all that's needed.

ACCIDENT --> + OUTCOME --> REPEAT; all needed is ability to recognize individual humans by sight in 2 classes - familiar & unfamiliar.

Is flexibility based on broadly similar categories (?perceptually based?) "intelligent"?

Romanes' dog... different parties "similar"

## What does conditioning have to do with intelligence?

How many heard of classes training prof to stand in corner?

Even human behavior can be modified by simple learning, association of stimuli, *without any conscious awareness or thought*.

This is why to understand intelligence, need first to understand NON-intelligent mechanisms that can produce seemingly same results, such as all this classical conditioning stuff.

## Trial and error (conditioning) not enough

Making associations helps with problems animals face - finding resources, not becoming a resource - by allowing 'predictions' based on experience.

Can we focus on *kinds* of problems a little, *as well as* consider whether simply learning associations is best way to behave adaptively?

What is WRONG with trial and error learning?

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Can we focus on *kinds* of problems a little, *as well as* consider whether simply learning associations is best way to behave adaptively?

There are kinds of problems that you CANNOT learn by repeated trial and error.



## Trial and error: What else is there?

**Imitation**... monkey see, monkey do. Why good? BYRNE - used to be trivialized, now thought insightful as implies (maybe) theory of mind [coming up].

### Alternatives:

**Stimulus enhancement** -- explore around and therefore work out for self; see other hurt in context and fear it (negative enhancement).

**Response facilitation** -- contagious (yawning). Watching other do something increases chance you'll do it (already something in repertoire; limited set of things that can work -- NOT OPEN ENDED)

**Emulation** -- copy the target of the behavior-- copy result, but not the precise mechanism of doing it. Byrne suggests no good examples, but open debate. This interesting; if naive figures own idiosyncratic way to accomplish new task, could interpret as more complex...

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& insight is both difficult to prove, and rare even in us ...



PLATE IV. GRANDE ON AN INSECURE CONSTRUCTION (NOTE SULTAN'S SYMMETRIC LEFT HAND)