

1. (15 pts) It has been hypothesized that the animals are capable of the following complex behaviors and mental capacities. For each one, (a) give an operational definition, (b) provide an example from the course (from one of the papers we read), (c) say whether it has been hypothesized as limited to just some animals, and (d) provide a contrarian or 'killjoy' viewpoint of the ability.

Note: I did not grade part c because opinions differ so much on the issue of which animals display the ability and which don't.

*Insight learning. Foerder et al 2001: "spontaneous problem solving without evident trial and error". Key element is **sudden** solution 'as if' animal has thought out all the elements of the solution to the problem. Foerder et al's elephant was said to have shown insight when he fairly suddenly pushed a box to where he could stand on it to reach fruit overhead. However, contrarians Epstein and Skinner have shown in a simulation experiment that a lowly pigeon can solve the identical problem, and will do it in the same sudden 'insightful' fashion, provided it has learned to push boxes first.*

Observational learning (contrast with Local enhancement). Said to be demonstrated when animal copies a behavioral solution to a problem after observing another individual do it. For example, the orangutans (Dindo et al) were shown to adopt either the slide or lift solution to the problem after watching another orang demonstrate one or the other. The contrarian viewpoint notes that the orang example is extremely simple. Most importantly, the experimenter has to show that more has occurred than just 'local enhancement', i.e., facilitation of learning resulting from drawing attention to a locale or place associated with reward. For example, all that the English birds may have learned from watching others was that there was food in those glass bottles (local enhancement) and nothing at all about how to get it.

Cultural transmission. Said to be demonstrated when a trait is transmitted over multiple animals and ideally over multiple generations. The orangutan example (Dindo et al) works here too since A demonstrated it to B who demonstrated to C etc (transmission by demonstration/learning). Contrarian viewpoint: rarely has it been shown that the trait has been passed over multiple generations (it's not shown in the orang example), or for that matter that it is not a fundamentally innate trait (like tool use by woodpecker finches).

Episodic memory. In humans, defined as the ability to subjectively experience a past event. In animals, subjective experience cannot be directly measured, so an animal's episodic memory is defined as the ability to recall the what, where, and when of an event. Martin-Ordas et al. presented evidence that chimps are able to remember the location, identity, and time of placement of food items. Clayton showed that scrub jays, a caching bird, are similarly able to recall what, where, and when, and rats seem to have the ability as well. Some people think episodic memory requires language, and perhaps conscious awareness too (Tulving). Our inability to measure the subjective experience of animals makes it impossible (right now, at least) to ascertain whether they can actually remember things as humans do.

Positive emotion. The ability to experience feelings like happiness and joy. Sandem et al use their 'eyewhite' measure to demonstrate positive emotion in a number of different circumstances in cows (when eating food, getting their calves back). Emotions are considered to be broadly found in

animals. Contrarian viewpoint: emotions are little more than physiological responses, combined with conditioned responses to various positive and negative stimuli.

Theory of mind. A capacity for recognizing that another being has a mind similar to one's own. Most likely present, at least in rudimentary forms, in brainy animals (higher primates, dolphins, maybe elephants, corvids). Examples: Kaminski et al 2007 – chimps know what others know, but not what they believe (partial TOM); Crockford et al 2012 – wild chimps who see a dangerous snake warn others, but only if they are perceived to be within hearing distance. Killjoy viewpoint: Not really theory of mind if limited only to what a three-year-old human can do.

Prosociality: Where an animal prefers a helping choice to a non-helping choice. Refers both to cases where the helper takes a cost (altruism) and where it takes no cost. Example: Horner et al's chimps who (at least some of the time) chose the token that gives treat to their helpless colleague as well as themselves over the token that gives it just to themselves. Contrarian viewpoint: the extent of prosociality shown in these experiments is surprisingly low, perhaps low enough to make the opposite point, that they're not very prosocial!

2. (5 pts) Most introductory courses in animal behavior have no section on animal mind (or animal cognition). For example, many of you had Alcock's animal behavior text in 200 or 300; you may remember he had nothing on animal mind. What is the justification that would be given for this omission?

*Animal Behavior courses focus on what animals do (behavior), and on **why** they do, i.e., the **ultimate** (functional, evolutionary) bases for these behaviors. Animal mind focuses on **how** the animal does what it does, and on one set of **proximate** causes: presumed psychological mechanisms. It turns out that in mainstream animal behavior the issue of what the animal is thinking, or believes, or feels, is easily ignored much of the time because predictions are usually about what the animal will or will not do in certain circumstances. So for example, although calling a particular display or behavior a signal of 'aggressive intent' appears to be talking about what the animal is thinking or planning to do, it can be tested in a simple and straight-forward fashion by asking does the signal in question actually predict eventual attack in threat situations. On the other hand, many hypotheses in the area contain hidden assumptions about animal mind. For example, the Beau Geste hypothesis assumes that a bird will be fooled into thinking there are many birds in a particular area if he hears many different song types, even if they are sung by one bird. It can be tricky to test these hidden assumptions about animal thinking.*

3. (5 pts) What does the Herrmann et al group think is different between the *learning abilities of humans, chimps and bonobos*? (You will need to refer to the group's earlier study as well as the more recent one we read.)

Humans best in social-cultural cognition (social learning, communication, theory of mind), no better than chimps in physical cognition. Chimps better than bonobos on aspects of physical

cognition (specifically tools and causality) whereas bonobos better than chimps on aspects of social-cultural cognition (specifically theory of mind).

4. (5 pts) I hang an opaque food container in the tree in my yard. The container has several latches that must be worked for the food to become accessible. One crow works on it for a long time, and finally gets it open. The latches are set to close when a bird leaves. The original crow leaves. Subsequently other crows, then other birds come and feed from the container. (a) Can we say that the first crow showed *insight* in figuring this out? Provide an *alternative explanation*. (b) Can we say that subsequent crows and birds learned how to get the food through *observational learning*? Provide an *alternative explanation*. And suggest an experiment that might distinguish between the two explanations.

The solution has to be arrived at suddenly otherwise it could just be trial and error. How long it takes actually doesn't matter, it's whether the animal puts the solution together quickly. We can't say observational learning occurred in subsequent birds because the first bird may simply have called their attention to the existence of food in the container (local enhancement, see Q 1). Here's an experiment that would distinguish between these two kinds of explanation. In group A the observer gets to watch the demonstrator carry out the requisite container-opening behaviors and then feed from the container. In group B, the observer simply gets to watch the demonstrator feed from the container (but not see how the demonstrator opened the container). Animals in group C, the control group, are introduced to the food container without having seen anything. If the observers in groups A and B learn to get at the food equally quickly, and more quickly than those in group C, we would say local enhancement had occurred. If observers in group A learned most quickly, we would say that observational learning had indeed occurred.

5. (5 pts) Suppose you think dogs are capable of the emotion of *jealousy* and that you want to convince a skeptic that you are right. Describe the demonstrations and/or experiments that you think would make a strong case. (If you prefer, you can turn this question around, and suppose you think dogs are *not* capable of jealousy, and that you want convince a skeptic that you are right about this.)

Key to this question was coming up with a good experiment, and students came up with several different ones. I've posted a good example of such an experiment by Range et al 2009 (a couple of students found this paper). However, one student also pointed out that it lacked a control condition you really need to invoke 'jealousy' (see if you can figure it out).

6. (5 pts) (a) What is *anthropomorphism*? (b) Why do humans do it? (c) Do you think animals do the same thing when thinking about us? Explain your reasoning.

(a) It is imputing human emotions, thoughts and motives to animals. (b) Humans do it naturally when interpreting the behavior of humans – some people would say it is one of the defining

characteristics of being human – so it is no surprise that we do it to animals as well. (c) This would depend on how developed their theory of mind is. As you know, this is an area of dispute and investigation right now. Chimps, for example, appear to have some TOM capacity, but perhaps not as fully developed as humans’. What is your dog thinking when he cocks his head at you? Is he wondering what you are doing or saying? Or is he wondering what you’re thinking?

7. (5 pts) Most (probably all) songbirds learn their songs. In the study of song learning, the older birds from whom the young birds learn their songs are referred to as “tutors”. The word is used just for convenience, but what would we need to show that older birds do in fact *teach* younger birds their songs? Describe this in the natural context rather than in a lab context.

Bender et al 2009 give a definition from Caro & Hauser 1992) that contains the three key criteria: “An individual actor A can be said to teach if it modifies its behavior only in the presence of a naïve observer, B, at some cost or at least without obtaining an immediate benefit for itself. A’s behavior thereby encourages or punishes B’s behavior, or provides B with experience, or sets an example for B. As a result, B acquires knowledge or learns a skill earlier in life or more rapidly or efficiently than it might otherwise do, or that it would not learn at all”. Thus you would need to show that the older bird sings more, or more instructively when a kid is near, that there is a cost to him (or at least no benefit) and that the young bird learns song earlier or more rapidly because of this ‘instruction’. The first point would be the key one to show.

8. (5 pts) The diagram at the right shows why intervening variables can be parsimonious. Explain why mental concepts in general and *theory of mind* in particular can be useful as intervening variables in the explaining behavior.

Mental concepts are intervening variables (like “thirst” in the diagram): they intervene between input from the environment and the output (response) of the animal. They are parsimonious if, like thirst in the example, they can explain how the different outputs (behaviors) of the animal relate to the different inputs from the environment.

