Animal cognition

What is it, what is interesting about it
Evolutionary and ecological relevance

What is it?
Is it interesting?
Why (or why not)?

- Do you expect this to be controversial or difficult?
- Do you expect this to be relevant to your research?

Cognitive science

- Studies mechanisms of behavior (rather than function, as behavioral ecology does)

Approaches:
- Neurobiology
- Psychology – like Neuro, but focusing on algorithms, not implementation
- Cognitive ecology – evolution and distribution of particular cognitive mechanisms

Differences and similarities in biological and psychological/philosophical approaches

Definitions

- General: any information processing, including perception, memory, decision-making, etc., regardless of mechanism

- Specific: high-level decision-making in the brain, often thought to involve consciousness

Science vs. Philosophy

- Science: define phenomena on basis of observables; find mechanism later

- Philosophy: define phenomena based on mechanism by which they occur

Either can be more or less in accord with common language usage.

Knowledge

- Science: animal takes information about environment into account when acting

- Philosophy: 'justified true belief', implying capability to reason, complex language and belief system, capability of introspection

In this case, the existence of knowledge in anyone but oneself is impossible to verify scientifically (at least with current methods).

Kinds of knowledge

- Procedural: rules for action (that produce desired result)

- Declarative: abstract facts (which can be used to decide about actions)

The latter is thought to be harder and tied to higher-level reasoning. But again, how do we test which one is used?

(Mental?) Representations

- procedural/declarative is related to how the world is represented in an animal's brain
    - e.g., cognitive map or behavioral rules?

- How can representation / mechanisms of information processing be studied?

Consciousness and intentionality

- "The bird sings to attract a mate" – *at an evolutionary level, this could be taken to mean "The bird (behaves as if he) wants to reproduce."*
- The bird does NOT have to consciously 'know' that this serves better reproduction
- NOR that the behavior serves to attract mates!

Studying the inner workings of animals

- Be careful not to anthropomorphize or overstate the abilities of animals.
- Be careful not to overestimate the abilities of 'machines' or 'zombies' – we don't often know the most adaptive (or any) way to achieve a complex behavior.

… like behavioral ecology!

- Comparative method
- Modeling
- Experiment

Interesting topics

- Evolution of flexibility (adaptive diff.?)
- Modularity & mechanism → action selection mechanics
- Brain size ~ behavioral complexity?
- Costs of information processing
- Limitations (behavioral syndromes, complexity of computation, sensory limitations)

General problems

- Relevance of lab tests to field-abilities
- Quantifying performance across species / situations
- Capability vs. realized behavior
- Finding the right hypotheses about mechanism
- Under- or overestimating flexibility

Perception

In what way is understanding mechanisms of perception relevant to understanding the function of a behavior?

In what way may perception be important for your research?