



Reasoning and Natural Selection

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Glossary

Adaptation Aspect of an organism that was created by the process of natural selection because it served an adaptive function

Adaptive Contributing to the eventual reproduction of an organism or its relatives

Bayes's theorem Specifies the probability that a hypothesis is true, given new data; $P(H|D) = P(H)P(D|H)/P(D)$, where H is the hypothesis and D is the new data

Cognitive psychology Study of how humans and other animals process information

Natural selection Evolutionary process responsible for constructing, over successive generations, the complex functional organization found in organisms, through the recurring cycle of mutation and subsequent increased reproduction of the better design

Normative theory Theory specifying a standard for how something *ought* to be done (as opposed to how it actually *is* done)

Valid argument Argument that is logically derived from premises; a conclusion may be valid, yet false, if it is logically derived from false premises

THE STUDY OF REASONING is an important component of the study of the biology of behavior. To survive and reproduce, animals must use data to

make decisions, and these decisions are controlled, in part, by processes that psychologists label "inference" or "reasoning." To avoid predators, for example, a monkey must infer from a rustle in the grass and a glimpse of fur that a leopard is nearby and use information about its proximity to decide whether to take evasive action or continue eating. Because almost all action requires inferences to regulate it, the mechanisms controlling reasoning participate in almost every kind of behavior that humans, or other animals, engage in. Human reasoning has traditionally been studied without asking what kind of reasoning procedures our ancestors would have needed to survive and reproduce in the environment in which they evolved. In recent years, however, an increasing number of researchers have been using an evolutionary framework.

I. What Is Reasoning and How Is It Studied?

When psychologists study how humans reason, they are trying to discover what rules people use to make inferences about the world. They investigate whether there are general principles that can describe what people will conclude from a set of data.

One way of studying reasoning is to ask "If one were trying to write a computer program that could simulate human reasoning, what kind of program would have to be written? What kind of information-processing procedures (rules or algorithms) would the programmer have to give this program, and what kind of data structures (representations) would those procedures operate on?"

Of course, the human brain was not designed by an engineer with foresight and purposes; it was "designed" by the process of natural selection. Natural selection is the only natural process known that is

