

## COGNITIVE SCIENCES AND THE MIND OF ANIMALS

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The paper by Prato Previde et al. discusses the problem of the cognitive approach to animal research. Are these studies condemned to remain within a strictly behaviorist framework? Can we escape from the S-R system without being accused of anthropomorphic interpretation? The reply to these questions requires that the criteria used to classify research as cognitive science be specified. It should also point out the difficulties likely to be encountered by anyone who raises the question of whether all animals are suitable for a cognitive approach.

Cognitive sciences include a system of information processing made up of data bases and processing procedures that may be activated by external stimuli, proprioceptive stimuli or by internal pathways. This system is capable of learning. The data bases can be enlarged and re-structured, old procedures can be modified and new processes acquired.

The researcher's approach is thus to postulate the existence of mental structure and processing procedures, and then the model thus constructed must be sufficiently accurate to allow behavioral predictions. The reasoning behind the description of structures can be described as follows: if a mental structure (animal or human) has a specific characteristic, then in specific circumstances the individual should behave in a specific fashion. The reasoning used in studying processing procedures is similar: If the subject operates in a specific way, then under given circumstances the individual will behave in a particular way. Empirical data are used to test the validity of the prediction, bearing in mind that these structures and procedures are biologically inscribed in the brain of the individual. As connectionist studies have shown, the neural organization serves as a model to describe cognitive structures.

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The problem raised by this approach to research on animals is summed up in the following four questions:

Do animals have mental structures?

How is nonsymbolic representation organized?

How can anthropomorphism be avoided when studying these structures?

How can we apply the cognitive approach to the themes that are central to studies of comparative psychology? The authors identify motivation, belief and desire as examples of these themes.

The authors answer the first question in terms of "mental state." Those who study cognition tend to speak of representations; these form one category of mental states. The question then is to decide whether animals have representations. The most basic representations are those that allow recognition of objects. To recognize prey (or more generally, anything that can be eaten), an animal must have stored in memory a representation of this prey. The representation must have the qualities of the prey without in anyway being dependent on nonsignificant details. This would indicate that all animals that show by a specific behavior that they recognize a stimulus (animate or inanimate) have representations, i.e., data bases containing the main characteristics of stimuli that have significance for the animal. The problem for researchers is to determine if all animals have representations, and thus to define the criteria by which it can be said that a given species does not have representations and only responds to stimulations. This focus on the notion of representation does not mean that studies on nonrepresentational capacities should be neglected as these play a major role in certain species.

Assuming this to be so, then, as animals have no verbal language, do they use representations that are not symbolic? Cognitive psychologists have already encountered this type of representation as indicated in the studies of Rumelhart and McClelland (1986) on perception. There remains the methodological difficulty of studying representations in an individual that cannot express itself via a verbal language. Cognitive psychologists are aware of this problem. The research methodology used in situations in which the individuals has no language is now well established. We should remember that the same problem is encountered in human studies, especially in studies of infants, where researchers have developed experimental paradigms, such as habituation (Gottlieb & Kranesgor, 1985), that allow, for example, studies of perception in newborns. The lack of verbal responses does not constitute a major difficulty, even if it increases the risk of anthropomorphic interpretation of results. This danger remains, however, limited if the researcher is careful to predict the empirical consequences of particular mental model, and to compare the functions of animal mental models with those of human mental models. In this sense, it can be said that animal psychology is essentially comparative.

The last question concerns the cognitive approach to motivation, belief and desire. These areas of research have only been recently treated in cognitive psychology. It is thus an area in which cognitive psychologists have much to learn from animal studies. The current approach (Martins, 1985; Nelson, 1988) involves the action of motivation, belief and desire on representations. This problem can readily be transposed to comparative psychology studies.

In conclusion, as stated by Prato Previde et al., there is no major difficulty in studying animal cognition. But, researchers should nevertheless define the level of the evolutionary scale at which it can be assumed that animals have representations. This question indicates that we should define the cortical structures necessary for the development and the storage of representation.

## REFERENCES

- Gottlieb, G., & Krasnegor, N. A. (1985). *Measurement of audition and vision in the first years of life: A methodological overview*. Northwood, NJ: Ablex.
- Martins, D. (1985). Influence des états émotionnels dans les activités de mémorisation, de rappel, d'identification et de production des matériels verbaux. *L'Année Psychologique*, 85, 577-597.
- Nelson, T. O. (1988). Predictive accuracy of the feeling-of-knowing across subject populations and individuals. In M. M. Gruneberg, F. Morris, & R. N. Bykes (Eds.), *Practical aspects of memory* (Vol. 2) (pp. 190-196). New York: Wiley.
- Rumelhart, D. E., & McClelland, J. L. (1986). *Parallel distributed processing. Exploration in the microstructure of cognition: Psychological and biological models*. Cambridge, MA: The M.I.T. Press.