

communication as human speech. This conclusion follows from the logic of natural selection: the restructuring of the human SVT [supralaryngeal vocal tract] to enhance the perception of speech would not have contributed to biological fitness *unless* speech and language were already present in the hominid species ancestral to modern *Homo sapiens*' (p. 141, also see Ref. 5). If this is true, then it is not implausible that natural selection has also restructured the human brain, however slightly, in response to these same selection pressures.

The existence of some domain-general capacities underlying language does not allow us to distinguish between evolutionary stories like Lieberman's, in which language followed selection for various motor capacities, such as manual dexterity, and brain lateralization and expansion, from evolutionary stories like that of Chomskian authors Calvin and Bickerton⁶. These scenarios have compelling similarities in terms of the emphasis on prior selection for motor capacity. They differ in the relative importance ascribed to subsequent natural selection for language (by Calvin and Bickerton) and to cultural transmission (by Lieberman) in the development of linguistic ability in the species over time.

Chomsky certainly did not choose the best term when he used 'language organ' to describe the neural seat of universal grammar, as this has implications that are inconsistent with the distributed nature of the language system that researchers like Lieberman have demonstrated. It might also be incorrect to assume that the representational and processing abilities we use for language have been specifically shaped by natural selection within that domain, even though this is still entirely plausible with a distributed system. However, nothing about the distributed nature of our language system argues against the existence of innate constraints on the ontogeny of language, the core concept within a Chomskian framework. As reptilian as my brain may be, it didn't learn to be that way.

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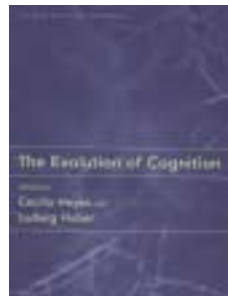
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Comparing cognition in animals, and researchers

The Evolution of Cognition

edited by Cecilia Heyes and Ludwig Huber, MIT Press, 2000. \$ 47.95 (viii + 386 pages) ISBN 0 262 08286 1



Thanks to the cognitive revolution that occurred in the middle of the 20th century, the field of animal cognition has expanded, from the study of learning processes in rats and pigeons

in the laboratory, to encompass virtually any kind of cognitive processes in any animal species. If the 19 chapters that constitute *The Evolution of Cognition* are representative of current research on animal cognition, then the news is good. The reader will be convinced that animal cognition is an exciting and vibrant field of research where conceptually sophisticated theories and important empirical findings are produced almost on a daily basis.

As in any rapidly growing discipline, controversies abound in contemporary animal cognition as to how cognitive processes should be defined and studied in animals, and whether and how the animal data should be extrapolated to humans. The book does an excellent job of representing this heterogeneity of approaches and their associated controversies. If animal cognition researchers with antithetical positions agree to present their research in the same volume and make efforts to cite each other's

chapters as much as they do in *The Evolution of Cognition*, then once again the news is good and all of us can feel optimistic about the future of this field. If, however, this book is representative of how scientists currently study the evolution of cognition, then, I am afraid, the news is not so good.

There are three basic ways in which contemporary research addresses the evolution of cognition, all of which are represented in this book. In the first approach, researchers formulate hypotheses, design experiments and collect data on animal cognitive abilities, using the conceptual framework and experimental procedures typical of the discipline in which they were trained (e.g. comparative psychology, cognitive psychology, or ecology). They then provide a few speculations as to how or why this or that cognitive ability might have evolved. In the second approach, researchers strive to formulate a set of clever propositions about how and why certain cognitive abilities may or may not have evolved. Great effort is made to ensure that the propositions are presented in logical order and the arguments are internally consistent. Less care is taken to ensure that the propositions are built upon a well-specified body of theories or empirical data. In the third approach, evolutionary theory is used to generate specific hypotheses about the distribution and characteristics of cognitive abilities in animal species, which are then tested with empirical data. This approach usually entails the recognition that: (1) cognitive abilities are likely to evolve as adaptations to the environment; (2) cognitive abilities have benefits and costs and both must be taken into account; and (3) the comparative study of the adaptive value of cognitive abilities in different animal species must be conducted in light of information about their phylogenetic history.

The editors of *The Evolution of Cognition*, Cecilia Heyes and Ludwig Huber (who deserve credit for their efforts at introducing and integrating the heterogeneous content of this volume) maintain that all the comparative research on animal cognition covered is equally evolutionary. Thus, it might appear that students of operant conditioning in rats, categorization in pigeons, imprinting in chicks, memory in scrub jays, and language learning in chimpanzees, are all equally committed to unraveling the evolution of cognition. In reality, not all animal research is truly comparative and not all comparative research is truly evolutionary,

as eloquently discussed by Konrad Lorenz more than four decades ago¹. I am sure that Lorenz would have been happy to know that a research institute named after him organized – in his hometown of Altenberg, Austria – the workshop that resulted in this book. I suspect, however, that upon hearing some of the workshop presentations, he might have turned a few times in his grave.

The use of evolutionary theory to generate testable predictions about animal cognition, as opposed to clever philosophical arguments or post-hoc explanations of behavior, is unfortunately only evident in three or four chapters of the book. It is perhaps best exemplified by Lefebvre's chapter, in which an evolutionary cost-benefit analysis is used to discuss feeding innovations, social learning, and cultural transmission in birds as adaptations to different ecological niches and in light of brain structures and other constraints. From the analysis, Lefebvre generates several predictions concerning the distribution of feeding innovations and their transmission, which are then tested against data from a number of bird taxonomic groups. Several original and important findings emerge, some of which were expected (e.g. observational learning of novel feeding behavior are associated with opportunism and social foraging) and others unexpected (e.g. interspecific differences in social learning are parallel to those in individual learning). To the editors, the approach taken by Lefebvre and a few other contributors may be just one of many flavors of evolutionary research on animal cognition. However, this is the flavor I find more effective, and more intriguing.

Overall though, *The Evolution of Cognition* is an excellent volume about animal cognition, which I would recommend to any cognitive scientist. It is possible that mentioning the word evolution so many times throughout the book will encourage more scientists to take a true evolutionary approach to the comparative study of human and animal minds. However, this book suggests that the road to understanding the evolution of cognition is long and the final destination is not yet in sight.

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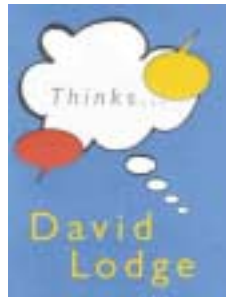
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Novel thinking

Thinks...

by David Lodge, Viking Press, 2001.
£16.99/\$24.05 (342 pages)
ISBN 0 670 89984 4



There is no shortage of psychology in fiction, but the main focus is clinical, about therapists who help beautiful women to learn to love again or who match wits with

serial killers. This may be the first novel whose main character is an active proponent of contemporary cognitive science. He is Ralph Messenger, director of a prestigious Centre for Cognitive Science in the (fictional) University of Gloucester. Confident, intelligent, and not particularly sympathetic, he fools around a lot, although he has a tacit agreement with his wife to keep his adulterous exploits away from his home turf, thus mostly restricting himself to conferences. *Thinks...* is about Messenger's developing relationship with Helen Reed, a recently widowed novelist, who takes a position as writer-in-residence at the University.

As with most of Lodge's novels, there is a lot about sex and adultery, as well as some astute observations about academic politics, but (given this forum) I want to focus on the cognitive science. Looking at the acknowledgements, it is apparent that Lodge has been getting good advice and reading some excellent books, but still, it is almost eerie how well he captures both the ideas that are dominant in the field at present, and the style and motivation of the people who advance them. Early in the book, Messenger takes Reed on a tour of his Centre, and, in an entertaining and clear fashion, walks her through a mural that colorfully depicts different notions from psychology and philosophy, including John Searle's Chinese Room¹, a pack of zombies,

Thomas Nagel's bat (the example he uses to maintain that one cannot appreciate the inner life of another creature²), and Frank Jackson's story of Mary – a woman raised in a black-and-white world who has a complete theoretical understanding of color and color perception, but, still, according to Jackson, does not really 'know' what it is like to see red³.

As you can tell, Lodge's primary interest is in the nature of consciousness. In a particularly amusing section, Reed assigns her students the task of writing some of these examples in the style of different authors, and so the book includes enjoyable stories such as the consciousness of a vampire bat as written by Martin Amis, or Henry James' version of Mary leaving her monochromatic cell.

This is clever, but the best part of the book is the contrast between Messenger, who sees consciousness as a scientific puzzle, fully explicable in material and computational terms, and Reed, who is dismayed at the prospect: 'I've always assumed, I suppose, that consciousness was the province of the arts, especially literature, and most especially the novel... Consciousness is my bread and butter. Perhaps for that reason I've never seen anything problematic about it as a phenomenon. Consciousness is simply the medium in which one lives, and has a sense of personal identity... I sort of resent the idea of science poking its nose into this business, *my* business. Hasn't science already appropriated enough of reality? Must it lay claim to the intangible invisible essential self as well?'

The format in which the characters voice their ideas mirrors their differences: we learn of Messenger's thoughts through a stream-of-consciousness dictation into a recorder; Reed's through written entries in a journal. It is to Lodge's credit that it is hard to see where his own prejudices lie – you might expect them to fall with Reed, the novelist, but Messenger's views are presented in a strong and coherent manner, and Reed mostly does the listening. (Even their names reflect their uneven roles: Messenger as the voice of the future; Reed as reflecting a more traditional literary perspective.)

But this changes somewhat towards the end, when Reed gives an invited talk at a consciousness conference, and articulates her defense of a unitary notion of self. Reed's view contrasts sharply with that of Robyn Penrose, a deconstructionist who gives a talk at Gloucester (and who was the main