Book Reviews

Evolution and the Psychology of Thinking: The Debate

Edited by DE Over (2003). Published by Psychology Press Ltd, 27 Church Road, Hove, East Sussex BN3 2FA, UK; http://www.psypress.com. 245 pp. Hardback (ISBN 1 84169 285 9). Price £39.95.

This book presents arguments for and against a hypothesis that appears to be exercising evolutionary psychologists. Whereas sociobiology argues that evolutionary pressures continue to influence human behaviour (to a greater or lesser extent), it has little to say about how evolution may have shaped brain structure or mechanism. In contrast, evolutionary psychologists are determined not to bypass the mind and, in recent years, have produced articles suggesting just how brain function may have been shaped by evolution. A good general introduction to the field of evolutionary psychology, including its strengths and weaknesses, is found in Laland and Brown (2002). This might be a good place to start before picking up the volume under review.

'Evolution and the Psychology of Thinking' focuses on a particular idea, termed the massive modularity hypothesis (MMH). The essential argument is that evolutionary pressures in the environment of evolutionary adaptedness (EEA) have forced solutions to specific problems dealt with by specific psychological mechanisms called domains or modules. The brain is thus seen as providing a set of highly specialised mechanisms to deal with highly specialised problems. This book outlines the arguments for specialisation (Chapters 1 to 3) and then presents a range of counter-arguments that suggest specialised functions can arise from very general learning mechanisms (Chapters 4 to 7).

One problem I found was the rather elusive definition of a module, although it is clearly taken to be mechanistic and not structural. In Chapter 1, Brase argues that a module could be viewed as a Darwinian algorithm, a cognitive adaptation, an instinct or a mental organ. Many modules have been proposed by the authors (Tooby & Cosmides 1992) whose work sparked this debate. A website (http://cogweb.ucla.edu/EP/Adaptations.html) has even been set up to try to document the major categories of module that may exist, dealing with such problems as learned taste aversion, or with social pressures such as cheater detection, or theory of mind. The extent to which such modules may physically map onto actual brain regions or be dispersed across the brain is sidestepped by most contributors, although in Chapter 3, Atkinson and Wheeler argue that it is already possible to localise abilities such as theory of mind to the orbitofrontal or ventromedial region. Most other authors take the view that the mapping of mechanism to structure will be a rather long-term goal.

Another problem, addressed in some depth both by those who propose solutions (Chapters 1 and 3), and those who see no easy solution (Chapter 4), is the question of what level of description could be used to define a specific problem. Brase argues that signal detection theory is used implicitly by humans to categorise problems, whilst Atkinson and Wheeler propose a hierarchy of levels of analysis. They argue that we can approach questions of module definition either by considering the neural basis of cognition and working up — by asking questions such as "What cognitive ability is affected in a patient suffering brain damage in a specific region?" or by specifying adaptive problems and working down to propose a specific module. Despite this, the counter-argument chips away at the very basis of the MMH by questioning whether evolution has acted to provide solutions to specific problems at all. In Chapter 4, Almor points out that many physical adaptations, such as legs, are a compromise, useful in a range of contexts for solving problems to do with both foraging and escape from predators. Why should the brain not work in a similar way, with generalised learning abilities providing flexible rather than tailor-made solutions? Almor proposes that even language acquisition in humans, cherished as a specialised human module ever since Chomsky (1959), can now be shown to be very strongly influenced, or even explained in full, as a weak biological predisposition overlaid by a general associative learning of statistical relationships.

Towards the end of the book one obtains the inevitable impression that the answer will lie somewhere between the two — either cognitive function relies on general mechanisms complemented by a few discretely identifiable specialisations, or there is a set of specialisations that have to be co-ordinated by some more general mechanism. Some reformed evolutionary psychologists are moving towards this second, dual-process position, while many biologists may feel more comfortable with the first.

The attempt to uncover empirical evidence in support of the MMH appears to have focused on just a handful of paradigms. One, the Wason selection task, involves asking people to solve a relatively simple logic problem. When the problem is set out in strictly logical terms, most people find it very difficult to solve. However, framing the same problem in terms of a social contract or a threat, leads to a dramatic improvement in the number of people who solve it (Fiddick, Chapter 2). This is used to argue that people are evolutionarily adapted to solve social problems. Incorrect answers on logical or mathematical problems can thus be viewed not as mistakes, but as the exposure of adaptive rules-of-thumb that would generally have led to the best outcome in situations that prevailed over evolutionary history. This sounds like a rather good excuse for anyone struggling with GCSE maths. Again, though there is an alternative view — simply increasing the amount of non-social background information also improves performance. Almor claims that the empirical evidence extrapolated from the Wason task in support of the MMH is weak. The exact details of this task were described in detail in nearly every

chapter, a weakness in the editing, which did at least allow my own performance on the purely logical form of the task to reach perfection by the last chapters.

A second empirical test examines the possibility that people have a module for calculating probabilities based on an assessment of the frequency of different outcomes in previously experienced similar situations. In Chapters 5 and 6, Over, the editor of this volume, deconstructs this argument, suggesting that many situations concern decisions where frequency information about past outcomes is unavailable. To make a sensible decision we need to consider all the available evidence and make a context-independent judgement.

The final chapter highlights the difference between ultimate and proximate goals, and argues that human rationality has evolved to a point where we are able to override our tendency to act in the best interests of our genes, and can instead act in the best interests of our own bodies. The use of contraception is perhaps one of the more obvious examples. This debate draws on Dawkins' concepts of memes and replicators (Dawkins 1982), but the longer-term implications of such a dissociation between the interests of the individual and the individual's genes, particularly should such human rationality have a strongly heritable component, were not examined in detail.

The book is almost exclusively concerned with human psychology so the animal welfare implications are certainly not explicit. I suppose that if one accepted the MMH then one could initiate experiments to determine whether animals possessed each specialised module. Since it has been proposed that modules for emotions such as jealousy may have evolved, it could, in theory, be possible to say whether given species possessed given emotions. This would undoubtedly have welfare implications. In the area of social cognition, work along these lines is already being done — experiments on primates and other species are targeted at questions such as "Do they have a theory of mind?" "Are they able to deceive?" "Are they able to detect cheaters?" Mapping any such modules to physical brain structures might then enable us to use neuroanatomy to classify species into groups that did or did not possess each type of module. This seems neat but harsh. The problem of the level of analysis is important — an animal of a given species may fail a cheater detection test because it has different building blocks underpinning its module, perhaps using olfactory rather than visual cues. It also ignores the possibility that an animal may have evolved a functionally similar module based on different neuro-anatomical structures.

The other animal welfare implication that I drew was to do with the fairness of the cognitive tests we impose on animals. If human performance on essentially the same test can vary from 15% correct to 70% correct depending on subtle contextual cues, we should be very humble when our animals 'fail' the tests we devise. A capacity to solve the task may be revealed using just a slight shift in protocol.

I enjoyed reading the book, and taking the psychological tests (!), although found some of the chapters far too verbose. I appreciated being drawn into an interesting debate but by the end of the book I remained sceptical about the MMH hypothesis. I accepted much more easily the idea of a general connectionist network, providing flexible solutions to a variety of different problems, underpinned by some biologically predisposed biases, particularly for species that live in complex and changeable environments (horses, dogs). Perhaps this is because such domestic animals seem to adapt so well to a huge variety of arbitrary and artificial situations for which they clearly could not have evolved very narrow and specific rules. For species that have evolved in highly specialised constant environments (worms living in horses or dogs), the evolution of correspondingly specialised modules might be easier to accept.

Christine Nicol

Department of Clinical Veterinary Science

University of Bristol, UK

References

Chomsky N 1959 Review of B F Skinner's verbal behaviour. *Language 35*: 26-58

Tooby J and Cosmides L 1992 Cognitive adaptations for social exchange. In: Barkow J H, Cosmides L and Tooby J (eds) *The Adapted Mind: Evolutionary Psychology and the Generation of Culture*. Oxford University Press: Oxford, UK

Dawkins R 1982 *The Extended Phenotype*. Oxford University Press: New York, USA

Laland K and Brown G 2002 *Sense and Nonsense: Evolutionary Perspectives on Human Behaviour*. Oxford University Press: Oxford, UK

Statistics for the Behavioural Sciences: An Introduction

R Russo (2003). Published by Psychology Press Ltd, 27 Church Road, Hove, East Sussex BN3 2FA, UK; http://www.psypress.com. 242 pp. Paperback (ISBN 1 84169 320 0). Price £9.95.

Statistics is a difficult subject to teach students of the life-sciences. Many students seem to have a natural aversion to mathematics, while others have difficulty in relating the academic subject of statistics to their future needs as citizens and research workers. Indeed, in most life science disciplines little or no attempt is made to teach the subject to undergraduates, and, as there is little formal teaching of graduate students in the UK, it is possible to obtain a PhD and become a full time research worker with little, if any, exposure even to quite simple statistical methods. As a result, the quality of research is often not as high as it might be, and where it involves research on animals there may be serious ethical implications. Clearly, experiments that use animals and reach the wrong conclusions as a result of either faulty design or incorrect statistical analysis, not only waste those animals but also may lead to a waste of additional animals used in trying to repeat the results. However, psychologists are an honourable exception. In order to join professional associations of psychologists it is necessary to have done a degree that includes a substantial amount of teaching of statistical methods. As a result, many basic statistical texts are aimed at students of psychology, although the statistical