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Book Review

Bounded Rationality: The Adaptive Toolbox edited by Gerd Gigerenzer and Reinhard Selten. (2002). Cambridge, Massachusetts, London, England, MIT Press.

Reviewed by Oliver Curry

It is a curious feature of 20th-century academia that the branch of mathematics known as rational choice theory led two of the most influential approaches to human behaviour to make completely different assumptions about the workings of the human mind.

Biologists use rational choice theory to model the effects of natural selection on populations of genes. For a given range of alleles and their phenotypes, natural selection will 'choose' the ones that replicate best. Equipped with this benchmark, biologists can proceed to the field to test whether the design of organisms comes anywhere close. Under this view, organisms are seen as collections of phenotypic effects -- effects that can be described in terms of strategies or decision-rules: Do X; If A, then do B; If C is greater than D, then do E… and so on. Individual behaviour consists of the execution of these decision rules. In other words, natural selection attempts to optimise the design of organisms; the organisms themselves don't try to optimise anything, they merely execute the decision rules of which they are composed. Given the problem of choosing where to forage or with whom to mate -- problems that have a very large number of possible solutions -- the biologist expects natural selection to have fashioned an efficient 'research strategy' that asks the most revealing questions of the world in order to arrive at an acceptable solution in the shortest possible time. Like a game of twenty questions, the winner is the one that arrives at the 'right' answer with the fewest yes-no questions.

Economists, meanwhile, use rational choice theory to model what goes on in an individual's head. For a given range of behavioural options, individuals choose the one that they calculate will maximise their utility. Choosing habitats or mates involves, or should involve, compiling as much information about as many available options as possible, performing some sophisticated number-crunching, and plumping for the utility-maximising outcome. (Most economists would admit that this 'rational actor' model is only convenient shorthand and was never intended as a realistic theory of human psychology. Nevertheless, the model is taken seriously enough for altruism and irrationality to constitute anomalies or problems for the model.)

Enter Gerd Gigerenzer who, for the past decade, has been developing the biological model of 'reasoning' in the hope of weaning

economists and others off the 'rational actor' model. Gigerenzer (and co-editor Reinhard Selten) illustrate what they call the 'fast and frugal' approach to rationality with the following example. Suppose one were to design robot capable of catching a ball. An economist might try to programme the robot with knowledge of parabolas, together with devices for measuring the speed, spin and initial location of the ball, wind speed and air resistance and so on, provide some software to allow the robot to calculate the position of the ball, and then run there. A biologist, meanwhile, might programme the robot to run such that the ball remains at a fixed point on the robot's 'retina'. By following this 'gaze heuristic', the robot will inevitably end up intercepting the ball as it lands (Gigerenzer and Selten, 2002; pp. 6-7).

Gigerenzer and his research group have successfully identified several of the major types of decision rules that organisms employ, shown that these decision rules work well on a range of problems, and demonstrated that 'real' people actually use these rules to make decisions (including the gaze heuristic). This biological approach to rationality is surely the correct way to proceed. But is 'Bounded Rationality: The adaptive toolbox' -- an edited collection of conference proceedings -- a good example of this research programme? The answer is a qualified 'yes'.

The book does a good job of setting out the historical and intellectual background to the 'fast and frugal' approach, explaining its methodology, and of summarising the results. Of particular merit are Gigerenzer's own chapter on 'The Adaptive Toolbox', and Gary Klein's chapter entitled 'The Fiction of Optimisation'. Thomas Seeley on the collective decision-making of honey-bees, and Kevin McCabe and Vernon Smith on the psychology of reciprocity represent novel and welcome applications of the 'fast and frugal' approach. However, there is some repetition between chapters, and the book covers ground that is familiar from Gigerenzer *et al's* outstanding previous book '*Simple Heuristics'* (Gigerenzer, Todd, and the ABC Research Group, 1999).

Bounded Rationality is less successful when it moves away from familiar ground and attempts to investigate the roles of emotion and culture in reasoning.

'Emotions' undoubtedly fall within the purview of the 'fast and frugal' approach to decision-making. But the book's treatment of the emotions seems based on confusion. To ask what effect emotions have *on* cognitive decision-making is to assume that emotion and cognition are two different things. But this seems to be exactly what evolutionary psychology in general, and the 'fast and frugal' approach in particular, call into question. If heuristics describe adaptations, then they also describe the motivational adaptations that are traditionally referred to as 'emotions'. For example, if one describes the motivational system called jealousy in terms of a decision-rule, it does not make sense to then ask how jealousy *influences* the decision-making process. 'Jealousy' *is* the decision-making process.

Contributors seldom embrace this confusion explicitly -- and hence many chapters, such as Dan Fessler's discussion of the roles of shame and self-esteem on dominance hierarchies, remain highly informative. But neither do contributors explicitly reject or repudiate this confusion. The result is that they can easily be (mis)interpreted as advocates of a 'spanner in the works' model of emotion -- in which emotions intervene in our rational calculations in order to prevent us becoming 'rational fools' -- an example of the 'optimising under constraints' view of rationality that Gigerenzer clearly rejects. This false dichotomy between emotion and reason is unnecessary, it undermines the 'fast and frugal' approach to rationality, and evolution-minded researchers should guard against it.

The chapters dealing with the effect of 'social processes' and 'culture' on reasoning are unsuccessful for different reasons. Why some decision-rules are contingent upon the behav-

iour of other individuals, what kinds of simple-heuristics are used to facilitate 'learning', and whether 'cultural' habits and artifacts exhibit a fast and frugal structure, are all fascinating questions. And certainly Kevin Laland's discussion of why it sometimes makes sense to eat, for example, what your nest-mates are eating, or mate with whoever your peers choose to mate with, represents a promising step towards answering them. But what would have been an interesting discussion seems to have been hijacked by Robert Boyd, Peter J. Richerson and Joseph Henrich's chapters on cultural evolution. These contributions take for granted that most human behaviour -- including mate choice and social exchange -- can be understood solely as the product of the cultural transmission of 'social rules' of behaviour, a disposition to conform, and group selection. This approach remains as unconvincing as it was when first mooted over twenty years ago (Daly, 1982).

If future fast and frugal researchers were to pay more attention to the ontological status of decision rules -- that is, whether they are adaptations, 'cognitive' rules, or cultural inventions -- and be clear about which of these, in an any particular instance, the rule happens to be, then the programme will undoubtedly continue to illuminate the processes by which humans and other organisms make decisions. We can look forward to a time when psychology textbooks come with appendices that map out entire sections of the adapted mind in fast and frugal heuristics.

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