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Opposing associationism

The Symbolic Foundations of Conditioned Behavior
by C. Randy Gallistel and John Gibbon, Lawrence Erlbaum, 2002.
£49.95 (196 pages) ISBN 0 8058 2934 2

This is an important, provocative and polemical book. The target of the polemic is associationism, the most venerable tradition in learning stretching back to the British empiricist philosophers, Locke and Hume. Not only do Randy Gallistel and the late, and greatly missed, John Gibbon attack associationism in its citadel – namely animal conditioning – but they also seek to usurp its authority with a synthesis of two cognitive theories. The first is Scalar Expectancy Theory (SET), developed by Gibbon over many years to explain the temporal control of behaviour, and the second is Rate Estimation Theory (RET) that was elaborated by Gallistel over 10 years ago to account for the acquisition of conditioning. This synthesis was presented in a paper published in *Psychological Review* in 2000, and the present volume is an elaboration of that paper.

Gallistel and Gibbon challenge associationism on three main issues. The first concerns the representational poverty of the concept of associative strength. According to associative theory, the predictive relationship between a conditioned stimulus (CS) and reinforcer is encoded by the strength of an association, a form of encoding that conflates many different features of the relationship, most notably the amount of training with the probability and magnitude of reinforcement. The second issue is the timescale invariance of acquisition which the authors claim is both the single most important discovery about conditioning, and problematic for associative theory. This invariance refers to the fact that acquisition is determined by the ratio of the interval between reinforced CSs to the duration of the CS, whatever the absolute lengths of these intervals and the probability of reinforcement. The final issue concerns the failure of associative theory to provide an account of the subtle timing of conditioned behaviour.

In response to these challenges, Gallistel and Gibbon offer a cognitive theory in which they assume that, during training, an animal encodes and remembers both the times at which reinforcers occur in the CS (based on SET) and the rates of their occurrence (based on RET). Then, when presented with a test CS, the animal retrieves memories of these intervals and rates before choosing whether to respond and, if so, *when* to respond, on the basis of decision rules. This account is applied not only to response acquisition and timing but also to complex temporal inferences revealed in studies of secondary conditioning, and to the operant choice behaviour.

Whether or not this cognitive theory presents a serious challenge to the hegemony of associationism is far from certain. Gallistel and Gibbon clearly seek to influence the neuroscience community by persuading us of the illusory nature of what they call the 'neurobiological transparency' of associationism. But be warned – this is not an introductory book and a critical appreciation of its central theses requires a firm grounding in both conditioning and associative learning theory. Moreover, I suspect that associative theorists will be mildly irritated by the numerous, dismissive over-generalizations that ignore many of the subtleties of their theories. My own judgment is that RET is too baroque an account to have a sustained influence in the field. Even so, it must be acknowledged that this book is a unique contribution to conditioning and learning. To maintain a healthy and generative state, every theoretical programme needs an official opposition and, at long last, associationism has found a worthy one.

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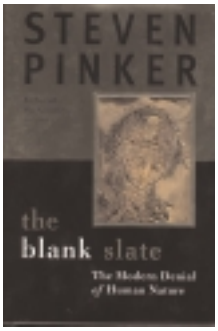
Back to nature

The Blank Slate: The Modern Denial of Human Nature
by Steven Pinker,
Viking 2002. £25.00/$27.95 (509 pages)
ISBN 0 670 03151 8



When Steven Pinker's *Language Instinct* came out in 1994, a philosopher friend of mine described it as a wonderful book with an awful ending. Being greatly influenced by Noam Chomsky, she was sympathetic to Pinker's arguments that language is an innate module – an instinct – and persuaded as well that language has evolved through natural selection. But she was troubled by his suggestion in the final chapter that the same approach should be extended to psychology more generally. Pinker's next book, *How the Mind Works*, did just that, applying a biological perspective to everything from depth perception to maternal love to aesthetic appreciation. She *hated* this book, seeing the whole enterprise of evolutionary psychology as repugnant: morally suspect and politically reactionary.

The Blank Slate is written for her. Pinker does a lot of things in this extraordinary work, but his main goal is to show that the notion of an evolved human nature does not have the negative connotations that many people think it does. There is no conflict between a materialist and biological perspective on the mind and the religious, political and moral values that people hold most dear.

Pinker starts by identifying three doctrines: the blank slate (mental structure comes from the environment, mostly from culture), the noble savage (humans are essentially good) and the ghost in the machine (mental life is the

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product of an immaterial soul). Pinker argues that these views are pervasive, quoting adherents ranging from Mao Zedong to Walt Disney, and underlie contemporary discussion of just about any topic that matters. He also reviews the ugly history of how those who reject these doctrines (even in very mild ways, such as tentatively suggesting that aggression has biological roots) become the targets of *ad hominem* attacks, bizarre mischaracterizations, censorship, and even physical assault. The doctrines are sometimes presented in extreme forms that even their adherents do not believe, something that Pinker describes as a sure sign of a cult-like mentality, where 'fantastical beliefs are flaunted as proof of one's piety'. Although the tone is calm and reasoned throughout, Pinker plainly takes delight in quoting, and dismantling, some of these sillier claims.

Of course, if it were true that rejection of these doctrines entails an endorsement of sexism, racism, infanticide, war, rape, and everything else that is evil in the world, then a little bit of censorship and hypocrisy might well be justified. In the core of this book, Pinker identifies several anxieties that people have about an evolved biological human nature – such that it would justify discrimination, or would strip life of any higher meaning – and argues that these are unfounded. He then goes further and reviews five 'hot buttons' – politics, violence, gender, children, and the arts. For each, he proposes that an enhanced appreciation of human nature can allow us to better understand, and improve, those areas that are most central to our lives.

This is a brilliant book. It is beautifully written, and addresses profound issues with courage and clarity. There is nothing else like it, and it is going to have an impact that extends well beyond the scientific academy. There is also plenty to disagree with. For one thing, while Pinker makes an excellent case that a scientific conception of human nature does not clash with liberal Western values, he is too optimistic when it comes to reconciliation with religion. Someone who is devout can easily give up on the blank slate and the noble savage – but the ghost in the machine is a very different story. Pinker notes that 'some biologists argue that a sophisticated deism, towards which many religions are evolving, can be made compatible with an evolutionary understanding of the mind and human nature'. But such a sophisticated deism would be so toothless and secularized that it barely deserves to be called a religion. The sorts of religions that people actually believe in include beliefs such as the soul surviving the death of the body and ascending to heaven. If you accept the scientific view of human nature, you have to give this up. This is not small potatoes.

Pinker might be too optimistic as well about the relevance of scientific theories to social and political life. He is plainly right that our feelings about issues such as good parenting, violent crime and abortion are deeply related to tacit assumptions about human nature, and he makes a persuasive case that this is also true for broader-scale ideologies such as capitalism and communism. But although it is flattering to think that these tacit theories come from the discoveries of those who study mental life, this might just be hubris. The assumptions about human nature held by dictators, reformers, racists, utopians and everyone else might have other origins, and it is unclear how much they are affected by insights from the laboratory or the seminar room. Pinker approvingly quotes Chekhov, who wrote 'Man will become better when you show him what he is like'. It would be nice if this were true, but so far there is little evidence to support it.

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Erratum

In the November issue of *TICS*, there was an error in the Review entitled 'The prefrontal cortex in sleep', by A. Muzur, E.F. Pace-Schott and J.A. Hobson. (*Trends in Cognitive Sciences*, Vol. 6, p. 475).

In the abstract, NREM was incorrectly defined as nonrandom-eye-movement. It should of course have read:

During nonrapid-eye-movement (NREM) sleep, frontal cortical activity is characterized by the highest voltage and the slowest brain waves compared with other cortical regions.

We apologize to the authors and readers for this error.

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