



With the advent of ancient cave art, human cultural innovation burst into being.

EVOLUTION

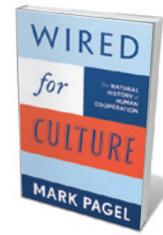
Custom built

Culture is both a product and a driver of human evolution, finds **Peter Richerson**.

When Charles Darwin discussed the forces driving human evolution in his 1871 book *The Descent of Man*, he placed cultural change — mostly under such terms as traditions, customs and inherited habits — on an equal footing with organic evolution. Darwin's idea that cultural traits adapt, change and experience selection as they are passed within and between generations attracted important followers among early behavioural scientists, but he had almost no influence on the anthropologists, sociologists and historians who dominated the study of human culture for most of the twentieth century.

Yet the parallels between culture and biology had long been obvious — just look at the tree diagrams for language relationships and for related species. Evolutionary biologist Mark Pagel's pioneering contribution has been to show that this similarity is more than skin-deep, and that methods for revealing the evolutionary history of genes can illuminate the historical relationships between languages and other culturally transmitted behaviours.

Wired for Culture provides a wide-ranging, non-technical survey of the field. Pagel's two main themes are the role of cultural evolution in patterns of cooperation and its part



Wired for Culture: Origins of the Human Social Mind/The Natural History of Human Cooperation

MARK PAGEL

W. W. Norton/Allen

Lane: 2012. 432 pp.

\$29.95/£25

in human economic diversity — our ability to make a living in various ways in all kinds of environments. Economic diversity is a major reason for our success as a species. Modern humans first used culturally transmitted toolkits to underpin an expansion out of Africa around 60,000 years ago, in the late Pleistocene epoch. As humans dispersed, populations underwent a series of cultural

adaptive radiations as they found differing ways to exploit their local wild resources and to domesticate plants and animals.

These changes required parallel innovations in social organization. In hunter-gatherer economies, between a few hundred and a thousand individuals cooperate to finesse risk and sustain a modest division of labour. Agricultural and industrial societies cooperate on far larger scales than hunter-gatherers to sustain an intricate system of exchanges between specialized workers with complementary skills. These workers are often unknown to each other, yet are utterly interdependent.

Art and religion mobilize our emotions in support of collective projects. In Pagel's terms, art and religion can act as enhancers that promote adaptive behaviour, but in other times and places, they can be selfish mind drugs — the cultural analogues of microbial pathogens. We use our extraordinary linguistic systems to operate these social structures by articulating morals through myths and stories, debating constitutions, negotiating deals, making requests, giving orders and making or breaking reputations through gossip.

Pagel's story of culture's dominant role in human evolution is vivid and effective. Inevitably, he simplifies some concepts in order to craft an accessible, coherent narrative. For example, he portrays Neanderthals as the hapless victims of invading modern humans who used more sophisticated technology. In fact, much evidence suggests that modern humans usually made the same sorts of tools as Neanderthals, and the question of why this species disappeared is still quite open.

Pagel has an interesting take on what is perhaps the deepest controversy among Darwinists: does culture fundamentally change the evolutionary dynamics of our species? As biologist Kevin Laland and his colleagues wrote last year in *Science*, many evolutionists take

NATURE.COM

For more on cooperation:

go.nature.com/rnqxac

S. WEINBERG/GETTY

culture to be a proximate phenomenon — a mechanism for achieving something, rather than the ultimate, evolutionary reason for that achievement.

The classic example of this distinction between 'how' and 'why' in biology is bird migration. The proximate causes of migration are hormonal responses to changing day length that motivate and prepare birds for long-distance flight. The ultimate cause is selection for migratory behaviour, which in turn results in genetic change. A common inference is that causation in biology flows one way — from selection, to genetic change, to traits adapted to their environment. But human culture raises two issues regarding the arrow of causation.

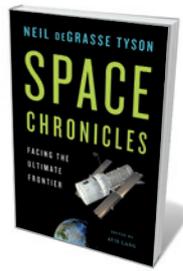
First, there are reasons to think that genetic change might be a response to cultural shifts as well as their cause. Pagel certainly thinks so. For example, he speculates that division of labour in humans has created selection for innate differences in personality and talent. Even the simplest human societies divide work between men and women and then pool the results of their specialized labours. In complex societies, myriad occupations trade their specialized products to assemble the goods that each person needs. Pagel also reviews evidence that many genes came under selection after we spread out of Africa and diversified our economic systems.

Second, culture creates an arena for selection and inheritance that is separate from genes. For example, as Pagel emphasizes, much cultural variation exists at the tribal, rather than individual, level. Some of us, including myself, think that selection of cultural differences between proto-tribes at the group level — with successful groups displacing their neighbours' cultures through the spread of people or their ideas — might have led to selection of genes favouring docility, empathy and group loyalty.

Pagel briefly discusses this concept, but favours the view that even suicidal self-sacrifice can evolve as a result of self-interested benefits to individuals, rather than to their groups. He puts great weight on systems that use reputation to monitor and enforce good behaviour, arguing that the benefits of a good reputation, and the effects of a bad one, more than outweigh the personal costs of helping other members of your group. The resolution of this issue is perhaps the most important task in the study of human evolution, and it is a pity that *Wired for Culture* does not convey what is at stake. But scholarly quibbles aside, this is the best popular science book on culture so far. ■ [SEE COMMENT P.297](#)

Peter Richerson is a professor of ecology and human evolution at the University of California, Davis, USA. He is the co-author, with Robert Boyd, of *Not By Genes Alone*. e-mail: pjricherson@ucdavis.edu

Books in brief



Space Chronicles: Facing the Ultimate Frontier

Neil deGrasse Tyson W. W. NORTON 368 pp. \$26.95 (2012)

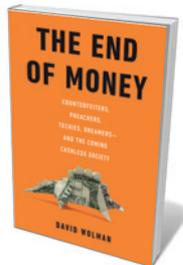
Astrophysicist Neil deGrasse Tyson is on a space mission of his own. With NASA's research and exploration now diminished, Tyson — director of the American Museum of Natural History's Hayden Planetarium — is keenly focused on what the United States will lose by failing to reinvent its space programme. In this collection, mined from 15 years of commentary and interviews edited by Avis Lang, he spotlights issues that underline the central importance of curiosity about the great beyond — from the nature of discovery to propulsion in deep space.



The Evolved Apprentice: How Evolution Made Humans Unique

Kim Sterelny MIT PRESS 264 pp. £24.95 (2012)

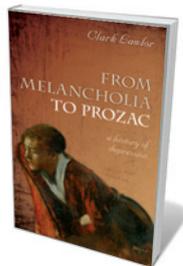
We are inescapably different from the other great apes — sexually, morphologically and socially. In a book that forms part of the Jean Nicod Lecture Series, philosopher of biology Kim Sterelny tries to answer the vexed questions of why that is by arguing that our divergence from our closest cousins over the past 3 million years is down to a gradually enriched learning environment. Cooperative foraging, he posits, paved the way for positive-feedback loops that, incrementally and over vast reaches of time, led to adapted minds that were nurtured within adapted environments.



The End of Money: Counterfeiters, Preachers, Techies, Dreamers — and the Coming Cashless Society

David Wolman DA CAPO PRESS 240 pp. £16.99 (2012)

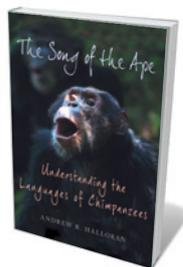
'Filthy lucre', David Wolman shows us, is a particularly apt phrase. Minting technologies gobble huge amounts of metals, cotton and water; the transport and production of cash has a giant carbon footprint; and *Staphylococcus* bacteria have been detected on 94% of US one-dollar bills. In this fascinating book, *Wired* contributing editor Wolman argues that its end is nigh. He spent a cash-free year researching everything from counterfeiting to tax-dodging and failed currencies, and looks at digital solutions such as smart banknotes.



From Melancholia to Prozac: A History of Depression

Clark Lawlor OXFORD UNIVERSITY PRESS 288 pp. £14.99 (2012)

Seventeenth-century scholar Robert Burton may have anatomized melancholy, but the definitions, diagnoses and treatments of and for depression are still hotly debated by the pharmaceutical industry, psychiatry, psychology and affected citizens. Writer Clark Lawlor trawls history from the classical era onwards, shining some light on this psychological dark horse. Along the way, he touches on radical differences in cultural definitions, explores tensions between the biomedical model and humanistic concepts, and weighs up 'cures' from talking therapy to drugs.



The Song of the Ape: Understanding the Languages of Chimpanzees

Andrew R. Halloran ST MARTIN'S PRESS 288 pp. \$25.99 (2012)

A chance observation drove primatologist Andrew Halloran to study how chimpanzees communicate. While keeper to a group of island-bound chimps, he saw five ousted members calmly using a rowing boat to escape, as if they had discussed a plan. Examining the histories of these five, he picked out and recorded dozens of phrases in their vocalizations. Weaving in the stories of controversial attempts to teach sign language to primates such as Nim Chimpsky, Halloran concludes that chimps have their own highly complex lexicon.