Book Review

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Culture Evolves

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Culture Evolves is an excellent book, and is truly exceptional for a conference volume. Its 25 chapters capture the contributions of all 24 participants at a 3-day Discussion Meeting of the Royal Society held in June 2010. The scope of the meeting was ambitious as is that of the volume: 8 papers cover the burgeoning evidence for cultural evolution in nonhuman animals, 6 deal with the archaeological evidence for cultural evolution, and 9 focus on language and modes of cultural transmission in humans. The volume is unique and important because it provides perspectives on cultural evolution through time and across human lineages, based on the application of numerical and objective methods. The roles of demographic and environmental factors in shaping cultural attributes, and the relative importance of teaching versus observational learning, are also examined thoughtfully and thoroughly in many chapters.

Thanks to close editorial attention, the chapters are generally very well written and definitions of key terms are provided first. Chapter 1 is written by the volume editors and frames the book while providing a concise and authoritative primer for anyone approaching the study of cultural evolution. Chapter 2 by Guillaume Rieucau and Luc-Alain Giraldeau explores the costs and benefits of social information, and sheds new light onto why social learning is the best strategy for dealing with an ever-changing world. Chapters 3 and 4, by K.N. Laland, N. Atton and M.M. Webster, and Tore Slagsvold and Karen L. Wiebe, respectively, examine social learning in nonmammals. The overview in chapter 3, 'From fish to fashion', lays out how convergent evolution in distinct vertebrate lineages for enhanced cognitive abilities created the rudimentary foundations of culture, and notes the importance of big brains in enhancing the efficacy of copying behavior. Chapter 4, on social learning in birds, surveys the evidence for cultural learning of foraging behavior in cross-fostered wild birds and concludes that most learning occurs through stimulus and local enhancement, not imitation. Chapter 5 by Alex Thornton and Tim Clutton-Brock, on social learning and the development of individual and group behavior in mammals, is one of the volume's highlights. Numerous examples from mammalian behavior illustrate the authors' point that neither imitation nor teaching provide the basis for cultural evolution, rather that the cognitive mechanisms that allow both mechanisms to be used in routine social interactions are what contribute to the magnitude and speed of cultural evolution in humans. The restriction of teaching in nonhumans to particular adaptive contexts is striking. Chapters 6 and 7, by Susan Perry and Andrew Whiten, respectively, deal with social learning in capuchin monkeys and chimpanzees, the two most highly encephalized nonhuman primates. Perry reviews the evidence for group-specific social conventions in tool-making and use, and in multistep food-processing. Her discussion of the development and transmission of behaviors in capuchins for testing social bonds and trust, such as controlled biting and eye-poking, makes for fascinating reading. Whiten's chapter on the scope of culture in chimpanzees, humans and ancestral apes is outstanding because it summarizes an enormous body of information in succinct language as well as in a single wonderful figure (fig. 7.1) worthy of making into a poster. The chapter also provides an excellent summary of the results of experiments on chimpanzee copying ability. In chapter 8, Carel P. van Schaik and Judith M. Burkart test and confirm the hypothesis that social learning is more efficient than independent exploration. In their words, their hypothesis is the 'evolutionary version of the cultural intelligence hypothesis', and among its many ramifications are that improved social learning improves asocial learning. In chapter 9, Simon M. Reader, Yfke Hager and

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Kevin N. Laland explore the evolution of primate general and cultural intelligence. Their innovative analysis confirms what many have suspected, namely that high general intelligence (and encephalization) evolved independently 4 times in primates (in capuchins, baboons, great apes, and macaques), and that natural selection has favored general intelligence and behavioral flexibility rather than a single specialized domain.

Chapters 10–15 focus on cultural evolution in the archaeological record – how it is studied and what has been found. In chapter 10, Ignacio de la Torre provides a very useful review of the origins of stone tool technologies in Africa that emphasizes examination of the contentious evidence for the earliest stone tools. In chapter 11, Naama Goren-Inbar provides a case study of culture and cognition in the Acheulean from study of the Gesher Benot Ya'aqov site in the Dead Sea Rift. There, meticulous documentation of modes of stone tool manufacture indicates that the production system relied on very precise communication, probably verbal language. Dietrich Stout in chapter 12 documents the presence of cumulative cultural evolution in the Lower Paleolithic through detailed study of stone tool-making action hierarchies. Despite the fact that the phrase *chaîne opératoire* is repeatedly misspelled in the chapter, the author does an excellent job at documenting an accelerating rate of change in what has often been characterized as technologically stagnant Oldowan and Acheulean industries. Chapter 13 by Francesco d'Errico and Christopher B. Stringer is a tour de force that focuses on what makes us 'really human', and whether these qualities emerged gradually or all at once in our history. The chapter contains one of the best ever reviews of the history of technological change in the human lineage. It also provides an up-to-date overview of the history of tool-making in Neanderthals. This documents the lineage's development of technologies parallel to those of *Homo sapiens*, and the evidence of contact between the two species that resulted in transmission and imitation of methods of tool production. Their analysis updates now-classic papers on rates of technological change in the human lineage to conclude that modernity was not a package with a unique African origin at one time. In chapter 14, Stephen Shennan examines how descent with modification may have worked in the archaeological record. He discusses how different kinds of bias – for instance, toward end results or toward prestige or conformity – as well as cultural drift affected the transmission of cultural traits. Throughout, he stresses the necessity of identifying histories of transmission through the careful identification of ancestor-descendant relationships. In chapter 15, R.A. Foley and M. Mirazón Lahr provide one of the book's best chapters and an inspired and creative account of the concept of culture and how diversity in cultures evolved. Drawing on their diverse backgrounds in archaeology, paleontology, and ecology, the authors explore the complex feedback relationships between culture and biology, including the paradox of low biological diversity (in hominin species numbers) and high cultural diversity. They establish convincingly that cultural diversity is the specific outcome of the way in which human populations have expanded and dispersed and that patterns of genetic diversification ultimately follow cultural packages. Their logical conclusion – that culture constrains biological diversity – is one of the most important in the entire volume.

Chapter 16 by Russell D. Gray, Quentin D. Atkinson, and Simon J. Greenhill, and chapter 17 by Andreea S. Calude and Mark Pagel are expressly devoted to language, and are refreshing in their approaches and results. In the former chapter, the authors review evidence for languages being documents of history and the problems inherent in dating language divergence. Rather than howling in anguish over the problems generated by rapid cultural expansion and equally rapid linguistic change, the authors conclude that the robust phylogenetic analyses and estimates of linguistic divergence dates are one of the most powerful tools for testing hypotheses about human history. In the latter chapter, the authors engage in an ambitious comparative analysis of the frequency of word use for 200 Swadesh word list items from 6 language families. Their analysis reveals that the frequency with which a common set of words is used in everyday speech is a shared feature of language, and that there is a surprising regularity in the way that people use language.

Each of the last 8 chapters of *Culture Evolves* take diverse and productive approaches to studying modes of cultural transmission in modern people. Thomas E. Currie and Ruth Mace in chapter 18 use phylogenetic comparative methods to demonstrate support that the sequence of forms of political organization, the prevalence of increases as opposed to decreases in hierarchical political complexity, and coevolution of political organization and social stratification follow patterns associated with Spencerian cultural evolutionary theory. In chapter 19, L. Rendell, R. Boyd,

M. Enquist, M.W. Feldman, L. Fogarty, and K.N. Laland provide one of the most novel and intellectually stimulating contributions in the book in their examination of how copying affects the amount, evenness and persistence of cultural knowledge. Studying data from computer-based tournaments, the authors show that successful strategies relied on copying, and that high levels of social learning through copying actually increased the amounts of knowledge generated and reduced the range of nonproductive behaviors used. In chapter 20, Mark Collard, Briggs Buchanan, Jesse Morin, and Andre Costopoulos re-examine the question as to what drives the evolution of hunter-gatherer subsistence technology, and specifically if toolkit variation is related to the risk of resource failure. The authors' result yielded the unexpected and hitherto unappreciated fact that the impact of risk is dependent on the scale of the risk differences among populations. In other words, when risk differences among groups are small, structural variation in toolkits is determined by factors other than risk of resource failure. Joseph Henrich and James Broesch explore the nature of cultural transmission networks in Fijian villages in chapter 21. Using data gathered in the field on 3 domains – fishing, yam-growing, and using medicinal plants – the authors show that Fijian villagers are biased to learn from individuals who are perceived as more knowledgeable and successful. This further supports the notion developed by Shennan in chapter 14 that selective cultural learning biases can have powerful effects. Another highlight of the book is chapter 22, by Gergely Csibra and György Gergely, on natural pedagogy. The authors define natural pedagogy as a process by which knowledge with opaque content to others can be conveyed in a single act of demonstration because the recipient recognizes specific actions as communicative and because the recipient expects the content to be significant cultural knowledge ultimately worth sharing. This is an exciting chapter because it explores natural pedagogy as a complex form of social learning that has previously not been documented, and then makes the convincing case that this is unique to and universal among humans. Comparably thought-provoking is chapter 23 by Derek E. Lyons, Diana H. Damrosch, Jennifer K. Lin, Deanna M. Macris, and Frank C. Keil on the scope and limits of overimitation in the transmission of artifact culture. The authors first discuss the phenomenon of overimitation, i.e. that humans – especially children – reproduce actions that are causally necessary but also those that are clearly superfluous. They then describe a series of ingenious experiments designed to test the scope and limits of overimitation. Their results suggest that overimitation may be a universal human phenomenon, and one that can provide a powerful boost to learning in an artifact-rich environment in which 'causally opaque objects' are common. Social learning among Congo Basin hunter-gatherers is the subject of chapter 24 by Barry S. Hewlett, Hillary N. Fouts, Adam H. Boyette, and Bonnie L. Hewlett. The authors report here on field studies of two groups of hunter-gatherers, and show that social learning occurred early and was quite rapid. Vertical transmission from parent to child constituted the bulk of learning under the age of 5 while horizontal transmission dominated ages 6–12. Processes such as observation and imitation were the dominant forms of social learning from then onward. In the book's final chapter, Paul L. Harris and Kathleen H. Corriveau explore the fascinating subject of children's selective trust in informants. Concluding that 'young children are trusting disciples', this chapter demonstrates that children are selective imitators and absorbers of information, and that they will monitor the social standing of potential informants before making a decision as to whose behavior to endorse or imitate.

This is a big book, but one well worth savoring in its entirety. The editors deserve great praise for organizing what appears to have been a thrilling discussion meeting, and for developing a volume which captured the excitement of the gathering in a timely fashion for posterity. Happily for scholars, because *Culture Evolves* was also published as an issue of the *Philosophical Transactions of the Royal Society B* (vol. 366, No. 1567, 2011), the chapters can be downloaded free of charge from the website of Royal Society Publishing (http://rstb.royalsocietypublishing.org/content/366/1567.toc).

This exceptional volume shows that the study of cultural evolution has come of age, and is now poised to inform the study of human (and nonhuman) biological evolution as never before. The influence of behavior and culture on gene expression and the development of phenotypes promises to reawaken the field of anthropology to its promise as an integrative discipline committed to shedding light on the totality of the human condition.

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