

anybody in danger of romanticizing the similarity of ape to child. Developmental psychologists will find here a well-articulated account of the ontogeny of cultural learning, which challenges alternative accounts from the vantage point of extensive research. The book should also be a thought-provoking read for cognitive psychologists, many of whom seem to disregard social and cultural processes. Of course, we have 'cultural psychology', but that is about cultural differences. Tomasello is instead talking about universals, an aspiration of most cognitive psychology. If he is even half-right, the field suffers a serious omission indeed. ■

Andrew Whiten is at the School of Psychology, University of St Andrews, St Andrews, Fife KY16 9JU, UK.

The sequence of words

Genes, Peoples, and Languages

by Luigi Luca Cavalli-Sforza

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Patrick V. Kirch

In the early twentieth century, a uniquely American version of anthropology emerged under the direction of prominent scholars such as Franz Boas, Alfred Kroeber and Edward Sapir. What set this school apart from its European counterparts was its efforts to construct a scientific approach to deep-time human history, and the catholic inclusion of evidence from ethnography, archaeology, linguistics and human biology (then called physical anthropology). Today, tensions within anthropology threaten to explode this model of a 'holistic' approach to the study of human cultures. Luigi Cavalli-Sforza, a geneticist whose research has depended on close collaboration with archaeologists and historical linguists, gives us ample reason to celebrate anew this holistic vision of anthropology.

For several decades, Cavalli-Sforza and his colleagues have pursued a variety of research projects involving not only the mapping of human genetic variation, but also the correlation of geographic patterns of variation with patterns of language distribution, and with archaeological evidence for ancient population movements. The underlying theme integrating these disparate studies traces the biological and cultural evolution of modern *Homo sapiens* throughout the past 100,000 years.

Over the course of Cavalli-Sforza's career, the methods for studying genetic variation have themselves been radically transformed, from the relatively crude mapping of ABO blood groups, to the sequencing of DNA, and even the recovery and sequencing of ancient



DAVID NEWTON

DNA itself. *Genes, Peoples, and Languages* tells the story of this research odyssey in a style that is highly accessible to intelligent readers from any background, without presuming prior grounding in genetics, statistics or, for that matter, linguistics and archaeology.

In his effort to make his research methods transparent to those without a background in human genetics, however, Cavalli-Sforza ends up devoting much of the first half of his book to a kind of primer in genetics, evolutionary trees and multivariate statistics. This may deter some readers, for the fascinating problems of deep-time human history do not begin to emerge until the fourth chapter. But for those who persist — or simply skip ahead — the intellectual rewards are ample.

In the chapter "Technological revolutions and gene geography", Cavalli-Sforza tackles one of the great problems of historical anthropology: the expansion of modern humans out of Africa, and subsequent diasporas that correlated with major periods of demographic growth. Here he draws on his work with archaeologist Albert Ammerman in demonstrating a major population-expansion-driven (as opposed to strictly cultural) diffusion from the Near East into Europe, associated with the spread of agricultural peoples. But while the genetic landscape of modern Europe still bears the signature of this major diaspora, other 'streams of gene diffusion' are also evident in statistical patterns of gene distribution, including an expansion from the region north of the Black Sea. This appears to have been associated with the expansion of pastoral nomads who originally domesticated the horse.

Although he dwells at greatest length on Europe, Cavalli-Sforza also discusses evidence for several other major diasporas, including the expansion of Bantu language-speaking groups in sub-Saharan Africa, and the remarkable dispersal of the Austronesian-

language speakers. This latter dispersal would ultimately result in the human colonization of the most remote Pacific islands, including Easter Island and Hawaii.

There are, of course, always pitfalls in multidisciplinary research waiting to entrap unwary scientists stepping beyond the familiar terrain of their own discipline. Writing on language, Cavalli-Sforza is liable to raise some hackles, for not all of his claims fall within what is currently accepted by mainstream historical linguists or prehistorians. This derives, in part, from Cavalli-Sforza's desire to have a 'big picture' classification, or family tree, of world languages, which can then be correlated with his genetic tree of human populations. Unfortunately, the classic methods of historical linguists have serious limitations once one attempts to move back in time to a level deeper than that of major language families. Cavalli-Sforza thus relies heavily on the work of linguists Joseph Greenberg and Merritt Ruhlen, especially the latter's highly controversial 'super-family' classification.

For example, in the key diagram comparing genetic and linguistic trees, Cavalli-Sforza identifies a 'Melanesian' population, and groups it genetically most closely with 'Polynesians' and 'Micronesians', and more distantly with a 'New Guinean' population. Linguistically, the Melanesians and New Guineans are depicted as linked together in an 'Indo-Pacific' family, while the Polynesians and Micronesians are identified as part of the large 'Austronesian' language family.

However, the very concept of a discrete 'Melanesian' population was rejected many years ago, and the notion of an 'Indo-Pacific'-language family was similarly abandoned. Rather, the people who occupy the islands of Melanesia (excluding New Guinea) display tremendous genetic variation. This is the result of a specific and complex history of

human migrations, including an early phase of hunter-gatherer expansion around 40,000 years ago, and a later phase of population intrusion by Austronesian speakers about 3,500 years ago — reflected archaeologically in the Lapita cultural complex. This latter intrusion resulted in virtually all island Melanesian populations speaking Oceanic languages (a branch of Austronesian).

Other regional specialists will doubtless find similar problems with Cavalli-Sforza's efforts to correlate genes and languages at such a broad level. But this does not mean that the effort to construct such worldwide correlations is futile, for there is clearly much historical truth in Cavalli-Sforza's models. As a first approximation, the history of human diasporas painted in this book shows a vast improvement in our knowledge, which has been made possible by rapid advances in method. And not just in biological science, for the historical linguists themselves are now tackling the thorny issues of deep-time language reconstruction more intensively than ever before. My point is simply that Cavalli-Sforza's models will need more work, and much refinement, before they will satisfy all the critics.

In his final chapter Cavalli-Sforza ranges widely over some of the most profound questions of human evolution, including the role of culture as a means of biological evolution, the modes by which culture is transmitted, and the emergence of complex hierarchical social structures. The ideas raised here reinforce how essential it is for social scientists and biologists not to be isolated — as they so often are in the intellectual structures of modern academia — and to realize how much they need each others' insights.

Edward Sapir eloquently laid out a multidisciplinary methodology for historical reconstruction in his now little-read 1916 monograph *Time Perspective in Aboriginal American Culture: A Study in Method* (Canada Department of Mines). At the time, the most sophisticated discipline contributing to the tracing of deep-time human history was linguistics. Sapir himself lamented that he had probably "undervalued the data of physical anthropology". Little could he have anticipated the advances that would come with the revolution in molecular biology and genetics.

Cavalli-Sforza and his colleagues have now given historical anthropology sophisticated tools to look at human variation, and to read that variation as a 'text' of human history. Cavalli-Sforza writes that "to some, history is not a science", but he has helped to show that history is susceptible both to the methods of science and to the power of a multidisciplinary approach. ■

Patrick V. Kirch is at the P. A. Hearst Museum of Anthropology, University of California, 103 Kroeber Hall, Berkeley, California 94720-3712, USA.

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Evolution in a broader perspective

Lucy's Legacy: Sex and Intelligence in Human Evolution

by Alison Jolly
Harvard University Press: 1999. 518 pp.
 \$29.95, £18.50

Christophe Boesch

Gigolo in French means a male prostitute, while in German it may mean a Don Juan, and some Americans see in it a man used by women in one way or another. Alison Jolly probably had this last sense in mind when she provocatively proposed to rename a group of primates with many females and a single male a 'gigolo' group. The alternative term 'harem' suggests that it is the male who is most important; if he's a gigolo, he's there because the females tolerate him.

Alison Jolly's book is a refreshing and stimulating account of evolution, and especially of the evolution of sex and intelligence in humans and primates. One of its strengths is her presentation of the female view. We men have always had a tendency to consider life mainly from our own perspective. Thus, terms such as 'female choice' or 'female control' rapidly faded out of favour despite the fact that Darwin used them. But it is important for men to consider the other view of evolution, sex and intelligence — especially since there are good theoretical reasons to expect that intelligence can out-compete strength, and that internal fertilization gives every female mammal the final choice of which sperm is going to fertilise her egg. It would be surprising if females did not use this huge advantage.

Jolly proposes that the traditional feminine viewpoint on evolution is one of cooperative organization and not of competition. This is a counterpart to the fundamental dilemma for anyone trained in Darwinian evolutionary theory, with its emphasis on rampant individualism: how did society develop in the face of this? For her, "selfish

genes, interacting with their environment, led to love between kin, trust between friends, the intricacies of the mind, and the emergent organisations of society".

Jolly tells the story from her own perspective as a woman, teacher and lemur-watcher, taking examples from women's lives such as female orgasm, menstruation, childbearing and menopause. Some of these stories are quite illuminating. To explain to sceptics that not all human behaviour is either learned or conscious, she takes the example of labour. "Your body, willy-nilly, starts to sneeze, goes into labour, opts to move from first- to second-stage contractions. A nurse told me once, 'Don't you dare push!' 'I'm not pushing!' I squawked, 'It is!' ... the body's wisdom during labour does not rest on your conscious decisions."

Obviously only men could propose in face of such evidence that human behaviour is a *tabula rasa!* The only regret I have is that her case for showing that evolution is as much about cooperation as about competition is not convincingly presented. Obviously cells in the same organism must cooperate, otherwise they would commit suicide. But individuals do compete regularly and Jolly does not present adequate evidence for cooperation.

A good case could have been presented about sex. Do males and females cooperate or compete? While commenting that "politically correct biologists try hard to describe sex as cooperation between equal partners", Jolly presents evidence of both competition and cooperation. In the course of evolution, the two sexes have differentiated in such a way that they depend on one another, so that sex does not work without at least some cooperation. But for readers who fear that biologists might apply what we observe in animals to human beings, she rightly says of observed instances of violence and killing in animals that "what is natural is not necessarily right", leading the way to more philosophical questions. As debate rages about the existence of 'moral' actions in animals, she tells us that, for some people, "it seemed immoral that morality should increase genetic fitness".

In other words, this book is a quest for a better understanding of human evolution and a challenging contribution to the debate about human uniqueness, if this does indeed exist. I strongly recommend it to those who are new to the field because of the breadth of the topics and the clarity with which they are presented. To those working in the field I strongly recommend it for the new approach Alison Jolly takes to some of those questions. She suggests that beside concealment of ovulation in women, what is new in human sex is the general need for privacy. But I'll leave readers to discuss that for themselves. ■

Christophe Boesch is at the Max Planck Institute for Evolutionary Anthropology, Inselstrasse 22, 04 013 Leipzig, Germany.

