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Stone, Linda, and Paul F. Lurquin. Genes, Culture, and Human Evolution: A Synthesis. 2007. xxii + 314 pages; figures; tables; black and white photographs; color plates; appendices; references; glossary; index. Blackwell Publishing, Malden, Massachusetts. ISBN-13: 978-1-4051-5089-7. Hard-cover. Price: US $100.95. Available from: Blackwell Publishing, 350 Main Street, Malden, MA 02148-5020.

Genes, Culture and Human Evolution: A Synthesis was written with three goals: to summarize the current state of human genetics as it relates to tracing human evolution and dispersion; to serve as a college-level text for courses in biology, anthropology and human genetics; and to make an appeal for greater collaboration between genetics, cultural anthropology and paleoanthropology.

The book is dedicated to L. L. Cavalli-Sforza, who also wrote the introduction. Cavalli-Sforza, of Stanford University, was one of the first geneticists to attempt to map human genetic variation onto cultural and linguistic variation. His work provides the inspiration for this book, and many of the chapters on aspects of human genetics are, in fact, summaries of Cavalli-Sforza's own research. In the introduction, however, Cavalli-Sforza treats genetic research only in passing. His focus is on the dangers he perceives as impeding scientific accounts of human biological and cultural evolution: insufficient and ineffective collaboration among scientific disciplines; weaknesses in the ways scientists communicate their research to the public; opposition from champions of creationism and Intelligent Design; and the postmodern movement in the social sciences. In its overall conception and organization, this book is a notable attempt to address those dangers.

Genes, Culture and Human Evolution: A Synthesis is organized as a textbook, with a synthesis (summary), suggestions for further reading and discussion questions at the end of every chapter. The first chapter presents "very short" (p. 1) histories of research in genetic and cultural evolution and a preview of what is to come in the remainder of the volume. Chapter two is devoted to an overview of human evolution from the perspective of paleoanthropology, itself an interdisciplinary program combining human paleontology, archaeology, earth sciences, paleobotany and numerous other disciplines. The chapter summarizes both the evidence from the fossil and archaeological records and the principal methods used to date prehistoric remains. The authors' account of current theory is adequate but highly condensed, so readers who are new to the field and those who teach introductory courses may wish to consult additional sources. For example, the competing uniregional (or single origin) and multiregional hypotheses concerning modern human (*Homo sapiens*) origins are mentioned in reference to the dispersals from Africa of both *Homo erectus* (ca. 1.8 million years ago) and modern *H. sapiens* (ca. 60-80 thousand years ago). In modern paleoanthropology, the uniregional and multiregional hypotheses apply only to the dispersion of modern *H. sapiens*. [Note: the uniregional hypothesis sees modern humans as having evolved from a single population in Africa; the multiregional hypothesis holds that modern *H. sapiens* appeared in several separate regions at more or less the same time.]

The next four chapters (3-6) constitute a primer on genetics and human evolution, from Mendel to the construction of evolutionary phylogenies. Each important avenue of

genetic research—protein polymorphisms, deoxyribonucleic acid (DNA) analyses, mitochondrial DNA (mtDNA) studies and more—is presented in its laboratory and practical dimensions, with special attention to how it can help us understand the movements of people in the past. Mutation, selection, drift and migration are discussed in the same research-oriented way. Considering how much information is included in these chapters, the presentation is admirably rigorous and introduces calculations of genetic distance, principal components analysis and other mathematical techniques. Stone and Lurquin are sensitive to their audience, however, and present only enough mathematics to illustrate and clarify the underlying concepts. This is the strongest section of the book and could form the core of an entire college-level introductory course.

Chapter seven is much more speculative because it tackles the issues of gene-culture interactions and biological and cultural co-evolution. The authors make the case for analogies between genetic evolution and cultural evolution in the forms of mutation, selection, drift and migration. In the cultural realm it is ideas that mutate and diversify. They propagate along two principal vectors, vertical (parent-to-child) and horizontal (peer-to-peer). In this view, vertically transmitted ideas tend to be conservative, to be transmitted on generational time scales and to be deeply embedded in people's minds. In contrast, horizontally transmitted ideas are more likely to be transformed and tend to propagate, with variation, much more quickly. Certain cultural ideas are selected for, although these may or may not contribute to the fitness of individuals or groups. The authors draw examples from the histories of religious denominations and sects to show how the mechanisms of mutation or drift, for example, can be used to interpret historical events.

These kinds of analogies are useful for heuristic purposes but become misleading if pushed too far. Analogies between genetic mutation and cultural innovation and between natural selection (fitness-based) and cultural selection (with no necessary fitness component) are especially problematic. Genetic mutations arise at random; whether or not they are retained in successive generations depends on their contribution to the fitness of the resulting phenotype. Cultural innovations rarely if ever arise at random and they may or may not enhance the fitness of those individuals and cultures who adopt them. Even more uncertain is the unit of cultural selection, the cultural analog of the gene. The authors suggest that it might be ideas or concepts or memes, but those remain too poorly defined to have any analytic utility. Alternatively, it might be "institutions and organizations" (p. 134), including governments, corporations and religious organizations, functioning as a kind of "cultural DNA" (p. 135). Such organizations persist over time, occupy specific places, interact with each other and are slow to change, say the authors. They "seem to take on a life of their own, acting like living organisms, even multiplying with increases in population or population density" (p. 135). At this point, any connection with evolution in the biological sense has become merely metaphorical.

In the remaining seven chapters (8-14), the authors illustrate the contributions of genetic data to issues in human evolution and the dispersion of modern humans. The topics range from the environmental sources of human phenotypic variation (e.g. the correlation of skin color with the intensity of solar radiation) to the correlations between genetic diversity and linguistic diversity. Along the way they consider coalescent theory—a way of estimating the effective sizes of ancient populations—and the results of mtDNA studies

that suggest that there was little if any interbreeding between Neanderthals and modern humans. The authors present substantial genetic data supporting the view that all living people share a common ancestor within the last 200,000 years. Every topic is accompanied by explanations of the specific genetic techniques involved and of how the results are analyzed.

Perhaps in an effort to interest cultural anthropologists who have reservations about genetic science, Stone and Lurquin illustrate how cladistic analysis can be applied to cultural evolution. In evolutionary biology, cladistic analysis is used to show the branching patterns of evolutionary diversification, with closely related species forming clades. The authors apply this perspective, at some length, to the development (evolution) of the great monotheistic religions: Judaism; Christianity; and Islam. They invoke horizontal transmission of cultural traits as the basic mechanism underlying the spread and branching of the monotheistic religious tradition. Once again, metaphors from evolutionary theory are being used to describe cultural change, with the implication that such change is evolution. Yet with no definable unit under selection, and no requirement that selected variants be adaptive or increase fitness, analyses become statements like "some global cultural trends are maladaptive for human life and reproduction" (p. 138; Box 7.1).

In addition to a section of general concluding comments, the book ends with four appendices, chapter notes, a glossary, lists of references organized by chapter and an index. The appendices expand on topics including the Hardy-Weinberg equilibrium theorem and ways of estimating genetic drift, and would provide good material for laboratory exercises or student research. The book is illustrated throughout with charts and diagrams, many showing the results of various ways of estimating human genetic relationships and clustering. There are thirteen beautifully reproduced color plates bound in the middle of the book. Although each plate is numbered and referred to in the text, it is not always clear why the images were chosen. For example, Plate 14.2 bears a small photo illustrating gel electrophoresis, whereas Cavalli-Sforza's important diagram relating population genetic trees to language families is reproduced only in black and white later in the book.

These minor criticisms notwithstanding, Genes, Culture and Human Evolution: A Synthesis will be enjoyed by anyone with an interest in human evolution, modern genetic analysis or the peopling of the world. It merits inclusion in any library's collection and is a must for academic libraries. While it is written for the reader with no prior knowledge of the topic, it is technical enough to be a primary or secondary text for both introductory and graduate-level courses in human evolution, genetics, anthropology and other fields. The references, organized by chapter, are current as of the date of publication and provide both students and general readers with resources for further research, technical and/or theoretical, into all of the topics presented in the book.

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