Molecular Anthropology?

Molecular Applications in Biological Anthropology

edited by Eric J. Devor

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Biological anthropology emerged from the Second World War tainted by a history of ethnocentric prejudice, racism and eugenics. It has since succeeded in distancing itself from these abuses, but its focus on morphological data has meant that it is often perceived as a somewhat archaic field of enquiry, an image that the introduction of molecular techniques is helping to change. The influence of such techniques is, however, far from being merely superficial: the information they generate is different from morphological data in that they reveal an almost unlimited number of traits that are discrete, largely selectively neutral and can be determined objectively. This opens a realm of new possibilities, most of which we are just beginning to realize.

In the seven chapters of *Molecular Applications in Biological Anthropology*, several authors describe the molecular methods used in anthropology. Eric Devor, the editor, provides a brief and stimulating introduction outlining the history of relevant technical developments, such as restriction enzymes, RFLPs and VNTRs (used by the author to denote minisatellites as well as microsatellites). Unfortunately, he fails to include the latest invention to come from Alec Jeffreys' laboratory: MVR-PCR. This technique allows determination of the internal sequence variation in minisatellites and thus may offer a way of estimating the degree of relatedness between alleles.

In the next chapter, Rogers surveys data from studies of nuclear DNA polymorphisms, such as those at the β-globin locus and on the X and Y chromosomes. Flint, Clegg and Boyce, in a well-written chapter, summarize our knowledge of the globin genes. The data presented here are most easily reconciled with an African origin of the human gene pool, although none can withstand statistical tests for significance, as they are applied to phylogenies above the species level. The timing of the putative exodus from Africa is another interesting problem: since the nuclear data so far available do not permit this date to be estimated, it may simply reflect the colonization of the non-African World by *Homo erectus* around, or shortly after, one million years ago. However, the mitochondrial DNA data reveal sufficient substitutions to allow tentative dates to be put on the putative exodus. The fact that these estimates suggest that the event was relatively recent has caused much discussion, since they indicate a complete replacement of *H. erectus* forms by modern humans less than 300 000 years ago. Phylogenies based on the mitochondrial data, however, are also not statistically significant. The resolution of these dates will come from more cost-effective sequencing techniques that will increase the amount of data available, and also from studies of the molecular mechanisms that generate new haplotypes and point mutations. When such knowledge is at hand, we will have better models for estimating the relationships between alleles and haplotypes, and be able to time divergences with more precision.

In a long chapter, Melnick, Hoelzer and Honeycutt describe the structural and genetic features of mitochondrial DNA and the methods used to study mtDNA variation, and review its use and usefulness in addressing evolutionary relationships, both among and within species. Of all the chapters, it is with this one that I most often find myself bewildered and in disagreement with the authors. For example, the arguments in favour of different evolutionary rates in different lineages and populations are confusing. They seem to rely on speculations about geological events separating species and unpublished simulations that are difficult to understand from the brief description offered. Furthermore, I strongly disagree with the claim that it is 'a problem' that intraspecific mtDNA variation often does not reflect the situation in the nuclear DNA. On the contrary, it is a great asset to be able to use two systems that differ in their rates of mutation, fixation times and modes of inheritance, since they provide different perspectives on the biological history of a species. When they 'conflict', this may reveal particular aspects of population history. This applies not only to differences in male and female migration, but may also be extended to inferences about past population structure and size.

Phenotype, as well as genotype, is now beginning to be investigated by molecular approaches. This is represented in the book not only by the piece on globin genes, but also by a review by Hixson of the molecular genetics of atherosclerosis, although many other fascinating areas, such as visual colour pigment genes, might also have been discussed.

Although the introduction of molecular techniques to biological anthropology opens many new possibilities for the discipline, to truly exploit these possibilities it is not enough, as the title and some of the chapters of the book seem to imply, simply to apply molecular methods to anthropological problems. Molecular biology is not only a technology but a discipline involving the study of genomic structure and function. Only when the theoretical expertise in this field is integrated with anthropology can the full power of the molecular approach be brought to bear on questions concerning human history. Such a fruitful synthesis of the two fields is exemplified by the chapter on globin genes by Flint, Clegg and Boyce. I hope that the readers of this book will be stimulated not only to apply molecular techniques, but to become 'molecular anthropologists'.

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Something for everyone

Genes and the Biology of Cancer

by Harold Varmus and Robert A. Weinberg

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Even before I saw this book, I knew it would be good. This one has it all. Written by two eminent scientists who have been very much part of recent developments in unravelling the mysteries of cancer genes, it is a synthesis of current knowledge in this fascinating area. Beautifully illustrated with colour photographs and imaginative artwork, it is a pleasure either to browse through or to read systematically. It assumes little prior knowledge of biology and all those with an interest in science should be able to understand it.

The first three chapters introduce the concepts required to understand the rest. The way in which growth and differentiation are controlled in multicellular organisms, the exact nature of the problem of cancer, and the epidemiological clues as to the origins of