**Infection, Polymorphism and Evolution**

Review Author[s]:
Andrew F. Read

*The Quarterly Review of Biology*, Vol. 74, No. 2. (Jun., 1999), pp. 224-225.

Stable URL:
http://links.jstor.org/sici?sici=0033-5770%28199906%2974%3A2%3C224%3AIPAE%3E2.0.CO%3B2-4

*The Quarterly Review of Biology* is currently published by The University of Chicago Press.

---



---

inability to examine evolutionary historical selection pressures. This is where adaptationism is so powerful because an adaptation's functional design is a record of the selective forces that guided it. Another impediment claimed is that "humans are not suitable subjects for . . . experimentation" (p 156). Actually, more experiments have been done with humans than any other species. Much of cognitive science is about experimental determination of the information-processing abilities of the human psyche, that is, the design of human psychological adaptations. I agree with the book that artificial selection experiments cannot (and should not) be done with humans, but this is just one kind of experiment. Such experimentation is useful in nonhuman organisms to demonstrate heritability, but it is not needed to demonstrate genetic influence on an individual's traits. The vast knowledge of how ontogeny works supports the latter.

Many critics of the scientific analysis of human behavior and psychology using modern evolutionary principles, such as those of sociobiology, claim that such analysis is genetically deterministic, meaning either that only genes are important, or that at least they are more important than environment during ontogeny. Sociobiologists, however, have emphasized that ontogeny simply does not work that way, and sociobiology, like all areas of biology, is based on the modern conception of ontogeny. Portions of *The Genetic Gods* are genetic determinism, as just defined. There is now an example of genetic determinism for critics to cite.

Overall, this book will confuse those who desire scientific knowledge of how evolution applies to human affairs. A different type of book is needed, one that follows the essence of Dobzhansky's view that nothing about living things makes sense except in the light of evolution. It is never a question of whether to apply evolutionary principles to features of living things (including all human features), it is only a matter of how to apply it. Many human features are not adaptations. Incidental effects of adaptations are most commonly seen. Evolutionary constraints are important, too, in modern evolutionary analysis.

Despite my reservations about this book in general, I found aspects of it quite interesting, including the hypotheses about genetic adaptations. I also found the discussion of genetic technology (Chapter 7) enjoyable. Even here, however, genetic determinism obfuscates the picture as the discussion deals only with genetic technological manipulations. There is no exposition of how knowledge of ontogeny leads to the implication that manipulations of relevant environmental causes would be important in eliminating unwanted outputs of adaptations, as well as unwanted heritable traits.

RANDY THORNHILL, *Biology, University of New Mexico, Albuquerque, New Mexico*

INFECTION, POLYMORPHISM AND EVOLUTION.
*Edited by W D Hamilton and J C Howard. Published in association with The Royal Society by Chapman & Hall, New York.* $117.00. ix + 120 p; ill.; index. ISBN: 0-412-63700-6. 1997.

Haldane pointed out half a century ago that host-parasite interactions can be a potent engine for evolution, at least in theory. But the full implications of that notion have yet to be worked through, in part because proper understanding requires interdisciplinary effort. This volume summarizes an attempt to get theoreticians and empiricists from fields as disparate as behavior, genetics, biochemistry and epidemiology together. The papers come from a two-day Royal Society discussion meeting; it must have been an interesting meeting—the whole volume crackles with tension.

There are two main themes: parasitic infection as a diversity-generating mechanism (Lively and Howard; Kelley; Wedekind; Schmid-Hempel) and recognition and resistance (Frank; Crute), especially the cause of major histocompatibility complex (MHC) polymorphism (Klein and O'Huigin; Hughes et al.; Potts et al.; Hill et al.). Views on the MHC are almost as diverse as the MHC itself. Back-to-back papers argue that inbreeding avoidance and malaria are either irrelevant or heavily implicated in the evolution of the MHC.

This volume was first published in the scientific literature some time ago (1994. *Philosophical Transactions of the Royal Society of London Series B* 326:271–385). Entertainingly, the paper that has been cited most is somewhat orthogonal to the main themes. Gustafsson et al. summarize their thinking and early data on infectious disease as an explanation for the cost of reproduction in birds. Numerous researchers, not the least Gustafsson himself, have found that increasing clutch and brood sizes reduces parental reproductive success in subsequent seasons. But why? This paper was one of the first to postulate that individuals allocating more energy to current reproduction allocate less to immune defense, so that future health suffers. This idea is a growth industry in evolutionary ecology, with a flurry of immune parameters being measured. As far as I can see, a fundamental problem remains: is immune suppression a cause or just another consequence of reduced vigor? That it might be causal is an attractive possibility, although how is unclear (are lifelong infections more likely to get established?).

Ironically, missing from this volume are the studies that unequivocally demonstrate the link between infection, polymorphism and evolution: those that deal with in-host pathogen evolution in response to somatic evolution of the vertebrate immune response. Indeed, only one paper deals with this topic, but it is largely theoretical (Ewald on HIV), and judging from the published discussion, the most

contentious at the meeting (and, as at the end of 1998, also the least cited). Yet there is a good understanding of the nature of immune variation and selection within hosts. Such an arena should yield more easily to evolutionary analysis than more conventional examples of coevolution.

ANDREW F READ, *Institute of Cell, Animal & Population Biology, University of Edinburgh, Edinburgh, United Kingdom*

EVOLUTIONARY PROGRAMMING V. *Proceedings of a conference held in San Diego, California, 29 February–2 March 1996. A Bradford Book.*

*Edited by Lawrence J Fogel, Peter J Angeline, and Thomas Bäck. Cambridge (Massachusetts): MIT Press.* $65.00. xv + 488 p; ill.; author index. ISBN: 0-262-06190-2. 1996.

GENETICS AND ANALYSIS OF QUANTITATIVE TRAITS. *By Michael Lynch and Bruce Walsh. Sunderland (Massachusetts): Sinauer Associates.* $64.95. xvi + 980 p; ill.; author, organism and trait, and subject indexes. ISBN: 0-87893-481-2. 1998.

The vast majority of character traits show continuous variation. Quantitative genetics could therefore be central to numerous approaches in both basic and applied evolution and ecology. To date, however, quantitative genetics theory is divided among disparate and unreconciled disciplines, and can be quite intimidating mathematically. In this book, the authors attempt to bring together the theoretical framework, empirical results, and contemporary statistical techniques from the diverse fields of plant and animal breeding, evolutionary biology, and human genetics into a comprehensive and approachable guide. It covers the basic biology, theory and methods of analysis of quantitative characters. A second book (not yet published) will cover the evolutionary dynamics of quantitative traits.

The book is separated into three sections. The first section reviews the history of quantitative genetics and develops a comprehensive linear model for quantitative traits from single-locus theory. This shows both the theoretical potential for a unified theory of quantitative genetics and the practical problems of decomposing underlying mechanisms. The second section describes methods for identification of major loci regulating quantitative traits (primarily a combination of molecular marker techniques and mapping and characterization using inbred line crosses and outbred populations). The third section deals with practical procedures for estimating the variance components of quantitative traits: the pros and cons of parent-offspring regression, sib analysis, twins and clones, as well as character correlations, cross-classified designs, genotype × environment interaction, maternal effects, sex linkage, breeding values, and complex pedigrees. For the less quantitative reader, other chapters and appendixes cover statistical and mathematical techniques over an impressively broad scope, and are much more extensive than most population genetics textbooks.

Each topic is covered comprehensively, and the text is absolutely teeming with cornerstone and contemporary literature references (about four thousand in total). Nonetheless, any of the chapters could easily be expanded to explain ideas more thoroughly. The primary audience will likely be limited to quantitative-minded graduate students and researchers. Thus, Lynch and Walsh succeed in bringing together disparate aspects of quantitative genetics theory. They do not make quantitative genetics easily accessible, but this may be a necessary tradeoff. Even though it may not reach all of its intended audience, this volume provides a comprehensive resource that will no doubt become the standard reference in the field.

WILLIAM A NELSON and ELIZABETH E CRONE, *Biological Sciences, University of Calgary, Calgary, Alberta, Canada*

GENETIC STRUCTURE AND LOCAL ADAPTATION IN NATURAL INSECT POPULATIONS: EFFECTS OF ECOLOGY, LIFE HISTORY, AND BEHAVIOR.

*Edited by Susan Mopper and Sharon Y Strauss. New York: Chapman & Hall.* $84.95. xxi + 449 p; ill.; index. ISBN: 0-412-08031-1. 1998.

Adaptation of conspecific populations to their local environments has long been known, but G F Edmunds and D N Alstad raised eyebrows in 1978 when they interpreted their experiments with pine-feeding scale insects as evidence that almost adjacent trees harbored genetically differentiated and differentially adapted demes of insects. That adaptation might occur on such a fine scale seemed surprising. The authors extended and improved on their original study, and several other researchers (including the editors of this volume) have since tested the hypothesis of fine-scale local adaptation ("adaptive deme formation") on other species of herbivorous insects.

Adaptation of insects to individual plants seems like a remarkably specialized subject for a 449-page book, but it provides entry into a wide variety of evolutionary and ecological topics. Adaptive differentiation of demes or populations represents a balance between divergent natural selection and the homogenizing effect of gene flow, so it provides reason to examine the role of both of these important evolutionary factors. Simply demonstrating local adaptation can be tricky; for example, nongenetic effects of parents' host plants on offspring must be ruled out. The causes of the selection invite examination, and physiological questions about whether there exist