

BOOK REVIEW

Thinking about evolution: historical, philosophical, and political perspectives

Edited by Rama S. Singh, Costas B. Krimbas, Diane B. Paul and John Beatty

Cambridge University Press, 2001. 606 pp.

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This is the second of the two volumes produced in honour of Prof. Richard Lewontin on the occasion of his sixtyfifth birthday. The first volume, *Evolutionary genetics: from molecules to morphology*, edited by Rama S. Singh and Costas B. Krimbas and published by Cambridge University Press in 1999, honours Lewontin's more technical contributions to genetics and evolutionary biology. In this second volume of essays, philosophical, historical and political dimensions of his work are honoured.

The editors deserve compliments for compiling a rich and varied collection of articles befitting the many-faceted contributions of Lewontin to important aspects of genetics and evolutionary biology. Genetics and evolutionary biology have been more influential than any other field of natural sciences in terms of their impact on the philosophy of science, and on the framing of social and political policies (in spite of the fact that the sole reason for Lewontin choosing a career in population genetics—as he himself put it in an interview included in this volume—was that he thought that it was an extremely apolitical topic!). However, very few of the traditional, mainstream, bench-and-computer practitioners are aware of the precise nature, and the astonishing extent, of these impacts. The collection of twentyeight articles presented in this volume goes a long way in providing a fascinating overview that covers topics ranging from the extremely esoteric (historical determinism and totalitarianism, dialectics, identity politics) to the extremely down-to-earth (political economy of agricultural genetics, military uses of nuclear alchemies). This diversity makes it impossible to do justice to them in this brief review, and it is hoped that the glimpses of some of them provided below will go some way towards motivating readers of this journal to pay attention to some of the ideas developed in this book, titled, very aptly, *Thinking about evolution*.

The very readable introduction (a must-read) by the editors is followed by a concise, lucid and incisive piece

by Lewontin titled 'Natural history and formalism in evolutionary genetics'. One continues to marvel at Lewontin's erudition and stylish prose (e.g. 'In a famous *synecdoche*, Dobzhansky (1951) once defined evolution as "a change in the genetic composition of populations" . . . , an epigram that should not be mistaken for the claim that everything worth saying about evolution is contained in statements about genes . . .), the uncanny knack of putting the finger on the most crucial issues ('Thus, any numerical value estimated for the formal selection coefficient might be quite wrong, but the judgment that selection is occurring would be correct. The converse is less likely to be true.') and describing them with utmost simplicity and economy of expression ('. . . the time for return to a steady state from occasional perturbations . . . is also very long, and so populations are likely not to be in the steady state. Once again, history matters.').

Easily the most interesting article in this volume is the text of the interview mentioned earlier. To say that these forty-odd pages provide an absolutely fascinating account will be an understatement – it is inspiring as well as awe-inspiring, touching as well as humorous, extraordinarily candid and thought-provoking, and, above all, provides an exciting view of the development of biology in the United States during the last many decades. I certainly wish there was a way of reprinting this interview to make it available to a much wider audience. The first-person accounts of the remarkable years in Dobzhansky's lab, the research on quantitative genetics in North Carolina, the most exciting discovery of electrophoretic variants in proteins, molecular biology at Harvard, views on funding as practised by various agencies, political economy of agriculture, . . . should on no account be missed should one get an opportunity to browse through this book.

The first of the other articles on the history of evolutionary biology includes a discussion of the 'question of the totalitarian connection between Darwinism and Marxism . . . [by] . . . two influential proponents of the connection: Hannah Arendt . . . and Karl Popper'. (The author, John Beatty, is 'pleased to offer this small contribution to the festschrift honoring the Marxist Darwinian,

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Richard Lewontin'.) The next article by Jean Gayon and Michel Veuille provides an interesting description of the (largely unknown and unrecognized) pioneering studies of the French scientists L'Héritier and Teissier on genetics of experimental populations of *Drosophila melanogaster*, carried out in the 1930s. The following article by Diane Paul and Hamish Spencer, titled 'Did eugenics rest on an elementary mistake?', shows how the application of the well-known, simple Hardy-Weinberg law shows the futility of trying to remove a recessive allele from a population by preventing the affected from breeding—a coercive measure vociferously advocated by the 'ignorant . . . muddled . . . foolish and inhumane' eugenicists. In the following article, intriguingly titled 'Can the norm of reaction save the gene concept?', Raphael Falk discusses the extremely important concept of 'the norm of a reaction', which describes an interaction between genotypes and environment (though most readers of this journal would perhaps be totally unaware that the gene concept was under some kind of threat and required a saving act!). Maryellen Ruvoldo and Mark Seielstad, revisiting Lewontin's seminal 1972 article 'The apportionment of human diversity' twentyfive years later, point out how it asked the right question (relative magnitude of within-group and between-group variation as judged by classical polymorphism), and how the modern investigations with RFLPs, mitochondrial DNA restriction sites and microsatellites of autosomes and Y chromosomes have confirmed time and again the correctness of his answer. Of greatest interest to Indian readers is the next article, by Rama Singh, on 'The Indian caste system, human diversity, and genetic determinism'. Exceptional in clarity, remarkable in scope, providing a scholarly account based on fields as diverse as archaeology, anthropology, religion, history, molecular biology, comparative linguistics and population genetics (to name just a few!), the author has been very successful in accomplishing the purpose of the essay: ' . . . to provide sufficient background on the religious and social structure of the Indian caste system and compare it with the British class system and American race theory'. Few contemporary topics in India are as capable of whipping up passions as the differences in people belonging to different castes, religions or ethnic groups, and this article by Rama Singh is a superb example of a critical and incisive analysis (amply supported by a wealth of scientific evidence) of these very differences, presented in a completely dispassionate and highly readable and lucid manner.

The next section, on philosophy of evolutionary biology, opens with the article 'Selfish genes or developmental systems?' by Russell Gray, which begins with a gem of a quotation from Lewontin: 'The price of metaphor is eternal vigilance' (and the subsequent articles in the section bring home this truth again and again!). Gray forcefully argues that 'replacing all talk of replicators

and vehicles with a focus on developmental systems and their contingent reproduction would not only be more accurate, but it would also facilitate the integration of development into evolutionary theory'. The highlight of this section is the next essay by the (late) legendary Stephen Jay Gould, with a title long enough to serve as its summary: 'The evolutionary definition of selective agency, validation of the theory of hierarchical selection, and the fallacy of the selfish gene'. For those who are familiar with the writings of Gould, there is no need for me to say anything more (and for those unfortunate enough not to have read him, there is no point). In the next article, 'Reductionism in genetics and the human genome project', Sahotra Sarkar describes, in his usual polished manner, an insightful, hitherto unnoticed, methodological objection to the Human Genome Project: 'the undeniable explanatory success of molecular biology is not necessarily a success of genetics'. Perhaps even more important than the comments on the Human Genome Project, however, is his crisp and penetrating account of reduction and reductionism in genetics. The following article by Peter Godfrey-Smith (a non-Marxist admirer of Lewontin) provides an interesting commentary on the dialectical approach (as opposed to Cartesian reductionism) preferred by Lewontin to the problem of organism-environment interaction (I must confess that, notwithstanding Lewontin's clarity of exposition, I have been unable to grasp, even dimly, the exact meaning (if any) of the terms 'problematic' (used as a noun), and 'dialectic'—and the fault is surely mine). Elisabeth Lloyd's authoritative and comprehensive discussion of ' . . . four distinct questions involved in the contemporary units of selection debates' presented in the next contribution deserves to be a mandatory reading assignment for all graduate students of evolutionary biology.

Constraints of space preclude description of the remaining articles in this section (and of a few more in the next section). Befitting their inclusion in this volume, they are informative, thorough, scholarly and interesting. Particularly noteworthy are the snippets about the authors' interactions with Lewontin. The normal practitioners of genetics and evolutionary biology may, however, on going through many of these essays, pardonably declare that (for example) it is infinitely easier to sequence a gene, and compute its degree of homology with others in the database, than to try to judge whether genes are selfish replicators or mere accounting devices, and deciphering the level of selection they belong to!

The final section of nine articles dealing with the politics of evolutionary biology also provides a rich and varied fare. Some of the unusual topics are: 'Identity politics and biology' (dealing with minorities of various kinds) by Ruth Hubbard, 'The agroecosystem: the modern vision in crisis, the alternative evolving' by John Vandermeer (the problems of modern agriculture and possible

alternatives), and the extremely fascinating 'Political economy of agricultural genetics' by Jean-Pierre Berlan, which describes the strategies of the seed companies. The poignant lessons described in Berlan's article will be of special interest to Indian geneticists (and in fact, also to a much wider audience) in view of the recent controversy regarding genetically modified crops and the role of multinational seed companies. A special mention must also be made of Richard Levins's article on chaotic systems (attractively titled 'The butterfly ex machina'). Not only does it provide an extremely accessible account of the dynamics of chaotic systems, but also indicates some robust criteria that reign in their (often) far-fetched applications to complex systems. The last article in the volume, 'What causes cancer? A political history of recent debates' by Robert Proctor, provides a fitting finale to this excellent collection. Beginning with the most entertaining statement of Gibson's law (for every Ph.D. there is an equal and opposite Ph.D.), it provides evidence for the first documented decline in mortality due to cancer (a drop of about 3% from 1990 to 1995), but then raises very disturbing questions about assigning reasons for this decrease. Taking the reader expertly through a maze of complex interacting interests, it ends with a thought-

provoking commentary on the state of affairs about cancer, which unfortunately is applicable to many other, perhaps equally important agents: '*We already know that half of all cancers are preventable, and we already have the knowledge required to avert those cancers. Cancer campaigns have neglected prevention for several reasons, having to do with the prestige of basic research and the reductionist conception of causes in terms of mechanisms but also from the political fact that prevention generally requires stepping on a lot of powerful political toes. Until this is realized, and acted upon, I fear we will be in a position something akin to that of a Cassandra—blessed with ever finer knowledge of our fate but with little ability to change it.*'

This has decidedly been a rather inadequate and biased glimpse of a set of exceptional articles on evolution. It is extremely unlikely that many readers will have either the access or the time (or perhaps the patience!) to go through all the articles. However, as someone who has been extremely fortunate in having been offered that opportunity, I can honestly state that not only a biologist, but also every practising scientist (including social scientists) will find reading the articles in this volume a very rewarding experience.