

Book Reviews

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Introduction to Conservation Genetics. R. FRANKHAM,
J. D. BALLOU and D. A. BRISCOE. Cambridge University Press.

Published in 2002, this book is much, much more than an ‘introduction’ to conservation genetics, it is an in-depth treatment of the subject suitable (as the preface tells us) as a university textbook and for professionals in the field. After a preface and a couple of introductory chapters, it has two large sections on ‘Evolutionary Genetics of Natural Populations’ (182 pages; 7 chapters, including one specifically on small populations) and ‘Effects of Population Size Reduction’ (135 pages; 5 chapters), which together amount to a textbook in evolutionary population genetics, liberally illustrated with examples from endangered animals and plants or laboratory models, often the Frankham-Briscoe lab’s own highly illustrative experiments with *Drosophila*. The final section, ‘From Theory to Practice’ (170 pages; 6 chapters) covers the practical application of the tools and principles discovered in the first two sections and ranges widely, from species definitions through uses of molecular markers to management advice in captive breeding. As in any good textbook, each chapter ends with further reading and problems, and at the back there is a list of take home messages, a set of revision problems, an extensive glossary, the reference list and the index. Truly this is a massive enterprise.

Rightly, the book places quantitative genetic variation, especially for reproductive fitness, firmly at centre stage in conservation genetics, and its main business is to consider the consequences of population size (and change) for this kind of variation. Molecular markers, especially non-expressed DNA markers, have many useful roles in conservation genetics documented here, but we should not (and here do not) lose sight of the central concern, which is expressed variation. The clarity of presentation of many population genetics issues is excellent. Although the treatment becomes reasonably mathematical at times, to a greater extent than most textbooks, this one delivers worked examples of even the simplest formulae,

and line-by-line algebra, making it very accessible to the mathematically challenged. The authors are also appropriately candid about uncertainties, for example in chapter 13, when writing about the mutational meltdown hypothesis and the effective population size required to avoid inbreeding depression; and they are appropriately dismissive, for example in chapter 12 when writing about fluctuating asymmetry as a way of detecting inbreeding depression. In fact sections 1 and 2 struck me as an excellent teaching resources for university-level evolutionary genetics, with the added benefit that undergraduates will be attracted to a textbook that is so overtly about conservation.

I found few serious issues to argue about in the text, which, considering the scale of the enterprise, is remarkably free of errors. The errors that have been spotted so far can be found on the book’s web page at <http://consgen.mq.edu.au/>.

The main criticisms one can make of this book concern its organisation and presentation. In their preface, the authors say that the organisation of material has been arrived at from teaching experience, and that some repetition results from trying to make each chapter the basis for a free-standing lecture. However, as a reader I found the extensive revisiting of topics and examples trying. Part of the problem comes from the separation of the two first sections, because events in small populations are described in a section 1 chapter, but then revisited in section 2 as events in *declining* populations. In consequence, by the time we reach the main treatment of inbreeding and inbreeding depression in section 2, we have already read quite a lot about them, both in an introductory chapter and in section 1. Furthermore, the main discussion of selfing in plants, a normal behaviour for some 20% of plants, ends up in section 2 about declining populations, which seems strange. Similarly, other topics such as effective population size and genetic rescue of inbred populations by supplementation are covered in more than one place. The organisation also leads to extensive revisiting of the same cases studies in different parts of the book. To give some extreme examples: the greater prairie

chicken and the northern hairy-nosed wombat appear ten times, the California condor 16 times, and the golden lion tamarin 17 times. I can't help feeling that a combination of more restraint on picking examples and more thorough treatment of some of these major case studies, bringing all the information to one place, would have brought economy of effort (writing and reading).

The production style adds to the sense of scattered facts. The main text is mostly in paragraphs, but regularly breaks out into lists of bullet points and equations. Aside from the main text, there are numbered boxes, examples, figures and tables. There are also frequent line drawings of the organisms under discussion and marginal summaries of the adjacent text. The overall effect is to break up the flow somewhat, as one flits from text to one of the display items and back, being careful to remember whether one is looking for Box 12.1, Example 12.1, Figure 12.1 or Table 12.1 (they all exist).

Given these remarks, the recent publication of a much shorter primer associated with this book sounds like a very good idea indeed.

In terms of content, so few stones are left unturned that it seems churlish to point out any omissions, yet for such a thorough treatment, I do think there are a couple. Compared with the heavy working of some case histories such as the Northern elephant seal and the golden lion tamarin, I was surprised that the cheetah has such a low profile in this book. There is no thoroughgoing treatment of the arguments that have surrounded this species, which is a shame, since its relative lack of molecular variation led to several arguable inferences that need to be set straight, and these authors could have done it.

Similarly, in this determinedly apolitical book, the main omission for me is discussion of the value-for-money of conservation genetics. Despite the 617 pages here, I believe that some remarkably simple and cheap rules of thumb exist for practical genetic management of endangered populations. Indeed, the book comes up with several: To avoid inbreeding depression, keep N_e at >50 ; to retain evolutionary potential, keep $N_e >500$; N_e is likely to be around 0·1 of census population size for many organisms; captive breeding introduces problems of its own, so only use it as a last resort; minimise kinship of mates in captive breeding programmes (more can be found in the book's closing list of take-home messages). To what extent should scarce conservation funds be spent on conservation genetics, for example on molecular surveys or computer modelling of endangered populations, versus securing their habitat or understanding the ecological causes of decline? If conservation geneticists can lever additional funds specifically for their work, then great, but mainstream conservation money should surely be spent on habitat protection and understanding of

ecology? I should have liked some discussion of this issue.

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DNA: Changing Science and Society. Ed. T. KRUDA.
Cambridge University Press. 2003. 193 pages. ISBN
0 521 82378 1. Price £25.00 (hardback).

To celebrate the 50th anniversary of the publication of Watson and Crick's model of the structure of DNA, Darwin College, Cambridge marked the event by holding a series of lectures by distinguished speakers to explore the impact of our understanding of DNA on contemporary science and society. This book comprises the eight essays based on these lectures, together with a short introductory summary by the editor, Torsten Krude. Its breadth illustrates how pervasive a topic DNA has become and how iconic its structure. Nevertheless whilst the public now accepts its use in forensic studies, for example, many remain wary of changes produced by genetic manipulation. This is not least because of an unwillingness by individuals, the press, and particularly the antagonists, to consider the problem at a finer level than is, for example, GM food safe or not, regardless of the insertion technique or construct.

The first chapter, by Aaron Klug, differs from the rest in dealing not with contemporary issues, but with the history of the discovery of DNA. It features the crucial work on x-ray crystallography, particularly that of Rosalind Franklin, and how that can be interpreted, showing some of the well and less known photographs. It is not a simple read, but interesting and informative.

The remaining essays can be grouped into those which mainly consider current technical developments, perhaps with historical background, and those which mainly deal with some of the political and ethical issues that arise from developments in genetic technology. In the former are Alec Jeffreys on Genetic Fingerprinting, Svante Pääbo on Ancient DNA, Ron Laskey on DNA and cancer, Robert Winston on DNA and reproductive medicine, and Dorothy Bishop on Genes and language. They provide nice reviews, which would be useful for a person requiring background knowledge in some of the applications of DNA. The professional is likely to find most interesting that which he knows least about: in my case the genetics of language, but the discussion here is mostly limited to what determines the ability to construct language and an argument against Chomsky's view that grammatical structures are inherited.

The discussions on DNA, biotechnology and society by Malcolm Grant, who was Chair of the Agriculture and Environment Biotechnology Committee, and on DNA and ethics by the philosopher Onora O'Neill seem to me well reasoned discussions. Not least both argue against the simplistic view that, for example, decisions should not be based on a strong version of the Precautionary Principle, which are argued by some ‘provides reasons for avoiding all GM technologies, indeed all new technologies, that *might* have bad consequences (O’Neill, p. 171)’. I was, however, disappointed that, in her discussion of individual’s rights on their DNA, she did not discuss

the use of such information in life and health insurance.

The content is not, with few exceptions, highly technical and should be readily accessible to a broad audience. Also citations are not given to specific papers, but a short list of background reading is given in each chapter. Overall, this book is a diverse and enjoyable book, which I hope gets a broad readership.

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