

as a process that would have greatly surprised Charles Darwin, and little of relevance to the concerns of geneticists.

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The Genetics of Populations. By JAY L. LUSH. Edited by ARTHUR B. CHAPMAN and ROBERT R. SHRODE, with an addendum by JAMES F. CROW. Iowa State University. 1994. Available from R. Willham, 239 Kildee, Iowa State University, Ames, IA 50011-3150. 900 pages. Price US\$45.00. No ISBN number.

Not many scientists have enough impact on their chosen discipline to have their books published twelve years after their death. Dr J. L. Lush (1896–1982) was, for most of his long life, the supreme authority on the application of quantitative genetics to animal breeding, and his influence through his research and teaching – particularly his teaching – was incalculable. His book *Animal Breeding Plans* was first published in 1937, so no one still at work has much experience of life before Lush. The book had reached its fourth edition by 1949, but by that time it was already being superseded by a set of mimeographed notes. These notes, initially prepared by Lush for his students, were much more explanatory than the book, and set out the statistical derivations in a much more satisfactory manner. They eventually became widely circulated though often difficult to obtain. Dr Lush, in his characteristic quest for perfection, kept on revising and improving them until his health failed, when he asked Dr Chapman to complete the task. With further help from Drs Shrode and Crow, this was finally achieved and the present volume is the result.

The editors wisely resisted the temptation to introduce extensive alterations, though they do supply some valuable footnotes and an addendum. The addendum, by Professor Crow, lists a number of points of clarification or correction. What we have is a book very much like what Lush himself might have written had he completed it himself. It is his thinking, and the clarity of his thought, that comes through the 900 pages. This is the strength of the volume.

The cover is adorned with a well-known formula on progress under family selection. Inside the covers, there are plenty more formulae of the same ilk, bringing the comfort of familiarity to those of us for whom this was bread and butter for most of our working lives. The material still is, and will remain, the essence of the teaching of animal breeding for some time to come. The text surrounding the formulae can still be read with pleasure, and few readers will fail to gain new insights into what they thought they understood. For all that, we are grateful. We should

be more grateful still had we been provided with a subject index. Despite a fairly detailed table of contents, not everything falls neatly into place. For instance, there are some incisive comments on the effect of linkage on genetic limits at the end of an early chapter on Mean and Variance – not at all where you might first think of looking.

However, nothing stands still. We are told in the preface that Lush himself had wanted to re-write certain parts of the book in the context of the developments in molecular genetics. It would be interesting to speculate what he might have said. Nor is that all. Since Lush died, there has been a spectacular explosion in the adoption of breeding methods that owe their power to advances in computing technology. Nowadays, if acronyms like BLUP and REML do not trip easily off your tongue, you cannot even hold an intelligent conversation about animal breeding. This is all post-Lush. As Professor Crow states in the introduction to his addendum, the book shows its age and is strikingly dated. This, as Professor Crow is anxious to point out, is no fault of the author. Still, it says everything.

Why then publish such a volume? The reasons are set out in the preface.

We believe it to be a valuable document for those with interest in a scientific approach to the genetic improvement of animals and plants. The book is of historical interest and importance because of the role this scientific approach played in Lush's contributions to research and teaching in the field of animal breeding.

Few reviewers, I imagine, will fail to echo these sentiments.

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Animal Breeding. By GERALD WIENER. The Macmillan Press. 1994. 208 pages. Price £5.99. ISBN 0 333 57298 X.

Animal breeding (used here to imply genetic improvement rather than reproduction), is an essential component of any efficient production system in temperate or in tropical environments. There is, nevertheless, a dearth of good texts for students and for practical breeders at both the basic and advanced level. This book is a welcome addition to the literature.

It is published in a series entitled *The Tropical Agriculturalist*, intended as field guides and textbooks. The principles of improvement are not, of course, any different whether they are to be applied in a developing tropical country or a developed temperate country, although some variation in emphasis is appropriate. There are, however significant differences in the sorts of problems encountered in practice, and it is nice to see the critical ideas of genotype × environment interaction brought into the introductory chapter, for

this is the major reason, apart from prejudice, why the topical breeder may not use the best stock available world-wide.

Gerald Wiener was formerly a member of the AFRC Animal Breeding Research Organisation (ABRO) in Edinburgh and has extensive experience of teaching students of tropical animal production and of consulting in developing countries. He is to be commended on writing a short and clear text and the publishers for pricing it at a very low level for a textbook. It deserves a widespread audience among undergraduate students and breeders, whatever the environment in which they keep their animals. The important topics are all touched upon, but the depth and quality of treatment are not uniform, reflecting the author's experience (and perhaps this reviewer's bias).

Strong points are the discussions of crossbreeding and of inbreeding, in which there are clear formulae and nice examples of practice. If, in the unlikely event that anyone was thinking of running an inbreeding programme, he will be put off by the pictures of unfit inbred sheep (taken from ABRO experiments). There are good descriptions of different types of breeding programme, with the basis for their choice and examples of their use. Obviously they are only outlines for any individual species, but a useful start nevertheless. There is a nice summary of new, including molecular, developments. The coverage is weaker on modern methods adopted in breed improvement, for example on indices combining records on the individual and his/her relative performance and on best linear unbiased prediction (BLUP). Although the computational procedures used in BLUP are obviously well outside the scope of this book, the results are the standard for comparing candidates for selection, for example of temperate bred dairy sires for use throughout the world. Even the definition of breeding value in the Glossary is unhelpful: 'Genetic worth of an animal in respect of a particular trait or combination of traits.' It is important that practitioners know what lists of breeding values or transmitting abilities computed by BLUP mean.

I found few errors, but the example (p. 147) on testing a bull for a genetic defect with females of unknown genotype is misleading: 'Mate the bull to his daughters. If the bull carries the defect but does not show it, he is expected to pass the allele responsible to 50% of his daughters. If he is then mated to his own daughters, the expectation is that, on average, 25% of them will have offspring which are homozygotes for the recessive and show the defect. Ten normal offspring from such matings (and no defectives) would provide reasonable confidence that the bull was not a carrier but would not prove it. There is still 1 chance in 20 that this [outcome] fails to detect the bull as a carrier.' Don't bet on it!

I hope the book will find a readership among those with a professional interest in general animal pro-

duction, for it could go some way to reduce the widespread ignorance of the opportunities for and successes of genetic improvement of livestock.

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Biological Inheritance: An Introductory Genetics Text.

By W. J. C. ROBERTS. Book Guild. 1994. 671 pages.

Price £30. ISBN 0 86332 729 X.

This book was written by a public (private) schoolmaster from the notes he used when preparing his pupils for the Oxford and Cambridge Entrance examinations. With the recent doubling of the number of British Universities only schools with an historical attachment to these tests are likely to train their students for them; and this market must be small and diminishing. Extra material has been added to make the text 'appropriate to first and second year biology or genetics students', a much larger readership, but one already well provided for.

The material is presented, Roberts says, 'in the order I use for my own teaching... and which I would use for my own learning'; but school pupils are nowhere given guidance as to how much they should know or how to pick and choose across these many pages. With changes imminent in the British School Curriculum, a pack of publishers is now preparing to capture this business by providing *ca.* 100 page texts, illustrated and laid out using the latest design technology; whereas Roberts' pictures are mostly little more than blackboard sketches in an old-fashioned-looking book. It is obviously unlikely to be a winner in this market. Some schools may want to have a copy in their library for the coverage it apparently gives of cancer (no *ras* genes?), human genetic diseases (very incomplete), ethics (superficial), population mathematics (elementary) etc. But no!

The remaining question is: can *Biological Inheritance* be used by undergraduates? In my experience, University teachers usually recommend a text which is up-to-date and corresponds to their interests. They then proceed, doing their own thing, to give a course which may have little relation to the emphases of that text, and, in a flurry of enthusiasm, rightly pursue a topic to the point where students anxiously await the next number of *Genetical Research*, or whatever, for the ensuing instalment of the story; and they often ignore whole areas of the subject; say, population mathematics, as old hat. The textbook is a safety net in which the student will find topics not dealt with in detail in the course, or will find particulars there is no time to cover in lecture or seminar. Open University courses (distance learning) seem to be the exception to this rule, for good reasons.

Biological Inheritance falls very far short of being a safety net. There are many *ex cathedra* statements