Book reviews

Genetics and Analysis of Quantitative Traits. Michael Lynch and Bruce Walsh. Sinauer Associates, Inc., Sunderland, Massachusetts. 1998. Pp 980. Price £34.95, hardback. ISBN 0 87893 481 2.

Whilst this is not a book for bedtime reading it is a timely reminder of the power of quantitative genetics in understanding the genetics of characters. The authors state in the preface that they set out with the goal of 'bringing together the diverse array of theoretical and empirical applications of quantitative genetics under one cover, in a way that would be both comprehensive and accessible to anyone with a rudimentary understanding of statistics and genetics.' A fine ambition but they have had to acknowledge that such a project would have resulted in a door-step rather than a book and this volume of just short of one thousand pages represents a job approximately half done.

The current volume is broken down into three sections: 'Foundations of Quantitative Genetics', 'Quantitative Trait Loci', and 'Estimation Procedures'. The first section gives a thorough introduction to basic principles. I welcome its inclusion because it establishes the background necessary for the next two sections. The section includes chapters on 'Properties of Distributions', 'Covariance, Regression, and Correlation', and 'Introduction of Matrix Algebra and Linear Models'. These three chapters are particularly valuable as they enable the uninitiated, and probably some initiated, readers to follow the mathematics behind the various equations presented elsewhere.

The second section deals with the concepts behind the control of quantitative traits and the identification of major genes. There follows a brief introduction to genetic maps which leads into chapters on Quantitative Trait Loci (QTL) mapping in inbreeders and outbreeders. This section is particularly relevant at the moment given the development of new methods of QTL mapping and the deluge of publications on the subject and, commendably, is well up-to-date, both with experimental approaches and published results.

The final section on estimation covers the usual topics with up-to-date examples where applicable. I feel that the section on genotype $\times$ environment interaction is rather brief, as such interactions are an important component of multi-environment trials and there are a range of methodologies to interpret them. The authors do refer to various reviews on the subject and give the reader a comprehensive review of the theory and analysis of linear genotype $\times$ environment interactions. The two final chapters are on 'Estimation of Breeding Values' and 'Variance Component Estimation'. These techniques are being applied in animal and, to a lesser extent, plant breeding. Consequently, breeding values and variance component estima-

tion are appearing in more and more publications so these chapters are again very relevant.

In general, the book is very well structured with plenty of worked examples to illustrate each concept being discussed, together with historical details where appropriate. The authors' aim of producing a book suitable for use both as a text-book in quantitative genetics and as a basic reference for research workers has, in my opinion, been achieved. I am glad to see that the authors see fit to remind people that quantitative genetics is not dead and that its alliance with molecular and developmental biology will provide a powerful basis for understanding the genetics of complex traits. I look forward to the second volume!

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The Genetics of the Pig. M. F. Rothschild and A. Ruvinsky (eds). CAB International, Wallingford. 1998. Pp. 622. Price £85.00, hardback. ISBN 0 85199 229 3.

In the preface the Editors set themselves the task: 'to present in one location a complete, comprehensive and updated description of the modern genetics of the pig ... to combine essential knowledge from the various fields of genetics integrated with livestock production in order to provide a useful and informative guide on the genetic improvement of the pig'. This purpose has been effectively achieved in the 18 chapters encompassing some 550 pages of text. The chapters follow a logical progression from 'Systematics and Evolution of the Pig', through to performance traits and meat quality. Despite the wide range of internationally-recognised authors, the editors have attained a remarkable standard of uniformity of presentation style. Although many of the topics were heavy going for this reviewer the style of writing and presentation was very acceptable. Furthermore the detailed chapter contents provide an easy means of homing in on particular topics. The extensive reference lists will also be of value to those less familiar with aspects of the subject.

Whilst the book is primarily aimed at the geneticist, it is of potential interest to a wide range of specialists. For example the chapter on domestication, breeds and their origin is very readable and provides useful references and source material particularly relating to the 17th and 18th Centuries. The chapter on morphological traits and inherited disorders summarises some 161 traits disorders and this, and the following chapter on biochemical genetics, should be relevant to a wider audience including those in

the medical field. The chapters on molecular genetics, immunogenetics, cytogenetics and gene linkage maps were a little beyond this reviewer but appeared readable and coherent.

Animal welfare has become an important issue in many countries. The chapter on genetics of behaviour is a balanced approach to the welfare issue and provides up-to-date information on aspects such as abnormal behaviours. Similarly, the chapter on transgenics and modern reproductive technologies provides what this reviewer regards as a balanced and common sense approach to the role of these technologies. These and later chapters will be of considerable interest to students of Animal Science in general.

The two Appendices providing up-to-date genetic linkage maps of the pig and a listing of identified loci will, no doubt, be of considerable value in providing an accessible summary of the state of play of gene mapping in 1998. In summary, this book lives up to the claims which have been made on the back cover and should find a wide readership, especially for reference to particular chapters.

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The Variation of Animals and Plants under Domestication (2 vols). Charles Darwin. The Johns Hopkins University Press, Baltimore. 1998. Pp. 473 (Vol. 1), 495 (Vol. 2). Price £15.50 (each), paperback. ISBN 0 8018 5866 6 (Vol. 1), 0 8018 5867 4 (Vol. 2).

In 1858, Charles Darwin learned that Alfred Russel Wallace had, quite independently, formulated the very theory of Natural Selection that he had himself been working on for twenty years. Fearing loss of priority, Darwin rushed a brief formulation of his own version of the theory into print in a short book. This short book, *On the Origin of Species* (1859), instantly became, and has remained, the classic text of evolutionary theory. The *Origin* quickly won the scientific community over to the notion that species have evolved, but the book was far less successful in establishing the mechanism that drove evolution along. Natural Selection theory, as presented in the *Origin*, was neither entirely clear nor entirely persuasive.

In 1868, after nearly a decade of intense debate about every aspect of evolution, Darwin published a further, far lengthier book — *The Variation of Plants and Animals under Domestication*. The second edition of this two-volume work (London, 1875, New York, 1883) has now been reprinted, in facsimile format, with a brief new foreword by the historian Harriet Ritvo. *The Variation* is in many ways a clumsy book, for Darwin was wrestling with so many intractable problems that a clear line scarcely emerges. First, he wanted to present in full the

reams of evidence, painstakingly collected over twenty-five years or so, of variation in domesticated species. He had been obliged brutally to summarize and compress this evidence into a single chapter of the *Origin*. Secondly, he wanted to clarify his theory of Natural Selection. Thirdly, he wanted to launch a hypothesis that the *Origin* conspicuously lacks — a hypothesis to account for the facts of heredity. And fourthly, he wanted to make clear his views on whether a benign creator can be envisaged, guiding and supervising evolution. (He thought not.)

Darwin called his new hypothesis about heredity 'pangenesis'. He proposed that all cells in the body 'throw off minute granules which are dispersed throughout the system'. These hypothetical granules, or 'gemmules', as he termed them, 'are collected from all parts of the system to constitute the sexual elements, and their development in the next generation forms a new being'. (Vol. 2, p. 370) The hypothesis of pangenesis did not prosper, and Darwin sadly watched it die a scientific death, but it is of great interest, for it shows something of Darwin's need to devise a theory that would supply a mechanism for the genetic feature whose reality and efficacy he did not doubt, and upon which he had come increasingly to rely, namely, the inheritance of acquired characteristics.

The Variation, with its thousands of hard-won observations of the facts of variation in domesticated species, is a frustrating, but worthwhile read, for it reveals the Darwin we rarely see — the embattled Darwin, struggling to keep his project on the road. Sometimes he seems on the verge of being overwhelmed by the problems he is dealing with, but then a curious fact of natural history will engage him (the webbing between water gun-dogs' toes, the absurdly short beak of a pouter pigeon) and his determination to make sense of it rekindles. As he disarmingly declares, 'The whole subject of inheritance is wonderful.' (Vol. 1, p. 446).

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Horizontal Gene Transfer. Michael Syvanen and Clarence I. Kado (eds). Chapman and Hall, London. 1998. Pp. 474. Price £79.00, hardback. ISBN 0 412 79310 5.

Horizontal gene transfer has, in recent years, been found to be increasingly important in many seemingly unrelated areas of biological science. Initially the phenomenon was only thought to be important in the transfer of antibiotic resistance between bacteria. However genetic elements capable of transfer to and between higher organisms, such as plants, fungi and humans, have been discovered. Horizontal gene transfer has now been shown to have import-

ant implications for human health, agriculture, taxonomy, epidemiology and of course the evolution of organisms.

This excellent book brings together workers who are active in the field, so that the reader is given an overview of the current research effort in this area rather than a comprehensive survey of horizontal gene transfer. In the first chapter the editors provide a clear and thought provoking introduction to the subject. They end their introduction with a stimulating discussion of the possible origins of the eukaryotic cell in the light of some of the arguments presented in the book.

The book consists of 34 chapters in five parts. Part 1 deals in some detail with the mechanisms of gene transfer. Reflecting the research effort into this area, this section is dominated by work on bacterial plasmids, although there is a welcome chapter discussing the mechanisms of conjugative transposition. In my view this area remains under-investigated given the importance of these elements. Also in Part 1 there are chapters covering the mechanisms of both plasmid and non-plasmid transfer into eukaryotic cells. In Part 2 there is a series of chapters that discuss the role and frequency of bacterial gene transfer in nature. Again the importance of the phenomenon is underlined. In Part 3 we are shown that the phenomenon is not confined to bacteria and convincing evidence is presented that insect transposons have been transferred horizontally. In Part 4 examples of trans-kingdom gene transfer are

presented. Part 5 contains articles that deal with macro-evolutionary trends.

There is at least one notable omission from the book in that the mobile self-splicing group I and group II introns are not discussed at all. These elements have often been found to be contained within genetic elements capable of mediating their own horizontal transfer (e.g. one has been found on a conjugative transposon). Furthermore, the self-splicing introns fit the editors' own criteria for inclusion as they are the focus of study of a number of active research groups. Nevertheless, this is the most up-to-date and comprehensive account of horizontal gene transfer available in one publication.

This book is likely to be useful to biologists working in many different areas as it emphasises the interconnections between diverse forms of life. I would highly recommend this book to all research scientists, research students, final year undergraduates and to anyone who wants to gain a deeper appreciation of the general importance of horizontal gene transfer.

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Books received

Foundations of Social Evolution. Steven A. Frank. Princeton University Press, Princeton, N.J. 1998. Pp. 268. Price £13.95, paperback. ISBN 0 691 05934 9.

Genetic Engineering — Principles and Methods, Vol. 20. Jane K. Setlow (ed.). Plenum Press, New York. 1998. Pp. 292. Price \$95.00, hardback. ISBN 0 306 45911 6.

Sperm Competition and Sexual Selection. T. R. Birkhead and A. P. Møller (eds). Academic Press, London. 1998. Pp. 826. Price £39.95, paperback. ISBN 0 12 100543 7.

Interpreting DNA Evidence: Statistical Genetics for Forensic Scientists. Ian W. Evett and Bruce S. Weir. Sinauer Associates Inc, Sunderland, Massachusetts. 1998. Pp. 278. Price £25.95, paperback. ISBN 0 87893 155 4.

Drosophila — A Practical Approach (2nd edn). David B. Roberts (ed.). IRL Press (Oxford University Press),

Oxford. 1998. Pp. 389. Price £29.95, paperback. ISBN 0 19 963660 5.

Phenotypic Evolution — A Reaction Norm Perspective. Carl D. Schlichting and Massimo Pigliucci. Sinauer Associates Inc, Sunderland, Massachusetts. 1998. Pp. 387. Price £29.95, paperback. ISBN 0 87893 799 4.

Molecular Genetic Analysis of Populations — A Practical Approach (2nd edn). A. R. Hoelzel (ed.). IRL Press (Oxford University Press), Oxford. 1998. Pp. 445. Price £29.95, paperback. ISBN 0 19 963635 4.

Molecular Biology Labfax I. Recombinant DNA. T. A. Brown. Academic Press, San Diego. 1998. Pp. 377. Price \$59.95, hardback. ISBN 0 12 136055 5.

Molecular Biology Labfax II. Gene Analysis. T. A. Brown. Academic Press, San Diego. 1998. Pp. 255. Price \$59.95, hardback. ISBN 0 12 136110 1.