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BOOK REVIEWS

Analysis of Human Genetic Linkage. By JURG OTT. Baltimore: Johns Hopkins University Press. 1985. 223 pages. £33.60. ISGN 0 8018 2485 0.

Anyone who has been involved in human genetic linkage over the past few years will appreciate how complex the field has become. Although there are several excellent textbooks available which give a full account of the basic concepts, they do not cover the more complex situations arising today. I was therefore quite excited to learn that Jurg Ott's book was now available. Here was an opportunity for all the new ideas to be brought together.

The book is prefaced with a note to the reader explaining the purposes of the book. One is to provide a guide to practitioners, to assist them in their analyses and to highlight possible pitfalls, and the other is to present a unified likelihood approach to linkage analysis. The main emphasis is on the detection and measurement of linkage and on the formation of linkage maps. However, very little is said about the practical applications of genetic counselling. Inevitably, the book begins with a brief summary of Mendelian inheritance, genetic linkage and gene mapping. The second chapter introduces the statistical concepts required, such as maximum-likelihood estimation, hypothesis testing and lod scores. A chapter on numerical methods outlines the calculation of lod scores, using examples, but points out that explicit formulation of the likelihood is only feasible for small families and simple modes of inheritance. Relevant computer programs in use at various places are described, including one, available from the author, which runs on an IBM personal computer. The remainder of the book concentrates on recent developments. There are many situations where standard assumptions no longer hold, and each is discussed. For example, the recombination rate may depend on sex or age, or may show interfamilial differences requiring heterogeneity tests. Inconsistencies may be found in the recombination rate owing to ascertainment, misclassification or misspecificion of the model. Penetrance may be reduced, age or sex dependent, or the loci may be epistatic. Marker loci may even need special consideration as in the HLA system. Finally, multipoint linkage and the practical problems of sample size and genetic counselling are covered. An appendix gives Fortran listings of programs which find maximum-likelihood estimates of the recombination rate and confidence intervals from lod-score data and conduct heterogeneity tests.

The book provides an excellent and remarkably up-to-date summary of the techniques used in linkage analysis currently fragmented throughout the literature. The more mathematically demanding sections are said to be highlighted so that they can be omitted by those with more practical objectives. Despite this I found the tone of the book very mathematical throughout and more suited to quantitative geneticists than medical practitioners. Many of the sections are also relevant to those working with other species.

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General and Quantitative Genetics (*World Animal Science*, *A4*). Edited by A. B. CHAPMAN. Amsterdam. 1985. xiv+408 pages. US $92.50/Dfl. 250.00. ISBN 0 444 42203 X.

Although much practical animal breeding is common sense – if you want to improve a population, select the best animals – it is based on a firm theory of quantitative genetics. This theory, and results obtained from many selection experiments, enable the breeder to be confident that the selection he practises is likely to bring reward, and it enables him to design his improvement programme and to use data collected in an optimal way. There has been little need for the student or practitioner to know any genetics other than basic Mendelism and advanced quantitative genetics. We are now at a stage where there may be a major revolution in methodology through the use of recombinant DNA techniques; and even if the revolution never comes, the student requires much more knowledge and understanding of molecular genetics if he is to keep up with the new literature.

It is therefore appropriate that a text aimed at providing the range of genetics needed for livestock improvement should span the sections of this book: 'I: Genetics at the level of the individual', which is mainly Mendelism; 'II: Genetics at the level of the population', the longest section, on population and quantitative genetics and their application to animal breeding; 'III: Genetics at the level of the cell', on chromosomal inheritance and basic molecular biology; and 'IV: Genetic engineering', a single short chapter. This seems to me to be an appropriate structure, but the depth of coverage varies substantially; for example, the chapter on mitosis and meiosis spans 35 pages, and there is a further chapter on chromosome number, while that on prediction and measurement of response to selection is of 20 pages, with selection indices being covered separately.

The editor, A. B. Chapman, contributes no chapters himself. Over half (9 out of 16) are by W. D. Hohenboken, who covers most of of the quantitative genetics and related animal breeding theory, to which I shall return. There is a nice introductory chapter by J. F. Crow, setting a standard of clarity the rest find hard to maintain. D. L. Zartman describes mitosis and meiosis, but this is just boring textbook material, written for potential students of chromosomal analysis not future animal breeders. Chromosome numbers and aberrations in domestic animals are discussed in a more useful and critical manner by N. S. Fechheimer, who also considers the propects for genetic engineering in the final chapter. The problem with this last chapter, and to a somewhat lesser extent in what is an excellent review by M. A. J. Ansay and R. H. Hanset on molecular genetics and function of protein molecules, is that the chapters appear to have been written by 1981 although the book was not published until 1985. This puts the genetic engineering discussion into the pre-giant-mice era. Following Palmiter and Brinster's transgenic work it is clear that genes can be brought in from other species and expressed in a useful manner, but the problem of what genes to transfer is, as Fechheimer discusses, a major, if not insuperable problem.

The quantitative genetics and animal breeding of Hohenboken is generally sound and clear. The lack of depth is an advantage in that complicated mathematics can be avoided, but it is rather limited in that the author's knowledge and examples come mainly from beef-cattle breeding. Thus we see little considerations of long-term response, such as a poultry breeder might worry about, and the arguments are rarely very firmly based on quantitative genetic principles – for example, the consequences of artificial selection at the single-gene level. I was also surprised not to find the classical response formula $R = ir\sigma_A/L$ for selection of intensity i, accuracy r, genetic standard deviation σ_A and generation interval L derived and used. There are also a few minor errors: for example, three methods of estimating heritability of all-or-none traits are described (pp. 108–109), but two are essentially the same – the analysis of variance of zeros and ones, which is dismissed as analysis of non-normal data, and Robertson and Lerner's 1949 method, which is considered acceptable.

A greater mathematical understanding is required for Ronningen and Van Vleck's chapter on selection indices and best linear unbiased prediction. This is an admirably comprehensive and clear account. The remaining chapter, on inbreeding, is by Pirchner, who, along with Hohenboken on a number of topics, gives useful tables of statistics on different species.

The student of animal genetics and animal breeding will find this a useful volume, except for the material that has become dated during the publication process, while the research worker is unlikely to find enough depth. The price tag is $92.50, however, so we have the anomaly of a student's book at a price few students can afford, and research libraries are reluctant to buy non-specialist material.

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An Introduction to Medical Genetics, 8th edition. By J. A. FRASER ROBERTS and MARCUS E. PEMBREY. Oxford University Press. 1985. 394 pages. £11.95. ISBN 0 19 261409 6.

For a textbook in the rapidly advancing field of medical genetics to go into eight editions spread over a period of 45 years (1940–85) is a remarkable achievement by the authors – Dr Fraser Roberts, who wrote the first six editions, and Dr Marcus Pembrey, who helped him with the seventh and is mainly responsible for the eighth edition – and they are to be congratulated. So fast has recent progress been in the genetic study of man that there is now a special field, aptly named 'clinical genetics', which concentrates on human diseases and biochemical and anatomical abnormalities which have (or may have) a genetic basis, sometimes multifactorial, and on the complex problems of genetic counselling. Medical students, physicians, nurses and a variety of medical scientists all have an increasing need to understand Mendelian principles and their applications in a wide range of medical problems, and this textbook aims to fill their need and to indicate where they can go for more detailed information.

The book is simply and clearly written, assumes no knowledge of genetics in the reader, and avoids all but the simplest mathematics. After a short explanation of chromosomes and genes and their segregation behaviour, and the nature of the genetic code, we are given a number of detailed examples of defects due to dominant inheritance, recessive inheritance and *X*-linked inheritance. Chapters follow on molecular genetics and the haemoglobinopathies, the genetics of the blood groups and tissue types, genetic linkage,