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Book Reviews

Pattern Formation: Ciliate Studies and Models. By JOSEPH FRANKEL. Oxford University Press. 1989. 314 pages. Hardback £52.00. ISBN 0 19 504890 3.

Ciliate protozoa differ from all other organisms in a number of ways, and notably in the extraordinary complexity of their surfaces. Cilia are arranged in longitudinal rows and arise from the basal bodies, which are often interspersed with other structures, such as trichocysts in *Paramecium*. In addition the feeding system or oral apparatus involves a cavity containing special cilia and membranelles. All these are precisely arranged in intricate patterns. If one could understand the mechanism controlling the development and arrangement of these structures, it is possible that our understanding of cellular differentiation in multicellular organisms might also increase.

The subject was first raised forty years ago in a little book by André Lwoff (Lwoff, 1950) though the technical facilities then available were primitive in comparison with those we have today. A central theme was the supposedly determinative role of the kinetosomes (basal bodies) which were considered – in Lwoff's words – to be 'endowed with genetic continuity'. This notion is no longer taken seriously, though perhaps the matter is not entirely closed, in view of the recent startling report by Hall *et al.* (1989) that basal bodies in the alga *Chlamydomonas* are apparently controlled by supernumerary (extra nuclear) pieces of DNA.

In 1965 Beisson and Sonneborn showed that inverted ciliary rows in *Paramecium* were inherited autonomously, thus reinforcing the oft-expressed view of Sonneborn that there was more to genetics than the standard system of chromosomal genes made of DNA.

Now J. Frankel surveys a mass of data bearing on these questions using modern technical methods, especially electron microscopy, on a number of ciliate genera, such as *Paramecium*, *Tetrahymena*, *Euplotes* and *Stentor*. He describes the normal surface structures of these organisms, as well as various abnormal arrangements produced by microsurgery, spontaneous accidents during growth and – less commonly – by gene mutations. On the whole the description is clear and readers unfamiliar with these little animals should have no difficulty in following the story.

Fascinating though it may be to become aware of these amazingly complex micro-patterns, it has to be admitted that no new general principles emerge. In the author's words: 'no persuasive generalizations can be made', and he hints that a possible explanation of this lack is that the molecular analysis of cytoskeletal components of single cells is still in its infancy – or perhaps it has not begun.

This is not to say that the contents of this book are unimportant. To this reviewer they are very important, but perhaps their importance lies in the realization that current biological theory, especially that of molecular biology, gives us so little help in understanding what controls the surface structures of cells. This is a serious gap in our knowledge and Frankel has done a very worth while job in bringing it to the attention of such unprejudiced students of biology as may exist.

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Molecular Genetics in Diseases of Brain, Nerve, and Muscle. Edited by L. P. ROLLAND, D. S. WOOD, E. A. SCHON and S. DIMAURO. Oxford University Press. 1989. 481 pages. Price £45.00. ISBN 0 195 051 637.

High technology medicine has always been attractive to clinicians if not to hospital Finance Departments. Despite this, the 'new genetics' has been less accessible to many clinicians than other types of technological advance because of a serious communication barrier between molecular genetics and clinical medicine. In 1985, only 18% of United States Medical Schools had courses in genetics and the situation was little better in many famous British Medical Schools. This book is

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designed to help bridge that gap, to make genetics more tractable to clinicians if not the other way round. The first half of the book is therefore devoted to the language and tools of molecular genetics and prepares the ground excellently. The authors of this section are experienced and successful researchers in the field, so that there is something to be learnt and a wealth of useful references even for those in the field. More to the point, the chapters are well illustrated and clearly explained. The coverage is broad and the historical perspective is kept in mind so that current ideas and techniques are put into context. The second half of the book deals with specific disorders of nerve, brain and muscle in which molecular genetics has made an impact. Again, the contributors are experts in their respective fields and the section includes excellent articles on Lesch–Nyhan syndrome and the problems of gene therapy on phenylketonuria, Duchenne muscular dystrophy, Huntington's Disease and Familial Alzheimer's Disease and many other less well known, but equally interesting, disorders and molecular approaches. This section of the book will become outdated most rapidly but I do not think this matters since the articles provide good examples of the techniques outlined in the first section. A small final section deals with ethical issues in which Nancy Wexler discusses the opposition to recombinant DNA research and reminds us that in the United States 80% of the population approves of use of abortion if the child will suffer deformities or death. The problems of gene replacement in neurological disorders leave one with the impression that in most cases prevention is what it is all about, but issues of quality of life, individual choice, confidentiality, responsibility toward the next generation and legal obligations are sensitively discussed. The 'oracle of DNA' is indeed a powerful influence that needs careful prescription but, in the words of one living under the threat of developing Huntington's Disease, it has the potential to 'bring freedom from suffering, pain and fear in ways not yet imagined'. This book will help to make such sentiments seem less idealistic.

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Successful Tree Breeding with Index Selection. By P. P. COTTERILL and C. A. DEAN. CSIRO Publications, 314 Albert Street, East Melbourne, Victoria 3002, Australia. 1990. 80 pages. Paperback $US 30.00. ISBN 0 643 04990 8.

Many tree improvement programmes across the world are now entering their second generation. More and more, the breeder is having to focus his mind on the end product of his breeding and what qualities the desired 'improved' trees should have. Breeding for one trait is easy; even two traits is not much harder if the two are well correlated. But three or more traits including some that are negatively correlated but still of economic importance can give problems.

'Index selection' is an option that often gets mentioned in passing in general texts. Other literature goes into deep (overpowering) mathematical formulation in an attempt to demonstrate the efficiency of Index Selection and often confuses the practical tree breeder along the way.

At long last here is a readable account of how Index Selection can work for you. It could be renamed 'Index Selection without tears'. The book is only short – 74 pages – excluding references, but if you are thinking about index selection or want to know more about it £15 could not be better spent. Requiring only fundamental quantitative genetics the book proceeds in a logical sequence from selection for a single trait to more than one trait, calculations of genetic parameters, economic weights (including how to manage without them!), and then the gradual introduction of more complicated and sophisticated indices culminating in a step by step journey through a Smith–Hazel Index.

The book also describes a computer programme RESI (Restricted Selection Index) to compute selection indices using any combination of information from individual trees, sib relatives, offspring and parents.

Each chapter has a thoughtful 'conclusions'; a couple of paragraphs summarizing the gist of the chapter. The opening chapter is at pains to illustrate the efficiency of index selection. Breeders, the authors argue, are often pre-occupied with design of progeny tests rather than the selection procedure of individuals within the test. They show how selection has far more influence on genetic gain than mating design and give examples from Radiata pine breeding in Australia and New Zealand.

The authors are obviously sold on 'Index Selection' as the way forward for all tree breeding programmes. Other texts have said the same but failed to convince the reader with the mathematical constipation that follows. This is the most readable and understandable attempt yet and will take some beating. If you want to know about index selection you can not afford to not have this book.

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