in particular two aspects of it, firstly chromosome abnormalities and gross mutant genes which have severe effects on mental capactities and secondly the quantitative approach to the inheritance of intelligence.

Coping with this bias has led to some pretty boring texts in the past, but Hay avoids the main pitfalls. He began his research career with the Birmingham school of quantitative genetics. At the time they considered that animals only had behaviour while humans had psychology. Hence, uniquely so far as I know, they referred to the field as 'psychogenetics' in case they frightened off the psychologists. Hay seems to have no problems in keeping up his interest in all the different areas but he still sees himself as writing primarily for psychologists and at times, is faintly apologetic about why one needs to talk about Drosophila and rodents' as well as humans. I do not think he is very clear in his opening discussion of the way other fields relate to behaviour genetics and he fails to understand the scope of modern ethology, but this matters little for the framework of his book.

After a short chapter laying out the scope of the field and the plan of the book, it starts directly with the evidence on human chromosome abnormalities and single gene mutations, using this topic to illustrate the fundamentals of Mendelian genetics. He assumes no genetic knowledge and I agree that this is a good way to introduce psychologists with little science background to the basic phenomena. The next chapter moves on to the problems posed by quantitative variation – which is that manifested by most of the behavioural characters that have been studied – using a variety of good examples.

The introduction of the necessary formulae and algebraic manipulations is well done, and used to illustrate work with inbred lines and artificial selection, themes which are picked up later. The book moves on to two chapters organized around their experimental animals – invertebrates, pooled together for convenience, and rodents. Drosophila and mice have understandably been major subjects for behaviour genetics. Hay's review is up-to-date and he recognizes that what gets studied has often been dictated by what it is possible to measure and what genetic manipulations are feasible. The field offers a series of interesting glimpses but not a coherent picture. For the most part the examples are well described and well chosen.

The three final chapters return to humans. They deal primarily with the vast, tortuous and flawed literature on human cognitive abilities: the nature and validity of intelligence tests; the twin studies and the evidence from adoption; the debates on the efficacy of education programmes, on racial differences and, finally, a more general discussion on the social implications of genetical studies of behaviour. I know of no better account to give to students. Hay presents the studies as they stand, commenting neutrally, but certainly not uncritically. He also makes a point of summarizing at intervals the different sides of an argument. In these chapters, as throughout the book, he makes extensive use of quotations from primary sources and the conflicting styles in this controversial area come out well – all the major contributors are there. Burt's refusal to allow inadequacies in the data to hamper a genetical theory of intelligence is compared with Margaret Mead's acceptance – at best naive – of fairy tales about Samoan culture to justify an environmental theory of behaviour. This is good, and the final chapter takes the reader through the old arguments on the biological sources of human nature and speculation on what behaviour genetics may have to contribute to the debate and to policy. Hay is not overly optimistic. Rotten arguments on both sides will not rapidly go away, but this book will certainly help to make them more easily recognized.

AUBREY MANNING,
Department of Zoology,
University of Edinburgh

Foundations of Developmental Genetics. By D. J. PRITCHARD. Taylor & Francis, London. 1986. 372 pages. Hard, £33.00. Paper, £14.50. ISBN 0 85066 2877.

It is generally acknowledged that the genetic control of development is an integral part of the subject of developmental biology, yet there are few textbooks which attempt to bridge the gap between genetics and development, and none, I think, does so more successfully than this one. It has been written primarily for undergraduates, but with the needs of postgraduates and research workers who are moving between the two fields in mind. The exposition of what are often rather complex topics is clear, and at the end of each chapter there is a bibliography containing references to a wide range of books, review articles and original papers, and there is a very useful and comprehensive glossary. The general plan of the book is to work down through the various levels of control, from external factors and gross phenotype, cell physiology and the properties of proteins, through RNA and translation to nuclear DNA and transcription. The balance between molecular genetic and embryological levels is well-judged, and the relation between the two is discussed in the penultimate chapter, in which such traditional embryological concepts as competence, induction and determination are interpreted in what currently appear to be the most likely molecular terms.

There are fifteen chapters. The first is on 'Prokaryotes and the origins of eukaryotes'; the author emphasizes the enormous gulf between the two groups, and the pitfalls in the way of deriving models of genetic control in the one from results obtained with the other. Chapter 2 is on 'The initiation of cytodifferentiation', an account of developmental strategies, illustrated in echinoderms insects and

amphibians. Chapter 3 is on 'Embryonic induction', a key concept as it emerges in the author's argument. Chapter 4 is on 'Cytoplasmic and extracellular controls'. Chapter 5 is on the 'Establishment of invertebrate body patterns' and here it must be said that, in view of current interest in them and of their likely importance in the light they will throw on fundamental problems of pattern development, the treatment of homoeotic mutations is too brief. The author regards the idea that body patterning in vertebrates and insects may be defined in a similar way as a highly dubious notion. This may be true, but the notion deserves a more extended discussion. In Chapter 6, 'The establishment of vertebrate body patterns', the question of segmentation is rapidly passed over, and the rest is given over to an interesting analysis of models of limb development. Chapter 7 is on 'Unstable differentiation', treating of, particularly, transdetermination in insect imaginal discs and transdifferentiation in vertebrate eye tissues, a subject to which the author has made important contributions and discussed authoritatively here.

Chapters 8–12 are clear, well-illustrated and thoroughly readable accounts of the chief topics of molecular genetics – 'Proteins and translation', 'RNA', 'Chromosomal proteins', 'DNA', 'Transcription and its control'. Chapter 13 returns to embryology with an account of various aspects of 'Growth and morphogenesis' and Chapter 14 – 'The principles of animal development' draws many strands together from the rest of the book. In the last chapter, 'An epigenetic theory of evolution', the most original in the book, the author considers what he takes to be the inadequacy of conventional theory in explaining how evolution takes place. He develops a complementary theory of his own, based upon an extension of Waddington's concept of genetic assimilation and an analysis of the relation between functional adaptations to external conditions and embryonic induction: external adaptive controls tend to become replaced by internal extracellular ones and then by intracellular ones, so that an important evolutionary role is given to adaptation to the environment. This may not be well received by strict neo-Darwinians, but in any event the author has produced a book which is interesting from the first page to the last as well as being an excellent introduction to its subject.

D. A. EDE,
Department of Zoology,
University of Glasgow

Genetics of Bacteria. Edited by JOHN SCAIFE, DAVID LEACH AND A. GALIZZI. Academic Press. 1985. 286 pages. Hard, £45.00, $59.00. Paper, £12.00, $19.50. ISBN 0 12 621180 9.

One criticism I have of this book is the title, which may well lead school Biology teachers and general Biologists, professional and amateur, to buy, as they think, the latest simple textbook on a fashionable topic of wide interest. If so, their reaction on getting their teeth into it will be much like that of most purchasers of Lancelot Hogben's famous book *Mathematics for the Million* when it first appeared – terrible frustration that they found it so difficult ('surely I am in the top million!'). The title of the book under review might have included the word 'advanced', and a paragraph should have been printed on the back cover of the paperback edition to indicate the nature of the book (this is made fairly clear in the preface, but who reads a preface?).

The book is in fact designed for 'advanced students and new recruits using bacterial systems', and 'should be particularly valuable for gene cloners, as an account of the basic biology of the bacteria, phages and plasmids commonly used in their work'. So now you have been warned. Actually, the book is rather narrower than that quotation implies, since it concentrates on *Escheria coli* K12 (apart from a brief side-step to *Bacillus subtilis*, and follows a rather classical and conservative approach, concentrating on *in vivo* genetic analysis.

The 13 chapters on particular topics are in the form of brief reviews (average 20 pages) with some helpful background information, on the following: insertion elements, transposons and plasmids, mutations and mutagenesis, informational suppression, gene fusions and their uses, recombination (homologous and site-specific), control of gene expression, and phages Mu, P1 and P22 – their life-styles and uses for transduction, minimuduction, transposition, deletion and mutation. Key references and further reading material are listed at the end of each chapter.

One could doubtless collect all the information given in this book by digging through recent literature – papers, reviews and symposium volumes (often very expensive and not easy to come by in these hard times). However, the authors assembled here are all experts in their fields and, even more important, manage to write well and clearly (not the same thing), and to bear the problems of the intelligent newcomer to their subjects in mind. Moreover, numerous examples are given of the power and elegance to be found in the conservative *in vivo* approach (helped by a little of the new molecular genetics when needed), e.g. in squeezing an amazing amount of information from study of mutations in the *lac* repressor gene, in following up the intriguing mysteries of the little Chi sequence (does it have a secret and perhaps illegitimate affair with the *recBC* protein?), in putting the curious characteristics of phage Mu to useful work, and so on and so on. On the DNA manipulation–Genetic Engineering–Biotechnology front there is an ever-increasing output of text-books and recipe manuals competing for our attention; but none of these cover most of the ground covered in the book under review here. So this book does, in my opinion, satisfy an