Inherited wisdom

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Genes III. By Benjamin Lewin. *Wiley: 1987. Pp.761. Hbk £33.45, $38.95; pbk £16.95, $17.50.*
Essential Genetics. By Peter J. Russell. *Blackwell Scientific:1987. Pp.493. Pbk £13.50, $29.95.*
Genetics. By Geoffrey Zubay. *Benjamin/Cummings:1987. Pp.1,049. $39.95, £19.95.*

GENETICS is concerned with questions about the mechanisms of inheritance: what carries inherited information, how information is passed between generations and between populations, how it is organized and how it brings about its effects. People with knowledge of genetics can contribute to many aspects of biology, from the ecological to the cellular and biochemical levels of analysis, but to do so they need to know about the breadth of the subject as well as having specialized knowledge within it. The remarkable advances in all areas of genetics pose a problem for today's students: how are they to see the wood for the burgeoning trees?

Although all of the three books reviewed here have similar titles, they set about helping the student in quite different ways. In *Genes III*, Lewin restricts himself to DNA. He describes its structure, replication and expression, together with the control mechanisms involved. The result is a detailed, even encyclopaedic, account of the currently agreed facts and hypotheses in these areas. The derivation of conclusions from actual experimental data is shown only rarely. Ordered tetrads, for example, are used to demonstrate the abnormal pattern of spores found following gene conversion and post-meiotic segregation, but without any indication of the normal spore pattern following an ordinary crossover between gene and centromere. The first 20 pages cover mutagenesis, transmission genetics and gene mapping, but are far too condensed to be useful to students.

Students reading *Essential Genetics* will have little difficulty gaining a sound understanding of inheritance in both pro- and eukaryotes. They will also be introduced to the way that DNA is organized, how its information is expressed, and to how genes behave in populations, as well as being given insight into the genetics of their own species. The balance of coverage is about right, although fungal genetics are covered in too much detail whilst the section on developmental genetics would have been better for reference to sequence reorganization and differential promotion and splicing of mRNA. Throughout the text experimental data are elegantly used to indicate how conclusions are logically derived from observations. What happens during crossing-over is clearly shown in Russell's book, but readers of *Genes III* will assume that exchange of pairing partners precedes chromatid breakage and reunion. Students who have read *Essential Genetics* will be well prepared for advanced courses on specialized aspects of genetics, and they will be well able to set those aspects in context.

Zubay's *Genetics* follows a tradition, notably successful in the past, of combining breadth and depth. The resulting 1,000 pages, even with input from 15 co-authors, is a compromise. Despite the use of colour, bold-type and underlining, and the inclusion of questions and answers, students will find it hard to read the book because of the excessive amount of detail given. Even so, only four advanced topics are covered: animal development, evolution, mobile genetic elements and cancer viruses. Keeping these up to date will require frequent revision, probably on the two-yearly cycle of *Genes*.

As Lewin recognizes in his epilogue, the recent history of genetics has been full of surprises. The book published in 1987 that will best help students prepare for such unpredictable events is *Essential Genetics*, for it shows most clearly the assumptions that underlie current explanations. □

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Further selection

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A Primer of Population Genetics, 2nd Edn. By Daniel L. Hartl. *Sinauer/Blackwell Scientific: 1988. Pp.305. $15.95, £12.15.*
Population Genetics: Basic Principles. By Donald P. Doolittle. *Springer-Verlag: 1987. Pp.264. DM70, £26, $35.*

OF similar length, title and degree of detail, and aimed at students of a similar level, Hartl's and Doolittle's books are designed for very different audiences. Hartl intends to integrate data and theory for natural populations, with emphasis on single-locus polymorphisms and molecular evolution. Doolittle aims at providing the foundation of population genetic theory for quantitative genetics in plant and animal breeding. Having these quite different niches these books are scarcely in competition, and each should be successful.

Hartl's book is a revision and updating of a well-received and popular first edition, and I think it is a considerable improvement. The present organization seems clearer than in the original, and many of the data examples on molecular polymorphisms, molecular evolution and quantitative genetics are new. The book is divided into four major sections. The section on genetic variation covers gene frequencies and polymorphisms, as well as the theory of random mating, assortative mating and inbreeding. 'Causes of Evolution' covers the evolutionary forces of random genetic drift, mutation, migration and selection, mostly as theory but with data examples.

The largest body of new material is in Chapter 3 on molecular population genetics, which introduces neutral theory and molecular clocks, but also briefly describes patterns of nucleotide substitution and the evolution of mitochondria, chloroplasts, multigene families and transposable elements. Chapter 4 covers the genetics of quantitative characters. This material replaces some of the coverage of ecological genetics that appeared in the first edition.

While Hartl achieves a nice balance between theory and data, derivations of the details of the theory are quite limited. Students will not necessarily be able to tell where the theory actually comes from, and sometimes the theoretical results are imprecisely stated. For example, the formula for the effective breeding size of a population whose size fluctuates is an approximation, but this is never indicated, and Fisher's 'fundamental theorem of natural selection' is presented without making it clear that it is inexact in the presence of dominance effects.

Doolittle covers the algebraic theory in more detail than does Hartl, and without attempting a comparable amount of coverage of data. For my taste there are too few diagrams illustrating the theory. The book is divided into 44 short chapters called 'lectures' and into five major parts. The order of presentation of theory is similar to Hartl's, but with much more coverage of quantitative genetics. Each lecture is followed by one or a few exercises, whose solutions are given and discussed at the end of the book, which also includes an appendix with review lectures on basic genetics, probability and statistics.

While fairly detailed, Doolittle's book is not intended as an advanced textbook of quantitative genetic theory — there is no coverage of such topics as index selection or maximum likelihood estimation of variance components.

Both of these books are successful in achieving their authors' stated aims. Hartl's ought to be received even more enthusiastically than was his first edition, and Doolittle's will be a useful theoretical supplement to Falconer's classic textbook on quantitative genetics. □

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