age is comprehensive and in-depth. The book opens with a discussion of the fundamentals of bacterial and viral genetics and moves to a description of the genetic material which includes satisfying amounts of information on DNA structure, genome structure and DNA replication. Next there is a chapter devoted to mutation in which quantitative and qualitative aspects are skilfully combined. An attractive feature of the book is that, where appropriate, relevant historical information is given on each subject covered. Thus the chapter on mutations and mutagenesis includes a treatment of the fluctuation test of Delbrück and Luria and an assessment of its importance to mutagenesis research. This helps to bring the material alive and to place it in context within the history of science. An introduction to gene regulation follows in a chapter which also deals with the structure of RNA. Again, this is handled from an historical standpoint, opening with a description of the Nobel-Prize-winning work of Jacob and Monod on *lac*. The chapter then deals in succession with *gal, trp* and *his*, giving a useful overview of the topic of regulation which prepares the ground for a more advanced treatment in Chapter 14. The fifth chapter deals with DNA repair and recombination, topics regarded as difficult by many students. Birge deals with these expertly and explains the concepts involved clearly. The author now changes gear and provides four successive chapters on bacteriophage genetics. This is essential material and is well presented. Phage T4 is used as a model genetic system and gets a complete chapter to itself. Other intemperate phage are dealt with in the following chapter while the temperate phage lambda, P1, P2, P4, P22 and Mu are covered in the third bacteriophage chapter. The fourth chapter on bacteriophage deals with genetic transduction. This leads seamlessly to a treatment of the concepts associated with genetic transformation, the topic of the following chapter. The theme of the movement of DNA between bacterial cells is developed further in chapters on conjugation and plasmid biology. Plasmid molecular biology, replication and incompatibility mechanisms are covered next, followed by a chapter on advanced regulatory topics where one is introduced to global control mechanisms and regulons. Different types of DNA rearrangements are explained in a chapter on general recombination, site-specific recombination and transposition. Applied bacterial genetics is dealt with in a single chapter which gives just a flavour of this vast subject. Finally, the book closes with a very interesting and up-to-date chapter on bacterial evolution. There is a useful appendix on the laws of probability as they relate to prokarytic cultures. This ends with a set of problems with answers supplied for the odd-numbered ones. A good glossary of genetic terms and an index is also provided. The book is adequately illustrated throughout with diagrams and black-and-white photographs. Each chapter concludes with a brief reading list which is divided into general articles and specialized references. Birge's writing style manages to make what many might consider a book on a 'dry' subject into quite an easy read. My only concern is that at £43.75 this (hardback) book may be beyond the financial range of many students.

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The Evolutionary Biology of Viruses. Stephen S. Morse (ed.). Raven Press, New York, 1993. Pp. 367. Price £59.00, hardback. ISBN 0 7817 0119 8.

'These are exciting times for the study of viral evolution. The increasing availability of molecular data ... and the development of tools for phylogenetic analysis ... have made it possible for the first time to address a variety of questions of profound evolutionary interest. The paucity of data that once plagued the study of viral evolution is giving way to something approaching a small flood of information.' So notes Stephen S. Morse, the editor, in his preface to this, the first multi-author book on viral evolution.

The book has 15 chapters and is set out in four sections — 'Defining Viral Evolution', 'Viral Phylogeny: Origins and Relatedness', 'Driving Forces in Evolution I: Processes Generating Genetic Diversity' and 'Driving Forces in Evolution II: Natural Selection'. Its cast of authors includes such notable virologists as Frank Fenner, who was a major force in the first knowing experiment in viral evolution, the release (and subsequent monitoring) of myxoma leporipoxvirus to control the rabbit plague in Australia, and also Estaban Domingo, whose pioneering work on Q-beta levivirus first revealed how viruses maintain stable species. The cast also includes Ernst Mayr, advocate of the 'evolutionary synthesis', a path that the editor wishes to promote among virologists.

The chapters reveal the way in which the study of viruses is rapidly putting flesh on the bones of a diverse range of evolutionary concepts and perspectives that previously were mostly speculation. The great diversity of viruses, their small genome sizes, and the fact that some of the most damaging to mankind evolve at measurable rates have all focused the attention of virologists. In his preface the editor states that the book has two principal objectives — '... to help place viruses within a general evolutionary framework and to encourage more integrative thinking concerning viral evolution', because, he believes, '.. most discussions of viral evolution have remained generally outside the 'neo-Darwinian' synthesis, and the relationship between genetic variation and natural selection remains largely unexplored with respect to viruses.'. I believe, by contrast however, that the study of viral evolution is already way past that stage and is producing newer ideas with wider horizons than the world

of shadowy phenotypes and selection, dominated by sex and maths, to which Dr Morse refers.

Non-virologists interested in evolution will find much of interest in this book, but must understand that, as in all new and vigorous cutting edges of science, many of the conclusions are speculative. For example, Goldbach and de Haan suggest that the clear genetic homology of some viruses of animals and plants indicates that such viruses have come from animal- and plant-feeding insects, rather than that the ancestors of such viruses predate the divergence of their hosts. They base their notion on the rapid rate of evolution of some viruses, ignoring the fact that there is no evidence that all such viruses evolve quickly, quite the reverse. Similarly Chao's analysis of the advantages of genomic segmentation for a virus, like influenza virus, when being antigenically selected, misses the point that influenza virus is primarily an inhabitant of bird guts, where there seems to be little or no antigenic selection. Finally, although several authors note the crucial role of recombination in viral evolution, resulting in the 'tree of VIRAL life' resembling an infestation of strangler mistletoes, none note that many viral genes have arisen *de novo*.

This book is a mine of information, a rich brew of facts presented in widely contrasting styles. It should be required reading for all virologists, especially the young; Darwin in his (or her) next reincarnation is very unlikely to join the 'neo-Darwinians', but will probably become a virologist.

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