embedded within a protein capsid. Only in the case of Φ6 is the lipid in the form of an envelope, so that penetration may involve fusion with the host-cell plasma membrane, similar to that known to occur in the case of some animal viruses, such as the paramyxoviruses. The last chapter of the book deals with what is essentially the most important step in the infective process, namely, the penetration into the host cell of the phage nucleic acid (E. Goldberg). Although knowledge is still largely at the descriptive stage, Goldberg tries to draw the various mechanisms that have been observed into a general scheme, and he makes some interesting speculations.

To return to the question posed at the beginning of this review: is virus research moving once more towards emphasis on bacterial hosts? No!—for it is now clear that animal and bacterial viruses (and plant viruses too, for that matter) use similar mechanisms to replicate themselves at the expense of their hosts. In fact, it is precisely at the initial binding stage that differences occur, for the simple reason that bacterial cells differ from animal cells most strikingly, in molecular terms, at their surfaces. It is therefore entirely apt that this volume on bacteriophage receptors is only part 1 of a two-volume series on virus receptors; part 2 will be devoted to animal viruses. In fact, they form part of the very extensive series of books on "Receptors and recognition" that is being pioneered by P. Cuatrecasas and M. F. Greaves. Thus, for the serious virologist interested in the initial stages of viral infection, these two volumes make essential and complementary reading. Part 1 is not only a well presented, up-to-date account, but is also very reasonably priced. We look forward to the publication of part 2.

C. A. PASTERNAK

The nature and organisation of retroviral genes in animal cells

The main concern of this monograph is with the interactions between the virus and the host-cell chromosomes, rather than on oncogenesis per se, in an attempt to place the biological and biochemical characteristics of this intensively studied virus group within the context of up-to-date molecular biology. The authors stress the great value of this virus group for the study of normal as well as aberrant gene expression and the possible relationships of the viruses and their progenitor host genes in normal development and differentiation. History of the subject is reviewed and the phylogenetic evidence for the origin of the various retroviruses is discussed. The organisation of the endogenous and the infectious retrovirus genes is presented. The horizontal transmission of retroviruses among animals is considered from the point of view of the putative transmission between species 3–5 million years ago and in the light of studies that have now shown that all the naturally occurring virus-induced leukaemias are associated with horizontal transmission of exogenous virus. The fascinating details of relatedness and combination among retroviruses are presented in a clear fashion, giving the reader an easy passage through this confused field. There follows an excellent chapter reviewing the current situation of human retroviruses and their possible relatedness to leukaemia and other diseases, posing some of the major difficulties of obtaining direct evidence of involvement in human oncogenesis. The authors review succinctly the mass of knowledge gained in the last 20 years up to the start of the new era initiated by the use of sequencing techniques and the discovery of the sarc gene product. Because retrovirus genes almost certainly have originated from host sequences, this short book provides a mine of information for those interested in gene expression and control functions, particularly in haemopoietic cells, as well as for tumour virologists.

W. F. H. JARRETT

The experimental foundations of modern immunology

This is an unusual textbook of immunology, distinguished from others by the author's approach to currently accepted concepts. He forms his arguments around critical experiments
and uses them to illustrate everything from elementary mechanisms of antigen-antibody interaction to complex cellular responses. I like this approach but, inevitably, experimental method is discussed more than is usual in a basic textbook. This is justified because it is directed mainly at postgraduates engaged in another discipline and particularly at those with a sound knowledge of biochemistry. The book is written with commendable clarity which is maintained, for example, throughout a detailed description of immunoglobulin structure.

Three subjects are covered in depth, namely, the structure and function of immunoglobulin, lymphocyte populations and their interactions, and the relationship between genetics and immunology. There are short chapters on immunity to infection and reactions of immunological injury but these are remarkably superficial in comparison with the rest of the book. Perhaps these topics are more difficult to analyse in the same way. Complement is treated relatively briefly within a chapter on the interaction of antibody and antigen and I think this highlights an imbalance that must be held against the book.

Overall, it is comprehensible and interesting to read, and at a reasonable price it is a worthwhile buy for the limited readership at which it is aimed.

M. H. WANSBROUGH-JONES

Fundamentals of human lymphoid cell culture

In the established subjects, such as synthetic organic chemistry, there are excellent practical textbooks that combine relevant theory with technical details and "cookbook" recipes. The appearance of similar texts in immunology indicates its coming of age. In the best of such handbooks the authors confine themselves to techniques with which they have personal experience and this is true of the above practical guide to long-term culture of human lymphoid cells.

The author details several important techniques that are usually dealt with elsewhere in a summary fashion. He describes the use of water purified by filtration and by activated carbon and mixed-bed resins, and the importance of resistance greater than 1 MΩ and preferably 12 MΩ. The need to rinse glassware in pure water is stressed. There is the useful comment that most tissue-culture media are stable for 6-12 months at 4°C, apart from the glutamine component which is stable for only 3-6 months. The necessity for "good" batches of fetal bovine serum or human serum (0.5-1%) for RPMI 1640 medium and of horse serum for Fisher's medium is indicated, and Hepes buffer, 25mM, with bicarbonate is recommended for the culture of human cells, avoiding the need for gassing. There is a valuable discussion of sterile technique and a check list for eliminating causes of bacterial contamination, and a method for removing mycoplasmal contamination is described.

Methods for the establishment of long-term B-cell lines by infection with Epstein-Barr virus are described. However, the value of removing T cells, which kill the newly emerging cell lines, was probably recognised too recently to be incorporated in this book. Simple methods for separating large numbers of lymphocytes and preparing conditioned medium containing T-cell growth factor are given. Cell cloning, preservation by freeze-drying, fluorescence tests for E-B virus antigen with Evans blue as counter stain, and the four-chambered Speir-Levy eosinophil counting chamber, a useful time saver for cell counts, are described. The chapter on cross contamination of cell lines is a salutary warning.

This book arose from workshops organised at Associated Biomedical Systems at Buffalo and indicates that instruction in techniques is just as important as availability of reagents in developing a large market for new commercial products. However, the author is scrupulous in his descriptions of the preparation of the commercial reagents. This is not a definitive textbook but it is a valuable practical guide to good tissue-culture technique and for the culture of human lymphoid cell lines.

G. L. ASHERSON