by numerous tables. Many good photographs are also included. Another useful device is the summary found at the end of most of the chapters.

It is difficult to keep an encyclopedia readable throughout. This is particularly the case when it is written by cautious individuals. The authors only touch on controversial subjects. For instance, the problem of whether or not there is protein synthesis within the nucleolus is not discussed in depth; and the experiments placing labeled amino acids in contact with giant chromosomes and their nucleoli are not even mentioned. More generally, there is a definite reluctance on the part of the authors to draw broad biological conclusions from their abundant material. Some would praise their restraint. Others would regret it, if only because a few flights of imagination would have enlivened the book. Should not one marvel at the ubiquitous presence of the nucleolus in plant and animal cells, and at the uniformity of its structure in all? Is it not exciting to think of the continuous production by the nucleolus of the building stones of ribosomes in all living cells, with the correlate of continuous protein synthesis? These and other majestic conclusions may be extracted from the book, but the reader has to do it himself.

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Adaptive Immunity

Antigens, Lymphoid Cells, and the Immune Response. G. J. V. NOSSAL and G. L. ADA. Academic Press, New York, 1971. xx, 324 pp., illus. $17.50. Immunology series.

A problem frequently ignored in general reviews which consider the mechanism of adaptive immunity in higher organisms concerns the elaborate mechanisms that affect the distribution, deposition, storage, catabolism, and disposal of alien antigenic material accidentally or deliberately introduced into the animal. These factors unquestionably influence the subsequent development of the immune response. The general question "How does antigen work in the immune response mechanism?" has constituted the dominant theme of research in Nossal's and Ada's laboratories over the past several years.

The stated purpose of this book is to present the current view of the manner in which antigens provoke the onset of an immune response, of the nature and properties of substances which qualify them as immunogens, and of the cell physiology of the mammalian lymphoid system which participates in the response to antigen. Rather than an overview of the cellular basis of immunity, which the title might lead one to expect, the authors have produced a general summary, in a technical but highly readable form, of their conceptions of the early events related to the fate of antigen in vivo, its interaction with the various cellular components of the immune response mechanism, and the confrontation between antigen molecules and competent lymphocytes which leads to immunity or to tolerance.

In their consideration of the fate of antigen in vivo, the authors start with the assumption that the humoral antibody response mechanism was designed through evolution so that the vertebrate species could cope more effectively with bacterial and viral pathogens. The development of their arguments is then influenced by two important considerations: that scavenger cell systems phylogeneti cally antedate adaptive immunity, and that humoral immunity constitutes a subsequent elaboration of the more primitive capacity for cell-mediated immunity. Thus the processes for the nonimmunologic disposal of alien material have evolved over a longer period of time than the means by which such material stimulates lymphocytes to produce antibody. The fate of antigen in a higher organism is therefore controlled by remnants of these three protective mechanisms, and possibly by others as well, such as those involving interferon. Systematic study of this question is consequently rendered more difficult.

In support of their concepts, the authors rely heavily on their own and their colleagues' studies. Other views are not always fully represented, and the results of experiments performed by others which best illustrate a point under discussion are sometimes ignored in favor of the local product. This should not be considered a serious criticism of the work, however, for this bias represents something of a blessing as well. Because they have contributed so extensively to this particular area of immunology and have, perhaps more clearly than others, defined the problems and pitfalls inherent in studies of antigen distribution in the intact organism, a synthesis of their views and a summary of their research activities should be of great value.

This book is well indexed both by subject and by author, contains a rather complete bibliography, and is illustrated with tables, diagrams, and photographs. The appendix includes a "cookbook" section on the preparation of flagellar antigens from *Salmonella* organisms and on the technique of electron microscopic radioautography and the properties of radioisotopes commonly used therein, procedures which the authors have used extensively and which they have developed to a high degree of refinement.

The lucid and thorough discussion of this rather difficult area of immunology will undoubtedly make the book one of the more valuable ones both in classrooms and in laboratories of immunology.

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Effects of Light

Photobiology of Microorganisms. PER HALLDAL, Ed. Wiley-Interscience, New York, 1971. xii, 480 pp., illus. $19.50.

With the Sixth International Congress on Photobiology on the horizon (Bochum, Germany, August 1972), it is appropriate that this book should appear; indeed, it has been long anticipated, since manuscripts were being prepared at the time of the Fifth Congress in 1968.

First for what the book is not. As Halldal points out in his preface, photobiology is a diverse field, and he has limited the book to microorganisms (though not just unicells), thereby excluding such aspects as vision and photodermatology. Furthermore, the approach being primarily biological, photochemistry and photodynamic action are not considered. Finally, several topics in microbial photobiology are not directly dealt with, or are dealt with only in part: photosynthesis (of microalgae and bacteria) is allotted only two chapters because "it has recently been covered extensively in several books," and the physiological effects of far ultraviolet (photoinactivation and photoreactivation, lesions and mutagenesis, and repair) are not specifically treated because of their "marked chemical and biophysical character." Although I feel