

is spoke: the editors have no right, in their view, to carry out etymological surgery on malformed words. They do, however, indicate in the introductory part of the book the rules on which words should be formed, and undertake to guide the reader through the pitfalls of medicalese. As might be expected, American spelling is used fairly consistently throughout. This should not prove an insuperable barrier to British readers, however, because the differences in the spellings are explained in detail.

A final decision on whether or not the dictionary is a good one will have to come only after it has been used for some time, but it seems to be comprehensive and easy to use. It is illustrated by plates and line drawings, although some of the latter seem to have been selected rather arbitrarily. The book is easy to handle, printed on durable paper, and its price does not seem excessive.

J. SPENCER

LYMPHOCYTES EVERYWHERE

The Lymphocyte in Immunology and Haemopoiesis

Edited by J. M. Yoffey. (The Symposium held at Bristol, April 1966.) Pp. viii+376. (London: Edward Arnold (Publishers), Ltd., 1967.) 120s. net.

PROFESSOR YOFFEY has a reputation as the "Grand Old Enfant Terrible" of students of the lymphoid system. Introducing this symposium he describes with candour and modest pride how his ideas, which but a short while ago interested few, have gradually come to be proved both wrong and right. There is now an impressive accumulation of data on the morphology, origin, circulation, life-span and potentialities of the small round cells collectively known as lymphocytes. Each method of investigation produces its own classification so that, for example, the cells are described as large and small, long-lived and short-lived, thymic and non-thymic-dependent (or derived), transformable or untransformable and with or without stem-cell potentiality.

This symposium of forty-three rather varied papers attempts with partial success to correlate some of these observations. Morphology and the response to phyto-haemagglutinin are dealt with adequately but without much new or significant detail. The kinetics and role of thymus-derived lymphocytes are clarified in papers by P. C. Koller, D. Metcalf, J. C. Schooley and their co-workers; other aspects of the immune activity of lymphocytes are described, notably by P. J. McCullagh and J. L. Gowans and by T. N. Harris, K. Hummeler and Susanna Harris.

The origin from lymphocytes of cells with a phagocytic property is discussed by J. G. Howard, J. L. Boak and G. H. Christie; theirs is certainly the best evidence for such a transformation, but its extent and importance have yet to be elucidated. Similarly the significance of the bone marrow lymphocytes remains uncertain; they appear to be a rapidly proliferating population of cells, but the degree of their stem-cell potentiality and the fate of their progeny are open questions.

Many other problems remain unsolved and in some instances there is, on the surface at least, a conflict of evidence. For example, the effect of incubation at 37° C on potentially immune cells appears to be either the abrogation of tolerance (McCullagh and Gowans) or immunosuppression (Mathe and others). This may be only an apparent paradox but it is the sort of point where publication of the discussion or some sort of final synthesis might have been useful. This volume contains neither and its value is thus diminished; it will nevertheless be essential reading for all who are seeking to unravel the complexities of the lymphocyte—or lymphocytes.

H. F. M. KAY

COLLECTED SEQUENCES

Atlas of Protein Sequence and Structure 1966

By Richard V. Eck and Margaret O. Dayhoff. Pp. xix+215. (Silver Spring, Maryland: National Biomedical Research Foundation, 1966.) \$3.50.

SINCE Sanger's pioneering work on the amino-acid sequences of insulin, a number of technical developments have simplified the work of determining protein primary structure very considerably. Most important, obviously, is the automatic amino-acid analyser, but qualitative techniques, such as fingerprinting, have also made valuable contributions. As a result, the number of complete sequences known is increasing rapidly, so rapidly, indeed, that it becomes difficult to keep track of them. Herein lies the major value of the *Atlas*; all the amino-acid sequences which had been established before July 1966 are presented, transcribed into a standard format for ease of comparison. The list is impressive—twenty cytochromes *c*, some fifteen haemoglobins, seventeen insulins and about a hundred other assorted proteins and peptides. A description of seventy-seven abnormal human haemoglobins is also included. Anyone concerned with protein structure from the point of view of either research or teaching must find this useful.

Having accumulated such data, what do we do with them? One answer to this is given in the latter part of this volume, where the basic principles of the determination of phylogenetic relationships from protein structural comparisons are discussed. While these studies should ultimately lead to a truly quantitative measure of interspecies relationships, insufficient data are yet available to provide any new insights. This discussion does no more than illustrate the method and explore some of its weaknesses. Thus, it is clearly unreasonable to expect that a single protein contains a record of the entire evolutionary process or that different proteins will necessarily tell the same story; not only must many more species be surveyed, but also many different proteins must be examined.

The authors also include the structures of three types of yeast transfer RNA. From these an attempt is made to derive the nucleotide sequence of the original primeval transfer RNA; this scarcely seems either possible or profitable with so little information to work from.

Although the book is generally well produced, the use of a number of fold-out diagrams makes it rather untidy.

I. G. JONES

MODELS FOR BIOLOGY

Natural Automata and Useful Simulations

Edited by H. H. Pattee, E. A. Edelsack, Louis Fein and A. B. Callahan. (Proceedings of a Symposium on Fundamental Biological Models held at Stanford University.) Pp. v+204. (Washington, D.C.: Spartan Books; London: Macmillan and Co., Ltd., 1966.) 56s.

Natural Automata and Useful Simulations is one of those books which emerge from scientific symposia, and bears the usual signs of such an origin. The symposium must have been very good fun, if only because of the variety of able people who took part. The different chapters, each of which represents a paper which was contributed to the symposium, vary greatly in readability. The first one, entitled "Global Properties of Evolution Processes", is almost completely unreadable, for the authors do not define their biological problem properly but plunge straight into a mixture of algebra, flow diagrams and programming technicalities. The second chapter is about self-reproducing automata. The said "automata" are strings of symbols to which the authors apply the eye of faith in identifying their transformations with definite stages in the repro-