different systems. The greatest spectral changes are produced in those cases where annelation leads to formation of a new aromatic sextet. The importance of the aromatic sextet is also evident from a study of the chemical behaviour of the hydrocarbons. One of the features of the chemistry of the aromatic hydrocarbons is the great difference in reactivity shown by members belonging to the different series. These differences can be correlated with the number of aromatic sextets which can be written into the structural formula; the greater the number of sextets the more stable the compound. On a simple view this is perhaps what might have been expected, but it is noteworthy that this simple treatment appears in some cases to give a better indication of the stability of an aromatic hydrocarbon than molecular orbital calculations. As is well known, Huckel has shown that monocyclic polyolefines containing $(4n + 2)\pi$ electrons have aromatic stability, and this rule has been supported by experiment in a number of instances. But the rule is not suitable for predicting the stability of polycyclic aromatic hydrocarbons. It covers only half the most stable compounds, and includes all the acenes from the most stable, benzene, to the most reactive, heptacene, and even the higher members which are too unstable to exist.

Further insight into the structure of the polycyclic hydrocarbons has been provided by a study of their magnetic properties and by X-ray crystallographic analysis. The latter has revealed that in many cases the bond lengths differ in a way not to be expected from simpler benzene derivatives. These measurements have been correlated with values derived from quantum mechanical calculations, and have thus offered an experimental test of the conclusions of the theoretical chemists. In some types of polycyclic structures molecular overcrowding must lead to distortion of the rings, and this has been confirmed by optical resolution of appropriate derivatives.

The polycyclic aromatic hydrocarbons have practical importance in a number of fields. The quinones of some of them form the basis of important dyestuffs and the search for new and better dyes has added new ring systems to the polycyclic structures already known. The properties of the more highly condensed hydrocarbons approach gradually to those of graphite. This applies also to the electrical conductivity; as a result of this, aromatic hydrocarbons are semiconductors and show photoconductivity. The carcinogenic properties of some aromatic hydrocarbons are also a matter of every-day concern, since many hydrocarbons are widely distributed in the environment as products of incomplete combustion, and they occur also as constituents of certain industrial products.

For discussion of all these and many other topics in the field of polycyclic hydrocarbons and their derivatives this book will be found valuable and stimulating, and it will be indispensable to chemists whose work is concerned in any way with aromatic hydrocarbons. It is very well produced and it is remarkably free from errors and misprints, but it is a little unfortunate that the publishers have considered it necessary to issue the work in two volumes.

W. CARRUTHERS

BIOLOGICAL FACTS AND FIGURES

Biology Data Book

Compiled and edited by Philip L. Altman and D. S. Dittmer. Pp. xvii + 633. (Washington: Federation of American Societies for Experimental Biology, 1964.) 10.00 dollars.

THE *Biology Data Book* edited by Altman and Dittmer under the general auspices of the American Committee of Biological Handbooks replaces, and in part supersedes, the original *Handbook of Biological Data* published in 1956 by W. B. Saunders Company.

The layout and type of the present volume are much better than those of the *Handbook*, being clear and easy to read. The columns of data which make up the book are well spaced and where I had to peer at the original *Handbook*, the present volume can be consulted in a much more relaxed way.

The contents of the book are difficult to summarize since they are themselves summaries, but their general value can be judged by the fact that there are thirteen sections and eight appendixes. The sections include genetics and cytology, development and growth, morphology, metabolism, respiration and circulation, biophysical and biochemical characteristics, environment and survival, parasitism, material and methods. The appendixes are more stereotyped, being the usual formulae (and some unusual ones), conversion factors, atomic weights, logarithms, and classification of plants and animals.

The value of a data book rests not only on the contents but also on the ease with which any desired information can be obtained. In this connexion, within five minutes I was able to find the life span of an ant, the method of assay and the effects of thyroxine, but could not determine the transpiration rate of elm leaves. There were many interesting data on transpiration but not the actual required information. Two out of three, however, is quite a good result.

The index must be used in association with the table of contents and together they constitute a reasonable guide to the data in the book. Another great improvement is the reference section at the end of each table which cites the papers from which the data in the table have been obtained. Thus, in many instances where method may be critical, the direct reference is immediately available.

The larger type and the clearer format, however, have resulted in a wholesale cut in the number of examples given. Thus, whereas in the *Handbook* the chromosome numbers of 500 animals are listed, in the *Data Book* this is reduced to 151. Similarly, the temperature tolerance of 59 algae is given in the *Handbook*, but only that of 16 species in the *Data Book*. This in turn creates a problem of selection and, not unnaturally, the criterion used is that the book shall be of value to scientists in the United States. Therefore, where only a few examples can be given, they are from that country and although they will indicate general levels they are not always relevant.

This criticism does not apply of course to the purely biochemical tables or diagrams, which are of universal value and are of high quality.

In summation, despite its shortcomings, which largely result from the improved format, this is a better, more accessible and, therefore, more useful book than the *Handbook* and should gain wide acceptance in all biological libraries and laboratories.

A. R. GEMMELL

FROM HYDROGEN TO HITLER

The Discovery of Time

By Stephen Toulmin and June Goodfield. (The Ancestry of Science.) Pp. 280 + 11 plates. (London: Hutchinson and Co. (Publishers), Ltd., 1965.) 35*s*. net.

THE authors of *The Discovery of Time* set out from the position that "the expansion of the traditional world picture (in which the whole story of the universe was compressed into a few thousand years) to the present billion-year time scale, has transformed our conception of human and social history". The book is an attempt to show how the present perspective of time has been achieved.

The first chapters deal with the origins, in Egypt and Mesopotamia, of comparatively precise records of human history, and with the first crude attempts at naturalistic cosmogony, as seen in the fragments of the pre-Socratics. The final chapters give a brief outline of modern ideas on the nature and on the scale of human history, and some account of the most recent speculations on cosmogony.