

most notable absentee was Professor Spiegelman who, although scheduled on the programme of the symposium to give a paper on the replication of Q β , was unwell at the time. Consequently, the section in the book on RNA bacteriophages gives few hints of the acrimonious dispute, on whether or not RNA bacteriophage replication involves a minus strand, which was raging between Spiegelman and almost everyone else, but Weissmann in particular. Those who went to the meeting were spared a repetition of the sparring match which took place at the Gordon Conference a week before the Edmonton Symposium and it is a great pity that the book contains none of this. For, after all, the main role of this book is as an archive and in the summer of 1966 the problem of RNA phage replication was one of the hottest topics in virology. Now, of course, Spiegelman has convinced himself that minus strands do exist while Weissmann, whose article in the book describes the role of replicative form and intermediate, has now gone on to question whether these structures really exist *in vivo*. All this goes to show just how out of date this section of the book is.

But it would be wrong to give the impression that the book is principally concerned with RNA bacteriophages. In fact, the symposium was ambitious enough to try to cover all the viruses with the exception of higher plant viruses. There are eight sections and only one of these is devoted to RNA bacteriophages. Three are on other bacteriophages, and there are sections on RNA and DNA mammalian viruses and two on oncogenic viruses. All these contain valuable reviews by leading workers. There is, just to take one example, a valuable paper by Brinton, who publishes less often than most, on his work on male specific *F* pili.

If I remember correctly, discussions of the papers at the symposium were quite extensive. They must have been severely edited or else the participants must have subsequently decided not to publish their remarks, because in the book there is never more than a page and a half of discussion after each section, which is a great pity.

A collection of review articles, such as this, is always valuable and this book is bound to find a place on library shelves if nowhere else. No doubt Academic Press had this in mind when they fixed the very high price which effectively excludes most individuals from the market.

JOHN TOOZE

LABORATORY ANIMALS

Husbandry of Laboratory Animals

(Proceedings of the Third International Symposium organized by the International Committee on Laboratory Animals.) Edited by M. L. Conalty. Pp. xvi+650. (London: Academic Press, Inc. (London), Ltd.; New York: Academic Press, Inc., 1967.) 150s.; \$28.

THIS is a very interesting volume, the Proceedings of the Third Symposium of the International Committee on Laboratory Animals, held in Dublin in September 1965, and should be required reading by all those who use laboratory animals. Its importance is that this volume presents some of the known factors in the whole animal environment and the effects of these on tests using laboratory animals.

At present the use of laboratory animals is entering a new phase; the established pathogen and germ-free colonies has made it possible to pay more attention to the effects of environment on the animal, and, with more interest in animal behaviour, the influence of caging on the experimental animal is now becoming apparent.

This volume is the result of forty-six contributions from fifteen countries and a further thirty-two participants in discussion, and the individual chapters are of varied interest, but show the growth, scope and limitations of our present knowledge of these topics.

The text is divided into six sections: section 1, on handling, production and organization, includes notes on handling scorpions and snakes, also techniques of skin grafting in rats and rabbits and a description of experiments to assess the environmental influences on mice.

Section 2 on nutrition is a series of papers which set out what is known about the vitamin, trace element protein and calorie requirements of laboratory animals, and of work on diets for SPF and germ-free animals, with a very interesting approach to a water soluble, non-antigenic diet. There is much yet to learn on all these topics.

Section 3 on ecology and disease includes a paper on aspects of stress in animals, the influence of numbers per cage on the development of spontaneous neoplasms and the successful limitation of mouse virus infections by the use of a filter fitting over each mouse cage.

Section 5 on physiology and psychophysiology includes papers on the effect of environment on the blood picture in laboratory animals and of social stimulation on adrenal and reproductive physiology.

Section 6 on pharmacology and pharmaco-ecology includes a paper on environmental influences on drug responses in laboratory animals and pharmaco-ecology (a new term) and some nutritional paradoxes. This term is used to describe the effects of environmental factors on drug action. There is an author index to references in text and a subject index.

The main impressions given by this book are that although little is really known about many of these topics they are now receiving serious consideration and that many of the earlier attempts to standardize the response of laboratory animals will have to be re-assessed. It is now possible to detect the influence of the environment on experiments with laboratory animals and clearly we must know more about this important topic.

This is a most stimulating book, not least from the eastern European contributions and the attention it draws to the need to study the total environment of the experimental animal in the assessment of biological results. The editor and the International Committee on Laboratory Animals are to be congratulated. M. C. LANCASTER

FLORA OF TURKEY

Flora of Turkey and the East Aegean Islands

Edited by P. H. Davis. Assisted by J. Cullen and M. J. E. Coode. Vol. 2. Pp. xii+581. (Edinburgh: Edinburgh University Press, 1967.) 189s.

THE second volume of this invaluable work follows on the heels of the first with a promptitude which calls for congratulations to the editor and his collaborators. Volume 2 closely resembles its predecessor in general format, being admirably printed, and admirably, if somewhat sparingly, illustrated. The de Candolle-Boissier sequence of families has been modified to accord better with modern opinions, with the apetalous Illecebraceae, Polygonaceae, Chenopodiaceae and Amarantaceae coming immediately after Caryophyllaceae, and forming the larger, and fairly obvious, alliance of Centrospermae. Few will wish to argue with this departure, nor will the re-unification of Hypericaceae and Guttiferaceae occasion much shaking of heads or shooting out of lips, but the sandwiching of *Drosera* between *Frankenia* and *Elatine* is a little unexpected. For the rest, most of the course from Malvaceae to a temporary stop at Celastraceae is already familiar to students of the *Flora Orientalis*, though one wonders why the sequence has been altered to transpose Rhamnaceae and Celastraceae, and why Anacardiaceae has been interposed between these two similar looking families. The permutations of phylogeny are indeed inscrutable, but the attitude of the *Flora* towards families, genera and species is on the whole so restrained and well

mannered that an occasional demonstration of individuality is forgivable.

The decision to omit such internal geographical subdivisions as Mysia, Pisidia and Lycaonia will not be regretted, for this classical hangover was always something of a burden on our memories and a cause of confusion. It would, however, be useful to have some general indication of distribution within Turkey, apart from the grid and vilayet references, and it is to be hoped that some acceptable system will be devised in time for the next volume.

R. D. MEIKLE

DESIGN IN FISHES

Functional Design in Fishes

By R. McN. Alexander. (Hutchinson University Library.) Pp. 160. (London: Hutchinson and Co. (Publishers), Ltd., 1967.) 10s. 6d. paper.

THIS book is about the structure of fishes. The functional design, as shown by the anatomical and physiological characteristics selected by the author, is related to evolution by natural selection. Where appropriate the author supports his arguments with mathematics and physics, but, wisely, he warns the student that the subject must be approached in the manner of historians and critics. Mathematics and physics do not render the conclusions unassailable, because in any biological situation there are so many interacting structures and functions that there is always a danger of overlooking an important point.

The first chapter is about the coefficient of selection. The author examines the case of a genotype which increases the amount of food a fish obtains, or decreases energy consumption, thereby tending to increase the number of eggs laid by females, and being favoured by selection. He concludes that evolution by natural selection offers a plausible explanation for adaptations which result in small savings of energy.

The next five chapters deal with swimming, buoyancy, respiration, feeding and some sense organs. In each of these chapters analyses of the structures and functions of the organ systems are made, and related to the natural history of the fishes discussed.

A final chapter is concerned with the interactions between different functions or consequences of a single structure. This chapter is a most important one, because of the danger of oversimplification in a mathematical and physical analysis of a biological complex. It is so important that it should have been at the beginning rather than at the end of the book.

An appendix gives an outline classification of the fishes. It goes down to the level of orders, except in the case of the Cypriniformes and Perciformes, where some sub-orders are given. This brief systematic section is useful for students.

The reference list gives seven books on fishes, and there are eighty-eight other references, not representing an exhaustive bibliography, but serving as an entry into the literature of the subject.

There are sixteen clearly drawn figures. A highly commendable feature of the book is the complete relevance and full discussion of these figures in the text.

The book is a good introduction to the concept of functional design in fishes. It will be helpful to undergraduate students, for whom the series of books is intended. It will also be useful to workers in other fields of biology because it is a lucid and concise account.

One fault must be noted. Throughout the book the fish are called by their generic names only. This procedure is adopted even when it is clear that one species is meant and not all representatives of the genus. It is surprising that such nomenclatural inexactitude should occur, and it is to be hoped that this will be corrected in subsequent editions.

JAMES C. CHUBB

SOIL BIODYNAMICS MISMANAGED

Soil Fertility

A Biodynamical Approach. By F. W. Pauli. Pp. xi + 204. (London: Adam Hilger, Ltd., 1967.) 50s. net.

THE idea of the soil as a biologically active environment is well accepted. The relationships between plants and soil conditions continue to provide fascinating studies and we still have much to learn. In the preface to this book Professor Flaig draws our attention to the fact that recent emphasis on inorganic ions for plant nutrition has led to neglect of work on humus. Paradoxically, soil organic matter is most studied in countries using most mineral fertilizers. Dr Pauli aims to remedy the shortcomings of work with fertilizers by considering the soil ecosystem as a whole and relating the results of research on soil organic matter using modern analytical techniques to the problems of improving soil fertility measured by increased crop production. If this aim is achieved, then, as Dr Pauli hopes, some profitable new approaches to problems in soil fertility should develop. Unfortunately, he fails in his effort and what is worse sometimes confuses his interpretation of present knowledge. We shall have to wait longer for the inspired synthetical approach the subject demands.

The book is divided into seven chapters of text varying in length from three to seventy-three pages. Following four short introductory chapters, most of the text is in the fifth chapter on humus and soil fertility (59 pages), the sixth chapter on analytical techniques (73 pages) and the seventh chapter on man's exploitation of soil biodynamics (19 pages). There are two pages of conclusions and a glossary, bibliography and index.

The book is written without references inserted in the text so that the reader does not know either to whom to attribute the various statements or how much of the book represents published work and how much is interpretation by the author. The list of books, theses and papers provides no clue. The author states that his bibliography does not claim to be exhaustive and he does not indicate his method of selection. The bibliography does not contain several books one might expect to find, and references to published work by several established workers are missing from the list of papers.

Dr Pauli omits the role of fungi in the breakdown of plant material and the synthesis of humus. Normally, in aerobic soils the initial attack is by fungi, and subsequent decomposition by fungi and/or bacteria depending on the soil conditions. In anaerobic soils, plant remains are decomposed only by bacteria with the accumulation of lignified residues as peat. Terminology is bad throughout; for example, Dr Pauli writes of "low-molecular humus" when presumably he means "humus of low-molecular weight compounds".

On page 35, he describes clay minerals, "Many of the clay minerals consist of cations co-ordinated with water, OH⁻, O²⁻ and other anions, some of which are excellent bridging ligands and give rise to amorphous and crystalline solid particles. The crystalline particles show disorder and other imperfections, and may have amorphous coatings. The large surfaces contain many groups, among which are oxygen and different kinds of hydroxyl groups which may dissociate, yielding negatively and positively charged surfaces. In addition, electrical charges arise as a result of ionic substitution inside the lattice." Dr Pauli's basic description of the structure of a clay mineral differs so much from the accepted idea of layer structures of clay minerals derived basically from two units (a) of four oxygens at the corners of a tetrahedron with a silicon ion in the centre, and (b) of six oxygens or hydroxyls at the corners of an octahedron with typically an aluminium or magnesium ion at the centre, and with charges arising within the crystal from isomorphous replacement and at the edges of crystals by discontinuity, that one wonders at the source of his description and his interpretation.