

Perhaps it should have been read by a stupid critic before rather than after publication.

Undisciplined model-building is a menace, and can give the whole art a bad name. McFarland's theoretical creativity is matched by his experimental ingenuity, and it is the elegance of his own results which especially gives confidence in the value of his methods. Curiously, I found the examples drawn from other people's work particularly difficult to read.

The book shows signs of having been put together in a hurry. For example the preface and chapter 3 were presumably not really intended to start with the same paragraph, and the last sentence of the chapter 3 version of the paragraph does not make sense. The drawing on the cover is not well chosen.

One feels that the title may have been outgrown during the writing of the book. There is more here than feedback mechanisms. Chapter 1 introduces the idea of mathematical analogy and the "generalized variables", "effort", "momentum" and so on which are later applied to behaviour. It also equips the reader with a basic dictionary and grammar of control theory. Chapter 2 introduces feedback concepts. Chapters 3, 4 and 6 show how engineering techniques for analysing transfer functions of systems can be applied to behaviour. Chapter 5 discusses "errors" and describes some of the statistical techniques used by ethologists. The long final chapter is largely a stimulating review of the motivational theories of both psychologists and ethologists from the engineering viewpoint. The re-evaluation of the maligned "energy models" is provocative. The book ends with some exciting new ideas on the application of optimization theory to motivation, and one is left with the feeling that a new edition cannot be far away, such is the pace of the author's own inventive output.

RICHARD DAWKINS

## Endocrine Elements

*An ABC of Endocrinology.* By K. J. Catt. (Reprinted from the *Lancet*, April 11 to August 15, 1970. With two additional chapters.) Pp. 154. (The *Lancet*: London, November 1971.) £1.

THIS new up-to-date summary of endocrinology can be strongly recommended as suitable for students in both medical and science faculties. The information provides an excellent synopsis of modern endocrinology but of necessity is too brief to serve as a full textbook. This was not, however, its intention. In spite of the brevity of the treatment, the information is well inte-

grated, covering both clinical and non-clinical examples, and the book has already proved invaluable to me for both senior science undergraduate students and postgraduate medically qualified staff following membership qualification courses. The diagrams are plentiful and well organized, and it is a pleasure to see such a useful text both well printed and reproduced and available in paperback form at a modest price. I thoroughly recommend it.

KENNETH A. MUNDAY

## Knotted Molecules

*Catenanes, Rotaxanes, and Knots.* By Gottfried Schill. Translated by J. Boeckmann. (Organic Chemistry: a Series of Monographs.) Pp. x+192. (Academic: New York and London, February 1971.) \$11; £5.15.

THE pioneering studies by Ruzicka and Prelog of the chemistry of large and medium-sized cyclic molecules were a necessary prelude to the examination of the synthesis of chain-like molecules in which the components are not joined together by chemical bonds, but are just held together mechanically. Molecules of this type are known as catenanes and, although they were first recognized as a synthetic challenge by Willstätter during 1900-1912, it is only during the past decade that their synthesis has been achieved.

Professor Schill and his co-workers of the University of Freiburg have made outstanding contributions in the field of catenane and rotaxane chemistry, and this book is essentially a personal record of their achievements. A large part of the synthetic work described in this monograph has not been published previously, but presumably the experimental details will be made available in full papers shortly. This plea is made because some of the experimental techniques which have been used are novel. This account will be complementary to the full papers because after reading this monograph one can appreciate the philosophy and tactics which have been used in the design and exploration of synthetic routes which ultimately led to the successful synthesis of catenanes and rotaxanes.

The next objective in this field is the synthesis of molecular knots. This has not yet been achieved, but the last chapter contains an interesting appreciation of the concepts to be considered in the design of projected synthetic routes to knots, doubly wound catenanes, and rotaxanes.

This subject demands clearly drawn diagrams and formulae, and their presentation in this book is excellent.

W. D. OLLIS

## Making Molecules

*Biosynthesis of Macromolecules.* By Vernon M. Ingram. Pp. xiii+301. (W. A. Benjamin: Menlo Park, California, 1971.) \$10.95 cloth; \$5.95 paperback.

IN negotiating the swiftly moving currents of molecular biology the author of a modern text on this subject must steer a skilful course between the Scylla of writing a volume that is already obsolete on publication and the Charybdis of including all the hottest—and often inaccurate—unconfirmed results. In his updated edition of *Biosynthesis of Macromolecules* Dr Ingram has admirably avoided these twin traps and has produced a lucid account that should prove to be a solid and lasting reference book for both students and practising scientists alike.

After charting his course Dr Ingram considers in turn the intricacies of DNA synthesis, RNA synthesis, protein synthesis and finally the genetic control of primary protein structure. Throughout the emphasis is on experimental fact. In every field the key experiments are described in detail and interpreted according to the strict canon of logic. The reader is left in no doubt as to what the experiment in question does—or does not—prove. Where doubts and gaps in our knowledge remain or interpretations are ambiguous, this is clearly stated. This approach allows a detached and refreshing analysis of contemporary concepts in molecular biology and compares favourably with the instant compilations of scientific papers which are now so much in vogue. Not that Dr Ingram neglects the original papers: on the contrary the reference list is comprehensive enough for the research scientist to use the book as a source of important references outside his or her own immediate field. It is a welcome sign of the importance assigned to experimental practice that the book includes a chapter describing and evaluating methods of sequencing biological macromolecules.

Only very occasionally does the normally impeccable oarsmanship of Dr Ingram show signs of catching a crab. Where it does, it is on such trivial snags as whether or not the -CCA end of tRNA molecules is transcribed by the DNA dependent RNA polymerase. Where the rare errors of fact occur, they can be attributed not to the author but to the original scientific paper to which he refers.

All in all, this is an advanced textbook about molecular biology as it is practised, written by a practising molecular biologist for those who are already practising and for those who