ly obvious are his treatments of the fundamental concepts of "action-specific energy" and "releaser." These two terms are not listed in the subject index. Hinde studiously avoids them even when he discusses research reports which have been considered by ethologists as classic examples of these very concepts. Thus he deals with phenomena that have been commonly evoked to illustrate action-specific energy in terms of "waning in absence of muscular fatigue and sensory adaptation." Similarly, he speaks of "selectivity in responsiveness" rather than of the "innate releaser mechanism" (although he has not completely ostracized the latter term from his treatise). Certainly he has a right to disagree with the use of these terms or concepts, but to dismiss them in such an oblique fashion would seem to be a disservice to the reader.

On the positive side, Hinde has presented material regarding the "fixed action pattern" admirably and has used this concept fully, particularly in his discussion of the evolution of behavior. He also presents several observations of his own which support the usefulness of this concept. He has also given fairly adequate consideration to several classical learning theory concepts and presents well their present-day complexities. It is not until nearly the end of the book, however, that he arrives at one of today's prepotent questions, "What is learning?" Clearly, current learning theory is beset by many issues, and Hinde apparently has reflected this state of affairs as adequately as is possible within the limits of his book's purposes.

There are a few instances in which Hinde omits to mention an important point which has been made by the particular research study under discussion. For example, he discusses at considerable length, from Schneirla's (1952, 1965) and Lehrman's (1953) early viewpoints, the controversy regarding whether pecking behavior develops by means of learning in the chick embryo. This learning of pecking, it may be recalled, was thought to be based on experience with the embryonic heartbeat. However, Hinde neglects to answer the question, raised by Lorenz (1961), of why other avian species, which presumably have the same ontogenetic experience of the heartbeat in the egg, do not peck, but gape, in order to obtain food immediately after hatching, and still others, such as ducks, dabble, or shove their own bills into the parents' mouths, as do pigeons.

Another example of omission is that, while Hinde mentions (page 352) a research report by Meyers and McCleary (1964) showing that there is interocular transfer of a learned visual-pattern discrimination in cats that have been deprived of pattern vision—which indicates that not even pattern-vision experience is necessary in order for cats to have binocular equivalence when first exposed to the normal visual world—he neglects to apply this finding to an earlier discussion (page 349), and records in the conclusion to the chapter (page 357) that binocular experience is a prerequisite for binocular equivalence in cats.

In spite of such flaws, Hinde's book is of significance in presenting a particular viewpoint, a combination of ethological and comparative psychological notions, regarding the causation and development of behavior in the individual organism as a member of a particular species. Particularly sensible, for example, is his statement that "It is thus not profitable to search for general theories of drive applicable to all types of behaviour in all organisms." He makes it clear that in his view both genetic and experiential factors play roles as determinants of individual behavior. Certainly it is true, as the ethologists themselves have repeatedly recognized, that the problem of the causation of behavior is by no means solved simply by calling specific instances either "innate" or "learned" behavior, for there are also the stupendous tasks of determining how genetically coded factors influence the development of behavior and how environmentally constituted factors do the same. For example, as Hinde says, "even when the processes of tissue growth and differentiation have led to the development of an eye, that eye may not be functional until it has been exposed to the light." Even so, there are indubitably genetic processes which have led to the development of that eye. Ethologists have stressed that the genetically given behavioral tools, the "fixed action patterns," must be known before the role of environmentally induced changes in behavior, particularly those of learning, can possibly be understood.

Thus Hinde's book represents a beginning of a forthcoming inevitable event: the development of a science of behavior which takes full advantage of ethological, psychological, physiological, and neurological techniques and knowledge. The integration of these fields of research in behavior, whether animal or human, is a process that will lead to a new and exciting phase in the progress of science.

It is regrettable that the publishers have produced the book so poorly, the most apparent deficiency being in the quality of the illustrations.

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## Titanium Compounds

**The Organic Chemistry of Titanium**, by Raoul Feld and Peter L. Cowe (Butterworth, Washington, 1965. 221 pp., illus. $9.95), is an unusually complete and compact book. It covers all the organic derivatives of titanium, those in which the titanium is linked to carbon through oxygen, nitrogen, or sulfur as well as those in which the linkage is direct. It describes not only the products and their properties, but also their structures and uses, and cites all the pertinent references and patents. It covers such diverse aspects of its subject as titanium-modified silicones, chelate complexes, and the Ziegler catalysts. Anyone who wants to know about titanium or has wondered about its present-day chemical uses will need this book.

Chapter 1 takes up the direct titanium-carbon linkage, in terms of both classical sigma-bonded alkyl compounds and pi complexes. Chapter 2 takes up the tetraalkyl and tetraaryl titanates, and chapter 3 the corresponding alkoxy- and aroxy-titanium halides. The fourth chapter is devoted to the complexes of a wide variety of titanium compounds with chelating agents, and the fifth, on compounds of titanium and polyols, includes a section on the analysis of titanium by photometric methods. There follow chapters on compounds of titanium and carboxylic acids, compounds of titanium with other metallic elements, addition compounds of titanium halides, and compounds of titanium in the lower valences. Compounds containing Ti-N, Ti-O-S, Ti-O-P, and Ti-O-B linkages are treated in chapter 10, together with titanium thiocyanates and copolymers. Chapter 11 is devoted to the Ziegler

catalyst. The last chapter (and the longest) is devoted to the diverse applications of organic titanium compounds, and includes 219 references.

The most attractive feature of this book is its comprehensive treatment of the subject. It does not disappoint the reader by omitting what he is after. In order to make things still easier for the reader, the authors have included an unusually complete index and nearly a thousand references. They have done an exceptionally good job, and their book can be recommended to all those who have to do with inorganic chemistry or polymers or addition compounds or organic chemistry—in short, to nearly everyone who has to do with chemistry.

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## Zoological Society Symposium

The results of the important symposium on the Cnidaria and their evolution, held by the Zoological Society of London and organized by W. J. Rees of the British Museum (Natural History), have now been made available in book form. The world's foremost experts on the systematics and biology of the cnidarians were among the 32 zoologists who presented and discussed the 18 papers published in **The Cnidaria and Their Evolution** (W. J. Rees, Ed. Academic Press, New York, 1966. 467 pp., illus. $17.50). These contributions deal with many aspects of the "coelenterate" animals. Some of them are addressed directly to the question of evolution, whereas others expand upon more remote topics such as physiology, symbiosis, behavior, pharmacology, and morphology. Consequently, the volume contains material of interest to every zoologist working with the cnidarians, whether or not from the evolutionary viewpoint, and its general implications are so broad that it concerns all zoologists.

It is beyond the scope of this review to criticize the results and viewpoints presented in *The Cnidaria and Their Evolution.* Certainly there are views that will not be accepted universally, and there are points about which argument is inevitable. It is always a good thing to have these matters brought into focus. At this juncture, I merely wish to call the attention of all zoologists to the volume, and for this purpose a brief review of its contents will suffice.

The volume opens with an essay on homology, analogy, and chemical identity in the Cnidaria, by C. F. A. Pantin, which brings out the evolutionary significance of the "archetype" in relation to homology and analogy. This is followed by a timely review of research on nematocysts, by L. E. R. Picken and R. J. Skaer, which contains a brief summary of the significance of these structures in classification and phylogeny. Chapters dealing directly with problems of evolution in the Cnidaria are those by D. M. Chapman on the scyphistoma of the Scyphozoa; Hj. Thiel on the Scyphozoa in general; Swedmark and Teissier on the remarkable hydroids of the order Actinulida, which are a component of the marine interstitial fauna; C. Hand on the Actiniaria; W. J. Rees on the Hydrozoa; and J. W. Wells on the coral family Fungiidae. W. Vervoort discusses the taxonomic position of the peculiar hydroid family Solanderiidae, and the value of nematocysts in evolutionary and taxonomic studies in general. G. Chapman describes the structure and function of the mesoglea; Braverman and Schrandt attempt to simulate the development of a hydroid colony as a mathematical model, using an electronic computer; G. O. Mackie presents new findings on the growth of *Tubularia* in culture; G. A. Horridge discusses coordination in Ctenophora; and D. M. Ross reviews some aspects of sensory functions in sessile cnidarians. Yves Bouligand summarizes recent work on the Lamippidae, copepods widely associated with coelenterates, and D. Davenport emphasizes the desirability of the wider use of symbiotic relationships to investigate basic physiological and behavioral problems in the coelenterates. Elaine Robson describes the behavior of certain actinians that are capable of swimming and sheds some light on the origin of this behavior. Finally, J. H. Barnes reviews the important and practical subject of the highly toxic—even fatally so—Cubomedusae of Australian waters.

W. J. Rees merits the highest commendation for his skillful organization of the symposim and for the attractive and valuable book that has resulted from his editorship.

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## Reactor Physics

M. M. R. Williams came to the United States, saw at first hand the technical work in his field, and, as his book clearly shows, was conquered. Although he did not contribute to the "brain drain" but rather returned to England after only one year, his book nevertheless strongly reflects his contact with the active group of reactor physicists at the Brookhaven National Laboratory.

The material covered by **The Slowing Down and Thermalization of Neutrons** [North-Holland, Amsterdam; Interscience (Wiley), New York, 1966. 598 pp., illus. $19.50] is narrower in scope than the title implies. The effects of chemical and crystal binding on thermal neutron interactions and the resonance escape problem at slightly higher energies receive most attention.

The obvious motivation is supplied by thermal neutron reactor technology, but the book emphasizes the underlying physics rather than the practical consequences of the physical phenomena and their numerical calculation. Beyond this chosen emphasis there appears a lack of confrontation of theory with experiment and a lack of dealing with realistic cases. The result of these lacks is that the book emphasizes the formalism and does not yield a quantitative feeling for most of the physical phenomena involved.

The usefulness of the bibliographical work is impaired by frequent informal references such as simply "Corngold's work" (the leader of the Brookhaven reactor physics group) and by such omissions as the lack of a proper reference to the work of Purohit (another member of the Brookhaven group) on the moments of the crystal kernel. Williams has produced nearly 600 pages covering diverse areas in a coherent fashion. For the reader with a mastery of classical mathematical analysis the book should read very easily; for a reader with less than this mastery the book should still be readable but will be tough going in places.

The book can be recommended to those wanting to have in one place much of the physics and formalism of neutron thermalization as the subject stood in 1964.

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