in ducks. Beer's earlier chapter shows some progress in understanding gull displays by noting their variations more carefully, but one is left with bewilderment. McKinney begins to sort out displays by spatial analysis. Why does the male green-winged teal do so many different things in the vicinity of the female? McKinney's data show convincingly that the angular orientation of the male's position relative to the female, his distance from her, and the orientation of his body relative to her all play a part in dictating the exact display given. McKinney also emphasizes that rape is a common, normal reproductive strategy in some ducks, a piece of knowledge without which reproductive behavior would seem chaotic.

In one sense, these chapters are truly "essays in honour of Professor Niko Tinbergen," showing he was so far ahead of his times in thinking about behavior that his followers have made little new progress. Deeper honor is paid here and there with new ideas that stem from the foundation laid by the mentor. If McKinney's chapter foretells the future, we may really be blazing a new trail where Tinbergen left off, rather than trimming branches along the old path.

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Biological Membranes

Membrane Biogenesis. Mitochondria, Chloroplasts, and Bacteria. ALEXANDER TZAGOLOFF, Ed. Plenum, New York, 1975. xviii, 460 pp., illus. $29.50.

With the emergence of the "fluid mosaic model," it has become clear that biological membranes are highly dynamic supramolecular structures whose biosynthesis and assembly pose new types of questions for the cell and molecular biologist. Among the matters that need explanation are: the means by which the cell handles the synthesis of membrane proteins and transports them, as well as phospholipids, from their location of synthesis to their point of deposition within the membrane; the degree to which the synthesis of membrane lipids and proteins is coordinated; the role played by the more hydrophobic (integral) membrane proteins in the attachment of the more hydrophilic (peripheral) membrane proteins to the membrane; the mechanism (or mechanisms) by which membrane proteins and lipids are assembled so as to form an asymmetric, bimolecular leaflet; and the nature of the protein-protein and protein-lipid interactions that must ultimately determine where and when new proteins and lipids are inserted into the "fluid mosaic." Add to these questions relating to the organization of genes (both structural and regulatory) that code for membrane components and, in the case of mitochondria and chloroplast membranes, the intracellular location (extranuclear or nuclear) of the genes involved, and one has a glimpse of the framework within which the newly emerging field of membrane biogenesis is developing.

The appearance of a book on membrane biogenesis is timely because this field is still somewhat fragmented as a result of the wide assortment of experimental systems and approaches in use. It was with this in mind that Tzagoloff assembled this collection of reviews dealing with the in vivo biogenesis of three popular experimental membrane systems: mitochondrial, chloroplast, and bacterial.

One of the strengths of the book lies in its emphasis on experimental approach and its detailed consideration of the problems that can be encountered in studying membrane biogenesis in vivo. These qualities are perhaps most evident in the papers by Ellis on the biosynthesis of membrane proteins by isolated chloroplasts and by Weiss and co-workers on the biosynthesis of two of the electron transport components (cytochrome c oxidase and cytochrome b) of the inner mitochondrial membrane. Although this approach to reviewing new developments in a field is of great heuristic value, it is regrettable that many authors have chosen not to discuss their results in the general context of membrane biogenesis or to draw upon the results of parallel experiments with other experimental systems. The introductory chapter by Tzagoloff compensates in part for this shortcoming by integrating the results derived from all the other chapters into a useful, albeit brief, overview of membrane biogenesis. Other integrative papers include the excellent ones by Mindich on the use of bacterial mutants which are auxotrophic for glycerol to study the coordination between membrane protein and phospholipid synthesis and by Ohad on the development of photosynthetic membranes.

This book has two obvious weaknesses. First, some important subjects (for example, turnover of membrane constituents and biogenesis of the endoplasmic reticulum and plasma membrane) have been omitted. And second, some authors have devoted sizable portions of their reviews to subjects of no immediate relevance to membrane biogenesis (for example, the evolution of extra chromosomal genomes and the mechanisms of ethidium mutagenesis in mitochondria).

On the whole, this volume should be of interest to teachers and scientists concerned with cell biology, membrane biochemistry, and organelle biogenesis, and it should be particularly useful to students encountering the field for the first time.

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Actions of Drugs

Cellular Pharmacology of Excitable Tissues. TOSHIO NARAHASHI, Ed. Thomas, Springfield, Ill., 1975. x, 538 pp., illus. $35.50.

This collection of reviews encompasses much of the field of cellular pharmacology. There are chapters on the synaptic physiology of the motor end plate, the autonomic nerve-effector junction, the autonomic ganglia, and the central nervous system; on smooth muscle, cardiac, and squid axon membranes; and on electromechanical coupling and contractile mechanisms in smooth and skeletal muscle. A great deal of information is presented, generally lucidly, and anyone concerned with cellular pharmacology, including graduate and medical students and neurophysiologists, should read the book.

The title is misleading, or at least overly narrow, since the book is largely physiology. In most of the chapters a reader will look in vain for lists of compounds and their action on a particular system or mechanism. After describing the details of normal functioning of a system, most of the authors more commonly discuss the action of a potassium ion than a drug, a nontherapeutic agent than a therapeutic one. This is not a criticism, since other sources of material on actions of drugs are available. But cellular pharmacology stripped of most of this material is indistinguishable from physiology.

In all collections of papers quality, style, and approach vary. In this book there is more variation than necessary. Bianchi, in a particularly fine chapter on the pharmacology of the contraction of skeletal muscle, and Wit and Hoffman, in their chapter on the pharmacology of the cardiac action potential, do analyze the actions of numerous agents, including many of the principal therapeutic ones. Most chapters are broad reviews, but those of Somlyo and Narahashi are