main unknown or are insufficiently established for inclusion in the first group. There also is an alphabetical list of 57 obsolete names not always ascribable to a single specific carotenoid but useful in searching the older literature. There remains in this chapter one desideratum. The value of the painstakingly assembled and listed information on known carotenoids could have been substantially enhanced had there been appended, for each entered compound, just a few diagnostic or characteristic data, such as the maximum wavelength values in reference solvents, partitional behavior, perhaps crystalline habit from specific solvents, and melting point. Such addenda could follow somewhat the forms and sequences in which carotenoids are presented in Rauen's *Biochemisches Taschenbuch* (Springer-Verlag, 1964). Such additional information might have added to the total space given to the list by 20 percent—or only about 1 percent of the book—and the increase would have been more than compensated for by the increase in the book's usefulness both at the desk and near the laboratory bench.

Dedicated as it is "to all scientists in the field of carotenoids," this volume will amply serve that wide fraternity for a long time to come. It belongs within ready reach of all such students and in all scientific libraries.

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Secretory Processes

Subcellular Organization and Function in Endocrine Tissues. A symposium, Bristol, England, Apr. 1970. H. HELLER and K. LEDERIS, Eds. Cambridge University Press, New York, 1971. xxiv, 1012 pp., illus. $37.50. Memoirs of the Society for Endocrinology, No. 19.

Results from different experimental approaches (biochemistry, physiology and pharmacology, and electron microscopy) are beginning to yield a coherent picture of the secretory process in endocrine systems which liberate peptides and monoamines. The planners of the symposium that gave rise to this volume wisely limited the scope of the meetings to a consideration only of tissues which secrete these hormones. In so doing, they have provided a comprehensive and valuable study of the dynamics of synthesis, transport, storage, and release of these hormones, and of the morphology of subcellular structures involved. Most of the contributions are current research papers rather than reviews; experimenters in the field will therefore find the book to be a stimulating source of methods as well as experimental ideas, references, and unanswered questions. Of the few review papers that are included, most are of the contributors' recent work, rather than exhaustive studies of the entire field.

The experimental separation of the stages from synthesis of the hormones to stimulus-release coupling is one of the difficult problems in analyzing the process of secretion. In this volume (as in the field as a whole), the most successful analyses of various stages are made on the neurohypophysis, beta cells of the pancreas, and monoamine-secreting cells. The incorporation of radioactive label is followed biochemically in the neural lobe (the coordinated synthesis of neurophysins and active peptides is demonstrated) and by electron microscope autoradiography (unfortunately presented here without micrographs) in the beta cells. Transport of newly synthesized hormones and granules, and disruption of this process, are traced in all three systems. The conclusion that rates of transport are rapid, and possibly crucial in maintaining the supply of releasable hormone, is an important one. The biochemical maturation of granules is discussed for several of the systems. There is now evidence for more heterogeneity of granules than is indicated by the simple distinction between those in a "readily releasable pool" and those "in storage." A great many data are presented on the nature of granule contents and the mechanism of binding of hormones (for example, the probable occurrence of high-molecular-weight aggregates of adenosine triphosphate and catecholamines), but in many cases the role of the binding proteins remains obscure.

Experiments on hormone release in the adenohypophysis, as described in this book, are somewhat less satisfying. Some experiments in vitro are complicated by high leakage rates. The conclusion of some workers that there is no calcium requirement for release must be squared with contrary results of other workers on the same system and with the general importance of calcium in the release of other peptidic hormones. Geschwind's important paper outlines clearly the many steps that may be involved in the release process in the adenohypophysis as well as other secretory tissue. It is possible that many of the agents tested for effects on "release" (for example, metabolic inhibitors, factors affecting adenyl cyclase) actually alter processes several steps removed from the actual coupling between stimulus and release.

Other papers deal with pineal, urophysis, parathyroid, and "tissue hormones," and the last 200 pages are devoted to round table discussions. In most cases, the formal contributions to this latter section consist of brief and concentrated descriptions of recent experimental results. Because of the abridged nature, or absence, of introduction, methods, figures, and references, parts of this section may be of less interest and value to those who are not already familiar with the particular problem under consideration.

Several of the electron microscopic studies included in this volume merit special mention. Even to those who have been skeptical about the possibility of interpreting dynamic processes on the basis of micrographs, the paper by Farquhar is particularly striking. Her interpretations of many stages of synthesis and release of several adenohypophysial hormones, and of the destruction of excess granules, are firmly based on physiological manipulations. The contribution of Douglas's group provides impressive microscopic evidence for exocytosis as a release pathway for neurohypophysial peptides, although the failure to demonstrate an effect of a potent releasing stimulus is still disappointing. Microscopic evidence for the electron-lucent microvesicles by uptake from the cell membrane after hormone release is also presented. The latter, coupled with the centrifugation studies on intact nerve endings reported by Livingstone and Lederis, suggests that the term "synaptic vesicles," as applied to the microvesicles of peptide neurosecretory cells, may finally be laid to rest.

In view of the size of the volume and the obviously tightly scheduled nature of the meetings, it is perhaps unfair to criticize the organizers for deciding not to include a session on invertebrate neurosecretion. While studies of the biochemistry, packaging, and release of invertebrate peptide hormones are still of a preliminary sort, important parallels to the situation in vertebrates have already been uncovered. The evidence for exocytosis and the origin of microvesicles from electron microscopic studies is, if anything,

stronger for invertebrate than for vertebrate neurosecretory systems. One of the most impressive aspects of this volume is that it shows that anyone studying peptide or amine secretion will find it valuable to consider results from any of the other systems. This conference and its memoirs are a major contribution which will help to further communication between groups working on these related vertebrate (and, one might hope, invertebrate) endocrine systems.

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Plasmodium and Its Hosts

The Primate Malarias. G. ROBERT COATNEY, WILLIAM E. COLLINS, MCWILSON WARREN, and PETER G. CONTACOS. National Institutes of Health, Bethesda, Md., 1971 (available from the Superintendent of Documents, Washington, D.C.). xii, 366 pp., illus. $7.

This long-awaited monograph on malaria parasites exceeds all expectations in the brevity and clarity of the text and the quality of the 27 colored plates. The authors went to great lengths to achieve uniformity in the preparation of the latter; all but two were painted by a single artist under their direct supervision from material stained by exactly the same technique, and all the illustrations are at the same magnification. The treatment of the subject is fundamentally zoological, but the malariological background of the authors is reflected in the concentration on the practical aspects of identification of species. Thus, most attention is paid to the morphology of the parasites in Giemsa-stained blood films. Nevertheless the diagnostic importance of the sporogonic stages is emphasized, and a unique feature is the inclusion of 18 plates, which trace sporogony from the earliest oocyst, in a series of figures, to the sporozoites. Less attention is paid to the details of exoerythrocytic schizogony (nine plates of photomicrographs in black and white illustrate the details) or the first stages of sporogony. Each species is described in a standard way: history and synonymy; developmental cycles of the parasite in the blood, mosquito, and liver respectively; the course of the infection; vertebrate and invertebrate hosts and immunity.

The first chapter comprises a highly original account of the evolution of the primate species of *Plasmodium*. It is suggested that the simplest explanation of the peculiar zoogeography of these parasites and their vertebrate hosts is that their cradle was sited in the jungles of southern Asia, where florid speciation of both parasite and host arose; then at a more recent date, perhaps in the early Pleistocene, an early hominid invaded this region from the west or north. He shared the same sylvatic environment and soon became infected with the indigenous parasites. Such events occur, albeit rarely, today, as the authors vividly describe from their own observations on the contraction of *P. knowlesi* malaria by an American surveyor who had spent a few days in the forest in Malaya. The zoonotic potential thus still exists. Speculations on the return of infected hominids to Africa and the late introduction of malaria into early man and the great apes in that continent seem less plausible, but no better theory has really been advanced. More certain, perhaps, is the theory of the introduction, only a few hundred years ago, of *P. malariae* and *P. vivax* into the New World, where these parasites spread not only to the human inhabitants but also to the monkeys, where they became adapted as *P. brasilianum* and *P. simium* respectively. A later chapter describes in more detail the present-day ecological relationship in the three continents regarding the transmission of primate malaria by sylvatic species of anopheline mosquitoes. The last introductory chapter is notable for a clear exposition of the nature of relapses and the various theories that have been suggested to explain the mechanism, but the complete picture is still missing.

Twenty-four species of *Plasmodium* are described in separate chapters which range in length from 30 pages (on *P. cynomolgi*, the most widely used experimental model) to little more than a single page (on *P. girardi* and *P. lemuris*, rare parasites of lemurs). The four species found in man receive considerable attention, and invaluable information is summarized here on the behavior of different strains, particularly of *P. vivax* and *P. falciparum*. Although, in general, clinical details are omitted from this book, symptomatology of these human infections is discussed in reference to types of fever and duration of the disease, largely on the basis of the authors' own observations on sporozoite-induced infections in patients requiring malaria therapy or, more recently, in prison volunteers. Many examples are taken from the literature also to illustrate special points of interest. The descriptions of the malaria parasites of Asian nonhuman primates are particularly good, because they embody the profound studies of the four authors, in the field, in experimental vertebrate and invertebrate hosts, and finally in man; incidentally, five of the species were discovered and named by one or more of the writers.

The book itself reveals throughout an intimate knowledge of the organisms. It is written in such excellent English that the nonspecialist can read it with interest and could quickly become familiar with the subject. The 73 figures and 41 tables relate chiefly to the course of parasitaemia and of sporogony, and show at a glance these important aspects of malaria in the primate and in the mosquito.

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Scattering Techniques

Theory of Thermal Neutron Scattering. The Use of Neutrons for the Investigation of Condensed Matter. W. MARSHALL and S. W. LOVESEY. Oxford University Press, New York, 1971. xxiv, 600 pp., illus. $38.50. International Series of Monographs on Physics.

This is a very timely and long-awaited book on thermal neutron scattering. Several reviews and monographs have appeared in recent years treating various aspects of neutron scattering for the study of basic properties of condensed matter. However, this is the first comprehensive theoretical treatment of thermal neutron scattering to cover all important applications of the technique.

As the authors state at the outset, thermal neutrons have a fortunate energy-wavelength relation (for example, 20 meV at 2 Å) which makes them ideal tools for the study of fundamental excitations in crystals, such as phonons and magnons. In addition, the normal cross-section for hydrogen permits wide applications to chemical and biological studies. Many strong sources of thermal neutrons are now available, and the neutron-scattering technique is now considered one of the basic tools in scientific research.

In this book, Marshall and Lovesey have succeeded in giving a systematic and lucid theoretical treatment of neu-