

Neuropeptides

Peptides in Neurobiology. HAROLD GAINER, Ed. Plenum, New York, 1977. xx, 464 pp., illus. \$34.50. Current Topics in Neurobiology.

The dramatic impact of the discovery that morphine-like peptides, the enkephalins, are present as normal constituents of mammalian brain led one correspondent to this journal, with only a modest degree of hyperbole, to describe research on these substances as "one of the hottest growth areas in the neurosciences." One spin-off of this latest vogue in the neurosciences has been an intensified interest in the neurobiological significance of the variety of small peptides known to exist in the nervous system.

Research on the enkephalins and the related pituitary endorphins continues to dominate. Nevertheless, the opioid peptides are heavily outnumbered by other endogenous neuropeptides, including the neurohypophyseal hormones vasopressin and oxytocin; the hypothalamic releasing hormones, now known to occur in many regions of the central nervous system outside the hypothalamus; various peptides initially described in the gut, such as substance P, vasoactive intestinal polypeptide, and gastrin; and brain peptides with unknown function, such as neurotensin and the two dozen or so dipeptides and tripeptides that contain putative amino acid transmitters such as glutamic acid, gamma-aminobutyric acid, aspartic acid, and β -alanine. The present volume reviews the overall field of neuropeptide research, and gives an accurate account of the state of the art in 1975 (with an addendum that is a valiant attempt to keep abreast of enkephalins up to mid-1976).

The endogenous peptides found in the nervous tissue are nearly all present in very small amounts, and methods for their analysis at the picomole and femtomole level are crucial for future research. The book has good reviews of the use of column chromatographic techniques, in which sensitive detection is afforded by means of modern fluorogenic reagents, and of the more popular radioimmunoassay approach. These techniques, used in conjunction with microdissection of specific brain areas, and the equally important technique of immunocytochemistry have rapidly advanced our knowledge of the cellular localization of neuropeptides and their distribution in the central nervous system. In all cases studied so far the peptides have been found to occur exclusively in neurons, and they are particularly concen-

trated in nerve terminals, suggesting that they may represent a new family of central nervous system neurotransmitter substances.

Very little is yet known about the biochemical mechanisms involved in the biosynthesis and degradation of brain peptides. The limited number of examples for which such information is available suggest, however, that neuropeptides are probably synthesized initially as parts of larger precursor polypeptides that are then attacked by specific cleavage enzymes. The inactivation of the peptides following their release in the brain may involve multiple sites of attack by the numerous peptidases present in the central nervous system, although the existence of specific degradative enzymes for individual peptides remains a possibility.

If we know little about the metabolism of neuropeptides, we know even less about their functional importance. A very useful chapter reviews what is known about invertebrate nervous system peptides. About 50 such substances are known (mainly in arthropods and mollusks), and they serve diverse functions, controlling pigmentation, molting, tanning, heart and gut function, sugar and fat metabolism, salt and water balance, and reproduction. These com-

parative data may provide valuable clues, although one may question how far extrapolation to vertebrates is permissible, since the neuropeptides in invertebrates seem to serve many of the functions assumed by endocrine tissues in vertebrates. Nevertheless, it may be helpful to view the peptidergic neuron as intermediate in its properties between a gland cell and a neuron. The known electrophysiological actions of peptides in the vertebrate central nervous system and their diverse effects on animal behavior are well reviewed. The latter are particularly important, since some of the first clues about the importance of peptides in brain function derive from behavioral observations, although the gulf between such observations and our understanding of the precise cellular distribution and mode of action of peptides within the central nervous system clearly remains immense. The present volume can be regarded as no more than a progress report in a rapidly growing field, but it should provide a useful entrée to the subject for those interested in joining in the fun.

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Acridology in the Uvarovian Style

Grasshoppers and Locusts. A Handbook of General Acridology. Vol. 2, Behaviour, Ecology, Biogeography, Population Dynamics. BORIS UVAROV. Centre for Overseas Pest Research, London, 1977. x, 614 pp., illus. \$40.

The first volume of this comprehensive work, covering the anatomy and physiology of the short-horned grasshoppers or Acridoidea and an introduction to their classification, was published in 1966. The second volume is posthumous, since the Russian-British author, Sir Boris Uvarov, died, at the age of 80, in 1970. We are indebted to several members of the London Centre for Overseas Pest Research, who revised and edited the drafts of the chapters left unfinished by the author and assembled the illustrations and bibliography. The work as a whole is an extremely solid contribution to entomological literature, the scientific testament of a man whose life was wholly devoted to the study of locusts and grasshoppers from the standpoint of taxonomy, descriptive ecology, and biogeography and the practical control of pest species.

The second volume deals with the gen-

eral activities and behavior of the insects, their food and feeding habits, flight, mating, oviposition, life cycles, and the relationship between "life forms" and "life zones" (somewhat vague but useful concepts around which discussion can be organized). Four chapters deal with aspects of "gregarization"—the genesis of migratory behavior in certain species ("locusts" as opposed to "grasshoppers" in Uvarov's sense), leading to the outbreak of swarms.

The major part of the book is concerned with the important locust pests of the Old World, the desert locust (*Schistocerca gregaria*, very closely related to the widespread North and South American *S. americana*), the migratory locust (*Locusta migratoria*, with many races extending from Europe and central Africa to the Philippines and eastern Australia), the South African brown locust (*Locustana pardalina*), and the red locust (East Africa, Madagascar). The review of the literature on these and other, minor pest species of Africa and Asia (some of them, such as the Moroccan locust, *Dociostaurus maroccanus*, not so