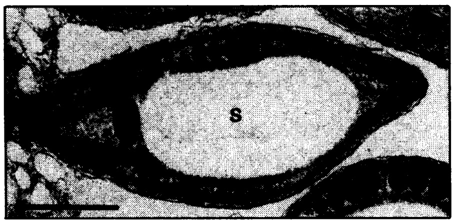

"Chloroplast of a green alga (*Codium fragile*). The thylakoids form grana with few thylakoids per granum, a feature typical of Chlorophyta. A large area is occupied by starch (S). Plastoglobuli are frequent between the thylakoid stacks. Bar: 0.5 μm." [From *Pigment-Protein Complexes in Plastids*]

complexes in the plant's plastids—is the subject of this book. The biochemistry of these pigment-proteins and the idea that it is proteins and not lipids that organize the pigments have been frequently reviewed; their biogenesis and assembly have not. Yet many exciting advances in photosynthesis research are occurring in this area. What is at issue is how multiple pigment molecules become associated with specific proteins, particularly given that their coordination is noncovalent, and how the assembly of the resulting complexes into the thylakoid membrane is regulated.

Sundqvist and Ryberg have brought a breath of fresh air to the literature on photosynthesis by obtaining contributions from several authors who are new to the review-writing circuit. Half the book consists of the obligatory material for any volume dealing with chloroplast biogenesis: discussions of plastid structure, aspects of chlorophyll biosynthesis, and photosystems I and II. The two chapters on photosystems I and II cover too much ground, at the expense of a fuller description of the photosystems' pigment-proteins. What little is known about the involvement and organization of carotenoids in pigment-proteins is for once well covered.

The essential topic of the book's title is treated in Paulsen's enthralling chapter, which provides a description of the in vivo and in vitro assembly of the pigment-proteins. De Boer and Weisbeek describe how nuclear-encoded proteins cross the chloroplast envelope and thylakoid membrane. Eskins discusses how light and temperature regulate chloroplast development in general, Franck describes what happens biochemically immediately after an etiolated plant sees the light, and Hachtel and Friemann thoroughly and succinctly review the regulation of pigment-protein synthesis at the molecular level. Selstam and Wigge manage to maintain their focus on the pigment-proteins while reviewing the much broader topic of how chloroplast lipids relate to the assembly process. The information they provide will become increasingly important, because lipids and carotenoids are the likely cues for the assembly of the component parts into photosynthetic complexes.

This book will be of value to teachers and researchers, particularly beginning graduate students, interested in any aspect of chloroplast biogenesis. It will also interest membrane biochemists. Few post-1990 citations are included, suggesting that the book's production was substantially delayed. Thus it should be read in conjunction with publications from recent meetings on chloroplast development.

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Purine Research

Adenosine in the Nervous System. T. W. STONE, Ed. Academic Press, San Diego, CA, 1991. xviii, 278 pp., illus. $82 or £44. Neuroscience Perspectives.

The history of research on adenosine and its related nucleotides provides a good example of the ebb and flow of scientific discovery. Almost 80 years have passed since adenosine was first administered to humans for experimental purposes. Pioneering work by Drury and Szent-Györgyi in 1929 demonstrated the actions of adenosine on the cardiovascular system and its potential importance in physiological processes. However, few new insights were forthcoming until the early 1960s, when Berne and Gerlach and colleagues independently proposed that adenosine was the endogenous mediator of increased blood flow in response to ischemia. This hypothesis proved to be the impetus needed for a resurgence of interest in adenosine and initiated research into whole organ and cellular actions of purines. After the 1970 discovery that adenosine could stimulate cyclic adenosine monophosphate (cAMP) production in brain slices and that this effect could be antagonized by methylxanthines, Suttin and Rall suggested that there were specific adenosine receptors that mediated these effects and that adenosine might be important in brain signaling.

In the late 1970s Burnstock postulated that there were two distinct classes of purinergic receptors—those mediating the effects of adenosine and those mediating the effects of the adenine nucleotides, adenosine triphosphate (ATP) and adenosine diphosphate (ADP). He termed these two types of receptors P1 and P2, respectively. The 1980s and early 1990s have seen the movement of adenosine research into the subcellular arena, where the techniques of biochemistry and molecular biology are used to define the structure, function, and regulation of purinergic receptors and their effector systems. Pharmaceutical firms are currently investigating therapeutic uses of adenosine analogs and receptor antagonists.

Adenosine in the Nervous System will be of interest to a much larger readership than is suggested by its title. Although 6 of the 12 chapters are specifically concerned with the tissues of the nervous system, their discussions and conclusions have implications for the cardiovascular and gastrointestinal systems and for receptor biology in general. The other chapters explore the production, metabolism, and modes of signal transduction of adenosine, adenine nucleotides, and their receptors.

The last three chapters provide an overview of the role of adenosine in normal brain function, dealing specifically with purine metabolism and neurological dysfunction, adenosine and central nervous system control of autonomic function, and the potential role of adenosine and its analogs or antagonists in neurological disease. At this point we know very little about the physiological importance of adenosine in the brain and which functions are regulated by purinergic mechanisms. In many ways the basic transmembrane signaling mechanisms are easier to understand than the role of this signaling in higher or integrative nerve function. It is known that activation of A_1 adenosine receptors can inhibit adenylyl cyclase and produce sedation, but it has not been determined how decreased cAMP causes sedation. The great therapeutic potential of this class of molecules for use as sedatives, neuroprotective agents, anticonvulsants, or analgesics has not been realized owing to side effects, such as hypotension and potential DNA damage. The authors of these final chapters suggest approaches to circumvent or eliminate these untoward effects.

The book is especially valuable for the global overview of the field that it provides, covering such diverse topics as the molecular biology of receptors, whole animal physiology, the electrophysiology of ion channels, medicinal chemistry, and drug development. Given the breadth of topics covered, however, no subject could be treated in great depth. If you want the most up-to-date information on the function, structure, or molecular biology of adenosine receptors, for example, you will come away disappointed. Not unexpectedly for a compilation of the products of individual laboratories, the book suffers from some repetition and parochialism. Taken as a whole, though, this is a good overview of adenosine research. And in this Decade of the Brain it seems an opportune time to take stock of what we know about the role of adenosine in the regulation of brain function.

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