A Process in Cell Regulation

Protein Phosphorylation. Papers from a conference. ORA M. ROSEN and EDWIN G. KREBS, Eds. Cold Spring Harbor Laboratory, Cold Spring Harbor, N.Y., 1981. In two volumes. xl, 1422 pp., illus. $140.

Protein Phosphorylation is the proceedings of the largest and most comprehensive conference ever held on the subject, and the 95 contributions in it reflect the ubiquity of protein phosphorylation as a regulatory device. Book A describes recent investigations of cyclic-nucleotide– and calcium-ion–dependent protein kinases, protein phosphatases, and the regulation of carbohydrate and lipid metabolism. Book B deals with insulin and growth factors and the role of protein phosphorylation in the control of muscle contractility, protein synthesis, nuclear and cytoskeletal function, cell transformation, and neuronal and membrane function. The papers are of a high standard, and the volumes give a reasonably complete account of ongoing research at the time of the meeting.

Some of the exciting developments that had emerged at that time are the discovery that epidermal growth factor activates a protein kinase that phosphorylates tyrosine residues specifically and shows intriguing similarities with the virally coded protein kinases that elicit cell transformation; the observation that insulin and growth factors increase the phosphorylation state of ribosomal protein S6; the discovery of a novel allosteric effector of phosphofructokinase, later identified by Van Schaftingen and Hers as fructose 2,6-bisphosphate; and the description of a new type of protein kinase that is completely dependent on calcium ions, diacylglycerol, and phospholipids. This last-mentioned enzyme may mediate the actions of some extracellular stimuli that do not use cyclic adenosine monophosphate as a "second messenger."

The papers in the book appear in the order of presentation at the meeting, with little apparent editorial control of length or content. Perhaps it would have been better to group all the papers dealing with calcium-ion– and calmodulin-dependent protein phosphorylations in a separate section, and a paper by Nishizuka and Takai describing the new calcium ion and diacylglycerol-dependent protein kinase should have been placed directly after the contribution 300 pages later by Exton and co-workers, who review the action of hormones that do not work through cyclic adenosine monophosphate. More generally, a different arrangement of some sections would have helped nonspecialists to realize how protein phosphorylation has linked areas of research that were previously thought of as being quite separate. Since no one paper can be regarded as an adequate review of any particular subject, it might have been useful had each section been prefaced by an introductory paper describing the background of and outstanding problems in the subject discussed in that section. This might then have avoided the repetitive introductions in each paper, which are particularly tedious in section 1.

However, the editors are to be congratulated for assembling such a comprehensive and talented array of contributors, and for publishing so complete an account of the proceedings within one year. These books are essential reference works for everyone involved in this area.

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Auditory Physiology

Neuronal Mechanisms of Hearing. Proceedings of a symposium, Prague, July 1980. JOSEF SYKA and LINDSAY AITKIN, Eds. Plenum, New York, 1981. xii, 444 pp., illus. $45.

This book of symposium proceedings is divided into nine sections. The first two sections, on cochlear mechanisms, are highlighted by a paper by Russell and Sellick on hair cell intracellular recording that describes their work demonstrating that inner hair cells respond to basilar membrane velocity at low frequencies and that outer hair cells respond to basilar membrane displacement. It is suggested that the role of the coupling of the cilia to the tectorial membrane is to avoid biasing at high frequencies, where the alternating-current component is quite small. Katsuki presents a model of receptor sites and Furukawa and Matsuura review their model of multiple release sites. Studies in the caiman have suggested that a traveling wave may not exist in all species. However, using auditory nerve recording, Smolders and Klinke demonstrate that the necessary conditions for a traveling wave do exist in the caiman. Ross and Jones present evidence that efferents are part of the parasympathetic system and that collaterals of spiral ganglion nerve fibers supply both afferent and efferent terminals.

Several issues concerning the cochlear nerve and cochlear nucleus are addressed in the third section. On the question of dynamic range—how do our ears operate over a 100-decibel range when the majority of cochlear nerve fibers have a dynamic range of 20 to 30 decibels?—Evans suggests that not all cochlear nerve fibers have restricted dynamic ranges, that a temporal code (phase-locking) can carry information about the relative levels of stimulus components, that background noise can bias the rate level function, and that care must be exerted in comparing the data from anesthetized cats with those from humans, since the efferent system is not functional in the anesthetized animal. Møller discusses the coding of complex sounds. He demonstrates that nerve fibers transmit temporal information even though the average discharge rate is in saturation. This result is supported by Voigt *et al.*, who demonstrate that a temporal-place mechanism can reflect formant structure even at signal-to-noise ratios less than one. Anatomical knowledge of the circuitry of the dorsal cochlear nucleus is reviewed by Osen and Mugnaini. Young and Voigt describe type II-III units in the dorsal cochlear-nucleus that have low spontaneous rates and primary-like response rates and cannot be driven anti-dormically. Type IV units have marked spontaneous activity, nonmonotonic rate curves, and inhibitory regions. Evidence has previously been provided that type II-III units may be the inhibitory input to type IV units, which may be fusiform cells.

The next two sections cover central auditory mechanisms, with an excellent review by Suga *et al.* of how biosonar information is represented in bat cerebral cortex. The review brings together much of the prior research on this important topic. The authors suggest that there are information-bearing parameter filters in the auditory system that are aggregated in identified regions of cerebral cortex. They suggest that the recognition of the overall acoustic image is directly related to spatiotemporal patterns of neural activity rather than to neural activity in a particular area.

Several papers discuss the inferior colliculus and medial geniculate body. Syka *et al.* report that neurons with different binaural response properties are distributed differentially in the inferior colliculus. Semple and Aitkin report that the ascending inputs to the inferior colliculus remain partially segregated with a fine pattern of integration.