just as much reason for interest in the effects of low pressure as in those of high. For example, there is evidence that locomotor activity in *Carcinus*, an inshore crab, is stimulated by changes as small as 0.1 atmosphere in its ambient pressure. The literature documenting such exquisite sensitivity is well covered, and a chapter is devoted to discussing some of the possible mechanisms for it. There are several chapters on the problems associated with the diving of air-breathing vertebrates. In these chapters one can learn what is known about the respiratory and cardiovascular adaptations required for breath-hold dives to depths with pressures as great as 100 atmospheres. Whereas the gas-condensed-phase interaction creates problems for some animals that want to dive, fish, cephalopods, and even some unicellular organisms have created a gas space in order, apparently, to regulate their buoyancy. Several of the symposium presentations are devoted to the mechanics, energetics, and regulation of buoyancy.

A common obstacle to the study of the effects of high pressure is the difficulty of acquiring and handling the hardware needed to maintain an organism in an environment having a controllable pressure and permitting experimental observation and manipulation. In the case of microorganisms, these problems are not too great. The difficulties become magnified as one undertakes to work with an organism under in situ conditions from the deep parts of the oceans or with a large organism or with gases at high pressures. The text contains many excellent paradigms of technique at high pressures. Particularly exciting is the potential of the apparatus shown in the photograph facing page 233 for the study of organisms retrieved at a high pressure from the deep sea. Hopefully, this apparatus is a harbinger of an increased understanding of life in this extremity of the biosphere.

The volume of activation, $\Delta V^{\ddagger}$, is incorrectly defined as a ratio on the bottom of page 175, but correctly defined as a difference on page 17, equation 20.

In summary, this book will be a valuable source of information and ideas in endeavors to understand the effects of high pressures on biological systems.

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Problems in Immunology

Contemporary Topics in Immunochemistry. Vol. 1. F. P. INMAN, Ed. Plenum, New York, 1972. xii, 186 pp., illus. $14.50.

In the preface to this volume Inman writes, "So much information is available that the immunochemist finds it a struggle just to keep the major problems in his discipline in focus! Most of the articles in this and the forthcoming volumes will not be comprehensive reviews of the subject. It is the editors' intention to publish discussions of rather limited scope in areas of intensive research. The purposes of most articles will be to inform the reader of the present state of comprehension germane to that particular problem area, to describe the current research, and to offer suggestions for future inquiries."

There are 11 articles, and I have chosen three to illustrate the different approaches to the handling of the specialized topics in the burgeoning field of immunochemistry.

Immunologists are prone to speak glibly about the exquisite specificity of immunologic recognition and responsiveness. Much of the incisive work that has provided insight into the operation of immunologic specificity has focused on small haptenic determinants. Proteins have been used in many of these studies merely as carrier molecules for the haptens. The lead-off article, an exposé of the role of protein structure in the operation of antigenic specificity by E. Benjamini, R. J. Scibienski, and K. Thompson, is therefore welcome. Evidence obtained from the work of many authors clearly points to diverse origin of antigenic determinants: Some are a direct expression of the amino acid sequence fixed in the primary structure of the molecule, whereas others are generated by modifications in the molecular conformation or intramolecular rearrangements including interaction of polypeptide chains. The authors draw on a number of proteins of known structure, differing in size and complexity, several with regulatory or metabolic functions of vital significance (ACTH, insulin, angiotensin, cytochrome c, ribonuclease, and immunoglobulin, to mention some). The discourse is kept within the framework of the immunological thinking of the moment with due recognition of the importance of binding sites, T (thymus-derived) cells and B (bone-marrow–derived) cells.

The current interest in histocompatibility antigens transcends the immunologist's concern with their role in homograft rejection. These antigens represent products of genes of complex and polymorphic genetic regions. The complexity of these regions is accentuated by the proximity of genes controlling such important functions as the immune response to antigens and differential susceptibility to infectious agents, including oncogenic viruses. It is therefore not surprising that many laboratories are assiduously attempting to isolate and identify histocompatibility antigens. The article by Ralph A. Reisfeld and Barry D. Kahan takes up the problem of isolation of human histocompatibility antigens. The major portion of the article is devoted to a procedure developed by the authors: extraction by means of high salt, 3*M* KCl. The authors attribute the action to disruption of noncovalent bonds, in contrast with covalent bond cleavage by enzymes, which has been used by others in releasing the cell surface antigens. Without questioning the utility of the high salt method, one can question whether the mechanism of antigen solubilization is entirely one of breaking hydrogen bonds. Information just released from an opposing camp indicates that KCl may be stimulating the release of proteolytic enzymes which perform the actual stripping of histocompatibility antigens.

A good deal of innovative thinking is displayed in the article by Richard A. Lerner, in which he describes "beginning observations on plasma membrane-associated macromolecules which may be involved in the 'linkage' between the surface and gene expression." It is known that lymphocyte membranes contain immunoglobulin molecules (M-Ig) which serve as receptors for the binding of antigen. Antigen triggers a number of events including cellular replication, differentiation, and cytoplasmic immunoglobulin (C-Ig) synthesis. The nature of the trigger mechanism is unknown, as is the nature of the communication between the cell surface and the genetic apparatus. Although some of the data are preliminary, Lerner makes a case for a membrane-localized system associating a unique species of DNA with M-Ig. Different messenger RNA's or different regulatory mechanisms or both are apparently involved in the synthesis of the M-Ig and C-Ig, and the membrane-associated DNA is different from the nuclear and mito-

chondrial DNA. In his speculations about the functions of these membrane-bound macromolecules Lerner considers such potential interactions as the union between antigen and M-Ig causing a conformational change in the membrane leading to either DNA replication or transcription which in turn may result in gene amplification or activation of biosynthetic processes. Moreover, the membrane-associated DNA may play a role in intercellular communications such as the interactions of B and T cells.

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Cyclic AMP

Advances in Cyclic Nucleotide Research. PAUL GREENGARD and G. ALAN ROBISON, Eds. Vol. 1, Physiology and Pharmacology of Cyclic AMP. 610 pp., illus. $29.50. Vol. 2, New Assay Methods for Cyclic Nucleotides. 144 pp., illus. $12.50. A conference, Milan, July 1971. PAUL GREENGARD, G. ALAN ROBISON, and RODOLFO PAOLETTI, Eds. Raven, New York, 1972.

The presentations in the "Physiology and Pharmacology" volume of these proceedings are concerned with three major aspects of cyclic AMP function: the nature and function of cyclic AMP-dependent protein kinases, the events controlling the activity of adenyl cyclase and thus the level of cyclic AMP, and the correlation of these changes with various aspects of cellular function. The papers are arranged in groups on regulation of metabolism, membrane permeability and secretion, the response of the cardiovascular system, the peripheral and central nervous system, and pituitary and reproductive function. A short section is devoted to studies on the involvement of cyclic AMP in the regulation of gene transcription in unicellular organisms, and a final section provides abstracts of 91 unpublished papers presented at the meeting.

This volume clearly illustrates to the reader the importance of cyclic AMP as an obligatory component in cellular function and as a major participant in intracellular communication and response of the cell to the environment. Although it is too early to postulate a single mechanism for the action of cyclic AMP, the similarities of the molecular events involving cyclic AMP in the hormonal control of glycogenolysis, glycogenesis, and lipolysis suggest that activation or modulation of cyclic AMP–dependent protein kinases resulting in the phosphorylation of phosphorylase kinase, glycogen synthetase, and triglyceride lipase respectively provides an excellent model for the diverse physiological and biochemical events involving adenylcyclase. Certainly the wide distribution of cyclic AMP–dependent protein kinases and the discovery of a variety of specific protein substrates for these kinases, ranging from histones, thought to be involved in gene expression, to a component of synaptic membranes, make this a primary hypothesis for the mechanism controlling adenylcyclase activity. The specificity of response inherent in the structure of protein kinases also provides an explanation for the multiple responses of cells to changes in adenylcyclase activity.

Much of this volume concerns the current efforts to elucidate the relation between the interaction of hormones and other agents at membrane receptor sites and the subsequent response of adenylcyclase. While little is known about how the hormone-receptor interaction leads to a change in the intracellular, membrane-bound catalytic activity of adenylcyclase, the number of agents or actions that modify the activity is very large, including most of the accepted hormones and even such agents as light, which has been shown to modify the activity of the photoreceptor adenylcylase of vertebrates. Other agents such as calcium ions, adenosine, and prostaglandins are involved in the regulation of adenylcyclase activity. Perhaps the most exciting matter dealt with in the book is the correlation of factors that affect impulse conduction by neurons with the activity of adenylcyclase. Several experimental approaches toward understanding the complex role of cyclic AMP in synaptic transmission, including studies with brain slices, isolated ganglia, neuronal cell culture systems, and interactions between specific pathways in the intact brain, are described. These studies appear to point towards an understanding of the biochemical basis of cellular communication, the basis for learning and memory.

The second volume of the proceedings, consisting of nine papers dealing with methodology, is a useful companion to the first.

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The Mind-Body Problem

Brain and Human Behavior. A symposium, Chicago, Oct. 1969. A. G. KARCZMAR and J. C. ECCLES, Eds. Springer-Verlag, New York, 1972. xii, 476 pp., illus. $30.50.

Unlike the usual symposium, in which a number of scientists investigating a single problem get together to compare notes and try to iron out discrepancies in their results, the Symposium on Brain and Human Behavior, held in 1969 as part of Loyola University's centennial program, was more in the nature of an interdisciplinary conference. Well-known experts in many areas of neuroscience, and some philosophers, presented papers that were in many cases excellent in themselves but unrelated to each other.

A possible explanation for the diffuseness of content (and for the somewhat misleading title; all the brains and most of the behavior pertain to experimental animals, not man) is that the symposium was organized with the idea of setting the stage for a powerful assault on the mind-body problem. This is the interpretation I put on the presence of the philosophical contingent and the tone of the introduction, which was written by the chief organizer of the symposium and editor of the volume, Alexander Karczmar. This ambitious hope was not realized, however, and Karczmar reveals his acceptance of the fact in his opening remark that the conference might have been a hundred years premature. It was, nevertheless, an interesting experiment, and even if there are few signs in the published volume that any of the participants benefited from hearing the others, it is possible that latent influences were planted that will germinate in less than a hundred years.

The symposium itself might well have served a useful purpose, but it is difficult to think of any group (other than librarians) who would get their money's worth from the published collection of papers based upon it. There are five sections, which bear the titles Molecular and Synaptic Organization, Biochemical Mechanisms and Pharmacological Approaches, Neurophysiological Correlates, Psychological Aspects, and Epistemological Aspects. Few of the contributors make any concession to the possibility that some of their audience might not be specialists in the fields they are discussing, so the book can hardly be recommended as a lay introduction to the neurosciences. At the