papers are written in reasonably general terms with good introductory comments so that the need for knowledge of previously published material is minimized. This is somewhat unusual in accounts of symposia and should make this volume of value to those outside the immediate field. One paper, on the multienzyme systems of fatty acid biosynthesis, is given in German.

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Glutamine Biochemistry

The Enzymes of Glutamine Metabolism. Based on a symposium, New York, Aug. 1972. STANLEY PRUSINER and EARL R. STADTMAN, Eds. Academic Press, New York, 1973. xx, 616 pp., illus. $16.

The metabolism of glutamine is of importance in the nitrogen economy of virtually all living systems. The formation of glutamine from ammonia and glutamate is an essential process for the assimilation and transport of ammonia. The amide nitrogen is utilized for the formation of a variety of other biological compounds, and both the amide and amino nitrogens are utilized for the biosynthesis of other amino acids. Glutamine, of course, is also an amino acid constituent of proteins and in some cases the glutaminyl residue serves a functional role in protein cross-linking reactions, for example in the formation of fibrin clots.

This book provides a fairly complete survey of what is known about these different glutamine-dependent reactions. A significant number of papers contain information that was unpublished at the time of the symposium that was the basis for the book. The book is logically divided into two sections, the first dealing with reactions involved in the interconversion of glutamate and glutamine and the second with the dozen or so enzymes, the amidotransferases, that catalyze the biosynthetic reactions in which glutamine serves as a donor of an amide group.

A comprehensive and comparative summary of the structures and of the catalytic and regulatory properties of the enzymes glutamine synthetase, glutaminase, and glutamine transaminase from bacterial and mammalian sources is provided by several review papers in the first section. Considerable attention is also given to the discovery in 1970 of the enzyme glutamate synthetase. Work on the properties of this enzyme and evidence that has established the "glutamine pathway" as the major route of ammonia assimilation in bacteria are reviewed. A unifying theme for this section is provided by several excellent contributions that emphasize work related to establishing the role of these different enzymes in the regulation of glutamine formation in vivo.

One common function of at least many of the amidotransferases would appear to be their ability to act as a "glutaminase," thus providing ammonia that subsequently reacts with an appropriate acceptor. Consistent with this view are the findings that several amidotransferases contain specific "glutamine binding" subunits that are capable of carrying out this function. It is apparent, however, from the detailed summaries of these enzymes presented in the second section of this book that this is certainly not true of all amidotransferases and that, in fact, there is a wide divergence in the structural, catalytic, and regulatory properties of these enzymes and in the complexity of the reactions catalyzed. Nevertheless, as Hartman points out, continued comparison of the similarities of the amidotransferases will continue to facilitate our understanding of these as well as other enzyme-catalyzed reactions. The comprehensive reviews of all the amidotransferases that are presented here under one cover will significantly aid investigators in this task.

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Atmospheric Physics

Radiation Processes in the Atmosphere. Second IMO Lecture. K. YA. KONDRATYEV. World Meteorological Organization, Geneva, Switzerland, 1972. xxxiv, 214 pp., illus. $20.50. WMO No. 309.

The present inadequacies in our understanding of physical processes occurring in the atmosphere and their formulation in numerical models are major obstacles to accurate prediction of weather and climate. In this book K. Ya. Kondratyev of Leningrad University has set himself the aim of "examining the problems of radiation factors in the general circulation of the atmosphere with a view to attracting attention to the most important unsolved questions." In successive chapters he comprehensively reviews measurements of the solar constant, albedos and emissivities of underlying surfaces, the radiation climatology of the earth, and aerosols and their radiative effects. These chapters are strongly oriented to measurements and detailed calculation, although surprisingly little stress is laid on establishing the accuracy of the calculations. The fifth chapter, dealing with radiative effects on the statics and dynamics of the atmosphere, hits the central theme. It is one of the most extensive discussions of this subject, and describes a number of interesting phenomena although the emphasis is necessarily on theoretical treatments and model results. These show that a dynamical problem in a radiating atmosphere requires a joint formulation and coupled solutions. The author's wide interests are evident by his extensive contributions in each of these areas.

The major problems he sees are worth reiterating. We need a highly accurate determination of the amount of solar energy impinging on the top of the atmosphere and the ability to monitor changes over a period of years and decades. This can now be done most straightforwardly from orbiting platforms. We need to understand the role of radiation during and after cloud formation, and its interaction with aerosols. These are now being studied observationally by the author's CAENEX program in the U.S.S.R. and some smaller projects in the United States. Perhaps most important, Kondratyev calls for increased understanding of the ways in which the atmosphere and the models that mimic it respond to radiative effects.

This is the crucial point. The studies cited, as well as more recent ones (publication of the original manuscript took almost two years), show that radiative effects must be included. However, we have very few heuristic concepts with which to assess the effects of radiative errors on the general circulation, although simple models developed by Stone and others may provide insights. Washington has reported that, for medium-range forecasts, considerable errors in radiative heating may be masked by errors in initial wind and temperature data. Taken together, these results suggest that the present crude treatments of radiative effects may suffice for one- to three-week forecasts. This is reinforced when one realizes that the useful accuracy of specifying radiative heating is probably limited by