# Everything you wanted to know about protein phosphorylation

P.J. England

*Protein Phosphorylation.* Cold Spring Harbor Conferences on Cell Proliferation, Vol.8. Edited by Ora M. Rosen and Edwin G. Krebs. Two-volume set, pp.1,421, ISBN 0-87969-140-9. (Cold Spring Harbor Laboratory: 1981.) $140 US, $168 elsewhere.

THE discovery that enzymes could be reversibly phosphorylated, with concomitant changes in activity, was made 25 years ago. For some time after that it appeared that only the enzymes of glycogen metabolism were so regulated, and that protein phosphorylation was a rather special and restricted form of control. However, during the past decade it has become apparent that almost every aspect of eukaryotic cell function is regulated in some way by phosphorylation, and the phenomenon is now known to have implications in many areas of molecular biology. This rapid expansion has made it difficult even for specialists to keep in touch with all aspects of the subject. The publication of these impressive books is thus most welcome; details of almost all of the current research on protein phosphorylation are brought together, so that no one working in this or related areas now has any justification for ignorance.

The books are the result of a five-day conference held in the summer of 1980. It was attended by about 200 people from all the major laboratories working on protein phosphorylation in North America, and a small number from elsewhere. Approximately 100 talks were given, each one of which is represented by a chapter. These individual contributions are grouped into ten sections, the titles of which give a clear idea of the wide range of topics covered in the two volumes — cyclic AMP-dependent protein kinases: structural studies; cyclic nucleotide-dependent and independent protein kinases and protein phosphorylation; glycogen synthetase/phosphoprotein phosphatases; regulation of lipid and carbohydrate metabolism; insulin and growth factor-promoted protein phosphorylation; contractile proteins; protein synthesis; nuclear and cytoskeletal protein phosphorylation; viruses and cell transformation; neural and membrane protein phosphorylation.

Each of the sections contains a wealth of recent results and interpretations from several laboratories. For example, one of the newest areas of interest is that of tyrosine phosphorylation coupled to viral transformation of cells. No less than six chapters are either devoted exclusively to this topic or mention it in detail. There are, overall, some 17 chapters on the role of protein phosphorylation in the control of transcription, translation and cell transformation. However, it should not be thought that some of the more established areas have been neglected; about half of the contents deals with protein kinases, phosphoprotein phosphatases and carbohydrate metabolism. There is now considerable knowledge of the structure and catalytic mechanism of cyclic-AMP-dependent protein kinase, which is discussed at length in several articles. The detailed descriptions of this enzyme at the atomic level contrast strongly with the imperfectly understood role of protein phosphorylation in the imperfectly understood eukaryotic nucleus. The books give the clear impression of a subject with distinct, well-established origins now bursting out in many directions.

Reading either whole sections or individual chapters I found much useful information and many stimulating ideas. Almost all of the chapters give an impression of current work being actively pursued, with little that is dated or incorrect. Excellently produced in the clear, uniform style typical of Cold Spring Harbor publications, the books will be equally useful to those new to protein phosphorylation who wish to discover how it relates to their current research interests, and to those already working in the area who need to be informed of new developments. This is undoubtedly a key reference work which should be in any laboratory working on protein phosphorylation, and in all medical and biological libraries. □

*P.J. England is a Lecturer in Biochemistry at the University of Bristol.*

## Textbook supplement

Next week's issue of *Nature* will include the Textbook Supplement, comprising reviews of over 100 recently published books for undergraduate students.

# What can be inferred from exciton lines?

Dennis Dunn

*Excitons: Their Properties and Uses.* By Donald C. Reynolds and Thomas C. Collins. Pp.291. ISBN 0-12-586580-5. (Academic: 1981.) $36, £33.80.

THE optical absorption of most insulating crystals exhibits a series of sharp lines at frequencies just below the onset of the continuous absorption spectrum. These are the exciton lines. The non-interacting electron theory presented in most solid state physics texts readily accounts for the general features of the continuous absorption spectrum but fails to predict the existence of the exciton lines. These arise as a consequence of the electron-hole correlation induced by the Coulomb interaction.

The aim of *Excitons* is to provide a self-contained review of the theory and experimental properties of excitons and of the information about electronic structure which can be determined by a study of the exciton lines.

The conventional effective-mass theory is presented in Chapter 2, which includes discussion of the effects of electric and magnetic fields (Stark and Zeeman splitting). The highlights of the book are the chapters on the experimental properties of intrinsic and bound excitons. These, of course, are just the areas where the authors have made significant contributions and their mastery of the subject is clearly demonstrated. Set in between — the chapters seem to be randomly ordered — is a brief review of the recent work on the electron-hole liquid, a condensed phase which occurs only if the optical excitation is intense enough to produce a high exciton density.

There are a few surprising omissions from the text. There is no discussion of the theory or experimental properties of the line-shapes. The mass of research on excitons in alkali halides rates only one paragraph, and the rare-gas solids are not mentioned. This is a great pity because research on these materials, which have "deep" excitons, has demonstrated that the effective-mass theory has a far wider range of applicability than was previously thought.

The low-point of the book is the first chapter which tries to lay down the theoretical foundations of exciton theory. Here the authors have been too ambitious and have attempted to present the whole of many-body theory in one brief account: Green function formalism, Bethe–Saltpeter equations, spectral representations all appear and disappear within the space of ten pages.

*Excitons* is certain to become one of the standards in solid state literature. Physicists who want to initiate their research students into the mysteries of excitons can safely direct them to this book with just one piece of advice: start with Chapter 2. □

*Dennis Dunn is a Lecturer in Theoretical Physics at the University of Reading.*