and shows how greatly they could affect the flux of CO_2. Then P.R. Bell writes about the massive stores of methane hydrate buried in the permafrost and in the ocean sediments. If this methane were released as a result of global warming by CO_2, then there would be a new and powerful positive feedback leading to further heating.

Our first intimation of the limits to our planetary environment came in the late 1950s, marked by the publication of Rachel Carson's *Silent Spring*. In those times growth was exponential and it was easy to predict doom, even by the end of the century. Now, in the early 1980s, growth is slow and linear; we may even be in a steady state. The geological world has changed also. In the stratosphere there is now a substantial excess of sulphuric acid aerosol and of hydrochloric acid gas, put there by the maverick volcano, El Chichon. This might bring freezing winters and wretched summers and by all accounts should modify the ozone layer. We may be glad of the tropospheric warming action of the CO_2 blanket and also of the stratospheric cooling by CO_2 to offset the destruction of ozone by the HCl. It is a measure of the stability of the *Carbon Dioxide Review* that the implications of the activity of El Chichon, which came too recently to be considered in the book, barely detract from the value of its information and conclusions.

There is an extensive and ecumenical bibliography, and data lists which look very solid and complete. We have needed a book like this for a long time. My grateful thanks go to William C. Clark and his colleagues for producing it. □

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Chemistry: getting the right reaction

H.M. Frey

Reactivity in Organic Chemistry. By Gerhard W. Klumpp. Pp.502. ISBN 0-471-06285-5. (Wiley:1982.) £41.55, $66.45.

THIS is a translation, and a good one, of *Reactivität in der Organischen Chemie,* Volumes I, *Produkte, Geschwindigkeiten,* and II, *Übergangszustände,* which were published in 1977 and 1978. However, the opportunity has been taken to add some new material including work published after the original volumes (up to and including 1980). The author's central concern is reactivity of organic compounds and his examples generally relate to reactions that are or have been important from a synthetic point of view.

The first short chapter, entitled "Multiple Reactivity of Organic Compounds", sets the stage for the remainder of the book. Here Klumpp notes that as well as the problems which result from a molecule containing different reacting groups, others occur because the same group (e.g. carbonyl) may react in many ways. He then turns to highlight the area of product orientation, the topics of stereoselectivity and regioselectivity being discussed in relation to a range of system types.

In the following four chapters the topics already introduced are considered first from the standpoint of thermodynamic and kinetic control, and with regard to their effect on product ratios. Rates or reactions are then thoroughly treated, the various empirical correlation equations (much loved by physical organic chemists) being presented in a comprehensive and detailed way. Transition state theory is also introduced, so that it can be used to discuss relative reactivities including kinetic isotope effects and linear free energy relationships.

An account of the properties of activated complexes forms the concluding chapter. In many ways I found this the most exciting part of the book, ranging as it does from energy surfaces, position of the transition state on the reaction coordinate to orbital symmetry correlations. Here there are some instructive and unusual diagrams, for example a "cinematographic" representation of $^1CH_2$ approaching ethylene to form cyclopropane, and an extremely improbable energy surface involving an activated complex of high symmetry together with a simple explanation, when one looks up the reference, of why it is unrealistic.

The book is really packed full of diagrams, tables and examples, and is very up to date. Quantitative data are given wherever possible. This is not a textbook nor is it a monograph, for it assumes too much to be one and is more far-ranging than the other. Rather, it is a book to be read after one has mastered a conventional textbook of organic chemistry. Able third-year honours students and research workers in organic or physical organic chemistry should find it most worthwhile to do so. □

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Research in Europe

NEW from Longman is the fifth edition of *European Research Centres,* edited by Trevor I. Williams, a guide to European organizations conducting or promoting research in science, technology, agriculture and medicine. The directory is in two volumes and for each institution includes details of research projects and a listing of senior staff. Price is £155.

A fluid mosaic

N. Michael Green

Lipid–Protein Interactions, Vols 1 and 2. Edited by Patricia C. Jost and O. Hayes Griffith. Vol. 1 pp.338, ISBN 0-471-06457-2; Vol. 2 pp.307, ISBN 0-471-06456-4. (Wiley: 1982.) Vol.1 £62.35, $99.75; Vol.2 £58.20, $93.10.

INTERACTIONS between proteins and lipids differ from those in most other protein–ligand systems in that both lipid and protein may be highly aggregated in aqueous media in the absence of a detergent. In consequence, equilibria are difficult to formulate and the subject has lacked a straightforward conceptual and experimental framework.

This is well exemplified by the first of these volumes, in which each non-membranous system is considered in a separate chapter. Although these proteins have been fairly well characterized, the experimental approaches have been so diverse that the systems have only slight relevance for each other. For example, in the first chapter B.W. Matthews gives a lucid account of the unusual three-dimensional structure of bacteriochlorophyll, a trimer of 15-stranded beta sheets, each subunit enclosing seven chlorophyll molecules; the unique configurations of the seven phytyl chains are emphasized but in the absence of the exact amino acid sequence little can be said about the interactions which determine these configurations. In contrast, in the next chapter the lack of crystallographic information about serum albumin is compensated by an abundance of chemical evidence, including the complete sequence, which is integrated into a convincing model by Brown and Shockley.

Much of the remainder of this volume deals with pancreatic phospholipase and the family of phospholipid exchange proteins. General reviews of their properties are followed by detailed descriptions of interactions with both monomeric and micellar substrates. It is disappointing that in spite of an impressive variety of experimental evidence, including the complete structure of phospholipase A, the full description of a phospholipid binding site remains tantalizingly out of reach.

The second volume considers membrane proteins from different operational points of view. Two penultimate chapters provide theoretical background to the whole field of protein–lipid interactions. The first, by J. Reynolds, leads from equilibrium studies of the interactions of amphiphiles with soluble proteins to a necessarily less rigorous treatment of membrane proteins. Many useful insights emerge from this and my only regret is that the chapter was not longer. The second, by the editors, gives a theoretical treatment of the exchange of