and its possibilities in the refinement of proteins is illustrated by N. Isaacs.

It is natural that a volume on Dorothy's contributions includes many papers on protein structures, as she has been involved in the development of the entire field. She has initiated and stimulated much work in the area and many leading crystallographers have spent some time in her laboratory. Examples are ferritin (P. M. Harrison), leghaemoglobin (B. K. Vainshtein) and penicillopepsin (M. N. G. James, I.-Nan Hsu, T. Hofmann and A. R. Sielechi).

Some papers deal with the relation between protein structures such as dehydrogenases (M. Adams, I. G. Archibald, J. R. Helliwell, S. E. Jenkins and S. W. White), actinidin and papain (E. N. Baker) and the symmetry of proteins (T. Blundell, T. Sewell and B. Turnell).

As expected for a *Festschrift* to Dorothy there is a section on insulin as she has devoted so much of her research to questions related to that molecule. Some crystallographic problems were described (M. Vijeyan) in the method section. In the main insulin part we find all aspects covered – precursors (D. F. Steiner), destabilizing agents (R. A. D. de Graaff), evolution (S. Falkmer and S. O. Emdin), semi-synthetic approaches (V. K. Naithani, H.-G. Gathner, E. E. Büllesbach and H. Zahn) and the main chemical synthesis (P. G. Katsoyannis). Other studies reported concern pharmakinetic work (M. Berger, H. J. Cüppens, J. G. Davies, P. A. Halban, S. M. Hoare, R. E. Offord, A. Lewill-Bentley and S. P. Talley), work on the hydrogen bonding in insulin (N. Sakabe, K. Sakabe and K. Susaki), and solution phenomena (D. Mercola and A. Wollmer). Two contributions dealing with largely the same insulin work as Dorothy's are reported from China by the Beijing Insulin Structure Research Group and by Zhang You-shang. The section adequately concludes with a comparison of different insulin structures (J. F. Catfield, S. M. Catfield, E. J. Dodson, G. G. Dodson, C. D. Reynolds and D. Vallaby) and the chemistry, structure and function of insulin (D. Brandenburg).

It is unavoidable that a review of this *Festschrift* becomes rather lengthy as the contributions cover so many aspects of science. The *Festschrift* should be in the possession of every crystallographer not only because of the outstanding contributions but also because it gives an excellent insight into one of the great eras of crystallography.

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Solid state reactions. Monographs in modern chemistry, Vol. 12. By HERMANN SCHMALZRIED. Pp. 254 (101 figures and 6 tables). Completely revised 2nd edition. Weinheim, Deerfield Beach (Florida), Basel: Verlag Chemie, 1981. Price DM 98.00.

A first edition of this book has already appeared in the German (1971), English (1974) and Polish languages but was not reviewed in *Acta Crystallographica*. This, second, edition has been thoroughly revised, enlarged and complemented in a number of sections; it follows the plan of the first edition, using the same chapter headings but with changes of detail. There are nine chapters and an idea of the scope of the book can be obtained from their titles: 1. *Short introduction to the bonding, structure and imperfections of solids* (10 pp.); 2. *Short introduction to solid state reactions* (8 pp.); 3. *Crystal defects* (18 pp.); 4. *Thermodynamics of point defects* (22 pp.); 5. *Chemical diffusion in the solid state* (34 pp.); 6. *Reactions in the solid state – ionic crystals* (37 pp.); 7. *Reactions in the solid state – metals* (38 pp.); 8. *Reactions between solids and gases or between solids and liquids with a solid reaction product* (33 pp.); 9. *Some technologically interesting solid state reactions* (37 pp.). In addition there are lists of symbols and units, author and subject indexes and an appendix (not in the first edition) of 18 problems. Some 450 literature references are distributed among the various chapters; about two thirds of these refer to sources written in English while most of the remainder come from the German literature. This broad coverage of the literature is to be welcomed. The first English edition had 214 pages so the present edition has been expanded by about 25% in content and is also more generously dimensioned than the first English edition.

The materials and reactions considered are taken entirely from inorganic and metallurgical chemistry; organic solid-state reactions, where a somewhat different approach would be required, are not considered. The range of topics covered is comprehensive but the number of reactions discussed is limited, with emphasis placed on in-depth, quantitative analyses. Thermodynamic aspects and matters of mass transport (diffusion) are stressed; although less attention is paid to structure and the role of defects, these are not ignored. The overall treatment is condensed and rather formal. The sometimes complicated symbolism is clearly typeset; I did not find any errors and the language is clear, with only a rare infelicity having escaped the editorial filter.

This book could serve as a very useful text in a high-level graduate course in solid-state chemistry, but I do believe that the instructor will find it necessary to provide an appreciable amount of assistance over the sticky patches. However, the efforts involved will be repaid – mastery of the subject matter of this book will give an excellent basis to anyone seriously interested in inorganic solid-state reactions.

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Structural aspects of biomolecules. Edited by R. SRINIVASAN and VASANTHA PATTABHI. Pp. xiii + 428. Madras: Macmillan India, Ltd, 1980. Price Rs 50.

This volume contains the text of 15 lectures which were delivered at the International Winter School on Current Trends in Biomolecular Structure, which was organized in Madras in January 1978. The lectures cover topics concerned with the chemical, structural and conformational aspects of biomolecules, obtained by the application of X-ray diffraction methods, optical and spectroscopic methods, and

theoretical and semi-empirical conformational methods. Each lecture has from 9 to 61 pages and lists from 6 to 82 references. A subject index follows after the papers. Since many chapters are comprehensive, this book will be suitable for the education of graduate students and junior scientists of molecular biology and biophysics. Furthermore, the references will be valuable for scientists who have an interest in these fields.

All the papers are printed directly from masters provided (as typescripts) by the authors; the reader should be aware that some mistakes and imperfections of description could not be avoided in this book.

The lectures have been classified into three sections, on the basis of the methods involved.

The title of the first section is *X-ray diffraction and related methods*. In this section, the first three chapters are related to methods for single crystals, the following two are related to the analytical method for protein structure, and the last two chapters deal with the analytical method for fibrous materials and the structure of viruses, respectively. The first chapter, which is on the determination of heavy-atom sites and which provides a checklist of the most popular methods, is the least satisfactory of the book: it is too difficult for a newcomer to understand because there is so little description of the basic principles. At least the formulae in which each coefficient in Table 1 would be used should have been given by the author – otherwise, one of his conclusions regarding the 'hand of heavy-atom sites' must be reversed, if we apply his coefficient ($\Delta F^{l}_{\text{ano}}$, $\alpha_p + 90°$) to one of the most popular Fourier summations. The sample maps which were illustrated, using simulated 5 A data, might be helpful to some students but they have no practical meaning because they are so far removed from real maps. The next chapter, by Hendrickson, describes phase evaluation in macromolecular crystallography. This is one of the most important steps of protein structure analysis, and his description covers almost all the important points. The following chapter, by Diamond, gives the principle and properties of the method of least squares. For refinement, this method is powerful and is a widely used technique. In this chapter the treatment is very comprehensive and diagrams are employed to assist the clarity of the explanation. A chapter by Srinivasan describes protein structural data presentation: Srinivasan represents protein structure by using a combination of parameters of distances or angles. This analysis will be valuable for finding the general features in protein structure. The chapter by Schulz describes the structural organization of globular protein on the basis of the regularity found in the three-dimensional structure. Schulz's hierarchy is simple, and we were able to read through it very easily. The last chapter of this section deals with the structure of simple viruses by electron-microscope and X-ray methods. The description of rod-shaped viruses, especially TMV, from a historical viewpoint, is interesting and is illustrated with many figures; but there are only a few diagrams in the description of the structure of spherical viruses. Anyhow, the reader should take note that the progress of this field is rapid and the latest references given for this chapter are dated 1978.

The title of the next section is *Optical and spectroscopic methods*. Four chapters deal with fluoroescence spectroscopy, circular dichroism (CD), Raman, and NMR spectroscopy. The first chapter, by Cantor, describes the dynamic aspect of fluorescence spectroscopy. Cantor gives a simple explanation of the principles and experimental method, and describes three specialized applications: environmental sensitivity, anisotropic polarization and singlet–singlet energy transfer. The feature of this method is that the behaviour of one molecule can be observed in a given time scale; but the application to macromolecules still has some limitations. The next chapter is on the application of CD to the study of polynucleotides and nucleic acid, and the following chapter deals with the application of Raman spectroscopy to nucleic acid. The last chapter, by Wüthrich, gives high-resolution NMR studies of peptides and proteins. NMR has recently become an attractive technique for the investigation of molecular conformation in solution. Wüthrich describes the features of ^{1}H, ^{13}C and ^{15}N spectra and the elucidation of structure and conformation by NMR. This chapter will be interesting for protein crystallographers who are working on structure refinement with high-resolution data.

The title of the last section is *Theoretical and semi-empirical methods of conformational analysis*. The first two chapters discuss the conformational structures of polynucleotides and polysaccharides respectively. The latter chapter, by Rao, contains many of the author's own results, obtained by using a semi-empirical potential function. The title of the next chapter, by Nagano, is *Seeming algorithms of protein folding*. This is a consideration of long-range interactions, and the theoretical basis of the prediction of structure derives from the careful inspection of all known tertiary structures. Thus, this treatment sometimes contains ambiguous and arbitrary choices of assumption. The last chapter gives the structure and conformational analysis of gastric mucus gels by biophysical and chemical methods.

Finally, we must express gratitude to the publishers for having produced this interesting book at such a low price that everyone can buy a copy.

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Phasendiagramme. By P. PAUFLER. Pp. 177. Berlin: Akademie Verlag, 1981. Price DM 8.00.

This book presents a well arranged summary of the science of phase diagrams of heterogeneous systems.

It is divided into chapters describing: basic phenomena; principles of equilibria in the thermodynamic system; phase equilibria in one-, two- and three-component systems; and analysis and representation of phase equilibria in four and more component systems. The connection between the atomic architecture of matter and the macroscopic thermodynamic functions is briefly summarized.

The analytical description of thermodynamic principles is appropriately exemplified by graphical representation and by discussion of the most common phase diagrams – mostly from the field of metallurgy, but some belonging to salt and oxide systems.

The book is eminently readable. Numerous references are given to sources which treat particular problems more thoroughly.