

of astrophysics has made many people look forward to a text on stellar structure from the pen of Professor Swihart. Such a text has now appeared in the form of a companion to his earlier *Basic Physics of Stellar Atmospheres*, and as an introduction into the field of stellar structure the new book can be quite as strongly recommended as Professor Swihart's earlier writings. This book is a short introductory text, but one which contains all the essential points. There are discussions of conditions of gas in thermodynamic equilibrium, of polytropes, of energy generation and transport, of radiative transfer and opacity. There is a final chapter devoted to a discussion of theoretical stellar models and to their evolutionary changes as the result of changes in their chemical composition. Present problems and discrepancies are as clearly stated as the remarkable overall agreement between theory and observation which exists in this field.

As in his earlier book the author has again found room in an appendix for a dozen problems whose solution will test a student's understanding of the text. The only change which I would like to suggest for the next edition of this most useful book is the adoption of the international system of units.

H. A. BRÜCK

## Chemicals in soil

*Organic Chemicals in the Soil Environment*. Edited by Cleve A. I. Goring and John W. Hamaker. (Books on Soils and the Environment Series.) Vol. 1, pp. xii+440; vol. 2, pp. xii+441-968. (Dekker: New York, August and September 1972.) Vol. 1, \$24.50; vol. 2, \$26.50.

CHEMICAL pollution of the environment is highly emotive, but solid facts are often lacking, so the publication of this tremendous work is certainly timely. Most people understand that the soils which mantle the Earth are a basic resource to be carefully husbanded in order to increase the world output of food and other raw materials. To achieve this end man has come to depend more and more on the application of fertilisers through foliar sprays or, more usually, through the roots by way of the soil; on optimising the water supply through the soil; and on minimising biological competition from weeds, pests and diseases through foliar or soil applications of crop protection chemicals.

This work comprises thirteen chapters grouped in four parts dealing respectively in vol. 1 with "The Soil Environment" (one chapter) and "Physiochemical Relationships of Organic Chemicals in Soil" (five chapters); and in vol. 2 with "Action and Fate of Organic Chemicals in Soil" (five chapters) and "Environmental Effects of Organic

Chemicals" (two chapters).

The editors head agricultural research at the Ag-Organics Department of the Dow Chemical Company in California. Both are men of distinguished research and organising ability; they have themselves contributed four chapters and enlisted the able help of colleagues, Drs Brandt and Meikle, to write two others, so that about half the total work emanates from the Dow Company. The remaining authors are all highly competent researchers and writers, including Dr Edwards from Rothamsted Experimental Station and Dr Thomas of Birmingham University; the net result is a well balanced text.

Chapter 1 by J. L. Ahlrichs of Purdue University is a comprehensive introductory account of macrocharacters of soils as they occur naturally and of the microcharacters of the soil solid, liquid, gaseous and living phases including some references to enzyme activity: some readers may be puzzled by the USDA "7th approximation" alternative names for soil horizons.

Chapter 2 by J. W. Hamaker and J. M. Thomson is a very detailed and valuable treatment of surface absorption principles. Chapter 3 by R. W. Meikle deals mainly with the biochemical mechanisms of decomposition, in soil systems, of the synthetic organic chemicals used for crop protection and includes a discussion of the "permease" concepts of active transport across cell membranes which those not familiar with these ideas will appreciate. Chapters 4 and 5 by Hamaker are concerned respectively with detailed reaction kinetics in relation to conditions in the soil environment and with diffusion and volatilisation in the gaseous phase. Chapter 6 by Professor Letey and J. Oddyson continues the theme of movement in the soil system, chiefly through mass flow in aqueous solution.

Chapters 7, 8 and 9 are respectively excellent reviews of herbicides and plant growth regulators (R. P. Upchurch), insecticides (C. A. Edwards), and fumigants, fungicides and nematocides (C. A. Goring). Then comes a change from the dominant crop protection materials to a consideration by J. D. Hauck in chapter 10 of synthetic slow release fertilisers and fertiliser amendments, and in chapter 11 of soil physical property modifiers by G. H. Brandt.

The final part is devoted to a chapter by Professor Martin on side effects of organic chemicals on soil properties and plant growth, and one on Goring's viewpoint of the impact of agricultural chemicals on the environment with some valuable data on input levels, accumulations and toxicity levels.

Every chapter is well written and illustrated, with very few typographical errors. Each concludes with numerous

references and at the end of vol. 2 there is a very useful list of the full chemical names against each of the common or temporary names quoted, followed by comprehensive author and subject indices. Though the books are costly for private pockets they are highly recommended to all who have a professional interest in the subject and for library acquisition. The authors and editors are to be congratulated on bringing together in comprehensive, readable form a mass of detailed information, much of which has hitherto been inaccessible to the average inquirer. Furthermore, it is infused with a good many stimulating ideas and comments.

J. TINSLEY

## Crystal physics

*Tensors and Group Theory for the Physical Properties of Crystals*. By W. A. Wooster. Pp. x+344. (Clarendon: Oxford; Oxford University: London, August 1973.) £7.

THIS book may be regarded as an expanded and modernised version of Dr Wooster's well known *Crystal Physics* which was first published in 1938. Its principal objective is "to enable students to grasp the essential techniques of dealing with tensors and group theory as they are applied to crystals". Numerous support exercises are interwoven with the text to which detailed answers are provided. The author's mastery of crystal symmetry and crystal physics comes through on almost every page, but whether he has achieved his stated objective remains open to question.

Tensors and groups are introduced in a piecemeal fashion without being built up into any coherent body of theory. This approach might well give the student deeper insight into the meaning of the symbolism, as Wooster points out in his introduction, but a heavy price must be paid. The theory of the crystallographic groups cannot really be understood without reference to the basic finite groups, including particularly the cyclic, dihedral and tetrahedral groups. Any attempt to bypass these leads inevitably to lacklustre multiplication tables and unduly complicates the determination of the conjugation classes. It also precludes the recognition of useful isomorphisms between apparently different groups. Similarly the discussion of polar and axial vectors suffers from an inadequate mathematical framework. It is no paradox to suggest that a dash more of mathematics could have reduced the length of this book and improved its clarity. But, despite these criticisms, it makes a refreshing change from the over-mathematical texts which hardly make any contact with physical ideas, and it contains a tremendous amount of valuable information. M. A. JASWON