

brown, and of blue, grey and green, which become important at an early point in some branches of the key, can be interpreted accurately. The use of rhizome characters, with consequent destruction of the plants, is also probably necessary, though regrettable.

With the exception of some of the drawings, the book is well printed, and the paper is sufficiently stout to stand a good deal of the rough treatment it will probably receive in the field.

This welcome book should go far to remove the expectation of defeat which at present comes on the botanist faced with an unknown, flowerless sedge. It is to be hoped that familiarity with the sedges following increased confidence in their identification may lead to a wider recognition of their interest.

R. S. CLYMO

PHOSPHORUS AND NMR

P^{31} Nuclear Magnetic Resonance

By Marvin M. Crutchfield, Claude H. Dungan, John H. Letcher, Victor Mark and John R. Van Wazer. (Topics in Phosphorus Chemistry, Vol. 5.) Pp. vi+492. (Interscience (Wiley): New York and London, 1967.) 220s.

THE book is divided into two sections: (1) a description of phosphorus-31 nuclear magnetic resonance in general terms, followed by a theoretical treatment and interpretation of phosphorus-31 chemical shift data; (2) a compilation of phosphorus-31 chemical shifts and coupling constants for 3,253 compounds (the reviewer did not count them) taken from 282 references, covered through August 1966. An additional set of references (to 341) come from unpublished results communicated to the authors. The book is written by members of the Monsanto group at St Louis, and represents their views rather than a critical review of the literature.

Chapter 1 is a clear and well written introduction to phosphorus-31 NMR spectroscopy. The present instrumental sophistication of NMR spectroscopy is beautifully represented by the spectrum of an analogue of ATP and of a mixture of poly (phosphoric acids) on pages 35 and 36. With such instrumentation it is a pity that a better spectrum of diphosphite cannot now be presented. The instrumentation described is a good advertisement for Varian, but it is felt that more descriptive matter on the Jeol and Perkin-Elmer machines could have been included. A random selection (10 per cent) of the references brought out two errors: references 11 and 51 are identical; in 89 two authors' names are omitted.

The second and third chapters deal exclusively with the theory and the practical correlations of this theory for phosphorus-31 chemical shifts. Coupling constants are dismissed in two pages. These chapters seem unduly biased towards the authors' own work. (This is, however, within the scope of the "Topics in Phosphorus Chemistry" series.) Thus chapter 2 is essentially contained in three papers in *J. Chemical Physics*, 1966. Because there is considerable dispute now on the virtues of certain types of π -bonding (see L. M. Venanzi, *Chemistry in Britain*, 162; 1968), it is felt that the overall reliance on these effects in explaining chemical shifts is not wholly justified. The graphs on pages 136-159 seem singularly useless. They are too small to be of practical value even if one believes their content. Where computer programmes are included in a work such as this, a flow sheet would probably be more valuable. The reviewer's opinion of calculations of this type coincides with comments in an article by J. I. Musher, "The Theory of the Chemical Shift", in *Advances in Magnetic Resonance*.

In reviewing the fourth chapter a random selection of about 10 per cent of the references was taken. The chemical shift data are very accurate; some slight errors were found in the formulae (for example, first formula,

page 316: $OP(CH_2I)(OC_6H_5)_2$ should be $OP(CH_2Cl)(OC_6H_5)_2$ according to ref. 100; PCl_5 is omitted). The presentation of the formulae is complex and tends to lead to repetition of references; thus $[C_2H_5P_\alpha P_\beta(C_2H_5)(C_6H_5)]-Li^+$ (ref. 206) is quoted on pages 236, 243 and 247. In several cases ((14, 95), (16, 95), (34, 95)) references are quoted which consist of data from the original paper plus data from a review which merely quoted that data; such duplication is totally unnecessary. It would be appropriate if the reference order in column 4 corresponded to the data order in columns 2 and 3.

The price of this book should put it beyond the finances of most individuals interested in its subject matter. If a library is prepared to pay the high price, then the collection of the references may be useful. It is, however, already dated by more than a year and a half.

JOHN P. MAHER

WETTING AND WETTABILITY

Wetting

A Discussion covering both Fundamental and Applied Aspects of the subject of Wetting and Wettability. (Comprising papers (with discussions) read at a Joint Symposium organized by the Bristol Section and the Colloid and Surface Chemistry Group of the Society of Chemical Industry, held on 12th to 14th September, 1966. SCI Monograph No. 25.) Pp. v+448. (Society of Chemical Industry: London, 1967.) 100s.

THIS book is a collection of papers mainly by British and US authors, but with some contributions from Europe. Many of the leading authorities in the field are represented. The subject includes particularly the magnitudes of the contact angles set up between a drop of liquid and a solid surface in the presence of air. Though this may appear at first sight a highly specialized topic, it is fundamental to many important operations, including adhesion, penetration of liquids into capillary systems, the wetting of powders, polymer latices, heats of immersion, and the retention of aqueous sprays on leaf surfaces. With so much commercial interest in the results, it is perhaps surprising for the reader to realize how much controversy still remains (as is brought out in the very full discussion) about the fundamentals of the contact process.

While there has been a wealth of interesting and stimulating material presented on the calculation of contact angles from inter-atomic forces, the experimental side of the subject clearly requires detailed further attention. How much is the surface of a plastic really deformed by the tension of the liquid meniscus? What is the contact angle of water on gold? (The latter metal may become important in promoting dropwise condensation, yet the experimental figures range from 0° to 70° .) How should the micro-roughness of a surface be characterized in mathematical terms? Have all traces of impurity always been removed from the solid surfaces? And may this impurity spread on to the liquid surface? Are there thick, polymolecular layers of oriented liquid molecules at a liquid-solid interface? These questions are all raised in this book, but the answers are not yet conclusive.

The trend to highly specialized conferences and books such as this is inevitable, indeed welcome, in this age of the conference and literature "explosions": not only can the participants focus all their attention on one field of endeavour, but also the published proceedings are authoritative and in a concise enough form to be bought by libraries and by individual research workers. Attractively produced as this volume is, it is a pity that the price could not have been lower. With its full report of the discussions (but unfortunately without an index), the book will be valuable to all workers in this field for many years to come.

J. T. DAVIES