



ether,  $59^\circ$ ,  $[\alpha]^{20}_D -54.5^\circ$  ( $c$  1.06 in ethyl alcohol). *Anal.* Calcd. for  $C_{14}H_{16}O_6$ ; C, 59.5; H, 5.7. Found: C, 59.9; H, 5.8. The crystalline product was converted by treatment with hydrogen bromide-acetic acid to an oily bromide which was directly treated in benzene with one equivalent of triethylammonium dibenzylphosphate to give presumably V. Hydrogenolysis of this product in the presence of palladium-charcoal catalyst, followed by mild alkaline treatment, gave  $\alpha$ -D-ribofuranose-1-phos-

phate which was isolated as the barium salt in 60% yield (based on the crystalline carbonate, IV). The dicyclohexylammonium salt, prepared by passing a solution of the barium salt through a column of Amberlite IR-120-cyclohexylammonium form, was crystallized from a methyl alcohol-ether mixture. *Anal.* Calcd. for  $C_{17}H_{37}O_8N_2P \cdot H_2O$ : C, 45.74; H, 8.81; P, 6.94. Found: C, 45.38; H, 8.82; P, 7.4;  $[\alpha]^{20}_D +40.3^\circ$  ( $c$  2.37 in water).<sup>7</sup> In lability to acid, behavior on paper chromatograms and reaction with dicyclohexylcarbodiimide,<sup>1</sup> the synthetic sample was identical with the enzymatically-prepared samples of ribose-1-phosphate. Incubation of the synthetic sample with fish muscle phosphorylase in the presence of hypoxanthine gave rise to the corresponding riboside, inosine.

It is clear that the crystalline methyl 5-benzyl-ribofuranoside 2,3-cyclic carbonate offers a promising route to the synthesis of  $\alpha$ -D-ribonucleosides as well as other ribose phosphates.<sup>8,9</sup> These synthetic possibilities are under investigation.

We wish to thank the National Research Council of Canada, Ottawa, for the financial support of this work and Dr. D. R. Idler for the microanalyses.

(7) Dr. D. H. Hayes in a private communication stated that a crystalline sample of dicyclohexylammonium ribose-1-phosphate prepared enzymatically had  $[\alpha]^{20}_D +53^\circ$  ( $c$  0.519 in water). We are grateful to Drs. Hayes and Kalckar for a sample of their material.

(8) H. Klenow, *Arch. Biochem. Biophysics*, **46**, 186 (1953).

(9) A. Kornberg, I. Lieberman and E. S. Simms, *J. Biol. Chem.*, **215**, 389 (1955).

BRITISH COLUMBIA RESEARCH COUNCIL  
UNIVERSITY OF BRITISH COLUMBIA  
VANCOUVER 8, B. C., CANADA

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H. G. KHORANA

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## BOOK REVIEWS

**Some Aspects of the Crystallization of High Polymers.** By G. SCHUUR, Member of the Staff of the Rubber-Stichting, Rubber-Stichting, Oostsingel 178, Delft, The Netherlands. 1955. 82 pp. 15.5 × 24 cm. Price, Five Dutch florins.

This short book (82 pages) is essentially a review paper of certain aspects of crystallization phenomena in high polymeric systems. The five chapters are concerned with: a general introduction; formation, structure and melting of spherulites; mechanism of crystallization; continuity of the crystal lattice, particularly in oriented and stretched polymers; rate phenomena and the melting range. The author refers frequently to papers published up to and including 1954, making this booklet quite up to date.

In addition to a thorough discussion of the published work on those topics selected, this book contains an appreciable amount of original material by the author. It is well organized and written. This reviewer was particularly taken by the beautiful microphotographs of spherulites taken with polarized light. The diagrams showing the growth of these spherulites are unusually clear.

This book is recommended to the attention of those interested in the crystal properties of high polymers. It is not at all complete, since the author addressed himself only to "some aspects," particularly those dealing with the natural rubber systems. For example, there is not a detailed discussion of the excellent, recent work on the crystalline

high polymers. Therefore, within the limits which the author has set for himself, he has done an excellent job.

POLYTECHNIC INSTITUTE OF BROOKLYN  
BROOKLYN 1, NEW YORK

HARRY P. GREGOR

**Dielectric Behavior and Structure. Dielectric Constant and Loss, Dipole Moment and Molecular Structure.** BY CHARLES PHELPS SMYTH, Professor of Chemistry, Princeton University. International Chemical Series, Louis P. Hammett, Ph.D., Consulting Editor. McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York 36, N. Y. 1955, x + 441 pp. 16.5 × 23.5 cm. Price \$9.00.

In 1931, Professor Smyth gave us a book on dielectric constant and molecular structure, which provided a very timely and useful survey of a rapidly growing field of work. Since then there has been great progress in which he and his pupils have taken a leading part. He has now placed us further in his debt by writing a completely new book covering not only the original topic but also several others which have developed collaterally and concurrently.

It is now possible to write a more or less definitive book. Basic theory is not likely to develop very rapidly. The methods of applying dipole moment measurements to the elucidation of chemical problems are now standard; and much the same is true of the methods of using other properties

such as dielectric loss. Applications will continue in this important and still vigorous field; but principles have largely been established. Therefore, this book also is timely.

The book has been arranged to suit the probable needs of its readers. The general theoretical basis is given first; and then those interested in dielectric constant and loss have their three chapters with one on measurement following, while those interested mainly in the measurement and application of electric dipole moments have several chapters grouped together. Amino acids, peptides and proteins are treated in a special chapter; and finally there is one on electronic and atomic polarization.

The author, very wisely, does not give detailed theory which can be found in other current books; but he does survey the principles very adequately and he gives a most useful guide to help the plain man through the recent jungle growth of rigorous theories which cannot be readily applied and of semi-empirical expressions which lack clear theoretical significance. These chapters are excellent, being both clear and comprehensive: and so too are those which follow, wherein the observations are critically discussed. Minor criticisms are that the reason for seeking an expression such as that of Clausius and Mosotti is not immediately made obvious; and in the discussion of semi-empirical methods of deriving "gas" values of dipole moments from solution values, more reference might be made to the recent work of Le Fèvre and his pupils. A somewhat more important one is that there appears to be no mention of investigations of the state of adsorbed substances by dielectric loss measurements: although not yet much developed, this is a promising application.

There are five chapters on the relation of dipole moment to molecular structure, *viz.*, a general one, and then one each on aliphatic and alicyclic compounds, on aromatic compounds, on intramolecular rotation, and on inorganic and organometallic compounds. The mass of data to be digested is vast; and the author's scheme is a good one. It requires the approach to be "Here are some dipole moments. What can they tell us about chemical problems?" rather than "Here are some chemical problems. What can dipole moments do about them?" However, it encourages a systematic treatment. A complete review is now impracticable: some of the recent, more elaborate applications have not been dealt with; but the basic ones have been, and they are discussed very clearly and fully.

The two remaining, special chapters are of the same high quality. Altogether it is a fine book. The author has clearly enjoyed writing it. All of us concerned, physicists, chemists, or engineers, are grateful to him for his labor.

The printing and the binding are excellent: the price is reasonable.

MAGDALEN COLLEGE  
OXFORD, ENGLAND

L. E. SUTTON

**Elementary Theory of Nuclear Shell Structure.** BY MARIA GOEPPERT MAYER, Argonne National Laboratory and University of Chicago, and J. HANS D. JENSEN, University of Heidelberg. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, New York, 1955. xiv + 269 pp. 15.5 × 23.5 cm. Price, \$7.75.

The authors have succeeded admirably in their purpose to make available to physicists and nuclear chemists a thorough survey of the scattered work in the literature relating to the shell structure of the nucleus. The treatment is elementary in the sense that this is an introduction to the subject and that only limited use is made of the mathematical concepts of modern physics. Such mathematical material as is necessary to show the limitations of shell theory is presented in a 37 page appendix.

The experimental evidence that supports the idea of "magic numbers" and nuclear shell structure is given in some detail. A brief review of the electronic structure of atoms serves as a natural introduction to a discussion of energy

levels in the nucleus. The theory is then applied to and correlated with the experimental facts observed for various types of nuclei. These include properties of ground states, angular distribution of products in stripping reactions,  $\beta$ -decay, quadrupole moments, nuclear spectroscopy, isomerism in nuclei of odd mass number, etc. Where difficulties with the theory arise, they are not glossed over in favor of its many successes.

This lucid presentation of nuclear shell structure by two of the most active workers in the development of the theory is commended to all scientists interested in nuclear behavior.

DEPARTMENT OF CHEMISTRY  
UNIVERSITY OF ROCHESTER  
ROCHESTER, NEW YORK

EDWIN O. WIG

**Biochemical Preparations.** Volume 4. BY W. W. WESTERFELD, Editor-in-Chief. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1955. vii + 108 pp. 15.5 × 23.5 cm. Price, \$3.75.

"Based on the suggestions, criticisms and labors of a great number of leading workers in the field of biochemistry, this book covers twenty hard-to-get biochemical substances. It provides reliable methods for preparing essential substances of interest which cannot be obtained readily from commercial sources or which are expensive to buy. All the preparations have been checked for workability."

The above statements made by the Publishers are certainly endorsed by this reviewer. The systematic checking by independent experts of the directions submitted to the "Biochemical Preparations" is a valuable feature of this Series, especially, since the pertinent comments of the checkers have not been merged with the original text but appear in separate footnotes. Thus, for example, in the Chapter "α-Lactalbumine" the reader receives additional help for avoiding pitfalls.

The recent Volume 4 presents experimental directions originating from various laboratories in the United States and from Sweden. The list of the contributors follows: R. G. Hansen, W. J. Rutter and P. Krichevsky; H. Wolkowitz and M. S. Dunn; D. J. Hanahan and M. E. Jayko; W. G. Gordon and J. Ziegler; B. L. Larson and R. Jenness; N. G. Brink and R. K. Bonnicksen; L. A. Heppel and R. J. Hilfmoie; N. C. Davis and E. L. Smith; H. Bauer, E. Adams and H. Tabor; A. H. Mehler, H. Tabor and O. Hayaishi; J. H. Boyer; H. H. Powers, G. Tabakoglu and H. Z. Sable; N. S. Radin and D. E. Metzler; R. M. McCready and W. Z. Hassid; G. B. Brown, J. Davoll and B. A. Lowy; P. B. Hamilton and P. J. Ortiz; A. Lepp and M. S. Dunn; W. E. Parker, R. E. Koos and D. Swern; W. R. Sherman; A. Lepp, M. N. Camien and M. S. Dunn.

The treatment of the matter is homogeneous throughout the volume but too much uniformity in this Series has been avoided by assigning the organization of each volume to a different Editor-in-chief.

It should be noted that in the present volume two procedures for the preparation of D-glutamic acid appear, whereby the "Crookes" strain of *Escherichia coli* and *Clostridium perfringens* cells were used, respectively, as the source of the decarboxylase. It is suggested that such duplications should be made use of to an increasing extent in future volumes. In many instances, although the degree of purity of preparations obtained via different routes might be the same, the nature of the contaminants present in the end products may show substantial variations. A comparison of such products may provide the worker with additional information on the physical and biochemical properties of the (not available) absolutely pure compound.

The volume under review contains a Cumulative Subject Index and a list of biochemically interesting compounds whose preparation has been described in the well-known Series, *Organic Syntheses*, through Volume 34.

CALIFORNIA INSTITUTE OF TECHNOLOGY  
PASADENA, CALIFORNIA

L. ZECHMEISTER