

Oxford which has been in the forefront of the development of these novel methods. Together they present a composite attitude toward these often complementary and sometimes competing techniques which gives the book a measure of internal unity absent from many of the current rash of edited compendia.

Several of the methods surveyed here have widespread scientific importance because, unlike optical spectroscopy, they are equally applicable to metallic and non-metallic elements and do not require destruction of the sample to be analyzed; some have a rapidity or a sensitivity far beyond conventional chemical methods. Neutron activation, isotope (stable and radioactive) dilution and X-ray spectrographic methods are in these ways furnishing new possibilities for understanding the intimate composition of all sorts of inorganic and biological materials. The excellent chapters reviewing the principles and present status of these methods—by Mapper, Webster, Moorbath and Shalgosky—can be studied with profit both by those who have already had some experience with them and by persons who may wish to appraise their possible value for their own research.

For geochemists there are also good chapters of more restricted application: a discussion of mass spectroscopy as it applies to determinations of the natural isotopic composition of rocks (Mayne), of optical spectroscopy (Taylor and Ahrens) and polarography (Moorbath) as now used in geochemistry; an outline of recent improvements in the standard chemical methods of rock analysis (Vincent); and treatments of methods of sample preparation (Wager and Brown) and chemical separation (Cornish) required in the application of one or another of the new techniques.

Each chapter is accompanied by a bibliography, several of which are sufficiently extensive to represent real contributions to the literature of the subjects they cover. The various topics are clearly expounded and an excellent balance has been maintained between discussion of basic principles, description of practical operational details and presentation of illustrative applications. Though the last are necessarily restricted to such geochemically important questions as trace analysis and determination of the age of rocks, they make clear the ways in which these methods can be applied to other materials. The book itself is very well printed and from this standpoint too is a pleasure to read.

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**Nucleoproteins.** Proceedings of the Eleventh Solvay Conference on Chemistry, University of Brussels, Brussels, Belgium, 1-6 June, 1959. By Institut International de Chimie Solvay, Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1960. 364 pp. 17 × 25 cm. Price \$10.50.

This book contains more material on the nucleic acids themselves than on nucleoproteins, although there are two chapters on the latter topic.

The first chapter, by J. Brachet, entitled "*Le rôle biologique des acides nucléiques*" (in French) starts with a brief history of work on localization and distribution of RNA and DNA, next gives a discussion of the function of DNA as gene material, and then proceeds to the question of the genetic function of RNA and its role in protein synthesis. Toward the close of the chapter there is a short discussion of the role of DNA in protein synthesis in bacteria and mammalian cell nuclei and a brief resumé of the most probable relationships connecting DNA, RNA and protein synthesis. The chapter is essentially a review of previously known material. It appears to the reviewers that more American workers should have been mentioned in the section on the history of the nucleic acids. The discussion following the chapter does not impress us as being particularly illuminating.

The second chapter on the "Molecular structure of deoxyribonucleoproteins" by M. H. F. Wilkins starts with an up-to-date discussion of the structure of DNA, with the purpose of giving a background for subsequent material on nucleoprotamine and nucleohistone. Nucleoprotamine is considered to represent a DNA double helix with protamine in an extended form wound around the smaller groove of the DNA. It is suggested that nucleohistone consists of a

DNA double helix with the histone in a coiled form running along the major groove, but this idea runs into some difficulty in the discussion following the chapter. It is also suggested that histone might serve as a bridge to connect parallel DNA molecules. The chapter is well written and very interesting. Most of the evidence presented comes from X-ray diffraction studies.

The third chapter by S. Moore on "The constitution of the histones" is well written and informative. Various histone preparations are discussed, including the arginine-rich and lysine-rich varieties. The problem of possible proteolytic degradation of histones during isolation procedures is carefully considered, although a clear-cut solution does not appear to be forthcoming. In the discussion following the chapter some new experiments of Butler and Westenbrink are presented. The chapter could very well serve as an excellent starting point for anyone wishing to begin research on the histones.

The fourth chapter, by C. Sadron (in French) entitled "*Les propriétés physiques de l'acide désoxyribonucléique en solution*" starts, after a short introduction, with a review of some of the fundamental equations applied in studies of viscosity, light scattering, and ultracentrifugation as applied to macromolecules. Considerable emphasis is placed on light scattering. As might be expected, this introductory material gives scarcely sufficient background material for a person not well trained in the physical chemistry of macromolecules, and presumably would be superfluous for those with adequate training. The second part of the chapter is concerned with the application of the above-mentioned physical methods, particularly studies using the ultracentrifuge and light scattering, to the determination of the mass and form of the DNA molecule. A critical evaluation of the limitation of each method is presented. A short discussion of the electron microscopy of DNA particles is also included.

The material in the discussion as well as in the general discussion at the end of the book demonstrates many disagreements among the experts concerning soundness of given methods and the interpretation of results, although no serious disagreements concerning the molecular structure of DNA appear.

Chapter five entitled "Heterogeneity of the nucleic acids and effects of chemical and physical agents" by J. A. V. Butler is informative and well written, in spite of one or two instances that appear to indicate failures in proofreading. Various methods used at present to fractionate DNA into different molecular components are discussed, and the effects on DNA and RNA of nitrogen mustards and irradiation by X-rays are outlined. Most of the chapter is concerned with the physical chemistry of DNA.

The first part of the sixth chapter on "The nucleic acids of microorganisms," by A. N. Belozersky, deals with polyphosphates in bacterial cells and possible RNA-polyphosphate complexes, while the second part deals with analyses for base ratios of DNA and RNA from a number of bacterial species. In the latter section of the chapter, which is of particular interest, it is shown that the base composition of the DNA of bacterial species varies widely, greatest variation occurring between the least related species, but on the other hand that there is only a small variation in base ratios for the RNA's of all species studied.

The chapter is well organized and easily readable, but in places the English is not smooth. More careful editing would have been desirable.

The seventh chapter entitled "The biosynthesis of ribonucleic acid," by S. Ochoa, is a well-organized and very well-written summary of the work of this investigator and his collaborators on the action of polynucleotide phosphorylase in bringing about the synthesis of RNA-like copolymers as well as polymers of single mononucleotides (polyadenylic acid, etc.), starting from the nucleoside diphosphates. In the discussion of primer action, only incorporated primers are mentioned. The suggestion is made of a template-like action of the primer in case the latter is RNA or a high molecular weight complex polynucleotide, but the evidence presented demonstrates only the addition of new nucleotides to the pre-existing chain, a process which would seem to exclude template action. Some additional material is included on other enzymes that can lengthen RNA chains and on Kornberg's system for DNA synthesis. The discussion following the chapter is of considerable interest.

The eighth chapter by A. Rich on "The formation of helical polynucleotide complexes" constitutes a brief but lucid account of the formation of "artificial" double and triple-stranded polynucleotide helices starting from Ochoa-type polymers (polyadenylic acid, polyuridylic acid and polyinosinic acid). The importance of ionic strength as well as type of cation in the formation of double and triple strand molecules is emphasized. At the end of the chapter the suggestion is made that RNA formation might occur through the formation of complementary base-binding involving a single DNA strand and the growing RNA chain, finally resulting in a hybrid DNA-RNA double helix, but a number of objections could be brought against this possibility. An informative discussion follows the chapter.

The ninth chapter by G. Schram on "The structure of RNA-containing viruses" consists mainly of a brief but clear description of the essential points of interest in the chemistry of the tobacco mosaic disease virus. The role of RNA as the genetic material of the virus is emphasized. Virus structure is considered briefly and the chapter ends with a discussion of the inactivation and mutation of T.M.V. which occurs as the result of treatment with HNO<sub>3</sub>. A small amount of material on other viruses is included. The discussion at the end of the chapter is interesting and informative.

The tenth chapter is a short review of work on "The chemical synthesis of polynucleotides" by Sir Alexander Todd. Four general chemical methods for achieving di- and polynucleotide synthesis are outlined. Two examples of polynucleotide synthesis are given for ribonucleotides and one for deoxyribonucleotides. The work is of obvious importance in preparing the di- and oligonucleotides of known sequence that will be needed in the determination of sequences in partial hydrolytic products obtained from RNA and DNA. The short discussion following this well-written chapter is concerned with suggestions for other possible reactions for synthesizing polynucleotides and with energy considerations.

The very interesting general discussion which constitutes the last chapter of the book is largely concerned with the physical chemistry of macromolecules such as those of RNA and DNA. Considerable space is devoted to a critical analysis of methods for determining the molecular weight of DNA. A fair amount of theoretical material not included in the preceding chapters is presented by Butler, Kuhn, Overbeek, Rich, Sadron, Ubbelohde and Wilkins, the comments of others being less extensive. A short discussion of nucleohistone is also included.

In the opinion of the reviewers this book presents material on nucleoproteins and nucleic acids in a form that should be of interest to biochemists working in other fields as well as to specialists in the fields in question. All of the chapters are easily readable even if sometimes in rather condensed form. The material presented is not seriously out of date. Typographical errors do occur but not to such an extent as to be disturbing to the reader. We consider the publication to be a worthwhile contribution in the field of the nucleoproteins and nucleic acids.

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## BOOKS RECEIVED

January 10, 1961-February 10, 1961

DOUGLAS S. BILLINGTON AND JAMES H. CRAWFORD, JR.  
"Radiation Damage in Solids." Princeton University Press, Princeton, New Jersey, 1961. 450 pp. \$12.50.

FRIEDRICH EMIL BRAUNS AND DOROTHY ALEXANDRA BRAUNS. "The Chemistry of Lignin." Supplement Volume Covering the Literature for the Years 1949-1958. Academic Press Inc., 111 Fifth Avenue, New York 3, N. Y. 1960. 804 pp. \$18.00.

T. W. GOODWIN. "Recent Advances in Biochemistry." Fourth Edition. Little, Brown and Company, Boston 6, Massachusetts. 1960. 301 pp. \$11.50.

S. HOLLMANN. "Biochemie und Klinik. Monographien in Zwangloser Folge." G. WEITZEL AND N. ZÖLLNER, Edited by. "Nicht-Glykolytische Stoffwechselwege der Glucose." Georg Thieme Verlag, Herdweg 63, Stuttgart N, Germany. 1961. 220 pp. DM. 39.---

I. M. KOLTHOFF AND PHILIP J. ELVING, Edited by. With the assistance of ERNEST B. SANDELL. "Treatise on Analytical Chemistry." Part I. "Theory and Practice." Volume 2. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1961. Pp. 811-1308. \$16.00; subscription price, \$14.00.

E. H. RODD, Edited by. "Chemistry of Carbon Compounds." Volume IV, Part C. "Heterocyclic Compounds." D. Van Nostrand Company, Inc., 120 Alexander Street, Princeton, New Jersey. 1960. 737 pp. \$26.50.

SCANDINAVIAN COUNCIL FOR APPLIED RESEARCH. "Scandinavian Research Guide. Directory of Research Institutions within Technology and Science Exclusive of Life Sciences." Volumes I and II. Scandinavian Council for Applied Research, Gaustadalleen 30, Blindern, Norway, 1961. 1173 pp. \$10.00.

RUDOLF SCHENCK. "Wissenschaftliche Forschungsberichte. Naturwissenschaftliche Reihe." Band 67. "Das Licht im Grundsystem des Kohlenhydratstoffwechsels. Ein Beitrag zur Chemie des Angeregten Wasserstoffs." Dr. Dietrich Steinkopff Verlag, Holzhofallee 35, Darmstadt, Germany. 1960. 138 pp. Brosch DM. 35.--; geb. DM. 38.--.

IVOR SMITH, Edited by. "Chromatographic and Electrophoretic Techniques." Volume I. "Chromatography." Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1960. 617 pp. \$10.75.

IVOR SMITH, Edited by. "Chromatographic and Electrophoretic Techniques." Volume II. "Zone Electrophoresis." Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1960. 215 pp. \$5.50.

WAYNE R. SORENSON AND TOD W. CAMPBELL. "Preparative Methods of Polymer Chemistry." Interscience, Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1961. 337 pp. \$10.50.

A. TAYLOR. "X-Ray Metallography." John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1961. 993 pp. \$27.00.

W. D. TREADWELL. "Physiko-chemische Grundlagen und Tabellen zur Qualitativen Analyse (Mit Ausnahme der Gasanalyse)." Nach dem Tode des Verfassers herausgegeben von PROF. DR. O. GUBELI UND DR. W. PRODINGER. Verlag Franz Deuticke, Hefnerstorferstrasse 4, Wien I, Austria. 1960. 236 pp. ost S. 168.---