est living miniaturist working in the technique of illuminated medieval manuscripts.

It is interesting to note that "De Revolutionibus Orbium Coelestium" is the rarest book in scientific literature to-day. The Union Catalogue of the Library of Congress records ten known copies of the first edition, Nürnberg, 1543, eleven known copies of the second edition, Basle, 1566, and six copies of the third edition, Amsterdam, 1617, in the United States and Canada.

FREDERICK E. BRASCH
THE LIBRARY OF CONGRESS

THE ELECTRON MICROSCOPE

The Electron Microscope. By E. F. BURTON and W. H. KOHL. 233 pages. New York: Reinhold Publishing Corporation. 1942. $3.85.

THIS book attempts the ambitious problem of taking a reader with infinitesimal knowledge of physics through the steps necessary to understand the electron microscope. There are, therefore, of necessity many inequalities of difficulty. However, the authors have succeeded as well as might be expected in this difficult task.

The first six chapters take the reader through some of the most elementary rudiments of optics, and the cartoon method of illustration is used freely with the objects and images depicted by cats, giraffes, etc., and where wave motion is explained by the picture of a child upsetting a pile of books. It is not to be expected that the reader who needs these devices will get a very clear comprehension of the "dual theory of light and of the electron" as propounded in Chapters 8 and 9; and the attempt to explain the motions of electrons in electromagnetic fields will probably be comprehensible to an appreciable degree only to those for whom the elementary parts are unnecessary. In this connection, the present reviewer feels that the statement on page 111 may lead the elementary student to believe that electrons starting with zero velocity continue to follow the lines of force. This they would strictly do only when moving with short mean free path as ions in a gas.

In spite of the foregoing unavoidable difficulties of presentation, the latter part of the book gives a very readable account of the potentialities of the electron microscope and of the essentials involved in its operation. The section dealing with the power of the microscope to reveal emission characteristics of thermionic emitters of various kinds will be of interest to many research physicists.

The book gives a clear picture of the orders of magnitude in relation to the various possibilities realizable with the electron microscope; and it will probably be of the greatest use to those who have no previous acquaintance with the microscope but are, nevertheless, beyond the stage for which the more elementary explanations would be necessary.

The implication on page 108 that a vessel containing millions of molecules represents a poor vacuum is probably a pure oversight, for, of course, a vacuum of 10^{-8} mm still contains about 3×10^8 molecules per cc.

RADIOACTIVITY

Kuenstliche Radioaktivitaet. By KURT DIEBNER and EBERHARD GRASSMAN. xi + 87. Leipzig: S. Hirzel. 1939.

THIS book seems to be a valuable compilation of data in the field to which it refers. It is of attractive form, and the material is well arranged. It will suffice to summarize its essential contents as follows, in which the reviewer has translated the titles from the original German:

Part 1: Induced Radioactivity by α-rays; Induced Radioactivity by Protons; Induced Radioactivity by Deuterons; Induced Radioactivity by Neutrons; Induced Radioactivity by Gamma-Rays.

Part 2: Tabular Presentation of all Stable, Natural and Induced Radioactive Isotopes with the most Important Data.

Part 3: Summary of all Stable, Natural and Induced Radioactive Isotopes, and the Transmutation Processes in Graphical Representation.

It is worth while calling special attention to the comprehensive chart contained in graph 3.

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NATURAL COLORING MATTERS

The Chemistry of Natural Coloring Matters. The Constitutions, Properties and Biological Relations of the Important Natural Pigments. By FRITZ MAYER, Ph.D. Translated and revised by A. H. COOK, Ph.D. American Chemical Society, Monograph Series, No. 89. 6¼ × 9¼ in. 354 pp. Bound in dark blue cloth. New York: Reinhold Publishing Corporation. $10.00. 1943.

THE book is divided into five chapters, each one of which has numerous references to the literature in the form of paginal footnotes. These chapters are: (1) Carotenoids (Polyene Pigments) (82 pp., 443 refs.); (2) Diaroylmethane Compounds (3 pp., 17 refs.); (3) Carbocyclic Compounds (59 pp., 240 refs.); (4) Compounds Containing Oxygen Heterocycles (108 pp., 512 refs.), and (5) Compounds containing Nitrogen Heterocycles (70 pp., 274 refs.). These chapters are followed by a brief General Bibliography, an Author Index and a Subject Index. The subject is presented compactly, access to further details being obtainable through the footnote references.

Paper, type, printing and binding are all excellent,

and the book is profusely illustrated by constitutional formulas where structures are sufficiently well established to justify this. The tasks of the compositors and proofreaders in the case of some of the more complicated and extensive of these formulas must have been particularly laborious and difficult.

This masterly treatise, in the wealth of its documented information, its wide sweep and its up-to-dateness, is *facile princeps* among English books in its own chosen field. So far as the reviewer is informed, nothing at all comparable has appeared since the publication twenty-five years ago of Green and Everest's "The Natural Organic Colouring Matters." Between that date and this, the whole great field of the carotenoids, which is not even mentioned in Green and Everest's book, has experienced a marvelous development and elucidation. Carotene has been recognized as the precursor of the all-important vitamin A. The constitution of many of the carotenoids has been determined, as well as their exceedingly interesting chemical and biological relationships.

This carotenoid chapter also will enable the reader to see what has been contributed to this group since the appearance five years ago of a similar chapter in the first edition of Gilman's "Organic Chemistry."

Realms of still more recent exploration, which find a place in this new book, include the pigments of butterflies' wings, investigated by Wieland, Schöpf and their collaborators, and called by them "pterins." So that even the beautiful dazzling colors of butterflies and of certain insects have been unable to escape the insatiable prying curiosity of the chemist, who has proposed structural formulas for many of them.

Another and much more important field, which twenty-five years ago was largely a *terra incognita,* is that of the blood and bile pigments, to which Hans Fischer and his co-workers have made so many and such splendid contributions. The structural relationship of porphin to the phthalocyanine synthetic pigments of Linstead and his associates is a striking fact.

Curcumin, the principal pigment of turmeric, still remains pretty much in a class by itself (Chapter 2), so far as its chemical constitution is concerned.

Chapters 3 and 4 follow approximately the same general lines of chemical classification as Green and Everest, so far as the older natural pigments are concerned, and are enriched by many new compounds and illuminated by the light of numerous fresh investigations.

One of the chief contributing factors in the elucidation of the chemical nature of those natural pigments which are present so often in infinitestimal amounts has been the remarkable development of microchemical methods of all kinds, stemming from Pregl's pioneer work in the microanalytical field.

As noted in its sub-title, this book is concerned only with natural compounds possessed of visible color, *i.e.,* with pigments and not with dyestuffs as such. The tinctorial properties are incidental and not the governing factor in determining the appropriateness of including a colored compound. On the other hand, attention is constantly called to the absorbingly interesting biological relations and implications encountered.

The chemist will find in this book vistas into many new and fascinating worlds, often but little explored, which beckon alluringly and challenge the adventurous.

The book is warmly commended to all organic chemists. It is deeply to be deplored that the senior author could not have lived to see the fruition of his labors.

MARSTON TAYLOR BOGERT

SPECIAL ARTICLES

HUMAN COMPLEMENT[1]

THIS is a summary of a detailed study of human complement, including the structure and functions of the complement components.[2] The method used for the separation of the mid- and end-pieces of guinea pig complement proved to be inadequate for the separation of the corresponding portions of human complement. The method finally adopted consisted of dialysis of fresh human serum against a phosphate buffer of ionic strength 0.02 and pH 5.4. The dialysis is carried out with mechanical rotation at 1° C for 24 hours or longer, depending on the amount of serum employed. The precipitate, which corresponds to the mid-piece, is washed with cold phosphate buffer of ionic strength 0.02 and pH 5.4. If this precipitate is to be stored it is dissolved in a phosphate buffer of ionic strength 0.3 and pH 6.6.

The supernatant, which corresponds to the end-piece, is neutralized by the addition of 0.02 ml of 1N NaOH per ml, and made isotonic with 18 per cent. NaCl solution. The supernatant is best preserved at 1° C in 1:1.2 dilution in isotonic saline or in 1:2.5 dilution in phosphate buffer of pH 6.6 and ionic strength 0.3. The details of this method will be published elsewhere.

The mid-piece and end-piece obtained by this method

[1] Aided by a grant from the Commonwealth Fund.

[2] For earlier studies *cf.* Mackie, T. J.: *J. Immunology,* 1920, 5: 379; Osborn, T. W. B., "Complement or Alexin," London, Oxford Univ. Press, 1937.—Hegedüs, A., and Greiner, H., *Zeitschr. f. Immunitätsf.,* 1938, 92: 1.