matic compounds (including a brief reference to qualitative and quantitative organic analysis), foodstuffs and a few biological substances; and physical chemistry, including properties of gases and of solutions, thermochemistry, electrochemistry, colloids, chromatography, spectroscopy, luminescence, and radioactivity. Nine pages of tables of useful constants, followed by a detailed index, complete the volume. The typography and the quality of the paper used are both very satisfactory.

There can be little doubt that this work will prove to be of service in aiding the student to acquire facility in the various experimental chemical techniques in which he may become engaged in the course of his training; and that likewise the instructor will find herein many useful ideas to assist him in preparing his experimental lecture demonstrations.

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● COAL: ITS FORMATION AND COMPOSITION

Wilfrid Francis, Consulting Chemist and Fuel Technologist. St. Martin's Press, Inc., New York, 1954. viii + 567 pp. 200 figs. 138 tables. 16 × 24 cm. $17.50.

THIS volume represents a new summary of the research work carried out on the formation and constitution of coal, in conformity with the pattern laid down in the "Monograph on the Constitution of Coal," by M. C. Stopes and R. V. Wheeler (1918). The author is well qualified for this task since he was one of Wheeler's first students, and also worked with Reinhardt Thiessen of the U. S. Bureau of Mines, who was preeminent in this field.

In discussing the individual subjects considered, the author has been selective in his choice of references and has not attempted to include a complete synthesis of all published papers. It is unusual in a volume of this sort to include so much original data not previously published; this enhances the value of the book to all interested in this subject. Many of the excellently reproduced photomicrographs, showing the microstructure of plants, peats, and coals, were provided by the original workers. The tables contain much valuable information, some of which has not been previously published or which has appeared only in reports not readily available.

After a brief review of the mode of accumulation of coal-forming plant debris in the first chapter, a detailed description is given of the structure of the coal-forming plants themselves. This is followed by a concise review of the chemistry of plant products to aid in an understanding of the chemical changes that must have occurred in the coalification process. The next two chapters discuss the formation and composition of peat and lignitous coals. Chapter 6 is entitled The Coal Series—Terminology, Structure and Petrology. The seventh and eighth chapters overlap somewhat in considering the classification and graphical-statistical studies of reaction processes and, in this reviewer's opinion, could be improved with better integration of published papers with the author's own development of a "rational classification." Interesting and competent discussions are given on normal and abnormal coal-forming processes and on the inorganic constituents of coal in the next two chapters. The final chapter considers several physical properties of coal, including structure as derived from heat of wetting and reflectance. While many of the subjects discussed are still controversial, the author does not indulge in polemics, but instead very ably presents consistently his own interpretations. Besides the usual author and subject indexes, the volume includes an appendix of twelve pages describing research procedures for the detailed examination of coals and coal-forming products.

The book is excellently produced, and the relatively high cost may be attributed in part to the large number of illustrations.

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● DIELECTRICS AND WAVES

Arthur R. von Hippel, Professor of Electrophysics and Director of the Laboratory for Insulation Research, Massachusetts Institute of Technology. John Wiley & Sons, Inc., New York, 1954. xii + 284 pp. Many figs. and tables. 22.5 × 28.5 cm. $16.

THE author begins by extending the conventional definition of dielectrics to the broad field of nonmetals in general, with metals as a limiting boundary case, and then proceeds to explore the experimental and theoretical consequences of the following hypothetical assembly: "We may pretend that a dielectric can be exposed to electric or magnetic fields of any frequency by filling a capacitor or a coil with the material in question and connecting it to a voltage source ranging in frequency from zero (direct current) to X-rays ($\approx 10^{18}$ c.p.s.)." His goal is to present to the reader the domain of science in which the interests in the above experiment of the physicist, the chemist, and the electrical engineer overlap. This is a formidable task, but despite the author's mildly pessimistic foreboding in the preface, this reviewer feels that the mission has been accomplished.

The book is divided into two main sections; in the first, the macroscopic properties of dielectrics are considered, while in the second, a correlation of these with molecular models is the objective. The physicist necessarily has the dominant role in both parts, because his vocabulary is comprehensible to both engineer and chemist; as might be expected, circuit and field theory are the guiding principles in the first section, while classical and quantum statistics take over in the second. Alternatively, the first approach might be described as continuum theory, while in the second, the discrete structure of matter and radiation is the center of attention.

The scope of the work is by definition far beyond that of previous books on dielectrics; in addition to dielectric constant, loss factor, and dipole moments, we find microwave spectroscopy, piezoelectricity, ferroelectricity, magnetic properties, and semiconductors among the new subjects presented. It becomes clear to the reader that the earlier limitations of the subject were artificial and unnecessarily restrictive to thinking. If we want to understand the fundamental structure of matter, it becomes necessary to consider all kinds of interaction between ultimate particles and electromagnetic energy. This thesis is developed in a masterly fashion by the author. Free use of mathematical methods is made, and a competent knowledge of theoretical physics is assumed; the book is not intended for beginners. There are a few curious pedagogical anomalies in the text. For example, complex numbers and transformations of coordinates are explained in elementary detail, while familiarity with many more sophisticated concepts is taken for granted. Some of the expository sections, such as those on wave mechanics and resonance theory, are so compact that they serve primarily to remind the reader that he should review these subjects in order to understand what follows. Fortunately, the bibliography contains an excellent compilation of more voluminous treatments of the many special topics which the author has included in his survey. Another useful and fascinating item in the bibliography is the citation of original fundamental sources. Papers of Poisson, Laplace, Gauss, Wien, Maxwell, Stokes, and Kirchoff represent a random sample.

No scientific library can afford to be without this book, because it should be available for study and reference to all three groups to whom the author has addressed it. The price, however, places it beyond the means of the graduate student.

● DIELECTRIC MATERIALS AND APPLICATIONS

Edited by *Arthur R. von Hippel,* Professor of Electrophysics and Director of the Laboratory for Insulation Research, Massachusetts Institute of Technology. Published jointly by the Technology Press of M. I. T. and John Wiley & Sons, Inc., New York, 1954. xii + 438 pp. Many figs. and tables. 22.5 × 28.5 cm. $17.50.

THIS book is intended as a companion volume to von Hippel's "Dielectrics and Waves." It is a carefully edited compilation