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THE CELLULOSE AGE.

Die Chemie der Cellulose unter besonderer Berücksichtigung der Textil- und Zellstoffindustrien. By Prof. Carl G. Schwalbe. Erste Hälfte. Pp. 272. (Berlin: Gebrüder Borntraeger, 1910.) Price 9 mk. 60 pfg.

THIS work is created by an opportunity, and in producing it the author has obeyed what in another walk of life would be a "call"—Germany not having produced a text-book or systematic work on this subject, the hiatus is a sufficient *raison d'être* for this publication. The author's qualifications as a worker in the field of cellulose promise a worthy fulfilment of his task, and we may say at once, the volume before us—the moiety of the work to be completed in and by a second volume, to appear at the end of this year—is a weighty contribution to the literature of this section of organic chemistry.

The general title presages a systematic treatment of the subject-matter; but the plan and method laid down are not critically selective, and the result is rather a classified account of original investigations, under sectional titles, such as "Cellulose and Alkalis," "Cellulose and Acids," "Cellulose and Salts," and "Colouring Matters" and "Oxidants," &c. The second part of the volume under the main title, "Derivatives of Cellulose," deals successively with "hydratcelluloses," "hydrocelluloses," "oxycelluloses," "hydracelluloses," "acid celluloses," &c.

The result is in effect a compilation, an edited bibliography. In recording this general impression we do not wish to detract from the value of the book; we merely note for the benefit of our fellow-students that there is a certain nonconformity of its matter with the title, and the promise of a pioneer work, which it contains, is still unfulfilled. The sub-title, "with special reference to the textile and wood pulp (zellstoff) industries," also fails to impress itself upon the plan or method of treatment, and therefore a dominating technical aim or *Leitmotiv* is no more in evidence than the critical scientific. The second volume yet to appear may modify these impressions; but we do not anticipate that the work will take rank otherwise than as an exhaustive bibliographical record. If we infer that this may be the author's intention, it is because we have no special or self-revealing preface (*Vorwort*), only a general introduction (*Einleitung*), and the reader is left to form his conclusions.

Following the short introduction in which technical rather than scientific generalities are prominent, we are confronted at once with the full complexity of cellulose in the title of section 1, "Die Baumwollcellulose Luft und Licht." To open with the problems connoted by this title is indeed to build from the top, upon foundations laid in the air. A merely *a priori* analysis challenges all we know plus a well-defined estimate of what we do not know of cellulose as a chemical individual, in being. The

next section, "Baumwollcellulose und Elektrizität," continues to occupy the reader with problems of much complexity and obviously of the most general import. The phenomena and reactions involved are those of the cellulose aggregate, of which nothing can be affirmed. Section 4, "Die Baumwollcellulose bei Wärmezufuhr," continues the study of the aggregate in relation to energy. The series of decompositions presented by destructive distillation are infinitely varied, and pyrogenetic products of resolution are generally the least simply related to the parent substances or molecules; the author does not attempt this genealogical investigation.

We notice in passing that no mention is made either of the specific heat or heat capacity of cellulose, or of the physical phenomena, such as changes of volume and dimensions, within the range of temperature—*i.e.* up to 150°—which conditions the persistence of cellulose as a chemical individual. Since cellulose and many derivatives are now produced in the form of solids of regular and controlled dimensions, this important direction of physical investigation is opened up.

The following and main sections are devoted to the changes determined in the cellulose complex by the action of acids, alkalis, and salts and oxidants, and its relations to colouring matters and "mordants," generally to such compounds which enter into what it is now fashionable to call "adsorption" combination. It is particularly in the treatment of the complex phenomena attending hydration, hydrolysis, and condensation, that the author should have adopted a critical method. A "genial" drawing is worth a volume of photography, and if the author had trusted himself as impressionist rather than camera artist he would have used his great opportunity to more adequate purpose. No chemist regards "hydrocellulose," "hydracellulose," "hydratcellulose," "oxycellulose," as terms defining chemical individuals; they connote a more or less definite equilibrium of action and reaction within the cellulose aggregate, which is susceptible of infinitely varied "schemes" of degradation; these are better classified in relation to the determining conditions than in terms of presumed end-products. The alternative method, with the conscientious discharge of the duties of an "all-truistic" bibliographer, leaves the reader without mental pictures which are the pleasurable reward of the diligent student. Students of the natural sciences bewail a tendency to over-population of their book-world as of other "worlds." The literature of cellulose is already of formidable dimensions, and yet its fundamental chemistry can be set forth on the proverbial "half-sheet of notepaper."

The present phase of diffuse expansion in the region of "cellulose" and other typical colloids calls for a more critical attitude of workers and investigators, both in the researches undertaken and the extent of their records.

We may note in conclusion that the volume, in paper covers, weighs 733 grams. It involves therefore a considerable weight of cellulose; and, moreover, the printing and finish of the volume are unusually excellent.