An Important Branch of Chemistry

History of Analytical Chemistry. FERENC SZABADVÁRY. Translated from the Hungarian edition (Budapest, 1960) by Gyula Svehla. Pergamon, New York, 1966. 429 pp., illus. $18.50.

Although analysis is the key to the development of knowledge in all areas of chemistry, the history of analytical chemistry has been sadly neglected. Not only has there been no book dealing with the subject; there have been few histories of chemistry that have given attention to analytical chemistry, and few papers dealing with the subject have been published. Therefore Szabadváry's book is a welcome addition to the history of science. Not only does it fill a conspicuously empty niche, it does so in brilliant fashion. The author shows a deep sensitivity toward the relations between analytical problems and the development of chemistry. He is knowledgeable on all phases of analytical chemistry and understands these phases in their historical context.

The book looks briefly at chemical tests in antiquity, then quickly moves to the origins of quantitative work by the Renaissance assayers. Much attention is given to the application of knowledge of chemical reactions to the growth of qualitative, gravimetric, and volumetric methods. Extensive treatment is given to instrumental methods, and the subject of analysis is brought up to the present era.

The book was originally published in Hungarian and has also appeared in German translation. It is unfortunate that the publishers of the English edition have not extended to the author the care and thoughtfulness that his book deserves. Some of the mechanical errors, such as misplacement of word spacing, are quite inexcusable. Considering the price of the book, the publishers should have sought a conscientious reader of proof. They should also have had the manuscript read by a chemist whose native tongue is English. This would have eliminated certain ambiguities and misuse of synonyms which were introduced by the translator. In general, the translation is adequate, but in places a clearer phraseology would be desirable. Despite these technical shortcomings the book is a notable contribution to the history of chemistry. The author communicates a deep understanding of his subject.

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Textbook for General Education

Physical Science: Its Structure and Development. Vol. 1, From Geometric Astronomy to the Mechanical Theory of Heat. EDWIN C. KEMBLE. M.I.T. Press, Cambridge, Mass., 1966. 520 pp., illus. Cloth, $12.50; paper, $5.95.

Today, as ever, educational freedom is a lively subject of debate on American university campuses. Much of this debate concerns the nature of the curriculum needed for a "liberal" education. Increasing criticism is being heaped upon the adoption of general education courses as a mechanism for providing the liberal education appropriate to today's needs. It is easy to be sympathetic with this criticism, in view of the watered-down, superficial courses offered as parts of many "general education" programs in American universities. Yet the alternative of a smorgasbord of professors' unrelated offerings doesn't have much appeal either. It is a real pleasure, therefore, to note the appearance of a new and substantial contribution to general education in the form of a textbook by Edwin C. Kemble, of Harvard, entitled *Physical Science: Its Structure and Development.*

Kemble, who is well known as a scholar in the field of quantum mechanics and a teacher of graduate courses, decided after World War II that the education of future citizens for a society undergoing massive change —as a result of the impact of a swiftly moving science and technology upon it—was too important to be left to chance. In 1945, in collaboration with Gerald Holton, he plunged wholeheartedly into the general education program at Harvard being led so vigorously by President Conant. The present text grew out of his experiences in teaching introductory physical science in this program to nonscience majors in liberal arts.

The book leans heavily on physics and would serve equally well as an introductory physics text. A second volume is planned. The present volume starts with geometric astronomy, goes through Newton's laws of motion, and ends with the second law of thermodynamics and the molecular theory of matter and heat. It does not presuppose a knowledge of the calculus but does make frequent use of the idea of "rate of change" and introduces the usual calculus notation for it.

Kemble believes strongly that to prepare for the future one must be aware of the past. His approach therefore is primarily a historical one with a good deal of philosophy thrown in. Neither his history of science nor his philosophy is superficial. References to recent historical findings are abundant, as, for example, Hawkins' evidence that Stonehenge was used to keep track of eclipses as well as the solar and lunar calendars. Near the middle of the volume are two excellent short chapters on "The spirit and methods of physical science" and "The impact of Newtonian science on the intellectual world of the eighteenth century." Kemble is especially to be commended for his description of the impact of science upon religion and for his willingness to venture (his words!) into a discussion of the relation of Newtonian ideas to the metaphysical problem of mind and matter. Also this reviewer found the story, near the end of the book, of the gradual evolution of early steam-pump technology into a science of thermodynamics especially interesting.

The fundamental question Kemble seeks to answer is, "What instruction in physical science should be given today to college students who do not plan to enter scientific careers?" Obviously, there is no single answer to this question. Kemble writes, "To disregard the history of science and the human meaning of the scientific enterprise is to cut off the part of the story most appealing to students whose interest is not professional." He is convinced that "by uniting a rigorous study of the basic scientific conceptions with a historical and human context" the story can be made "more interesting to most students and more meaningful to all." Unfortunately, in providing such a beautifully clear and lucid historical background, he must, as he freely admits, leave out many inter-