science students are interested in the general history of science, almost all are interested in the history of the science in which they are specializing.

This series of books, each with extracts from the classic works and memoirs of the founders of science, has given the student what he really needs in a handy and easily accessible form. The latest addition, a source book in Greek science, may well prove the most useful, not only to the student, but also to the general reader. The editors have cast their net widely and gathered almost six hundred pages of extracts with explanatory notes on mathematics, astronomy, mathematical geography, physics, chemistry and chemical technology, geology and meteorology, biology, medicine and physiological psychology. A detailed table of contents allows the reader to find quickly any topic in which he is interested in a period covering about a thousand years. There is at the end a valuable classified list of some important works on Greek science.

The section on chemistry and chemical technology includes translations from the Leyden Papyrus X and the Stockholm Papyrus, both of which may be described as 'Greek' only because they were written in that language, their content being derived from ancient Egypt; the translations made by Berthelot are more satisfactory than those quoted here.

It is a vast canvas, on which the contribution of the Greeks to mathematics stands out above all their other scientific activities; the reader soon appreciates how little understanding they had of experimental science and how far they are from us in that respect.

D. MCKIE

PHOTOGRAPHIC EMULSIONS FOR RECORDING NUCLEAR PARTICLES

Radioactive Measurements with Nuclear Emulsions
By Herman Yagoda. Pp. ix+356. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1949.) 30s. net.

THE photographic (silver halide) emulsion has now been fully established as a tool as useful as the Wilson cloud chamber, ionization chamber, or Geiger counter in nuclear physics and radioactive studies, with the added advantage of simplicity, continuous sensitivity and permanent recording of the tracks of individual particles. Progress in the use of silver halide emulsions has been particularly rapid within the last few years, and there should be a demand, therefore, for a book which deals with the properties and limitations of the emulsion, together with a description of the numerous applications already devised.

Dr. H. Yagoda has attempted such a book and has collected together in one volume a large mass of experimental data, chiefly on the use of silver halide emulsions as alpha-particle or beta-particle detectors in radiochemistry, mineralogy, metallurgy, crystallography and biology, and the chapters on these subjects should prove very useful to anyone contemplating working, or already engaged in work, in these fields. Emphasis is on the experimental technique, and methods for producing suitable flat specimens are described in detail. The book has been designed primarily as a guide to the use of

emulsions in radioactive measurements and provides an extensive survey of work in the above-mentioned fields, the bibliography alone including more than six hundred references. The final section of the book is a fairly brief survey of experimental techniques and results obtained with emulsions in nuclear physics.

The book loses much of its value, however, by the way in which the emulsion data and theoretical material are presented. These are scattered rather at haphazard throughout the book, sometimes under very misleading chapter headings. One would scarcely class, for example, the chemical reactions of emulsions with hydrogen sulphide or metals, and the effect of pressure, important as a knowledge of such effects is in order to prevent misleading interpretations of autoradiographs, under the general heading of "Photographic Detection of Nuclear Particles". The general properties of emulsions are described in Chapter 4, under the main heading of "Alpha Particle Patterns in Nuclear Emulsions". The most detailed description in the book of a nuclear emulsion is given on p. 255, which is somewhat delayed, considering the title of the book. Only the main chapter headings are given in the list of contents, and, as these headings are often vague, one has to rely on the index to look up any specific information; but owing to the scattering of related information throughout the book this process is not easy.

A knowledge of the dependence of the ionizing power of a particle on its velocity and charge, the range-energy relationships for the various types of particle in emulsions, and the variation in ionizing power along the path of a particle, together with the fact that silver halide grains in an emulsion can differ in size, sensitivity, concentration per unit volume and development-rate (fog), is essential in order to obtain a clear picture of why a particle may or may not give a recognizable track in a particular emulsion. Only by such an approach can the future applications of emulsions and their possible limitations be fully recognized. This does not seem to have been clearly realized by the author, with the result that the theoretical parts of the book tend to present a confused picture. Descriptions such as that which occurs on p. 249, where it is stated that the photographic action of gamma-radiation is due to the formation of secondary electrons in the sensitive film, and that the efficiency of this process is low, are also confusing. It is not the efficiency of the process which is low but the absorption of the gamma-rays. The expressions "photographic action of gamma rays" and "photographic action of beta-particles" (see p. 223) are in themselves misleading.

This sort of treatment leads to the arbitrary distinctions made between alpha- and beta-autoradiography, and between 'nuclear' and 'optical' types of emulsion. Emulsions utilize silver halide as the sensitive material, and the sharp division which is implied between 'nuclear' and 'optical' types is entirely artificial.

This book is the first of its kind and, in spite of the above criticisms, can be recommended as a survey of work already carried out with silver halide emulsions in radioactive studies; but it is suggested that it should be read in conjunction with a sound exposition of the properties and characteristics of emulsions when exposed to nuclear particles, such as that given by Webb in the *Physical Review* (74, 511; 1948).

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