five years ago to begin regular instruction in the subject to small classes in the Massachusetts Institute of Technology, and both of the undersigned have now been teaching the history of science in collaboration for the last ten years or more. Like Professor Libby we have keenly felt the need of a text-book, and *faute de mieux* have now in hand the first of two volumes entitled "Outlines of the History of Science" designed expressly for the use of our own classes. Next summer we hope to have ready Volume I., dealing with the rise and progress of science and the scientific spirit to the fall of the Roman Empire. Volume II., treating of the development of science in medieval and modern times, should be ready a year later.

The course at the Massachusetts Institute of Technology is now an elective for all students in the third (junior) year and consists of one hour (lecture) and two hours (preparation) in the first half year, and two hours (lecture) and three hours (preparation) in the second half.

W. T. SEDGWICK,
H. W. TYLER
MASS. INSTITUTE OF TECHNOLOGY,
November 27, 1914

SCIENTIFIC BOOKS

Paul Ehrlich, Eine Darstellung seines Wissenschaftlichen Wirkens. Festschrift zum 60. Geburtstage des Forschers (14 März, 1914). Mit I Blidnis. Gustav Fischer, Jena, 1914.

Thirty-seven authors join their efforts in this book of 668 pages to present a summary of the investigations of Paul Ehrlich. The contributions of Ehrlich himself and of his immediate coworkers only are considered primarily, and according to the bibliography (up to February 1, 1914) at the end of volume, it concerns, in addition to several books and monographs by Ehrlich, no less than 612 separate scientific articles.

The book opens with an interesting biographical introduction by A. von Weinberg. In the gymnasium Ehrlich excelled in mathematics and Latin. In the university he early was recognized as of unusual ability and originality. While still a young medical student he became interested in problems presented by the selective affinity of lead for certain tissues, an interest which soon extended to the problems of protoplasmic affinity in general and thus really determined the main scope and nature of his later work.

The main part of the book is divided into five sections covering different phases of Ehrlich's investigations. The first section is devoted to work that especially concerns the histology and biology of cells and tissues. Here is included Ehrlich's early work. Among the more notable results discussed in the seven articles of the section, the introduction to which is by Professor Waldeyer, of Berlin, may be mentioned: important discoveries in bacterial staining methods, now in daily use everywhere, in the working out of which Ehrlich cooperated with Koch; the microchemical differentiation of leucocytes; the demonstration of the methylene blue reaction of living tissues; and the development of new conceptions of the structure and function of protoplasm (Ehrlich's "Das Sauerstoffbedürfniss des Organismus," 1885), which form the basis of the celebrated sidechain theory advanced in the nineties to further the understanding of reactions in immunity.

The next and the largest section deals with Ehrlich's contributions to the study of immunity. It contains fifteen articles by well-known workers in the field in question. The side-chain theory, in the course of the proving of which so much of the work now considered was carried out, is discussed by Wassermann, Of the other subjects dealt with in this section may be mentioned the technical methods employed in the investigation of immunological problems, toxins, antitoxins and other antibodies, hypersusceptibility and the working out under the guidance of the side-chain theory of a practical method of standardization of diphtheria antitoxin. From the reading of these articles one is deeply impressed with the great usefulness of Ehrlich's theory of the constitution and affinities of protoplasm in promoting fruitful investigation of the complex problems in chemical biology presented by the phenomena of immunity. The imme-

diate practical results of this work are seen most clearly perhaps in the standardization of diphtheria antitoxin, as Ehrlich's method is used exclusively everywhere, but the influence of the work may be said to dominate in large measure every department of investigation of immunity and every branch of the practical application of the knowledge and principles derived therefrom.

The third section (three articles) considers Ehrlich's work on cancer, which forms a sort of interlude between the period of intensely active investigation of problems in immunity and the latest phase of his remarkable activity, namely the development of experimental chemotherapy. The principal outcome of the work of cancer is pointed out to be the demonstration that the cancer cell increases in power of growth on passage from animal to animal, and the formulation of the view that resistance to the growth of cancer cells, often observed in experimental inoculation, depends on the lack of available food-particles for the cancer cells (atreptic immunity).

The two remaining sections of eleven articles deal with Ehrlich's contributions to chemistry and his chemotherapy of syphilis and certain other spirochetal infections. The development through a long series of systematic biochemical experiments, based on original conceptions of the affinities of cellular constituents, of a successful chemotherapy of important human infections, by direct attack on the parasites by substances specially built up for that purpose and introduced from without, is emphasized, and properly so, as the logical culmination of a unique investigative activity of the highest order. Even now Ehrlich's results fully justify Huxley's prediction in 1881 that through discoveries in therapeutics it would become possible "to introduce into the economy a molecular mechanism which like a cunningly contrived torpedo shall find its way to some particular group of living elements and cause an explosion among them, leaving the rest untouched."

Most of the articles are written by men who have worked under Ehrlich, and every now and then we catch interesting glimpses of his picturesque and genial personality as well as hints to his methods of work. Naturally the many articles are not of the same merit and interest, but altogether they give us a very good and comprehensive idea of the tremendous achievements of Paul Ehrlich.

Ludvig Hektoen

Infection and Resistance. By Dr. Hans Zinsser, Professor of Bacteriology at the College of Physicians and Surgeons, Columbia University, New York. The Macmillan Company, 1914.

The purpose of Dr. Zinsser's book of 546 pages is to render easily accessible the knowledge that has accumulated especially from laboratory work in regard to the intimate mechanisms of infection and immunity. There are twenty-one chapters: infection and the problem of virulence; bacterial poisons; immunity in general, natural and artificial; the mechanism of natural immunity, and the phenomena following on active immunization; toxin and antitoxin; bactericidal properties of serum and cytolysis; complement fixation (two chapters); agglutination; precipitation; phagocytosis (five chapters); anaphylaxis (five chapters); therapeutic immunization in man; protective ferments; colloids. The last chapter, on colloids, which is very useful in view of the many allusions in the other chapters to the analogies between colloidal reactions and the reactions between the substances concerned in the phenomena of immunity, is written by Professor Stewart W. Young. As each chapter so far as possible has been prepared as a separate unit, more or less repetition could not be avoided, but as compensation there is increased clearness in the presentation of each subject. We are told in the preface that the book is intended primarily for the undergraduate medical student, and the author replies to anticipated criticism of his treatment as being too difficult and too technical for the student by saying that his experience in teaching does not indicate such to be the case. Herein the reviewer is inclined to agree with