

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

the author, but at the same time it must be said that more attention has been given to the details of certain controversies and experiments now largely of historical interest only than might be regarded as required in a book like this. This fondness for detail, however, does not detract seriously from the usefulness of the book to student and practitioner. The references to original sources are very abundant and will prove of great help, but they are not given according to any accepted bibliographic standard, the page being omitted in most cases. There are altogether but very few books that attempt to give a comprehensive summary of immunological knowledge of the same general scope as this one by Dr. Zinsser, but their number is increasing; for the present Dr. Zinsser's is the most serviceable.

LUDVIG HEKTOEN

The Norwegian Aurora Polaris Expedition, 1902-03. Vol. I.: On the Cause of Magnetic Storms and the Origin of Terrestrial Magnetism. By KR. BIRKELAND. Second Section. Christiania, H. Aschehoug & Co. 1913. 4°. Pp. x + 319-801, with many maps and plates.

Five years have elapsed since the publication of the first section of the present work, yet, in spite of incessant labor, this second section could not be sooner completed. This was due to the great number and variety of the computations and experiments necessary. The author considers that the results attained by the investigation of conditions during positive and negative Polar storms, and particularly the diurnal motion of the respective magnetic storm centers, are so valuable as to fully compensate for the exertions and personal sacrifices that the work has cost.

In order to make it clear whether his conclusions from widely spread observations in different parts of the world could be harmonized with his previous theoretic assumptions, he has carried out a long series of experiments with a "terrella" or magnetic globe suspended in a large vacuum-box intended for electrical discharges. He has thus been able

to obtain photographic representation of the way in which cathode rays move singly, and group themselves in crowds about such a magnetic globe. Special study has been made of these groups of rays which produce magnetic effects analogous to those observed upon the earth during positive and negative magnetic polar storms. The photographic plates of these experiments are veritably fascinating.

The author holds that he has demonstrated that the magnetic storms on the earth, polar and equatorial, may be assumed to have as their primary cause the precipitation toward the earth of heli cathode rays, of which the magnetic rigidity is so great that the product $H \cdot \rho$ for them is usually about 3×10^6 C.G.S. units. He discusses the objections raised to this theory by Schuster and Hale, and states that the experiments which were originally intended to procure analogies capable of explaining terrestrial phenomena, such as the Aurora and "magnetic storms," were afterward continued to derive information in regard to the conditions under which the emission of the assumed heli cathode rays from the sun might be supposed to take place. The terrella was made the cathode in the vacuum chamber and experiments carried on for many years. In this research there gradually appeared experimental analogies to various cosmic phenomena, such as zodiacal light, Saturn's rings, sun spots and spiral nebulae. Whatever be the fate of the author's hypotheses the facts recorded in this work are well worthy the careful study of those interested in electromagnetism.

W. H. DALL

Physics of the Household. By CARLTON JOHN LYNDE, Macdonald College, Canada. 1914. 12mo. Cloth. Pp. 313.

Professor Lynde's book indicates that the author believes in teaching physics by consulting and describing, first, the student's own environment in information, experiences and appliances. These things are the fundamentals of this book. The reasons assigned in the preface for the teaching of physics to young students are, "First, that they may ob-