of the real nature of the effect of ultra-violet light in facilitating discharge, and in honor of whom the phenomena of photo-electricity are not infrequently called "The Hallwachs Effect," one too whose laboratory has been perhaps the most continuous and prolific contributor to the literature on the subject, this book gains an authoritativeness which none of its predecessors can claim.

In addition, the book has been written with an admirable objectiveness and freedom from bias of either a national or personal kind. All experimental work is reported fairly and fully, and all theories are presented from the points of view of their authors. Professor Hallwachs does not hesitate to state his own convictions, but he never seeks to impose them. If only the scholars and statesmen had carried over into political affairs the method and spirit which Hallwachs here exemplifies, there would have been no great war.

Professor Hallwachs divides his historical survey of photo-electricity into two periods: the first period extends from the discovery of the photo-electric effect in 1887 to the year 1900; the second period covers the period from 1900 up to the present. This division is probably due to the fact that the interpretation of all electrical phenomena from the standpoint of the electron theory began about 1900.

The first two hundred pages constitute an exceedingly valuable digest of all the experimental work done up to August, 1913. In the 11th Chapter, too, this summary is extended so as to include all articles which appeared up to the end of the year 1913. Some of the most interesting photo-electric developments which have appeared since 1913, especially those having to do with the relations of Planck's $h$ to the initial energy of emission and the relation of gases to photo-electric discharge, could not be included at the date at which the book went to press.

The portions of the book thus far considered make it an invaluable reference book to every student of photo-electricity. But it is in the thirty-five pages included in Chapter 9 that the greatest interest in the book will center, for it is in this chapter, which is entitled "Ueber den lichtelektrischen Grundprocess; Versuche einer speziellen Deutung der Lichtelektrischen Vorgänge," that the author reviews and weighs all attempts which have been made thus far at an interpretation of photo-electric results. He does not commit himself to a belief in any theory thus far formulated. He gives, however, a very clear exposition of the strength and weaknesses of the theories which are at present before the scientific world.

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*Sewage Purification and Disposal.* By G. Bertram Kershaw. London, Cambridge University Press, 1915. Pp. x + 340, 56 figures.

Although books on sewage purification and disposal are becoming increasingly numerous this new work of Mr. Kershaw's is a welcome addition to the list. The author was engineer to the Royal Commission on Sewage Disposal for many years and has a well-deserved reputation not only in England, but in this country. No one has had a better opportunity than he has had to study the various methods of sewage treatment under English conditions.

The present volume is a recapitulation of some of the previous works of the author and is published as one of the Cambridge Public Health series. It deals chiefly with the methods which have shown their value by experience and does not pretend to cover some of the newer processes which are now in the experimental state. For this reason it is a more satisfactory book to place in the hands of students than are those which do not take pains to discriminate between the old and the new, the tried and the untried. Throughout the book there is frequent reference to the cost of processes. The data are valuable, but American readers must remember that the conditions in England are different from those in the United States, and in general it will be necessary to nearly double the English prices in order to make them applicable to conditions in America.

The author omits entirely the subject of disposal of sewage by dilution as that subject

is to be dealt with in a forthcoming volume in the Cambridge Public Health Series by Dr. W. E. Adeney. This also will be welcomed by American readers. Another omission is that of the process so largely and successfully used in New England, the process of intermittent sand-filtration.

The author's treatment of septic tanks and their limitations is extremely interesting. He describes not only the hydrolytic tank by Dr. Travis and the Imhoff tank, but also the Kremer and Fieldhouse tanks, which are not as well known in this country. Greater attention is given to the disposal of sludge than in many books and the subject of trade wastes and their disposal is also treated at considerable length.

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## *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES*

(NUMBER 5)

THE fifth number of volume 1 of the *Proceedings of the National Academy of Sciences* contains the following articles:

1. *Some Problems in Stellar Photometry:* JOEL STEBBINS, Astronomical Observatory, University of Illinois.

This was a part of the address of Mr. Stebbins as Draper Medallist before the Academy on April 20, 1915. It contains a number of suggestions as to probably fruitful methods and problems of stellar research with the aid of the photometer.

2. *The Composition of Brachiopod Shells:* F. W. CLARKE and W. C. WHEELER, United States Geological Survey, Washington.

The authors present an investigation to determine, more definitely than hitherto, just what substances are contributed by each group of marine invertebrates to the marine sediments, with a special reference to the formation of magnesian and phosphatic limestone.

3. *On the Occurrence of the Line 4,686A and the Related Series of Lines in the Spectra of the Planetary Nebulæ:* W. H. WRIGHT, Lick Observatory, University of California.

The line 4,686A and related series of lines as observed in the spectra of heavenly bodies, and more recently obtained from laboratory sources, have played an important rôle in some theories of the constitution of atoms; and Mr. Wright here presents a number of observations concerning the different forms in which line 4,686 occurs in nebulæ. In particular, he observes that it appears either as a narrow line in the nebulosity or as a broad band in the nucleus; rarely in both forms.

4. *The Nature of Nerve Conduction in Cassiopea:* A. G. MAYER, Department of Marine Biology, Carnegie Institution of Washington.

The nature of nerve conduction appears to be some chemical reaction involving the adsorbed sodium, calcium and potassium cations, and its rate is proportional to the concentration of these absorbed ions, and is thus a surface effect. The work, therefore, supports other recent work by Tashiro and Lillie.

5. *A New Canonical Form of the Elliptic Integral:* B. I. MILLER, Department of Mathematics, Johns Hopkins University.

A new canonical form of the elliptic integral is suggested which has the advantages over the Klein-Bianchi form that it is simpler in form, unique and invariant under certain transformations.

6. *The Structure of Complex Atoms and the Changes of Mass and Weight involved in their Formation:* W. D. HARKINS and E. D. WILSON, Kent Chemical Laboratory, University of Chicago.

This is a contribution to a subject at present very widely discussed as to the nature of the atom. The authors find that it is possible to construct the various atoms of low atomic weight out of the helium and hydrogen atoms. The departure of the atomic weights from integral values on the hydrogen basis is attributed to the fact that the interference of the electric charges in the nucleus of the helium atom produces a diminution of the electromagnetic mass sufficient to lower the atomic weight; and close coincidence of the atomic weights with integral values on the oxygen basis is taken to indicate that the diminution