A NEW educational review has appeared at Leipzig, *Deutsche Zeitschrift für Ausländisches Unterrichtswesen*, edited by Dr. J. Wychgram.

SCIENTIFIC LITERATURE.

Justus von Liebig, His Life and Work (1803–1873). By W. A. SHENSTONE, F. I. C., Lecturer on Chemistry in Clifton College. New York, Macmillan & Co. 1895. Pp. 220 + vi.

This is one of 'The Century Science Series' edited by Sir Henry Roscoe, and it is fitting that one of the first chemists to receive attention should be Liebig. In his preface the author says: "The name of Liebig is doubtless familiar to most of us, but I fear very few have any clear idea what he did, why chemists admire and esteem him, or, indeed, are aware that they do admire and esteem him. As the result of many inquiries made among cultivated people, I have found the prevailing impression concerning Liebig to be that he was a man who gained a large fortune by making 'extract of meat.' Now and then one meets someone who 'seems to have heard' of his name in connection with agriculture. Scarcely anyone now seems to know that he was one of the greatest of that class in whose work Mr. Balfour finds 'the causes which more than any others conduce to the movements of great civilized societies.' I have therefore made it my object in writing this little book not so much to dwell upon Liebig's private life as to tell what he was, what he did, and why all chemists and all those who are versed in the history of science admire and esteem him so greatly."

There can scarcely be a doubt that chemistry owes more to Liebig for its advancement during the present century than to any other one man. He was born in 1803 at Darmstadt, where his father dealt in colors, which he also manufactured. The boy was a failure at school. He had no ear memory and could not, therefore, make progress in linguistic studies. On the other hand, he had the powers of an experimenter, and was attracted by everything connected with chemical phenomena. He spent some time in an apothecary shop, but he took little interest in the commercial side of his occupation, and, in the course of a few months, he was sent back to his father. It was then decided that he should follow his bent and study chemistry. He went to the Universities of Bonn and Erlangen, but did not find what he wanted. In 1822 he took the degree of Doctor of Philosophy at Erlangen, and then he was provided with the means for continuing his studies abroad. He went to Paris and was soon admitted to the laboratory of Gay-Lussac, one of the leading chemists of that time. Two years later he was appointed Extraordinary Professor of Chemistry at Giessen. In 1826 he became full professor. In 1852 he was called to Munich, where he died April 18, 1873.

"Liebig was essentially a pioneer in science. In the course of his life he took the lead in no less than four great departures. The first was in organic chemistry, the second and third in the applications of chemistry to agriculture and to physiology, the fourth was the outcome of his labors as a teacher."

How he labored in these four fields is well told in Mr. Shenstone's little book, and every one interested in the intellectual development of mankind, be he chemist or not, will find here much that is stimulating and suggestive. The book is divided into nine chapters with the following titles: Introduction; Liebig and Wöhler; Chemical Discoveries; Liebig and Dumas; Fermentation; Chemistry and Agriculture; Physiological Chemistry; Education and Other Work; Character and Later Years.

Anleitung zur mikrochemischen Analyse der wichtigsten organischen Verbindungen. VON H. BEHRENS. Prof. an der Polytechnischen Schule in Delft. Erstes Heft (Anthracengruppe, Phenole, Chinone, Ketone, Aldehyde) Mit 49 Figuren im Text. Hamburg und Leipzig. Verlag von Leopold Voss. 1895. Pp. 64+viii.

The author of this book is well known in connection with work on microchemical analysis in general. He has now endeavored to show the chemist who deals with organic compounds how he may avail himself of the microscope for the purpose of recognizing various substances. The methods described have been thoroughly tested in the author's laboratory and the results have been most satisfactory.

The refinement attainable is not equal to that reached in the case of inorganic compounds. One cannot think of working with millionths of milligrams, and will at times have to be content if a satisfactory result is reached with tenths of milligrams. The classes of compounds dealt with, in this first number of the book, are: 1. The anthracene group; 2. Phenols; 3. Nitro-compounds; 4. Quinones, Ketones, Aldehydes. It is to be hoped that the appearance of the book will lead chemists to try the new methods, as it appears that their work will be much facilitated by them. It must, of course, be borne in mind that the problem of detecting minute quantities of organic compounds does not often present itself, though there are cases in which it becomes of importance. IRA REMSEN.

On the Densities of Oxygen and Hydrogen and on the Ratio of their Atomic Weights. By EDWARD W. MORLEY, Ph. D. Published by the Smithsonian Institution, Washington, D. C. 1895. 4°. xi. 117 pp.

For more than ten years Prof. Morley has been almost constantly engaged on the work which is described in this paper. With a painstaking fidelity to the highest ideals of accurate work which has rarely been equalled and has never been surpassed, he has determined four constants which are partly interdependent, and which are of very great importance in physical science. These constants are: the density of hydrogen, the density of oxygen, the ratio of the combining volumes and the ratio of the combining weights of the two elements.

The density of oxygen was determined by three different methods.

In the first series nine determinations were made. From nine to twenty-one and one-half liters of oxygen were weighed in large globes which were filled at the temperature of the laboratory.

In the second series sixteen determinations were made. Instead of measuring the temperature and pressure directly in this series the oxygen was brought to the same temperature and pressure as that of hydrogen contained in another large globe. The pressure of the hydrogen was previously measured at the temperature of melting ice, thus making the globe containing it, in effect, a very sensitive air thermometer. The difference between the coefficients of expansion of hydrogen and of oxygen was of course considered.

In the third series seventeen determinations were made. The globes were filled at the temperature of melting ice and, after weighing them filled with oxygen, they were exhausted and weighed again. The oxygen in this series was prepared partly from potassium chlorate and partly by the electrolysis of dilute sulphuric acid.

The results of three series were:

By use of thermometer and manometer	$D = 1.42879$
By compensation	$D = 1.42887$
By use of ice and barometer	$D = 1.42917$

Giving double weight to the last series, the weight of a liter of oxygen under normal conditions at sea level and in latitude 45° is 1.42900 grm., with a probable error of 0.000034 grm.

Five series of determinations of the density of hydrogen were made.

In the first and second series the same methods were used as in the first and third series for oxygen.

In the third, fourth and fifth series hydrogen was absorbed in palladium, contained in a glass tube, and, after weighing, was expelled into three globes which were surrounded with melting ice, and which had a combined capacity of forty-two liters. By this means three and seven-tenths grams of hydrogen were weighed in a comparatively small apparatus, and the volume occupied by the gas was accurately determined. The method has the additional advantage that any mercurial vapor contained in the globes was without effect on the determination. In all, sixty-four determinations were made. The results were as follows:

Series	I.	$D = 0.089938$
"	II.	$D = 0.089970$
"	III.	$D = 0.089886 \pm 0.0000049$
"	IV.	$D = 0.089880 \pm 0.0000088$
"	V.	$D = 0.089866 \pm 0.0000034$

It is believed that mercurial vapor entered the globes in the first two series and that the results of those series are too high. They are accordingly rejected. The remaining series give as the weight of a liter of hydrogen at sea