sachusetts. In 1924, he was appointed curator of the Chandler Museum in Columbia University. Of late, he exercised a great influence upon the social development of Columbia students, seeking to make them men of the world. All sorts of willing helpers came to his aid—distinguished actresses and others. He had a very pretty pen, as all know who have his delightful volume of "Percolator Papers" (Harper Bros., 1919), a model in its way—named after the organ of the New York Chemists' Club. He could write on subjects so far apart as Saul of Tarsus and C_2H_5OH—even ascribe to the latter the greater influence for good in the world.

Hendrick was a perfect letter writer. Early in March of last year, he wrote me a rapturous account of "Green Pastures," the work of his friend Marc Connelly. "I'm so full of it, I want to write about it to some sympathetic soul." To him it was a wonderful picture of the way in which the "darkies" took the Bible and adjusted it to their own minds. (This may not be without repercussion upon ourselves, if we consider what is the effect upon students of text-book tarradiddles and modern pseudo-scientific mysticism.) "It is all real from a simple and childish point of view that everybody had once. I urge you to see it. It is free from all the offensiveness of apologetics." His charm, in fact, lay in his being himself a primitive. In "Green Pastures," Hendrick was in the element native to his spirit.—HENRY E. ARMSTRONG in *Nature.*

SCIENTIFIC BOOKS

The Migration of Butterflies. By C. B. WILLIAMS. Biological Monographs and Manuals, No. IX; Edinburgh and London: Oliver and Boyd, 1930, pp. xi + 473, 71 figs. (all diagrams and maps).

MR. WILLIAMS has been studying the subject of migration for a number of years and has written much about it. He has paid especial attention to the migration of butterflies. His successive residences in England, United States, British West Indies, Egypt and East Africa have given him unusual opportunities for observations, and he has not only made the most of these opportunities but has corresponded largely with naturalists in different parts of the world and has collected the literature of the subject very carefully.

The present volume is painstaking and full. The actual evidence in regard to each species is displayed with great care and detail in the first 312 pages. Part IV of the book, which gives a general discussion, is both interesting and important. It contains chapters on the true nature of migratory flights, on the condition and the behavior of the migrants, the conditions determining the start of the flight, and the determination of route and goal. Then follows a chapter on comparison with other animals, in which dragon-flies, locusts and other insects, birds, mammals and fishes are considered. And then there is added a chapter on general problems, with another which contains a summary, conclusions and suggestions for further work. The bibliography is extensive and covers 26 pages of fine type. The format of the book is admirable. Other monographs in this series are probably well known to workers. The general editors, as is well known, are F. A. E. Crew, of Edinburgh, and D. Ward Cutler, of Rothamsted. The object of the series is an admirable one, namely to provide authoritative accounts of what has been done in some of the diverse branches of biological investigation and at the same time to give those who have contributed notably to the development of a particular field of inquiry the opportunity of presenting the results of their researches, scattered through the scientific journals, in a more extended form, showing their relation to what has already been done and to the problems that remain to be solved.

As Mr. Williams states in his introduction, he has not included in his book any entirely new records of migration not published elsewhere. The work, however, brings the subject quite down to date, and it is done in a masterly way by a broad and very competent student.

L. O. HOWARD

BUREAU OF ENTOMOLOGY

Barlow's Tables of Squares, Cubes, Square Roots, Cube Roots and Reciprocals of all Integer Numbers up to 10,000. Third edition. Revised and enlarged by DR. L. J. COMRIE. Pp. xii, 208. E. and F. N. Spon, London, 1930.

PETER BARLOW'S TABLES will need no introduction to many of the scientists who have found it desirable to use a calculating machine in their work. These tables originally appeared in 1814; a new incomplete edition was edited by Augustus de Morgan in 1840. Since then, an ever-increasing demand for the book has led to many printings from the stereotype plates of 1840.

It is very fortunate that the present revision of these tables has been carried out by Dr. Comrie. His expert knowledge of the efficient use of calculating machines and his wide experience in the construction of tables fitted him well for the task.

It will not be necessary to go into great detail regarding the content of this book since the title gives a very good idea of the principal tables. The present edition retains all the valuable features of the first two editions, and in addition contains certain new tables. Among the latter may be mentioned factorial n up to $n=100$, and n^4 and $1/\sqrt{n}$ up to 1,000. For the integers between 1,000 and 10,000, inclusive, $\sqrt{10n}$ is given in addition to the usual $\sqrt{n}$. The powers up to the tenth of the first hundred integers and powers up to the twentieth of the first ten integers are given.

Interpolation in the tables of square roots, cube roots and reciprocals is facilitated by the provision of interlinear first differences. The square roots and cube roots have been cut to eight significant figures, a number sufficient for practically all purposes. The computer will appreciate the fact that the publishers have chosen to use clear, easily-read modern type and a good grade of paper.

CHARLES H. SMILEY

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

A CONVENIENT HYDROMETER FOR DETERMINING THE SPECIFIC GRAVITY OF HEAVY LIQUIDS

THE separation of minerals from loose aggregates by using liquids of high specific gravity is a common practice in the study of a variety of sedimentary rocks. Frequently only one cut is made of the aggregate, the desire being to separate the heavy minerals, or those with a specific gravity of about 2.8 and above, from the more common quartz. In such a case bromoform that will float quartz is satisfactory, and the quickest test of density is to drop a grain of quartz in the liquid. In other cases it may be desirable to make cuts between the quartz and some of the feldspars, and then the extreme heavies; or between the quartz and the carbonates; or many other cuts at a variety of values of specific gravity. In such cases it is necessary to know the exact specific gravity of the liquid used, and to control the dilution when preparing a liquid for a specific separation.

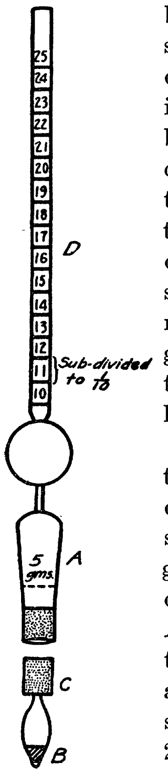

FIG. 1

Various methods have been used by the writer in making specific gravity determinations of heavy liquids. A small picnometer has been used with good success, but the method is tedious and time-consuming. Eimer and Amend, of New York, on the suggestion of the writer, recently prepared a new type hydrometer with which the specific gravity of a liquid between 2.000 and 5.000 can be determined accurately and quickly in one operation. A distinct advantage of the apparatus is that only 5 cc of the liquid is needed for a test. When mixing liquids in small quantities to obtain a required specific gravity, quick determinations are possible with this instrument.

The hydrometer is made of glass tubing with a ball float near one end and just above a liquid chamber *A*. Fig. 1 shows the hydrometer in the inverted position as it is placed in a column of water and the scale is read. A small amount of mercury *B* is used as a balancer, and is sealed in the glass stopper *C* which fits in the liquid chamber. A scale *D* with graduations from ten to twenty-five grams, sub-divided in tenths, is contained in the long glass rod. The liquid chamber or cylindrical bulb is marked to show the level of five grams of distilled water at 20° C. The glass stopper is ground for tight fitting when the hydrometer is inverted in a cylinder of water.

To determine the specific gravity of a liquid which is between 2.000 and 5.000, the liquid chamber *A* is filled with the liquid to the level marked on the bulb, the stopper put in place securely, and then the whole is inverted and floated in distilled water in a tall cylinder. A 1,000-cc cylinder of six or seven cm diameter is satisfactory. The bottom of the meniscus of the water is read on the graduated scale of the long glass tube and this value divided by five (the gram units of the water capacity of the bulb) gives the specific gravity of the liquid.

The instrument may be used for the determination of gravities of solid particles as well, the usual weighing in air and weighing in water being necessary, the balance being the float of the hydrometer in the water. Only two operations and measurements are necessary. (1) Place the solid mineral or rock particle (air dry) in the specimen bulb (which is the liquid chamber *A*), insert stopper and float in the column of water. The value read is the weight of the specimen in air. (2) Put distilled water in the specimen chamber up to the 5 cc mark, and again make a reading with the instrument floating in the column of water. This value is the weight of the