A Text-book of Astronomy. By George C. Comstock, Director of the Washburn Observatory and Professor of Astronomy in the University of Wisconsin. New York, D. Appleton and Company. Cloth. Pp. 391. Price, $1.30.

Written in simple, clear and concise language, illustrated by appropriate and well-constructed figures, made interesting by apt and homely comparisons and useful by numerous and well-chosen exercises, this book forms a welcome addition to the list of elementary text-books of astronomy. Professor Comstock has written a new book and has not merely rearranged the material of earlier ones. His purpose is clearly outlined in the first paragraph of the preface: "The present work is not a compendium of astronomy or an outline of popular reading in that science. It has been prepared as a text-book, and the author has purposely omitted from it much matter interesting as well as important to a complete view of the science, and has endeavored to concentrate attention upon those parts of the subject that possess special educational value. From this point of view, matter which permits of experimental treatment with simple apparatus is of peculiar value and is given a prominence in the text beyond its just due in a well-balanced exposition of the elements of astronomy, while topics, such as the results of spectrum analysis, which depend upon elaborate apparatus, are in the experimental part of the work accorded much less space than their intrinsic importance would justify."

Inspection of the table of contents shows that the author has departed widely from the conventional methods of treating the elements of the subject, especially in the first six and the eighth chapters. The special features of the book are numerous questions scattered throughout the text, to teach the student to think and construct as well as to read and assimilate; and many exercises, in the nature of laboratory work, all to be performed with simple apparatus, easily constructed by the students themselves. In these exercises the students obtain practice in the three fundamental processes of all practical astronomy, the measurement of time, angle and distance. Although the exercises are numerous, still the author has not exhausted the list and might with profit have given more.

It would have been well, if possible, to so arrange the material that the exercises, which all fall in the first five chapters, would be more distributed. It is not necessary, of course, that the teacher present the material in just the order given, but the facts are that the large majority of teachers will present it in that way. The author has, apparently, purposely avoided all reference to the *Nautical Almanac* and *American Ephemeris*. The wisdom of this is open to question. While it is unnecessary and certainly unwise to introduce the *Ephemeris* at first and thus make the student dependent upon it, still I think it equally unwise to totally exclude it. An explanation of the *Ephemeris* and a few exercises which demand its use should, I think, be included in the most elementary course in practical astronomy. Any school in which astronomy is taught can surely afford to buy one of these books each year, and any person capable of teaching the subject should be able to use the book intelligently.

Many bits of good advice are given in connection with the exercises. On page 3, for instance, in connection with a measurement to be made, we find: "But perfection can seldom be attained, and one of the first lessons to be learned in any science which deals with measurement is that however careful we may be in our work, some minute error will cling to it and our results can be only approximately true. This, however, should not be taken as an excuse for careless work, but rather as a stimulus to extra effort in order that the unavoidable errors may be made as small as possible."

A point to be commended is the use of the metric system throughout the exercises. In the descriptive parts of the text, however, the author retains the English units. Perhaps it is best to break away gradually, but I believe no criticism would have been offered if the metric system had been used throughout.

The illustrations and figures of the book are well chosen and the student should learn something from each. Very few, if any, have been inserted for pictorial effect. Among the figures

which deserve special mention are Nos. 16 and 17, from which the position of any of the five brighter planets may be determined for a number of years; No. 23, which ingeniously illustrates the tide-raising forces; No. 54, illustrating the moon's rotation; No. 121, illustrating the determination of parallax of the fixed stars.

Of the many apt illustrations contained in the book, the following, page 121, is one of the best: "Every such timepiece, whether it be of the nutmeg variety which sells for a dollar, or whether it be the standard clock of a great national observatory, is made up of the same essential parts which fall naturally into four classes, which we may compare with the departments of a well-ordered factory: I. A time-keeping department, the pendulum or balance spring, whose oscillations must all be of equal duration. II. A power department, the weights or main spring, which, when wound, store up the power applied from outside and give it out piecemeal as required to keep the first department running. III. A publication department, the dial and hands, which give out the time furnished by department I., IV. A transportation department, the wheels, which connect the other three and serve as a means of transmitting power and time from one to the other.

"The case of either clock or watch is merely the roof which shelters it, and forms no department of its industry. Of these departments the first is by far the most important, and its good or bad performance makes or mars the credit of the clock."

The last chapter, growth and decay, deserves special mention. It is a clear, philosophic treatment of the best theories of sidereal evolution, and although not out of place in a high-school text, it might well form a part of a larger treatise.

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SCIENTIFIC JOURNALS AND ARTICLES.

THE *Journal of Physical Chemistry*, June, 1901. 'The Theory of Electrolytic Dissociation as viewed in the Light of Facts recently ascertained,' by Louis Kahlenberg; 'On the Generalization of Clapeyron's Equation,' by Paul Sorel; 'On the Phase Rule,' by Paul Sorel. This paper by Dr. Kahlenberg demands more than passing mention. Since its enunciation by Arrhenius in 1887, the theory of electrolytic dissociation has received a recognition which has rarely been accorded a scientific theory in so short a time, and few theories have been so productive of results. Unhesitating assent has been by no means accorded it by many, especially of the older, chemists, but few attempts have been made to reveal its weaknesses experimentally. Dr. Kahlenberg, himself a pupil of Ostwald, has been one of the few who have from time to time called attention to experimental facts which were not in accord with the theory. In his present paper, the author first details a large amount of experimental work on the electrical conductivity of solutions at low and at high temperatures, and on molecular weight determinations by boiling point and cryoscopic methods, in solutions of gradually increasing strength, in which is shown often a great discrepancy between the results and those required by the dissociation theory. He then proceeds to discuss at length these and many other failures of the theory, drawing the conclusion that the theory is applicable to a decidedly limited class of solutions. The true nature of solutions must be reached by a study, not of those extremely dilute, but first of the concentrated solution, approaching the dilute solution as a limiting case. In conclusion, he says: "It must be fully and freely admitted that the dissociation theory has done much good in stimulating research in many lines. It has been fruitful in proportion to the amount of truth contained in it. Like other theories founded upon too narrow a basis of induction, it has gradually been outgrown—the facts are too much for it. It would be difficult of course to say of any theory—even of one long ago discarded—that it is entirely worthless, and so the writer has no inclination to make such a statement concerning the dissociation theory. * * * It is solely because of the rapid growth of the erroneous idea that the deductions drawn from the indiscriminate application of the simple gas equation to solutions and from the notion that all well-known facts harmonize with the theory