

the needs of such students, and suggests comparison with the work on astronomy by the late Hugh Godfray, which has held the field in our universities for so many years. A good deal of space is wisely devoted to the chapter on time, for the experience of teachers generally will confirm the remark made in the preface that "this subject seems to cause the student more difficulty than any other branch of practical astronomy."

The young student of spherical trigonometry, entering upon the practical solution of triangles, is sometimes a little bewildered by the number and variety of the formulæ put before him for the determination of an angle from three given sides, by means of the halved sine, cosine, tangent, etc. A somewhat novel feature of Prof. Hosmer's work is a short discussion of the conditions under which one of these is to be preferred to the others.

To each chapter is appended a small collection of examples, some numerical, some calculated to test the grasp obtained upon the subject-matter of the chapter. These should be of great assistance to the student.

H. B. G.

History of the Theory of Numbers. Vol. i. *Divisibility and Primality.* Publication No. 256. By Prof. L. E. Dickson. Pp. xii+486. (Washington: Carnegie Institution of Washington, 1919.)

THIS work appears to be a chronological encyclopædia rather than a history as that word is usually understood. Prof. Dickson has aimed at giving references to all papers bearing on the subject, and in most cases he has given a summary of the contents.

These papers are so numerous that the need for brevity has forced the author into a style which is often abrupt and occasionally irritating, but the subject-matter will be found invaluable by all who aim at original work in the theory of numbers.

The volume begins with an account of the theory of perfect numbers¹; these are now of historical interest only, but the quest for all perfect numbers has proved one of the greatest driving forces in the general theory of numbers.

The next topic includes the theorems of Fermat and of Wilson; it is remarkable that the first proof known of the one and the first enunciation of the other are both due to Leibniz.

The section on indices, binomial congruences, and circulating decimals includes a large number of writings of an unusually miscellaneous character, and the reader will find that this source contains much information which has not been easily accessible hitherto.

The most elaborate chapter bears the title "Sum and Number of Divisors"; and this chapter contains many references to the analytical theory of numbers, which has grown so rapidly of late years. On the other hand, recent work

¹ The Greeks called a number *perfect* if the number happens to be equal to the sum of its divisors. For example, we have

$$\begin{aligned} 6 &= 1+2+3, \\ 28 &= 1+2+4+7+14. \end{aligned}$$

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on prime number theory is but lightly sketched, and rightly so, inasmuch as the treatise by Landau and subsequent reports have provided all the necessary material.

Physical Laboratory Experiments for Engineering Students. By Prof. Samuel Sheldon and Prof. Erich Hausmann. Part i. *Mechanics, Sound, Heat, and Light.* Pp. v+134. (London: Constable and Co., Ltd., 1919.) Price 6s. net.

THIS book, prepared for use in the Polytechnic Institute of Brooklyn, is suitable for candidates for engineering degrees who have already pursued laboratory courses in physics. "Each experiment has been chosen because of its close connection with engineering work, and in many cases the theoretical result may be calculated from the constants of the apparatus with which that result obtained by experiment may readily be compared. As these two results approach to an equality the student gains confidence in the apparatus, confidence in the theory, and confidence in himself." This is well said. There can be no doubt that many students lose not only confidence but also interest in physics when they find that owing to inefficient apparatus results of reasonable accuracy cannot be obtained. The experiments here described are well selected, and as apparatus of engineering design has been chosen, the equipment with ordinary care in use should continue to give sufficient accuracy. Special mention may be made of the apparatus for the study of the harmonic motion of a rotating system, which appears to be unknown to British instrument makers. The book is printed on good paper, and is well illustrated.

H. S. A.

The North Riding of Yorkshire. By Capt. W. J. Weston. Pp. viii+161. (Cambridge: At the University Press, 1919.) Price 2s. 6d. net.

IN view of the time which has elapsed since the greater proportion of these well-known county geographies were issued, one had almost feared that the greatest county had been overlooked. It is now apparent that three volumes will be issued for Yorkshire, one for each Riding, and the first of these, dealing with the North Riding, has just appeared. As we are fairly familiar with all that have previously been published, it is a pleasure to be able to state that this is one of the best; the author seems to have had a better grasp of the object of the work he has had in hand, resulting in a volume which is much more a geography than a guide-book. The illustrations are numerous and well chosen; misprints, as usual, are few—which makes that in the word "Montreal" on p. 58 all the more glaring. The only statement we cannot agree with is in reference to the "raised beach" at Saltburn, which is now known to be a "kitchen midden." The colouring of the geological map at the end, for which the author is not responsible, does not seem quite so successful as with the maps in the earlier volumes.

T. S.