ferent way from other men. Instead of setting such a man apart as a research professor, we should let him understand that withdrawal from the lecture room and relief from the duties of supervising elementary students carry with them a larger obligation to publish as fully as possible the results of all discoveries, to organize departments intelligently, to train up young men who can teach; and to make liberal room for such men, instead of trying to get in their way when their work becomes popular.

The routine work of teaching, if done under favorable conditions, is often a positive help to a scientific or literary man in keeping his nerves steady. Very few scholars, however productive, can write well all the time. Very few investigators, however well qualified, can make a continuous series of discoveries. If a man has nothing to occupy him in his less fertile intervals he will be tempted either to remain wholly idle or to publish second-rate books and pseudo-discoveries. A teaching position enables him to fill his time with work sufficiently close to his lines of productive activity to be stimulating and yet with enough of routine in it to make it healthful. And to most men this combination of teaching with research gives positive enjoyment of a high order. We may well remember the words of Lord Kelvin in connection with his receipt of the degree of Doctor of Laws from Yale in 1902:

> There is one point on which I specially desire to speak. College professors should be permitted and given the means to do research work. On this matter of research I feel deeply. At the same time I do not believe it wise to have a research laboratory without teaching. It is a pleasure for a professor to meet students and to tell them what he can, and a greater pleasure if he can make them understand, and the greatest pleasure if he can widen the borders of their knowledge. To combine research work with teaching is most valuable both for student and teacher.

This is not intended as an argument against the establishment of institutions for research. There is room outside of the universities for all the endowments which we now have for productive work in science and letters, and for many more. There is as much difference of temperament among investigators as there is among men of any other kind. Some do better research work when they are relieved of the necessity of teaching. For these we should have independent foundations. Others, whom I believe to be a decided majority, do better research work in connection with university positions. I regard it as a most fortunate circumstance that we are able to make provision for men of both kinds.

Nor is this intended as an argument against appointing men to professorial positions who are inspiring teachers rather than productive scholars. Our colleges need all the good teachers that we now have, whether they are productive scholars or not. But with a large number of men good teaching and productive scholarship ought to be conjoined; and it would be most unfortunate for such men themselves, for our universities, and for America's progress in science and letters, if we attempted to dissociate things that so generally belong together.—From the annual report of President Arthur T. Hadley, Yale University.

SCIENTIFIC BOOKS

List of Prime Numbers from 1 to 10,006,721. By DERRICK NORMAN LEHMER. Carnegie Institution of Washington, Publication No. 165, 1914. Pp. xv + 133.

By the publication of his factor table for the first ten million natural numbers (Publication 105, Carnegie Institution of Washington, 1909) Professor Lehmer offered to the public a monumental work which will probably remain a model of its kind for centuries in view of its accuracy. The present work is based upon this factor table and was prepared with equal care. The pages are of the same size in these two publications, but the present volume is not quite one third as large as its predecessor.

Since the natural numbers are fundamental in many mathematical theories, it is not infrequently useful to know whether a given number is prime. The direct determination of this property is generally very laborious when the number is large. Hence a reliable table may save an enormous amount of labor.

On the other hand, such a table is very useful as a check in the development of theorems relating to prime numbers. Mathematical interest along this line has been greatly stimulated in recent years by the publication of the elegant work, in two volumes, entitled "Handbuch der Lehre von der Verteilung der Prinzahlen" by E. Landau, of Göttingen, Germany.

The prime numbers contained in the present volume can be found by means of the given factor table, but it is much easier to use the present table in case the only question under consideration is whether a given large number, within the limits of this table, is prime or composite. Each page contains 100 rows and 50 columns of numbers, and hence there are 5,000 different prime numbers on a page. It is therefore very easy to determine, by means of this table, the number of prime numbers lying between any two numbers within the limits of the table.

The Introduction covers fifteen pages and deals with various questions relating to prime numbers. It includes a table exhibiting the actual numbers of prime numbers at intervals of 50,000 up to 10,000,000, and comparing them with the approximate numbers of these primes according to the formulas of Riemann, Tchebycheff (Čebyšëv) and Legendre. It is somewhat surprising to find that the Introduction contains evidences of carelessness while the body of the work seems to have been prepared with the greatest care.

In fact, at least three inaccuracies appear on the first page of the Introduction. Line twenty begins with the word "infinite" instead of "finite." In line thirty-seven of the first column it is stated that Eratosthenes was a contemporary of Euclid. As a matter of fact it is not known whether Euclid was still living when Eratosthenes was born. We know very little about the life of Euclid, and it is distinctly stated in Günther's "Geschichte der Mathematik," 1908, page 83, that we do not know whether Euclid and Eratosthenes were contemporaries. In line sixteen of the second column of the first page the symbol 2^{2n} should be replaced by $2^{2}n$.

In referring to these inaccuracies in the Introduction it is not implied that they affect seriously the value of the book. On the contrary, we desire to emphasize the fact that the table is not to be judged by its Introduction. Professor Lehmer realizes very keenly the great importance of accuracy in listed results, and he has made a careful study of methods which tend to insure the greatest possible accuracy. In view of the enormous amount of labor involved in testing the accuracy of such tables sufficiently to pass reliable judgment, the reviewer bases his confidence in the accuracy of the present table on the methods used by the author, and not on his own direct observations.

In closing we may refer briefly to the following interesting sentence which appears on page x of the Introduction: "It is hardly likely, indeed, that any theorem of importance in the Theory of Numbers was ever discovered which was not found in the first place by observation of listed results." Professor Lehmer's comprehensive knowledge of the developments in Number Theory gives great weight to this striking emphasis on the importance of listed results. To the reviewer the quotation appears to emphasize too much the usefulness of the method under consideration, especially as regards the developments in the theory of algebraic numbers.

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Natural Sines to Every Second of Arc, and Eight Places of Decimals. Computed by E. GIFFORD from Rheticus. Manchester. Printed by Abel Heywood & Son, 47 to 61 Lever Street. 1914. Pp. 543.

Among the extensive trigonometric tables which were calculated during the sixteenth century those of Rheticus occupy the most prominent place. That an immense amount of labor, devotion and perseverance was involved in the preparation of such tables may be seen from the fact that Rheticus employed computers for twelve years at his own expense.[1] His "Opus Palatinum," published posthu-

[1] Braunmühl, "Vorlesungen über Geschichte der Trigonometrie," Vol. 1, 1900, p. 212.