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.

mously in 1596, contained tables to ten decimal places of the natural trigonometric functions at intervals of ten seconds. This was surpassed in 1613 by the tables in the "Thesaurus Mathematicus," which were based by Pitiscus upon unpublished tables computed by Rheticus, and gave the values of the natural functions to fifteen decimal places.

Soon after the appearance of these extensive tables the public began to realize the great advantages of logarithmic computation. The "Trigonometria Britannica" by Briggs and the "Trigonometria artificialis" by Vlacq appeared in 1633, and served as sources for numerous briefer logarithmic tables of trigonometric functions. For about three hundred years it appeared as if the greater part of the labor put on the natural function tables had been wasted. In recent years calculating machines have to a considerable extent replaced logarithmic tables, and have brought the natural function tables into more prominent use; thus furnishing another instance of unforeseen usefulness of mathematical lore.

In 1897 W. Jordan published a table of the natural trigonometric functions to seven decimal places, basing his work upon the "Opus Palatinum." To-day we have before us this work by E. Gifford based on the tables of Rheticus and aiming to facilitate the use of these tables by computing the values of the natural functions from second to second by interpolation. In view of the recent refinement in observation seven place tables do not always secure sufficient accuracy. Hence the present tables are computed to eight decimals.

One of the most important elements in such tables is accuracy. As the main tables of Rheticus have been improved by successive computers it would appear that serious inaccuracies in such tables as the present could easily be avoided. The author of the present table does not inform us as regards his precautionary measures except that "the sines to 1″ were interpolated by the Thomas calculating machine from Rheticus's figures for 10″, each being copied to 10 places and obvious mistakes corrected so that the differences run in descending series." It is a somewhat curious fact that at the top of the first page of the table we find cosine 1 in place of cosine 90°.

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*Zur Frage der Entstehung maligner Tumoren.* By TH. BOVERI. Jena, Gustav Fischer. 1914. 64 pages.

The eminent position held by Professor Boveri in the field of cytology, if for no other reason, entitles him to a careful hearing in any allied field of research, and the present highly suggestive hypothesis as to the origin of malignant tumors is by no means inappropriate from him since the tumor problems in their last analysis are cell problems. The medical man will probably pay little attention to this theory because it offers no practical solution of the cancer problems. Medical men interested in the theories as to the causation of cancer, and especially those who follow von Hansemann, however, will find in Boveri's hypothesis a most interesting and suggestive *modus operandi* for their favorite theory.

In any hypothesis of cancer origin the difficulty to be overcome is the phenomenon of unrestricted cell division of the malignant cancer cells. This is the crux of the whole matter and it is here that every current hypothesis of cancer origin falls down, but in Boveri's hypothesis this point is met.

The theory rests upon a number of assumptions, some of which are supported by experimental evidence, some are purely conjectural. We may briefly summarize these assumptions as follows: First, the chromosomes are qualitatively different and a certain number and assortment of them are necessary for normal balanced activities of the cell; second, abnormal mitosis in the form of multipolar spindle formation, leads to unequal distribution of the chromosomes in the resulting cells; third, lost chromosomes are never replaced and the abnormal cell, if it divides further, must give rise to similar abnormal cells; fourth, such an abnormal cell with its chromosome complex has a different set of interactions with the surrounding tissues