On many accounts the report of Dr. Clarke describing the geologic structure of a portion of Chenango county is one of the most important of these contributions, since it considers the correlation of the rocks for a part of the State concerning which great uncertainty and difference of opinion have prevailed. The plate at the beginning of the article gives a clear idea of the character of the sandstones and shales at the base of Vanuxem's Oneonta sandstone, while the figures bring out nicely the lithologic and stratigraphic features of the various sections, which are carefully described by the author and are accompanied by accurate lists of the species of fossils found in the various beds. In the lower exposures, near Norwich, Dr. Clarke found abundant Hamilton fossils; above these Hamilton species also, but with them specimens of *Spirifer mesastrialis*, *Actinopteria zeta* and a few other species which occur in the 'Ithaca group,' while in the upper part of the shales and sandstones, below the Oneonta sandstone, fossils are very scarce.

The formations of the Middle and Upper Hamilton of central and western New York are usually given in ascending order as the Marcellus shale, Hamilton sandstone with the Tully limestone at the top, Genesee shale, Portage formation (which in central and eastern New York is partly replaced by the 'Ithaca group' and Oneonta sandstone), and Chemung formation. These formations form the Hamilton and Chemung series, the line of separation usually being drawn at the top of the Genesee, although some authors prefer to place it at the base of the Tully limestone.

The Genesee shales and Tully limestone form a marked horizon across western New York, but they disappear in going eastward and are not clearly known east of the Chenango valley. In this eastern area Hamilton fossils, with the addition of a few species found in the 'Ithaca group,' occur in the bluish shales and sandstones underlying the Oneonta sandstones, and whether these deposits belong in the Hamilton formation, or are above the horizon of the Genesee shale and Tully limestone, has been a greatly disputed question.

Dr. Clarke found in the western part of Chenango county that the Hamilton fauna with *Spirifer mesastrialis*, 'and of quite the same character as that of the lower beds at Norwich,' is clearly and unmistakably above the Genesee shales. Consequently it will be readily seen that this work is of great value in accurately determining the line of separation between the Hamilton and Chemung series in central New York. In passing it may be stated that this conclusion agrees with the writer's interpretation of the section near Smyrna, twelve miles north of Norwich, which is at the most eastern unquestioned exposure of Tully and Genesee.

The final settlement of difficult questions of this nature in correlation—and there are many in the United States—will be obtained by careful field study of a typical region by a geologist familiar with its paleontology and also versed in stratigraphical geology.

A preliminary copy of the Geologic Map of New York is now passing through the press, and the above and later work of Dr. Clarke, as well as that of other assistants, will be of great value in revising this map upon which the veteran State Geologist, Prof. James Hall, has been actively engaged for so many years.

C. S. Prosser.

Computation Rules and Logarithms. S. W. Holman. Macmillan & Co., New York. $1.00.

Prof. Holman's book is the outgrowth of several years' experience with large classes and is sufficient for most of the computations occurring in engineering, physics and chemistry. The tabular matter consists of a variety of five and four-place tables, together with modern values of important constants. The introduction, which comprises one-third of the book, is of great value, its chief object being to teach students how to get results of any desired degree of accuracy without wasting time and labor in the manipulation of useless figures. For instance, the H. P. which can be transmitted safely by a certain wrought-iron shaft is $2\pi^2 \cdot 1.364^3 \cdot 10000 \cdot 300/6336000$. How many places of logarithms are to be employed, if the computation-error is not to exceed one per cent.? By one of the author's rules it is instantly decided that four-place logarithms will give ample accuracy. One of the devices on which stress is laid is moving the decimal point till it stands directly after the first significant figure. Thus $850.72=8.5072 \cdot 10^2$; $0.000652=6.52 \cdot 10^{-4}$.

We cannot go into details, but may say that Prof. Holman's rules are few and simple, and so abundantly illustrated that students will find little difficulty in applying them. The book is probably the best, in its particular field, which is available for American students and engineers. When five-place tables are not sufficiently accurate the author recommends the well-known Vega or other seven-place tables. It is a pity that engineers and others seem to be unaware that Bremiker's six-place tables, revised by Albrecht, are sufficiently accurate for almost any problem which occurs in practice, and are easier to use than any seven-place tables.

A few peculiarities of Prof. Holman's book deserve notice. Negative characteristics are used, even in the tables, and recommended. Decimal points are introduced in the arguments of the tables of logarithms of natural numbers; instead of 621, 6.21 is printed. Interpolation tables are not given for all the tabular differences on a given page, when the differences are large, even though there is ample room on the margin of the page. The interpolation tables given are not accurate. Thus $0.3 \cdot 22$ is called 7 instead of 6.6; this suffices in multiplying by one figure, but in division needless inaccuracy may arise.

In the table of 5-place logarithmic trigonometric functions the argument is for each minute, but no proportional parts are given. There is no provision for finding accurately the logarithmic sines and tangents of small angles involving fractional parts of a minute.

A student will sometimes wish that the author had been a little more particular in his statements. On page xii., for example, after stating two fundamental propositions, "which one can easily verify by algebra or by numerical examples," the author adds:

"A more general form of statement from which these follow is: If several numbers are multiplied or divided, a given percentage error in any one of them will produce the same percentage error in the result." Take the example $\frac{120}{2}=60$. The student will think that the author means that if the divisor 2 be in error by 25% of itself, the quotient is in error by 25% of itself. This he will find to be false. Had the author given a definition of 'percentage error,' the student would be able to determine whether the above statement were exact, or simply approximately true for such examples as are likely to occur in practice. The two propositions mentioned above might be improved by re-writing.

Two errata have been noticed: In the first line of p. xxiii for 'numerator' read 'denominator;' in the last line of p. xii for 'merely' read 'nearly.'

The book is elegantly printed on heavy paper; one can only wish that it were so bound that it would lie open with a flat page, a *sine qua non* of logarithmetic tables.

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SCIENTIFIC JOURNALS.

AMERICAN JOURNAL OF SCIENCE.

THE subject of the Röntgen rays is discussed in the *March number* by A. A. Michelson, who proposes a new hypothesis to account for the phenomena observed. He mentions, first, the two theories that have hitherto been suggested, that of longitudinal waves and that of projected particles, and remarks upon the special difficulties which each of these theories meets. His own hypothesis he calls the 'Ether-Vortex' theory, which he states as follows:

"Let it be supposed that the X-rays are vortices of an intermolecular medium (provisionally, the ether). These vortices are produced at the surface of the cathode by the negative charge, which forces them out from among the molecules of the cathode." He shows that certain of the phenomena which are most typical and difficult to explain may be accounted for on this supposition. The fact that a high vacuum is essential within the tube while, once outside, the rays can pass not only through air, but also through many solids, is regarded as finding a solution if it be considered that, in order that ether vortices may result from the electrical impulse, this impulse must be communicated to them, and must not be dissipated in the interchange of molecular charges which