A FEW MATHEMATICAL ERRORS IN THE RECENT EDITION OF THE ENCYCLOPÆDIA BRITANNICA

As a large number of students do not have easy access to extensive special literature, they are led to regard general works, such as the Encyclopædia Britannica, as the supreme authority on many questions. It may, therefore, be of interest to call attention to a few conspicuous errors in the new edition of this excellent work. On page 857 of volume 19 (1911), we read as follows: "What is quite certain is that our present decimal system in its complete form, with the zero which enables us to do without the ruled columns of the abacus, is of Indian origin." How far this is from the truth may be inferred from the following paragraph.

During the meetings of the second international congress of mathematicians held in Paris in 1900 the eminent German mathematical historian, Moritz Cantor, expressed the opinion that the use of zero was probably discovered by the Babylonians about 1700 B.C.[1] In the third edition of volume I. of his classic "Vorlesungen ueber Geschichte der Mathematik," 1907, page 616, Cantor remarks that according to his opinion the discovery of zero is due to the Babylonians, while the deepening (Vertiefung) of the concept is due to the Hindus.

A more decided error is expressed on page 626 of volume 12, in the following sentence: "The technical mathematical sense (of the term group) is not older than 1870." It is surprising that such a statement could emanate from the country where Cayley worked and developed the foundations of abstract group theory as early as 1854. It is well known that Galois (1811–32) was the first to use the term group as a technical mathematical term, with its present significance, and that Cayley and Kirkman employed this term with its technical mathematical sense in a number of articles, published before 1870, in the *Philosophical Magazine* and in the *Memoirs* and *Proceedings* of the Literary and Philosophical Society of Manchester.

[1] *Bulletin of the American Mathematical Society*, Vol. 7 (1900), p. 70.

Closely related to the error noted in the preceding paragraph is the following, which appears under the word *Galois:* "To him (Galois) is also due the notion of group of substitutions." While the technical mathematical term group is due to Galois, as we observed in the preceding paragraph, the *notion* of group is very much older. According to Frobenius and Stickelberger, the theory of finite abelian groups was founded on the one hand by Euler and Gauss, and on the other by Lagrange and Abel; and, according to Poincaré, the principal foundation of Euclid's demonstrations is really the existence of the group and its properties.[2] No one acquainted with the history of group theory would say that the *notion* of group of substitutions was due to Galois.

In the first volume of the Encyclopædia Britannica under the term *abscissa* we find the following incorrect statement: "The word (abscissa) appears for the first time in a Latin work written by Stefano degli Angeli (1623–1697), a professor of mathematics in Rome." As early as 1903 C. R. Wallner pointed out in the *Bibliotheca Mathematica,* page 37, that the statement in Cantor's "Vorlesungen ueber Geschichte der Mathematik," which might furnish the basis of the error under consideration, is incorrect. In a recent part of the Encyclopédie des Sciences Mathématiques, tome 3, volume 3 (1911), page 1, G. Eneström points out that the origin of the word abscissa goes back to the Latin translations of the "Conic Sections" by Apollonius, written in the third century before Christ. Eneström gives, at this place, numerous references in regard to the early use of the term abscissa.

Another incorrect statement appears in the article on number theory, volume 19, page 851, and reads as follows: "By totient of n, which is denoted after Euler by $\phi(n)$, we mean the number of integers prime to n and not exceeding n." While Euler studied some of the properties of the totient of n he did not use the symbol $\phi(n)$. This symbol, as far as we know at present, was first used by Gauss in article 38 of his "Disquisitiones Arithmeticæ,"

[2] *The Monist,* Vol. 9 (1898), p. 34.

1801. The function of n represented by $\phi(n)$ is, however, generally called Euler's function, since Euler had studied some of its fundamental properties before the appearance of Gauss's "Disquisitiones."

It is a well-known fact that it is easy to find errors in nearly every book and the few errors noted above would be of very little interest if they did not occur in such an excellent work. As they were met incidentally, it is not implied that they include the most important mathematical errors in the work under consideration. They may perhaps serve to emphasize the great importance of a thorough study of the question on hand before expressing a definite conclusion, and also the large amount of labor involved in such a study. There is a vast amount of error afloat even in the best literature of the present time, and this calls for a larger army of workers who investigate questions *ab initio* and who are fearless in resisting the tendency towards the further spreading of these weeds on the intellectual earth.

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More Washington Science

To the Editor of Science: I have been reading with much interest the recent communications on Washington science. No one will deny credit to the scientists who are giving the government department their best energies. Still, these same men are occasionally lacking in—I am almost tempted to say a system of professional ethics. I have been quite near the inside of Washington methods and herewith present the case.

In the event of choosing a scientific assistant for a vacancy, I have known in several cases that the matter of minimum salary the applicant would accept was of paramount importance while the ability and training of the applicant seemed to be an insignificant matter. I know cases where men with practically no college or scientific training of any sort were preferred to college graduates with experience, because the former could be obtained for five dollars a week less. I know a case in one division where $100 per year represents the difference between the beginning salary of an untrained man and that of a post-graduate of a large eastern university. I do not refer to men appointed under the civil service competitive examination, but rather to those who come under the general heading of agents and experts, who are appointed merely at the recommendation of a division chief. Many of us know of cases wherein good men were discouraged, by this state of affairs, to the extent of entering other lines of endeavor. It is now in order for some one to sign an earnest communication containing the phrases "love of science," "mercenary," etc. To one interested in this subject I would suggest looking up the records of resignations of very good men from the government bureaus as a result of the order of Secretary Wilson (1909) that no promotions were to be made for the next fiscal year. Is there not a system of ethics in these matters?

For obvious reasons, I emulate my predecessors and sign myself

A Former Washingtonian

Columbia and Berlin

A statement has recently appeared in a number of newspapers to the effect that Columbia University having passed the University of Berlin in attendance is now the largest university in the world. As a matter of fact it will probably be several years before the attendance at Columbia exceeds that of Berlin. The error in calculation has arisen primarily from the fact that the Columbia figures include not only the fall attendance but also the enrollment of the summer session of 1911, proper allowance, of course, being made under duplication for the summer session students who returned for work this fall. The figures of the University of Berlin, with which a comparison has been made, include, however, only the attendance during the winter semester, the summer semester enrollment not being considered. Inasmuch as registration at the University of Berlin for the winter semester of 1911–12 is not yet completed, it is simpler to make a comparison between