for a final decision; the former for a much-needed rule as to whether or not "a generic name is to be considered identical whether the ending is masculine, feminine or neuter" if from the same root; the latter for an official opinion as to whether a lapsus calami does or does not exist in the case of *Libell[ula] americanus* Drury.

In the meantime we feel that our action is as clear and consistent as is possible, our aim being to follow the official decisions of the International Code, and, in cases where action has not as yet been taken, to follow that course which, after careful consideration, we believe most likely to coincide with the later rulings of that body.

We naturally do not relish our work being used as a striking illustration of the hopelessness of unanimity among systematists on nomenclatorial matters, but we could hardly hope for a less gloomy viewpoint from one of the authors of "The Entomological Code" the first rule of which recommends in the vernacular "everybody for himself."

MORGAN HEBARD

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SYLVESTER AND CAYLEY

ON page 781 of the last volume of SCIENCE there appeared a criticism relating to a statement in my recent book entitled "Historical Introduction to Mathematical Literature." The statement in question seems to be the following: "Cayley and Sylvester were students at Cambridge at the same time and formed then a lifelong friendship," which appears on page 259. In view of the fact that a "colossal error" is said to have been committed it may be of interest to compare the given sentence with the following quotation from the third edition, page 484, of "A Short Account of the History of Mathematics," by W. W. R. Ball:

> He (Sylvester) too was educated at Cambridge, and while there formed a life-long friendship with Cayley.

The same statement appears in the fifth edition (1912) of Ball's "History" and an equivalent form of it is found in the reviewed and augmented French translation of the third edition.

The fact that Ball has been connected with Trinity College, Cambridge, for a long time and that he was Fellow of this college during many years while Cayley was professor in the University of Cambridge led me to place more confidence in the given statement as a reliable historical fact than I should otherwise have done. While I do not now recall all the evidence at hand when writing the sentence which has been the subject of said criticism, it appears to me that the given evidence is sufficient to warrant this sentence until it can be proved that this evidence is unreliable.

G. A. MILLER

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SCIENTIFIC BOOKS

Fundamental Conceptions of Modern Mathematics, Variables and Quantities, with a Discussion of the General Conception of Functional Relation. By ROBERT P. RICHARDSON and EDWARD H. LANDIS. Chicago and London, The Open Court Publishing Company, 1916. Pp. xxi + 216.

According to the announcement near the end of the present volume "that portion of 'Fundamental Conceptions of Modern Mathematics' dealing with algebraic mathematics will consist of thirteen parts." The volume under review is Part I. and has as subtitle "Variables and Quantities with a Discussion of the General Conception of Functional Relation." The magnitude of this undertaking and the fundamental character of the questions considered combine to direct unusual attention to the project, and hence the present volume is of interest not only on its own account, but also on account of the hopes or fears it may inspire as regards the remaining volumes of the projected series.

A striking feature of this volume, which will doubtless create at the start an unfavorable impression on many mathematical readers, is the somewhat harsh criticism of some of the work of many eminent mathematicians, including Baire, Bauer, Pringsheim, Riemann, Russell, Weber, and many others. For instance, on page 152, we find the following statement: "Among English mathematicians of the Peano School the Honorable Bertrand Russell stands preeminent. He is the author of a ponderous and pretentious treatise entitled 'Principles of Mathematics.'" On page 192, we find the following sentence: "The blunder of thinking that in a functional relation between two variables the one variable *necessarily* alters its value when the value of the other alters is, we hope, so far obsolescent as to be peculiar at the present day to the learned ordentliche Professor of the University of Munich."

On page 145, we find the following severe stricture on authors of English text-books: "Practically all the mathematical text-books now in use in England and the United States, either give no definition at all of variable and constant, or reproduce almost verbatim the definition of Newton. As, however, such text-books are brought forth almost invariably by mere compilers, rather than mathematicians of authority, we turn to continental Europe, where we find equally bad definitions from more authoritative sources." On page 195 appears the statement that "inability to use language with precision seems to be a failing endemic among mathematicians, and Riemann was not immune"; and on page 151 the reader is enlightened by the comprehensive remark that a mathematician "can seldom lay claim to more than a narrow technical education."

The fact that authors of a mathematical work criticize rather harshly a considerable number of eminent mathematicians and direct attention to common failings of the tribe is in itself no conclusive evidence against these authors, but it naturally leads the mathematical reader to assume a somewhat critical attitude with respect to such authors; especially when, as in the present case, most of the authors' criticisms relate to definitions or to the choice of words. The critical reader of the present volume will not need to look long to find evidences tending to show that its authors were not, at the time of writing, familiar with some very well known mathematical facts.

For instance, on page 35, we find the following statement: "The only mathematician that we recall as making a specific distinction between quotient and ratio is Hamilton." As a matter of fact this distinction is so common that in the "Encyclopédie des Sciences Mathématiques," tome I., volume I., page 44, it is proposed to restrict the use of the symbol: as an operational symbol to represent a ratio, instead of continuing its use to represent both a ratio and also the operation of division.[1] On page 177, and elsewhere, the common erroneous assumption according to which the word function was used by the older analysts as synonymous with power is repeated notwithstanding the fact that about seven years ago there appeared in the "Encyclopédie des Sciences Mathématiques," tome II., volume 1, page 3, a clear exposition of the way in which this error crept into the literature.

The main question involved in a review of the first volume of an extensive projected series relating to fundamental questions in mathematics is, however, not much affected by occasional historical inaccuracies or by infelicitous statements relating to eminent mathematicians and to mathematicians as a class, even if these facts are not void of important implications. To the reviewer the present volume appears to be poorly adapted for the mathematical reader, since the treatment is often prolix and involves many considerations of little mathematical import. According to the preface, the key-note of the work "is the distinction we find it necessary to make between quantities, values and variables on the one hand, and between symbols and the quantities or variables they denote or values they represent, on the other."

Probably most mathematicians will be more interested in the definitions given by those who have made important advances in the fields to which these definitions are related than in those given by men who appear to be mainly interested in philosophical speculations. This is especially true in case the latter authors exhibit evidences of knowing

[1] *Cf.* G. A. Miller, *School Science and Mathematics,* Vol. 7 (1907), p. 407.

little about the mathematical literature. For instance, we find on page 33 of the present volume the statement that mathematical works afford no reply to the question which of the ordinary complex numbers should be regarded as positive and which as negative. The fact is that the terms positive and negative are commonly applied only to real numbers and the reviewer does not see an advantage resulting from the use of these terms in connection with complex numbers as proposed by the authors of this volume. For a very elementary generalization of the terms positive and negative numbers we may refer to volume 15 (1908) of the *American Mathematical Monthly*, page 115.

As regards form the volume under review could have been made more useful by the addition of headings of sections. If the series is continued it is to be hoped that the future volumes will be improved along this line as well as along the line of more complete references and less prolixity in the development of the special views of the authors. While the many shortcomings of the present volume have forced the reviewer to the conclusion that the series will be used by only a small number of mathematicians unless the future volumes should exhibit a marked improvement over the one before us, he recognizes the need of a scholarly work on the general subjects selected by the authors of this volume, and he would like to hope that the later volumes of the series may tend to fill this want.

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Harvey's Views on the Use of the Circulation of the Blood. By JOHN G. CURTIS. Columbia University Press, New York, 1915. 8vo. Pp. 194, 4 pls.

It is a great source of inspiration to feel that one belongs to a goodly company possessing a common ideal and a common interest. What enthusiasm is aroused in us by a great International Congress of scientists! Here the appeal is made to our social sense, but there is a second powerful appeal, that to our historic sense. This comes when we realize that we of to-day are but the visible part of a long line of precursors who have been our teachers and the teachers of our teachers and have handed down through the ages the enthusiasm for knowledge and truth which we consider our dearest heritage. Just as none of us can afford to be provincial, so none of us can afford to neglect the history of scientific thought. That would be to affirm the importance of evolution in theory while denying it in practise.

At this time when proper international relations are interrupted it is a solace to turn from the present to the past and to strengthen our acquaintance with the illustrious scientists of former times. This is especially desirable when we can do so in the company of one whose familiarity with ancient viewpoints makes him a competent expounder of that which time has rendered obscure.

The theme of Professor Curtis's book is clearly stated in the title. To make Harvey's views intelligible to us we are introduced to the illustrious ancients from whom, next to nature, Harvey drew most of his learning or who colored learned opinion in Harvey's time. Harvey's importance as a discoverer has long been recognized, but for a lucid explanation of his place in the history of scientific thought we have waited for this book. Our sincere thanks are due to Professor Lee, who has completed and published the manuscript left by Professor Curtis.

Nutrition.—According to Aristotle and Galen (who borrowed the idea from Plato) the parts feed themselves tranquilly from the blood vessels, which act as irrigating ditches in the garden. So why, asks Harvey, this rush of such great quantities of blood through all parts of the body? Although Harvey recognized that such a mechanism as the circulation was most useful in explaining intestinal absorption in that it did away with the classic belief that in the portal vessels there were two currents, one carrying blood to the intestines and the other carrying absorbed food to the liver, still he could not believe that the sole use of the circulation was the feeding of the parts.

Respiration.—In his quest of the meaning