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**The Theory of Determinants in the Historical Order of its Development. Part I. Determinants in General: Leibnitz (1693) to Cayley (1841).**

By Thomas Muir, M.A., LL.D., F.R.S.E. Macmillan &amp; Co. 1890.

CSP, identification: MS 1365. See also: Burks, *Bibliography*. This notice is unassigned in Haskell's *Index to The Nation*, vol. 1.

The only history of much interest is that of the human mind. Tales of great achievements are interesting, but belong to biography (which still remains in a prescientific stage) and do not make history, because they tell little of the general development of man and his creations. The history of mathematics, although it relates only to a narrow department of the soul's activity, has some particularly attractive features. In the first place, the different steps are perfectly definite; neither writer nor reader need be in the least uncertain as to what are the things that have to be set forth and explained. Then, the record is, as compared with that of practical matters, nearly perfect. Some writings of the ancients are lost, some early matters of arithmetic and geometry lie hidden in the mists of time, but almost everything of any consequence to the modern development is in print. Besides, this history is a chronicle of uninterrupted success, a steady succession of triumphs of intelligence over primitive-stupidity, little marred by passionate or brutal opposition.

Dr. Muir, already well known by many investigations into determinants and continued fractions, and by a charming little 'Introduction to Determinants,' has thoroughly studied the history of this subject, and has arranged his account of it with remarkable clearness. Each writer's results are stated in his own language, followed by a luminous commentary. An ingenious table shows the history of forty-four theorems, and at the same time serves as an index to the first half of this volume, which, it is to be presumed, is one-half of the first part, and not more than one-fourth of the whole work.

Perhaps Dr. Muir attaches a little too much importance to theorems, as contradistinguished from methods and ideas. Thus, he speaks rather unfavorably of Bezout's work (1779), although it contains the idea of polar multiplication; but because this is not made a theorem, Dr. Muir hardly notices it. The first paper analyzed in the book is by Leibnitz, and contains the umbral notation, which is the quintessential idea of the theories of determinants as well as that of matrices, to which the theory of determinants is but an appendage.

We have already mentioned that the last number of the *American Journal of Mathematics* contains an admirable memoir upon matrices by Dr. Henry Taber of Clark University.

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**Elements of Logic as a Science of Propositions.**

By E. E. Constance Jones, Lecturer in Moral Sciences, Girton College. Edinburgh: T. &amp; T. Clark. 1890. Pp. 208.

Attributed to Peirce by Fisch in *First Supplement* (internal evidence). This review is unassigned in Haskell's *Index to The Nation*, vol. 1.

Emily Elizabeth Constance Jones (1848-1922) was a British logician. She was vice-mistress (1896-1903) and later mistress (1903-1916) of Girton College, Cambridge, and also resident lecturer in moral sciences from 1884 until 1903. Miss Jones was governor of the University College of Wales at Aberystwyth, member of the Aristotelian Society, and of the Society for Psychical Research. Among her other publications are *A Primer of Ethics* (1909) and *A New Law of Thought and its Logical Bearings* (1911).

Prof. Schroeder, in the preface to his important work on 'Die Algebra der Logik,' the first volume of which has recently appeared, says that the chief advance which has been made in late years in exact Logic is due to the labors of the American, Charles S. Peirce, and his school. The inmost secret of this advance, the luminous guiding principle to which it is due, is the fact that attention is concentrated upon thought-relations, and not upon the *words* in which they may happen to be expressed. The meaning of this may be made clear by an example. The older logicians said that in every proposition the copula is *is* (or *are*), and that it can be nothing else. The newer school looks upon this series of affirmations—

All men are mortal,  
Every man is mortal,  
Any man is mortal,  
Being a man implies being mortal,  
If any one is a man, he is mortal,

That one is a man implies that he is mortal—as indicative one and all of the same state of things, as expressive one and all of the same kind of relation, and hence as properly subject one and all to exactly the same formal treatment. In other words, it is concerned, to use again the language of Prof. Schroeder, with the *canon* of logical thought, and not with an analysis of the psychological processes of actual thinking. The above unification alone, for instance, makes it possible to do away with the distinction between categorical and hypothetical propositions, and also with the distinction between the application and the signification (or extent and intent) of words; in any proposition the terms may be taken in either sense at pleasure without necessitating the slightest change in the *formal* method of procedure.

The last four of the above affirmations do not contain any very strong implication that there are any such things as men; hence, for the sake of unity, it is desirable to assume that the statement "All *a* is *b*" may still be taken as true when it is not known whether there are any *a*'s or not. When it is said that there may not be any *a*'s, it is not meant that the term *a* is logically inconceivable, but that it is perhaps not contained in an (understood) limited field of thought (what De Morgan has called the universe of discourse). How large the field of thought is at any moment may be gathered from the application which we attribute to our