

*A Study of the Traité des Indivisibles of Gilles Personne de Roberval.* By Evelyn Walker. New York, Bureau of Publications, Teachers College, Columbia University, 1932. vi+272 pp.

According to the extended title, on the title-page, this study was undertaken "with a view to answering, insofar as is possible, the two questions: Which propositions contained therein are his own, and which are due to his predecessors or contemporaries? and, What effect, if any, had this work on his successors?"

The answers to these questions are found in a summary (pp. 165-167) at the end of Part 2 of the book. Roberval is credited, among other accomplishments, with having "invented a method of integration by means of infinitesimals"; "founded his treatment of infinitesimals upon an arithmetic basis, thereby anticipating Wallis"; "successfully applied his method of infinitesimals in order to establish a number of quadratures and cubatures, and to find the centers of gravity of certain plane and solid figures"; drawn "the first trigonometric graph that was ever constructed, namely, the curve of sines, found the area under it and the volume of the solid generated by revolving it about its base line as axis"; made various discoveries relating to the cycloid and, in so doing, "invented a new curve which he called the companion of the cycloid."

Two of the most important conclusions reached are given in the paragraphs numbered 10 and 12 (pp. 166-167) and they are here quoted in full:

"10. In this treatise, Roberval has given one example of his method of drawing tangents to curved lines by means of composition of motions, namely, in the case of the cycloid. The invention of the method gave him the right to be considered a pioneer in the domain of the differential calculus as well as in that of the integral calculus. A method almost identical with his was later used by Torricelli and still later by Wallis and Barrow. In Newton's hands it developed into the method of fluxions, and in those of Leibniz into the method of differentials.

"12. Furthermore, Roberval's influence as a teacher, as a member of Mersenne's Academy and later of the Académie Royale des Sciences, and finally as a correspondent of other scientists, was probably much more widespread than has been generally realized."

These statements seem slightly more conservative than the following paragraph, which appears on the wrapper:

"GILLES PERSONNE DE ROBERVAL, who made important contributions to the early development of both the differential and the integral calculus, is rarely given the credit that is his due. He has, indeed, been treated with unpardonable neglect by historians of mathematics, although he was held in highest esteem by his contemporaries. The present work, in which some of his achievements are indicated, may help to restore him to his proper place among the scholarly pioneers of the seventeenth century."

Possibly the author placed in the text itself the conclusions which she felt had been sufficiently documented and on the more perishable jacket the somewhat more emphatic personal convictions to which the study had led her.

An "Acknowledgment" following the title-page states that the study was inspired and aided by Dr. David Eugene Smith. Evidently, during his years of exploration in the field of mathematical history, Dr. Smith, more or less in-

formally and gradually, came to some such conclusions as those stated above and, feeling that if they were accurate the evidence ought to be carefully collected and arranged, he suggested this work to Dr. Walker as a very worth while undertaking. The facts that Dr. Smith suggested the study and that he undoubtedly read and approved of the manuscript strengthens greatly the reader's confidence in Dr. Walker's conclusions.

An introduction of twenty-nine pages, which sketches the life and character of Roberval, tells of his relations with other mathematicians, and explains how he lost the credit for his discoveries, furnishes an excellent background for the discussion of his merits.

The marshalling of evidence and presentation of the main argument constitute Part II "Discussion of the Contents of the *Traité des Indivisibles*" (pp. 33-167). The author contrasts the work of Roberval with that of Cavalieri, discusses Roberval's treatment and invention of curves and his contributions to the processes of differentiation and integration, and considers the question of priority for his important discoveries.

Part III (pp. 171-258) incorporates the translation of the *Traité* itself and the author has made good her promised effort "to render clear the author's meaning, and to remove, as far as possible, the reproach of obscurity that has always attached to Roberval's writings."

Dr. Walker's style of writing is such as to inspire confidence. The reader soon comes to feel that much patient searching for material and careful consideration in weighing evidence have gone into the making of this book. She deserves recognition for having made a distinct and valuable contribution not only to our understanding and appreciation of the work of Roberval but also to our general perspective of the very interesting period in which he lived.

The addition of a ten page bibliography enhances materially the value of the book as a work of reference. The figures are beautifully drawn, and the work of the publishers has been well done.

U. G. MITCHELL

*Les Théorèmes de Conservation dans la Théorie des Chocs Electroniques.* By L. Goldstein. Paris, Hermann, 1933. 26 pp.

This is number 70 of the series *Actualités Scientifiques et Industrielles*, and number 9 of the sub-series *Exposés de Physique Théorique*, published under the direction of L. de Broglie. The monograph discusses the problem of electron-atom collisions by the method of Born and Dirac and arrives at the conclusion that the principle of conservation of energy and momentum is valid. A short résumé of the Born-Dirac method is given. A reader with a mathematical spirit will doubtless be confounded to meet at the beginning of an essential point of the argument the sentence "Nous ne manquerons pas de signaler que cette démonstration laisse à désirer du point de vue de la rigueur." The monograph concludes with some general remarks on proton-atom collisions and atom-atom collisions.

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