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I. Grattan-Guinness
From the Calculus to Set Theory 1630-1910.
An Introductory History
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REVIEW

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The book under review was published for the first time in 1980 by Gerald Duckworth & Co. Ltd. in London. The present edition is the first paperback printing. The book consists of a collection of essays that recount the development of the differential and integral calculus from the early 17th to the late 18th centuries and their subsumption under the broader subject of mathematical analysis in the 19th century. It describes the progress of this discipline up to the early 20th century. It records also the introduction and development of set theory and mathematical logic in the period 1870-1910. Their close relationships and the unfolding of one into the other are stressed.

These topics have been, of course, treated by historians of mathematics before. The novelty of the approach of the authors is that they not only discuss the mathematics involved in some detail but they first introduce the reader to the historical development of their subjects. In this way they avoid the traditional limitations of mathematical education (which can be traced back to the late 18th century and the standards established at the École Polytechnique and École Normale in Paris) in which the emphasis was usually put on the accumulation of mathematical knowledge without considering the growth of mathematical understanding, and the appreciation of why a mathematical theory developed and took its form. Because work in history and the connections between history and education have increased greatly in the last 20 years, the book can be of use not only to mathematicians and historians but also to teachers of courses in the histories of the topics covered. Undergraduates, especially in the later years of their

courses, post-graduates, teachers and research mathematicians will find the material useful.

The book has an Introduction (where the aims and main ideas underlying the book are explained) and six chapters. It is supplemented by an extensive bibliography, name index and subject index (all prepared by I. Grattan-Guinness).

The first chapter "Techniques of the calculus, 1630–1660" written by Kirsti Møller Pedersen (University of Aarhus, Denmark) is devoted to various forms of pre-calculus in the early 17th century. The next chapter "Newton, Leibniz and the Leibnizian tradition" by Henk J.M. Bos (University of Utrecht, The Netherlands) presents Newton's fluxional calculus and Leibniz's creation of the calculus, describing differences between them, and the contributions of l'Hospital, the Bernoulli brothers, Euler and others. The third chapter "The emergence of mathematical analysis and its foundational progress, 1780–1880" written by I. Grattan-Guinness (Middlesex University, England) discusses the development of the calculus since Euler, and the emergence of mathematical analysis by Cauchy in the 1820s and its further development to about 1880 in the works of Lagrange, Riemann, Weiestrass and Dirichlet. The fourth chapter "The origins of modern theories of integration" by Thomas Hawkins (Boston University, Massachusetts, USA) presents the development of the theory of integration in works by Fourier and Riemann and indicates the paths leading to a measure-theoretic formulation of the integral. The last two chapters are devoted to the foundations of mathematics, namely to set theory and to mathematical logic. The fifth chapter "The development of Cantorian set theory" by Joseph W. Dauben (City University of New York, USA) considers Cantor's contributions to the emergence and development of set theory indicating its origin in his analysis of Fourier series. Its main components: the topology of the line and the plane as expressed in the theory of sets of points, the infinitely large cardinals and ordinals and their arithmetic are also discussed. The last chapter "Developments in the foundations of mathematics, 1870-1910" by Bob Bunn (University of British Columbia, Vancouver, Canada) describes the development of mathematical logic drawing together strands from previous chapters and showing the influence and significance of the works of Weierstrass, Frege, Russell, Peano and Hilbert.

Why have just these subjects been chosen? The editor explains this by stating in the Introduction that "they are of great importance, are widely taught, pose interesting educational as well as historical and mathematical questions, and lead in some way to a more general appreciation of mathematics" (p. 3). In order to keep the book to a

reasonable length the authors have decided to concentrate on "pure" and foundational aspects of their subjects. For the same reasons the discussions in the book concentrate on the principal mathematicians and their main (usually published) writings. Also the lives of the main historical figures are not described in much detail (more biographical information can be found elsewhere).

Summing up, one must say that the book under review is a valuable and useful collection of articles. It will serve students as well as researchers as a good reference (provided one has enough preparation in mathematics).

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