ROBERTSON, A. P. AND ROBERTSON, W. J., *Topological Vector Spaces* (Cambridge Tracts in Mathematics and Mathematical Physics no. 53, Cambridge University Press, 1964), viii + 158, 30s.

The theory of Topological Vector Spaces has developed during the last 25 years, as a generalisation of the theory of Hilbert Space and of Banach Spaces, because these particular types of linear spaces were not sufficiently general for many applications; and the theory has led to important advances in the theory of differential equations and other branches of mathematics, notably in the theory of distributions.

The book under review offers an excellent account of the theory in a short space and with what would seem to be the minimum demand for prerequisites in the reader; it should be accessible to anyone with the knowledge of analysis available in an honours course and with some preliminary ideas in general topology; though the ideas used from this subject are explained as they occur.

The first chapter gives an account of linear spaces, metric spaces and general topological spaces, and begins the study of the proper subject of the book by an account of convex sets and norms. The crucial extension theorem of Hahn-Banach, its consequences regarding the existence of continuous linear functions and the idea of duality of linear spaces is the subject of the second chapter. The third chapter studies duality relations more deeply, leading up to the important theorem of Mackey-Arens concerning the topologies in which a space has a given dual. Chapter IV deals with theorems which are associated with the category theorems: the Banach-Steinhaus theorem and the theory of barrelled spaces, which are the widest class of spaces for which such a theorem is valid, are discussed, as are spaces of linear maps. Chapter V deals with inductive and projective limits and with various properties of spaces which are constructed as such limits. Chapter VI gives an excellent account of the closed graph theorem and the open mapping theorem and their relations to various types of completeness which a linear topological space may have. Chapter VII deals briefly with strict inductive limits and with tensor products. Chapter VIII discusses the extension of the classical Riesz-Schauder theory of eigenvalues of compact operators to general convex linear spaces.

The book is written very clearly and accurately (I have noted one misprint, at the foot of p. 85, E' in place of o). Its text is supplemented by references to further extensions of the subject and examples of its applications. It will be very widely welcomed as a most helpful survey of an important part of functional analysis.

J. L. B. COOPER

MAMELAK, JOSEPH S., *A Textbook on Analytical Geometry* (Pergamon Press, 1964), viii + 247 pp., 35s.

Many textbooks on this subject, of sixth form standard, suffer through confining themselves mainly to conic sections, while giving no adequate treatment either of polar coordinates or of parametric representation of curves. The author of the book under review has set out to remedy such drawbacks and in less than 250 pages has covered a commendable amount of ground in plane analytical geometry.

The directed line segment forms the basis of the cartesian coordinate system, set notation is introduced, and functionality discussed. Various forms of the linear equation are investigated, treatment of length of perpendicular from point to line being particularly full. Non-degenerate conics are given 52 pages of condensed information, with ample examples. There is a useful short chapter on parametric equations. Tangents and normals to conics are treated via curtailed limit theory in Chapter 10, but standard British procedures are preferable for these. There are chapters on curve tracing for algebraic, trigonometric and simpler transcendental functions, including as an exercise the hyperbolic functions but not their inverses.

The variety of loci introduced is wider than in many comparable texts. Polar equations are given thorough treatment, an omission being the equiangular spiral. Chapter 15, the last, is confined to the fitting to data of linear equations and those of type $y = kx^n$ and $y = ke^{nx}$.

Several misprints and some departures from current use of language were noted. More serious is the statement on p. 42 " If $y = \sqrt{x}$, $x>0$, then y is a two-valued function of x". Chapter 10 is capable of improvement, while Chapter 15 might either be omitted, or expanded to include some polynomial theory.

In spite of these criticisms, the good points easily outweigh the bad, the shift of emphasis away from conics should be welcomed, the book is useful and stimulating as it stands, and finally, there is no reason why subsequent editions should not develop this into a really valuable book. S. READ

MANHEIM, JEROME H., *The Genesis of Point Set Topology* (Pergamon Press, 1964), 166 pp.

Point Set Theory was created virtually single-handed by Georg Cantor between the years 1872 and 1884. His later work, represented by his papers of 1895 and 1897, was concerned with the theory of transfinite numbers. The originality of his ideas may be judged by the hesitation with which they were accepted by contemporary mathematicians and the active hostility they aroused in some, notably Kronecker and Schwarz. But however original a new theory in mathematics may be it does not spring fully formed from the mind of its creator independent of the existing mathematics. The particular conjunction of ideas which gave it birth can be known only to the creator himself, but its antecedents and collaterals and the climate of thought in which it grew deserve serious study in the case of a theory which ushered in a new era in mathematics.

The genesis of set theory is a fascinating subject from the points of view both of history of ideas and manifestation of individual genius. And the story as it unfolds is unusually dramatic and charged with controversy arising not from any sordid quarrels about priority but from logical difficulties of deep philosophic import.

This book sets out to give a systematic account of the evolution of the ideas and problems in analysis which made a theory of sets of points both necessary and possible and then traces the development from it of point set topology up to the publication of Hansdorff's *Grundzüge der Mengenlehre* in 1914. The material is therefore classical but not of course definitive. A period of intense activity, largely dominated by the famous journal *Fundamenta Mathematicae* founded in 1920 in Warsaw, began immediately after the First World War and the end is not yet. The historian, however, must call a halt somewhere and the halting point chosen by the author is a natural one.

The book has seven chapters. The first two are concerned with the logical difficulties associated with the discovery of the calculus by Newton and Leibniz in the seventeenth century and its exploitation in the eighteenth. Due credit is given to Berkeley for the perspicuity of his attack in *The Analyst* on the slipshod reasoning of contemporary mathematicians and to Maclaurin for the first serious attempt to set matters right. Chapter III deals with the development of the theory of trigonometric series, the problem of convergence and the occurrence of singularities. Chapter IV, entitled Arithmetization of Analysis, completes these scene-setting preliminaries by describing the emergence of the various theories of irrational numbers under the hands of Bolzano, Weierstrass, Dedekind, Heine and Cantor and the impact upon mathematical thought of the discovery of non-differentiable continuous functions. The key chapters are Chapter V on The Development of Point Set Theory and Chapter VI on The Emergence of Point Set Topology, together occupying thirty-five pages. In Chapter VII