

SHORTER NOTICES

Storia delle Matematiche. By Gino Loria. Volume 3. Dell' Alba del Secolo XVIII al Tramonto del Secolo XIX. Torino, 1933. 607 pp.

The third volume of Loria's *History of Mathematics* is a worthy completion to a most interesting and valuable work. The first two volumes have been reviewed in this Bulletin.* They brought the account of the main lines of mathematical development down to the end of the 17th century. The present final volume discusses the 18th and 19th centuries. The same qualities of vividness and clarity that distinguished the other volumes are maintained here.

Chapters 31 and 32 continue the account of the development of calculus, begun in Volume 2, and carry it on to the time of Euler. Here the arrangement is such as to bring out the progress made in the several countries, Switzerland, England, Italy, and France. In the first the chief names are Jean Bernoulli and his successors in that famous mathematical family. As to England, an adequate summary is given of the debate regarding the validity of Newton's *Fluxions* which has been still more completely discussed for English readers by Cajori in his *History of the Conceptions of Limits and Fluxions . . . from Newton to Woodhouse*.† The chief writers treated from Italy and France are Grandi, Rolle, and Clairaut.

Chapter 33 describes the early stages of the development of the theory of probability, with a brief but satisfactory account of the *Ars Conjectandi* of Jacques Bernoulli.

Chapter 34 is devoted to an account of the life and some of the most significant works of Euler; Chapter 35 to his contemporaries. As more than 30 pages are given over to the most important of Euler's discoveries in the various fields, it may be granted that even this extraordinarily fertile genius has received adequate attention. The chapter on Euler's contemporaries discusses the work of Saccheri, d'Alembert, Condorcet, Lambert, Cramer, and others.

Chapters 36 and 37 discuss Lagrange and his contemporaries. Laplace receives a very "stepmotherly" treatment with a page and a half, which is insufficiently explained by the statement that his work was largely in applied mathematics—but this is surely not quite consistent with the final judgment (page 267) "It has been said, and not mistakenly, that the theory of probability owes more to Laplace than to any other man." The great *Théorie Analytique* is only mentioned, not described or even summarized.

Chapter 38 gives an admirable account of the beginnings of "modern geometry" such as we should expect from Professor Loria, who has for so many years given proofs of his mastery of this field both in mathematics and in the history of mathematics. The greatest names in this chapter are Monge, Carnot, Gergonne, and Poncelet. This chapter is continued by Chapters 42 and 43, which show how Chasles, Steiner, von Staudt, and Cremona added to the structure which had been so adequately founded by Monge and Poncelet; and

* Vol. 36 (1930), pp. 336–337; and vol. 38 (1932), pp. 787–788.

† Reviewed in this Bulletin, vol. 27 (1921), pp. 468–470.

how Pluecker, Cayley, Klein, and others, using analytic methods freely, still further extended this palace of pure reason. Non-euclidean geometry and n -dimensional geometry, quaternions, and Lie's and Grassmann's theories, are shown in their setting.

Chapters 39, 40, and 41 are inserted between the first and second parts of the discussion of modern geometry (which does not imply that this order is necessarily to be criticized, as *some* regard must surely be paid to chronology). They take up respectively German mathematics, culminating with Gauss; the beginnings of modern analysis under Bolzano, Cauchy, Abel, and Jacobi, and mathematical physics, with Fourier, Ampère, Poisson (why not Laplace, who seems to be missing from this chapter?), Green, Stokes, Maxwell, Kelvin, and Helmholtz, to mention only the most outstanding names.

Chapter 44 is devoted to the later 19th century's contributions to analysis, and probably comes too near our own times to enable one to make a very just estimate of the relative value of extensive additions and improvements that have been introduced, and which Professor Loria indicates in about fifty pages. The final chapter, Chapter 45, deals with the historians of mathematics, in fifteen pages.

The three-volume history of Loria's must be regarded as not only the most recent but one of the most valuable of the general histories of mathematics; and it would seem eminently desirable that an English version should be published and made available to every student of our science who has any interest in the study of its growth and development.

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Les Corps Algébriques et La Théorie des Idéaux. By O. Ore. (Mémorial des Sciences Mathématiques, Fascicule LXIV.) Paris, Gauthier-Villars, 1934. 71 pp.

This book contains a clear and concise development of the fundamentals of the theory of algebraic numbers and the theory of ideals in algebraic fields. The author begins with an account of rational approximation and criteria for algebraic numbers. The second chapter contains an exposition of the fundamental properties of algebraic fields, their integral bases and discriminants. Minkowski's theorem on linear forms is stated without proof. Chapter 3 is an account of the theory of ideals. The author gives a simple proof for the theorem of unique prime ideal decomposition based on ideas of Krull and van der Waerden. The treatment of residue classes and congruences for ideal moduli is complete and concise in Chapter 4. In Chapter 5 the author gives a new proof of the Dirichlet theorem on units based on a neat generalization of the Kronecker theorem identifying as roots of unity all integers whose conjugates lie sufficiently near the unit circle.

Although the book does not pretend to be exhaustive and subjects such as the relation between the defining equation and the arithmetic of the field or the ideal structure of the discriminant divisors are not included, the author has been very successful in making clear many outstanding problems in the subject. An extensive bibliography is appended. The book will be extremely valuable for beginning students.

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