Père Lefebvre's work shows the effect of writing and publishing his essays at different times. There is a lack of that perfect coordination which comes from uninterrupted labor. Moreover, the work, as has been shown above in a few instances, has various slips of the pen or of the memory, little errors, in the main, that it is quite unnecessary to mention in a brief review. The treatment of the Middle Ages is so scholarly and helpful as far to outweigh the minor imperfections that, considering the tumult of recent years, can easily be overlooked. Rather than search for errors of no moment, we should express our indebtedness to one who, with all his cares in these troublous times, has collected his material and made it more available for historians and students of mathematics.

DAVID EUGENE SMITH.

Lezioni di Meccanica Razionale, Seconda Edizione. By Pietro Burgatti. Bologna, Nicola Zanichelli, 1919. xi + 544 pp.

The first edition of this work was published in 1916. Although the present edition contains about fifty pages more than the first, the topics treated and the method of treatment remain unchanged; the additional pages being due to brief additions scattered throughout the various chapters. There are no exercises, but it is stated in the preface that the author intends to publish a separate book of exercises with solutions.

The book begins with a chapter on vector analysis containing as much of the subject as is needed for the development of the mechanics of a rigid body, which is taken up in the immediately following chapters. This development, aside from the fact that vector methods are used, is pretty much along traditional lines, i.e., kinematics of a particle and of a rigid body, including some discussion of the geometry of motion; statics, in which problems are first solved by writing the equations of equilibrium and later by the method of virtual work; dynamics, which includes the theory of the top, generalized coordinates, and a brief chapter on the problem of three bodies. Before taking up the last two chapters which give a brief introduction to the mechanics of deformable bodies, the author finds it necessary to insert another chapter on vector analysis, in which are considered such matters as divergence and curl of a vector, the theorems of Green and Stokes, and Poisson's equation. The closing chapter deals with the historical development of mechanics.

It is recognized that the student of mathematical physics must be familiar with vector analysis, and texts on electricity and magnetism generally begin with a mathematical introduction which gives the machinery required for what is to follow. More recently the same idea is being extended to mechanics. We now have a number of books which treat the mechanics of a rigid body and also the mechanics of continua by vector methods, but the number is not so large but that the book under review can find a hearty welcome. So much of the subject of mechanics is essentially geometric that it is particularly well adapted for study by vector methods, and any careful teacher, whether he uses the formal vector notation or not, is sure to bring out the geometric interpretation. The thing that must be remembered, however, is that even when a property

is expressed in vector notation, it may be necessary to add some explanation or to put things in a way that is not too abstract in order that the student meeting the expression for the first time may see clearly the significance of the matter under discussion, for vector methods should add not only brevity but clearness. The second chapter on vector analysis would seem less elegant but would be more easily understood by a student if more effort were made to bring out either geometric or physical interpretations.

The author has done well in showing no particular aversion to the cartesian coordinate system, as a familiarity with the various quantities in both the vector and cartesian notation is needed. In view of the statement in the preface that it was desired to show how to treat problems that arise either in science or in the field of technical applications, it is surprising that so little attention was paid to graphical statics. On the other hand it may of course be argued that the one thing in mechanics which the engineer is sure to be familiar with is graphical statics. The treatment in many cases is very elegant, as for instance in the derivation of the acceleration, the theorem of Coriolis, and Euler's equations.

The book is suited to our seniors and graduate students and could be covered in a three-hour course throughout the year.

PETER FIELD.

Mathematik des Geld- und Zahlungsverkehrs. By Alfred Loewy. Leipzig and Berlin, Teubner, 1920. viii + 273 pp.

This work is a very readable elementary treatise on the mathematics of finance with the usual chapters on simple interest, compound interest, annuities certain, amortization and sinking funds, with the accompanying compound interest and annuity tables. Life annuities and insurance problems are not discussed. The general treatment is not so formal as that of most of the English and American books on financial mathematics. Much historical and economic matter is included:—for example there is a very interesting historical account of the rate of interest from the earliest times and a clear explanation of the question of foreign exchange. The book had been sent to the publisher in 1918, but was withdrawn by the author and practically rewritten in order to bring it up to date for German readers by inserting discussions of the various new laws and taxes arising out of the financial condition of the country at the close of the war. At one point the author rather gloomily concludes a discussion of the low exchange value of the mark: "An einem Übergang zur Bareinlösung des jetzt in Deutschland valutarischen Papiergeldes durch Gold ist für lange Zeit nicht zu denken."

The notation of the Text-Book of the Institute of Actuaries is used in the book with a few trifling exceptions, the most noticeable being $j^{(m)}$ as an abbreviation for $m\{(1+i)^{1/m}-1\}$ instead of the usual notation $j_{(m)}$.

On the physical side there is much to be desired in this book. The typography is fairly good, but the matter is very much crowded on the narrow-margined page. Before the reviewer had finished reading, the book had changed into a mass of loose leaves of very poor paper.

A. R. CRATHORNE.