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Review

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Analytical Geometry, A First Course. By C. O. TUCKEY and W. A. NAYLER. Pp. 367. 5s. 1912. (Bell & Sons.)

The aim and scope of this book (which consists of 367 pages) is thus set forth in the preface: "This book is designed primarily to provide an interesting course of Analytical Geometry for those who are unable to devote a great deal of time to the subject, and especially to meet the requirements of Engineering, Science, and Army students. At the same time it is hoped that the arrangements adopted will not make the book less useful as a first course for Mathematical Specialists." It may be said at once that within the limits proposed to themselves the authors have executed their task excellently. The treatment throughout is "vocational"; the student sees at once the use of any piece of bookwork by an immediate application. Furthermore, the student has to keep his pencil and his mind going simultaneously throughout the book, the former for diagrams and the latter for the calculations appertaining thereunto. In a word, the geometry and the analysis go hand in hand, and there is not too much reliance on either; the one is called upon to aid the other; if a thing is best done by geometry, it is done by geometry, and if by analysis, it is done by analysis. For special commendation the following points may be noted: the ellipse, hyperbola, circle, parabola are introduced on pages 1 to 14 as cases of arithmetical graphs; on page 52, the perpendicular from a point on a line is found by a more geometrical method than usual—which is easier for the beginner; the rule for writing down the general equation to the tangent is explicitly set down on page 31; the early introduction of analysis to investigate loci on page 85 is particularly good; polar coordinates are introduced and applied to concrete problems in Chapter V., and a few elementary properties of the line, circle, lemniscate and limaçon are investigated,—which convinces the student that polar coordinates are of some use; the following sensible advice is given on page 114 with respect to oblique axes: "Oblique axes are very seldom used, except when their use makes no difference. This will be the case when we are concerned with conditions for concurrence of lines, collinearity of points, or division of lines in a given ratio. When the distance between two points or the angle between two lines is concerned the use of oblique axes brings in complicated conditions, and should if possible be avoided"; parameters and parametric methods receive an excellent introduction on page 115. The subject of Solid Geometry receives an easy introductory treatment towards the end of the volume. The application of the methods of the Calculus with respect to gradients at the beginning of the book enables the student to apply parametric methods with ease and potency. Lastly, the subject is not divided up into water-tight compartments.

The following minor defects have to be noted: it seems undesirable to write $x_1 + \Delta x$ instead of $x_1 + \Delta x_1$; the evaluation of the root of an equation to many places of decimals is probably best done by Horner's method and the location of roots taught by concrete examples and the cultivation of the pupil's instinct rather than by the application of such formal methods as those given on pages 126-129, at any rate when he is beginning the subject; the introduction of "Line-Equations" is not successful,—a more extended treatment should be given, and practice in drawing the envelopes of arithmetical equations given just as in the case of loci,—it is a pity that this important part of the subject should have received such scanty treatment, but it is to be hoped it will be amended in any future edition. The bookwork should have been printed in clear relief from the examples, etc., for revision purposes.

The book can be thoroughly recommended for the purposes stated by the authors in the preface. There is an excellent collection of examples, both practical and theoretical.

WILLIAM P. MILNE.

Versicherungsmathematik. Von HUGO BROGGI. Pp. viii + 358. Price 7 m. 1911. (Teubner.)

This is a translation into German, by Professor Bernstein, of a text-book on the mathematics of Insurance by Professor Broggi of the University of Buenos Ayres. The special object of the book is to present the practical problems of life insurance in a form which will be acceptable to the university student of mathematics with a good working knowledge of the calculus. The book is divided into four sections, dealing respectively with the first principles of the theory of

probability, and the theory of the construction of a mortality table for a stationary population; the fundamental problems of the mathematics of life insurance (including annuities and the insurance of invalid lives), the technical aspects of life insurance (premiums, reserves, profits) and the expectation of loss or gain. The second part contains a very clear sketch of the principles by which the effects of immigration, emigration and a natural increase can be allowed for in deducing a theoretical mortality table from a statistical record of deaths.

At page 56 a confusion between γ and y has produced a series of misfortunes, and the series in question diverges for all values of γ and not only for $\gamma < 4$.

Der mathematische Unterricht an der deutschen Navigationsschule. Von Dr. C. SCHILLING and H. MELDAU. Pp. 82. Price 2 m. 1911. (Teubner.)

Most people are aware that the International Commission on Mathematical Education, originating at the International Congress of Mathematicians held in Rome in 1908 on the initiative of Professor David Eugene Smith, aroused special interest in Germany. The present pamphlet is one portion of that voluminous German report, which testifies to the enthusiasm of the band of workers directed by Professor Klein. The reports as a whole deal in an outspoken manner with mathematical education. The easy-going toleration of incompetence, which is the cruel and bad side of English gentleness, finds no counterpart in Germany, where the trashy or antiquated text-book is sternly dealt with. The present paper deals particularly with the system of training for the mercantile service. Perhaps the most interesting feature to us is the account of the effects of the unified system of examinations in vogue. Bitter complaints, it is stated, have been made by experienced teachers of the crushing out of local initiative and local aspirations by the rigidity of the official system. "Once we could try to teach pupils something: now we have to see that they pass their examinations." The authors do not altogether endorse this view: they point out that the examinations have had a stimulating effect upon the weaker schools.

At a time when we are threatened with a uniformization of our own examination system, just as examinations are rapidly improving, these remarks should not be overlooked.

Collected Papers in Physics and Engineering. By JAMES THOMSON. Selected by Sir J. LARMER and JAMES THOMSON. Pp. civ + 484. Price 15s. net. 1912. (Cambridge University Press.)

There is a quality of mind—which might be described as exalted common sense—giving to its possessors the faculty of "hitting the nail on the head." It is sometimes present in people of little education, and its possessors can sometimes give but a poor account of how it is that they invariably seize upon what proves to be the feature which is decisive of the case. This faculty is especially valuable in problems whose complexity and breadth render the mathematical microscope ineffective, and hence it is frequently found among great soldiers and lawyers.

In conjunction with mathematical genius in the mind of Kelvin it accomplished miracles. James Thomson, with less mastery over mathematical weapons, possessed the faculty, as he showed by his papers on the subject of atmospheric currents and Trade Winds.

Guldberg and Mohn and von Bezold have made progress in the application of definite mathematical processes to the dynamics of atmospheric circulation, but it is nevertheless true that Hadley, Ferrel and James Thomson are the three writers, dealing with the subject by means of general reasoning, whose treatment is regarded as essentially sound.

The same faculty of seizing upon the essential element of a mass of complicated detail was exemplified in Professor Thomson's treatment of the centrifugal pump, and the flow of water over a notch. In both these cases subsequent theoretical investigations have confirmed the results obtained by James Thomson by methods for the most part elementary and general.

The present collection of papers will therefore never become obsolete.

A brief biography by the authors relative to Dr. Bottomley is included in the reprint.

Educationally Professor Thomson was a great coiner of new words—Radian and Interface redeem some score of others, most of which have found happy oblivion.