somewhat more safe, I may send you one from Oxford (whither I am now going) from

Sr your humble servant,

These, JOHN WALLIS.

For Mr J. JOHNSTON, Secretary for Scotland;
at my Lord Nottingham's Office, at Whitehall, London.

SHORTER NOTICES.

Analytic Geometry and Calculus. By FREDERICK S. WOODS and FREDERICK H. BAILEY. Ginn and Company, 1917. 516 pp.

THIS book is a revision and abridgment of the authors' Course in Mathematics for Students of Engineering and Applied Science. In making this abridgment the authors have omitted determinants, theory of equations, poles and polars, diameters, center of curvature, special methods of integration, and complex numbers.

The first eight chapters deal entirely with analytic geometry and give the subjects usually given in a first course in American colleges. The following topics are exceptionally well treated: "Variables and functions," "Graphs" and the derivations of the standard equations of the conics. In several places the authors are very careless about a theorem and its converse, i. e., they prove a theorem and then state or use its converse. An example of this is on page 61 where they prove that two perpendicular lines have their slopes negative reciprocals of each other and then conclude that "two lines are perpendicular when the slope of one is the negative reciprocal of the other." Moreover no attention is called to the fact that if the lines are perpendicular to the coordinate axes their slopes are not negative reciprocals.

In Chapter IX they introduce calculus by means of slope and area. This is a very well written introduction to the calculus except for the fact that the definition of limit on page 130 is incorrect (the word "numerically" should be inserted after the word "remains" on line 4). Then follow chapters on the conventional work of maximum and minimum, tangents and normals, integration, etc. This is followed by Chapter XIII on Applications of integration which is exceptionally well written. The fundamental idea of the summation process of the integral calculus is given in the clearest manner. On page 268, line 10, a lower limit has been omitted and at the bottom of the same page the letter A stands for a point, while on the next page (line 8) it mysteriously becomes an area.

Passing from the best-written chapter in the book we come to the poorest, namely Chapter XIV, on Space geometry. In this chapter the authors have made many inaccurate statements. For example on page 310 we find: "Find the equation of the sphere formed by revolving the circle $x^2 + z^2 = a^2$ about OX as an axis." Now $x^2 + z^2 = a^2$ represents a cylinder and not a circle. The authors evidently meant the circle $x^2 + z^2 = a^2$, $y = 0$. The proof of the distance formula from a plane to a point is also incorrect, for it assumes that the plane cuts the z-axis. The same trouble exists on page 63 in the proof for the distance formula from a line to a point; there it is assumed that the line cuts the y-axis.

The chapter on space geometry is followed by chapters on Partial differentiation, Multiple integrals, Infinite series and a short course in Differential equations.

Many fine examples are worked out in the text and many more are given in the exercises, the total number of which is 2,000. These exercises are to be found only in long lists placed at the end of each chapter. The book is well adapted for use in a course covering both analytics and calculus.

F. M. Morgan.

Introduction to the Calculus of Variations. By W. E. Byerly. Cambridge, Harvard University Press, 1917. 8vo. 48 pp. Cloth. Price 75 cents.

This little book is the first of a series of "Mathematical Tracts for Physicists." It indicates in admirably clear style the solution of a number of examples involving some of the fundamental ideas of the calculus of variations. As the subject owed its origin to the attempt to solve a rather narrow class of problems in maxima and minima, the eight pages of the Introduction are mainly taken up with a discussion of three simple examples: the shortest line, the curve of quickest descent, the minimum surface of revolution.

The integrals of the Lagrange equations arising in con-