

of those and later times. Perhaps the latter spirit is still effective, as cricket is apparently never played on Sunday.

The neglect of physical education up to the time of Rousseau is sketched by Prof. Welton, and its advance since then in secondary schools. He tells us with regard to elementary schools that the conception of education that guided the Education Act of 1870 was essentially the scholastic tradition, that education and instruction are synonymous, and he affirms the most crying need in English education of to-day to be adequate provision for physical training. H. R. B.

Bathy-orographical Map of the British Isles. Natural Scale 1 : 875,300, or 14 miles to an inch. *Bathy-orographical Map of South America.* Natural Scale 1 : 6,150,000, or 97 miles to an inch. Constructed and engraved by W. and A. K. Johnston, Ltd. Prices not stated.

Handbook to accompany the Map of the British Isles. Pp. 32. Price 6d. net.

No more convincing indication could be found of the improvement which has taken place in recent years in the methods of geographical instruction in schools than the enterprise shown by publishers in the production of good orographical maps, both in atlases and on a large scale for class-teaching purposes. The present wall-maps are good examples of the excellent aids which are available to assist teachers in demonstrating the fundamental importance of the distribution of the highlands and lowlands of the areas being studied. In the map of the British Isles six shades of brown are employed to show graphically the course of important contours on the land, and two shades of blue indicate the 20- and 50-fathom lines in the surrounding seas. In the case of South America the varying heights of the land above sea level are depicted by five shades of brown and two of green, while the 100-, 1000-, and 2000-fathom lines are shown on the oceans. Care has been taken to avoid crowding, and the maps are models of clearness.

The "Handbook" should prove a great help to those teachers of geography who have had little experience in teaching their subject by modern practical methods.

Invariants of Quadratic Differential Forms. By J. E. Wright. Pp. vi+90. Cambridge Tracts in Mathematics and Mathematical Physics, No. 9. (Cambridge: University Press, 1908.) Price 2s. 6d. net.

This number of the Cambridge Tracts deals with a clear and definite problem, the simplest case of which may be stated as follows. Let a, b, c be given functions of the independent variables, x, y , and let

$$adx^2 + bdx dy + cdy^2$$

become

$$a'd\xi^2 + b'\gamma d\xi d\eta + c'\eta^2$$

by a change of variables from (x, y) to (ξ, η) ; what functions of a, b, c and their differential coefficients transform into the same functions of a', b', c' and their differential coefficients? The importance of this inquiry begins to appear in Gauss's celebrated memoir on the deformation of surfaces; and a very large part of what is called the differential geometry of surfaces is, from another point of view, the invariant theory of a quadratic differential form in two variables. In the general theory there are n variables, and the first great step in this direction was taken by Riemann; references to his principal successors are given by Prof. Wright (pp. 5-8). The methods explained in the tract are those of Christoffel, Lie, and Maschke;

the last, which is symbolical, and quite recent, is only very briefly summarised, but enough is done to show its interesting character. Another special calculus applied to the subject is that of Levi-Civita and Ricci (pp. 20-8); and other manipulative devices may doubtless be discovered. So far as one can see at present, the essential elements of the theory are the Riemann-Christoffel four-figure symbols; while the broadest aspect of it is presented by Lie.

Pp. 51-90 give various geometrical and dynamical applications, concluding with the representation of one manifold on another with correspondence of geodesics. Besides being a useful guide to the analytical theory, this tract will be of service to readers of Darboux's and Bianchi's works on the theory of surfaces.

G. B. M.

A Course of Plane Geometry for Advanced Students. Part I. By C. V. Durell. Pp. xi+219. (London: Macmillan and Co., Ltd., 1909.) Price 5s. net.

THIS is a really capital book for students of what may be called scholarship standard. It contains, among other things, sections on similarity, transversals, vector geometry, inversion, and coaxial circles. As examples of the author's choice of elegant methods, and his clearness of exposition, may be taken the proof (due to Mr. Hillyer) that the centres of the diagonals of a complete quadrilateral are collinear (p. 118), and the proof of Feuerbach's theorem by inversion (p. 149). In the latter example, as in many others, teachers will notice the excellence of the diagrams, which give, without confusion, all that is required and no more. There is a practically inexhaustible stock of examples, with a very wide range of difficulty. Mr. Durell is a master at Winchester College, and those who remember the late Mr. Richardson's success in making his boys like and learn geometry will be glad to see that there is no risk of the subject being neglected now that he is gone.

The Contents of the Fifth and Sixth Books of Euclid. By M. J. M. Hill. Second edition. Pp. xx+167. (Cambridge: University Press, 1908.) Price 6s. net.

THIS is a new work rather than a new edition. Prof. Hill has now completely abandoned Euclid's treatment of proportion as given in his fifth and sixth books, and replaced it by an arithmetical theory. Two commensurable quantities, pA, qA , are defined as having the ratio p/q . Equal ratios are defined as those between which no rational fraction lies. The theory is now made rigorous by means of Dedekind's treatment of irrational numbers, the Cantor-Dedekind axiom, and the axiom of Archimedes. It is a foolish man that never changes his mind; and Prof. Hill's deliberate change of method after eight more years of teaching is a fact to which special attention should be directed.

The Elementary Dynamics of Solids and Fluids. By Prof. W. Peddie. With Sectional and General Examples by J. D. Fulton. Pp. xii+188. (Edinburgh and London: Oliver and Boyd, 1909.) Price 2s. 6d.

THIS little book is intended for use by junior students in university classes, and for boys in the higher forms of secondary schools. The treatment is very elementary, and fluids are disposed of in the concluding three of the thirteen chapters. The wisdom of printing answers immediately after the exercises throughout the book may be doubted. As an introduction to dynamics, the book should prove useful.