relating to curves and surfaces, maxima and minima, limits and infinite series, are especially praiseworthy.

JAMES PIERPONT.

A Course in Mathematical Analysis, by EDOUARD GOURSAT, Professor of Mathematics in the University of Paris; translated by EARLE RAYMOND HEDRICK, Professor of Mathematics in the University of Missouri. Volume I. Ginn and Company, Boston, 1905. 8vo. viii + 548 pp.

THE French edition of this work was published in 1902, and it was reviewed in the BULLETIN.* While it is true that advanced students of mathematics recognize the necessity of learning to read mathematical French and German, and equip themselves duly in this respect, the undergraduate finds the additional difficulty of a foreign language a serious handicap in the use of a mathematical text-book. And yet it is precisely for the undergraduate, the student in the second course in calculus and the first course in the theory of functions, who is perhaps preparing to specialize in applied mathematics and will not carry his study of analysis beyond the undergraduate courses, that Professor Goursat's book contains so much which is important but at present is not to be found in English text-books. Professor Hedrick has prepared the translation with great care and has made it a worthy reproduction of this standard work. In his preface he says: "Few alterations have been made from the French text. Slight changes of notation have been introduced occasionally for convenience, and several changes and additions have been made at the suggestion of Professor Goursat, who has very kindly interested himself in the work of translation." To the publishers is due much credit for the excellent typography of the book. Niceties of spacing and arrangement of the formulas, which hitherto have usually been neglected by American and English printers, here contribute to make the page extremely attractive.

WM. F. OSGOOD.

Elementary Modern Geometry. Part I.: *Experimental and Theoretical, Triangles and Parallels.* By H. G. WILLIS. Oxford, Clarendon Press, 1905. v + 236 pp.

THE order of sequence of the adjectives in the above title might lead to a misunderstanding; the subjects treated are those

* Cf. BULLETIN, ser. 2, vol. 9 (1902–03), p. 547.

of a beginner's school geometry, but the method of treatment is rather unusual. Indeed, so many text-books on geometry are being published that the appearance of still another seems hardly justified, unless it presents something new. The first seventy pages are empirical and experimental to develop space intuition without any attempt at formal demonstration. Paper folding plays an important part and most of the constructions of ordinary geometry are actually made. Free use is made of ruler, compasses and superposition.

After this somewhat extensive introduction, formal definitions, postulates and axioms are given, the latter including an axiom of continuity, an axiom of displacement and an axiom of rotation. The last axiom replaces Euclid's fifth postulate and is stated as follows: "If a straight line, after turning in a plane about various points in itself, coincides with its initial position, the algebraic sum of the angles turned through is zero or one or more straight angles." The definitions of a straight line and of a plane are those of Leibniz.

Demonstrations based on unexplained constructions are frequent in the book, even the possibility of the construction not being expressly postulated. The third chapter considers all these constructions and adds a good discussion of graphs, including the circle, hyperbola, sine curve (without trigonometry) and a long list of others as exercises, a good sample being

$$y^2 = x(x - 2)^2(x + 2).$$

The fourth chapter, of fifty pages, deals with parallels. Limiting values are discussed, and parallel lines are said to meet at infinity. The propositions are carefully worded, and the various theorems are shown to be all true or all false together. An alternate treatment, based on Playfair's statement of the fifth postulate is also given, but the two procedures should be more sharply separated, especially in the deductions drawn from the sum of the angles of a triangle. The subsequent propositions of the chapter are all discussed by both methods, but the proper selection of the demonstration which belongs to each is pointed out only in the preface.

A particularly instructive feature of the book is the long list of well-chosen examples and original questions, about two thousand being included. Among them are thirty-five on non-euclidean space, which are certainly novel, and of considerable

educational value provided the pupil has not become so saturated with intuitional ideas derived from the first part that he cannot rid himself of them. It seems to me that in the hands of a skillful teacher the book would prove of value, although the only test is that of actual use. A school text in geometry which succeeds in making a direct and natural transition from the traditional programme to such books as von Staudt's and as Enriques's will be a welcome addition to our mathematical literature.

VIRGIL SNYDER.

Zwölf Vorlesungen über die Natur des Lichtes. Von J. CLASSEN. Leipzig, G. J. Göschen, 1905. x + 249 pp.

The author has already published through Göschen in the Sammlung Schubert three volumes on electricity, magnetism, and light which appeal to a technical public of mathematicians and physicists. The present volume, which is not in the Sammlung Schubert, is of a wholly different character. It is the reprint of a series of lectures given before a lay public and consequently freed of all technicalities whether mathematical or physical. The aim of the book is to set forth and discuss those simple experiments which begin with showing the rectilinear propagation of light and advance systematically and logically to the end of demonstrating the electromagnetic nature of light. A large range of phenomena is treated, including even the latest researches, such as those of Rubens, which put the electromagnetic theory upon a seemingly sure footing. A mathematical treatment of the subject built up in the same straightforward and logical manner would be highly useful, and better worth our attention here.

E. B. WILSON.

NOTES.

THE ninth regular meeting of the San Francisco Section of the AMERICAN MATHEMATICAL SOCIETY will be held at Stanford University on Saturday, February 24. Abstracts of papers intended for presentation should be in the hands of the Secretary of the Section, Professor G. A. Miller, Stanford University, as early as February 10.