

continuously. This is of fundamental importance, as hereon rests the proof that the same quadrilateral-hypothesis must hold everywhere in the same plane, but it should not be left without proof, merely because it is plausible, or because we ardently wish it to be true.

In the historical note at the end are serious errors. The author states (p. 92) that Saccheri, after developing elliptic, hyperbolic, and parabolic geometries side by side, states dogmatically that the two first are false. Now this is not only incorrect, but it conveys an unfair impression of the Jesuit mathematician. He does not state dogmatically that these geometries are false, but gives an elaborate and ingenious sequence of propositions in each case, to show that the system is self-contradictory.\* Again the author states on the following page, that elliptic geometry was discovered by Riemann. This seems to us rash. It is by no means clear whether Riemann looked upon the geodesics of a surface of constant positive curvature as cutting in one or two points: the probability being that he held the latter view, so that it is customary to credit Klein and Newcomb with the discovery of elliptic geometry.†

We may say, in conclusion, that the book is a contribution to educational rather than to mathematical literature. It is neither a scholarly nor a profound work, but comes in answer to a real need, and marks a step in advance.

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## BIANCHI'S DIFFERENTIAL GEOMETRY.

*Vorlesungen über Differentialgeometrie.* Von LUIGI BIANCHI. Autorisierte deutsche Uebersetzung von MAX LUKAT. Leipzig, B. G. Teubner, 1896-1899. Pp. xvi + 659.

IN 1886 Bianchi published a lithographed edition of his lectures on differential geometry given at the University of Pisa during the winter 1885-86. This publication, on which the book now before us is based, consisted of only fourteen chapters. The *Vorlesungen* contains twenty-two. Professor Loria, of Genoa, says of the lithographed edition :‡

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\* Conf. Engel und Staedel, Die Theorie der Parallellinien von Euklid bis auf Gauss, pp. 67 and 109.

† Killing, loc. cit., p. 70. Russel, The Foundations of Geometry, pp. 39, 40.

‡ *Jahrbuch über die Fortschritte der Mathematik*, 1886, p. 648.