

## RECENT TEXT-BOOKS OF GEOMETRY.

*Elements of Geometry.* BY GEORGE C. EDWARDS, Associate Professor of Mathematics in the University of California. New York, The Macmillan Company, 1895. 8vo., pp. xvi + 293.

*Plane and Solid Geometry.* BY WOOSTER WOODRUFF BEMAN, Professor of Mathematics in the University of Michigan, and DAVID EUGENE SMITH, Professor of Mathematics in the Michigan State Normal School. Boston, Ginn & Co., 1895. 8vo., pp. ix + 320.

*Plane and Solid Geometry.* Suggestive Method. BY C. A. VAN VELZER, Professor of Mathematics in the University of Wisconsin, and GEO. C. SHUTTS, Professor of Mathematics in the Wisconsin State Normal School. Madison, Wis., Tracy, Gibbs & Co., 1894. 8vo., pp. viii + 395.

These geometries are written by authors whose attainments prepare them for careful and thorough work. The author of the first is associate professor of mathematics in the University of California, and the remaining authors are professors of mathematics in the Universities and Normal Schools of the States of Michigan and Wisconsin, respectively. This combination of joint authorship in each of these States shows that the two great schools of each State work in harmony with each other.

1. Professor Edwards has followed an unfortunate plan of logical development which mars an otherwise excellent and original work. Several popular text-books in the United States employ the directional method of defining a straight line, and apparently get rid of or deduce Euclid's axiom of parallels from it just as Professor Edwards has done. The authors of these books do not seem to be aware of the startling position in which they have thus placed themselves. The directional definition accomplishes no more for the straight line than Euclid's or others that have been employed, and simply makes straight lines such lines that, if two of them are placed with any two points in coincidence, they will coincide throughout. A hemispherical surface furnishes a moderately good analogue of a non-Euclidean plane. Suppose the physical conformation of the light medium were such that rays of light traveled in arcs of great circles on this surface and were absorbed at the boundary. Then, according to the directional definition, arcs of great circles would be straight lines, and all that can be logically derived from the definition holds for this spher-