respectively and represents rotations about μ and λ in the reverse directions. The changes in the figure required by this reversal are obvious.

PACIFIC GROVE, CALIFORNIA,
February 23, 1905.

SHORTER NOTICES.

Introduction a la Géométrie Générale. By GEORGES LECHALAS. Paris, Gauthier-Villars. Pp. ix + 58.

THE point of view of M. Lechalas is different from that of most recent workers on the foundations of geometry. Ordinary usage at present applies the term mathematical science to any body of propositions deducible from a set of postulates. The term geometry is applied with various degrees of freedom to a large number of sciences, all however characterized by similar types of relation and modes of study. These abstract geometries are "represented concretely" in many different ways, as is illustrated for example, by the beautiful theorem of M. Barbarin :*

"Each of the three spaces, Euclidean, Lobachevskian, Riemannian, contains surfaces of constant curvature of which the geodesic lines have the metric properties of the straight lines of the three spaces."

To Lechalas, on the other hand, a geometry is a "form of externality." Under the title General Geometry he includes only the geometries of Euclid, Lobachevsky and Riemann (double elliptic or spherical geometry), thus excluding from consideration not only the current "bizarre geometries" but even the symmetric non-archimedean geometries of Hilbert and Veronese as well as the classical "single-elliptic" geometry. In no place do we find clear distinctions between metaphysical and mathematical questions, in a book where both are considered. On the contrary we find the following statement (page 16), which reads rather strangely in view of the vast number of different ways of representing an abstract science to the imagination :

* Quoted thus in a translation by G. B. Halsted of a report by P. Mansion on the non-euclidean researches of P. Barbarin, *Science*, n. s., vol. 20, No. 507 (September 16, 1904).