

## CESÀRO'S INTRINSIC GEOMETRY.

*Lezioni di Geometria Intrinseca.* By ERNESTO CESÀRO, professor of mathematics at the Royal University of Naples. Published by the author, Naples, 1896. 8vo., 264 pp., 48 figures.

*Ernesto Cesàro, Vorlesungen über natürliche Geometrie.* Authorized German translation by Dr. GERHARD KOWALEWSKI, docent at the University of Leipzig. Teubner, 1901. 8vo., vi + 341 pp., 48 figures.

THE subject of intrinsic geometry is almost unknown among American mathematicians, yet it has quite an extensive literature, which has been recently collected and published by Wölfing.\* The name Cesàro occurs more frequently than any other in this report.

The work here under consideration contains considerable new matter, but its principal mission is to provide a systematic treatment of the subject from the beginning. The success of the effort is attested to by the fact that the work received honorable mention at the awarding of the Lobachevsky prize in 1897.

The German translation differs but little from the Italian original, except that it corrects a considerable number of typographical and other errors, and embodies in the text a number of notes appended to the original. The further changes will be mentioned later.

The work is divided into seventeen chapters, of which eight treat of plane geometry, two of twisted curves, three of surfaces, one of line congruences, and finally the last three of three-dimensional space, of curves in hyperspace, and of hyperspaces, respectively. There is also an appendix giving a generalization of Grassmann's numbers, a discussion of the equilibrium of flexible but non-extensible wires, and the equations of elasticity in hyperspace.

The physical improvements in the German edition, the spaced paragraphing, the full index (wholly lacking in the original)

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\* Bericht über den gegenwärtigen Stand der Lehre von den natürlichen Coördinaten, *Bibliotheca Mathematica*, Ser. 3, vol. 1, pp. 142-159.