Tullio Levi-Civita, Hon.F.R.S.E.

by A. E.

Tullio Levi-Civita was born in Padua on March 29, 1873, of a distinguished family; his, father was for many years Mayor of Padua and Senator of the Kingdom of Italy. Tullio studied at the University of his native town, where Veronese, the celebrated geometer, was one of his teachers. At the age of twenty-five he succeeded Padova, another of his teachers, in the Chair of, Mechanics at Padua University. It was a very fortunate circumstance that he was thus enabled to continue and deepen his collaboration with that one of his former teachers whose influence was most important for his development as a mathematician, with Ricci-Curbastro. Accordingly the period of his occupying this Chair was one of the most fruitful scientific activity. When, in 1918, he was appointed to the Chair of Mechanics in the University of Rome, he could look back to a long series of important and distinguished contributions to the mathematical sciences.

His research extended to many and varied branches of Pure and Applied Mathematics. Hydrodynamics, Optics, Electromagnetical Theory, Theory of Numbers, Differential Calculus, Analytical and Astronomical Mechanics, Engineering Sciences, are all indebted to him for contributions, some of these branches for very important contributions. Yet in the eyes of the general mathematical public his name is most intimately connected with the Theory of Differential Equations and Differential Geometry, more particularly with the Tensor Calculus. The Absolute Differential Calculus, as it has been called by its originators, is an adequate way of describing intrinsic features of an n-dimensional manifold with Riemannian metric features, that is to say, which are invariant under any change of coordinates. This Calculus originated with some researches of Ricci and has been developed in the period of Levi-Civita's tenure of the Padua Chair. Already in 1901 Felix Klein invited Ricci and Levi-Civita to give a general account of their work, which they did in a memoir published in vol. liv of the Mathematische Annalen. The recognition as a significant branch of Mathematics of the new Calculus may be dated from the publication of this fundamental memoir; yet at first research in the field thus opened up was restricted to a limited number of specialists: the days of fame for the Absolute Differential Calculus were yet to come. They did come with the advent of the General Theory of Relativity, which found in the Ricci Calculus, as it was called by early relativists, the most adequate means of formulating the new ideas mathematically. Einstein announced his discovery of the gravitational equations (1915) in the words "sie [the General Theory of Relativity] bedeutet einen wahren Triumph der durch Gauss, Riemann, Christoffel, Ricci, Levi Civiter [sic] begründeten Methoden des allgemeinen Differentialkalkulus," and the attention of mathematicians and physicists was at once focussed on Tensor Calculus,
which from this time onward permeated many branches of Mathematics and gained a firm foothold in many Universities.

Levi-Civita's own contributions to the theory are manifold: perhaps the most celebrated among them is his notion of parallelism. The definition of parallel directions on curved surfaces presents some difficulties. Levi-Civita first defines parallel directions on developable surfaces as directions which become parallel when the surface is developed upon a plane. In the case of non-developable surfaces two directions are called parallel with respect to a specified curve on the surface if they are parallel on the developable circumscribed to the surface along the specified curve. If the direction at Q parallel to a given direction at P does not depend on the curve joining P and Q, the surface is said to admit of teleparallelism. All these notions can be carried over to manifolds of several dimensions.

Levi-Civita's work has received well-merited recognition throughout the world. He was honorary graduate of several Universities, Member of all Italian Scientific Academies and of many Academies and learned Societies abroad: in this country he was Foreign Member and Sylvester Medallist in 1922 of the Royal Society, and Honorary Fellow of the Royal Society of Edinburgh (1923). He received and responded to invitations by many Universities and other bodies for lectures abroad, and on these occasions as well as on his frequent travels he made many friends in foreign countries.

In 1938, in consequence of the racial legislation introduced by the Italian Government, Levi-Civita, together with other distinguished scholars of his native country, was deprived of his Chair and of his membership of all Italian Academies: the only academical honour which he continued to hold in Italy was his membership of the Vatican Academy. He received the news of his dismissal seemingly calmly, yet inwardly he was deeply affected. He developed a heart trouble which prevented him from travelling, and made it impossible for him to make use of any of the offers made by many foreign Universities to continue abroad his activities as a teacher and a researcher. His health declined and for the last year of his life he was confined to his room. He died on December 29, 1941, of an apoplectic stroke. In him the Society lost one of its most distinguished Honorary Fellows.