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(*b,* Padua, Italy, 29 March 1873; *d*. Rome, Italy, 20 December 1941),

mathematics, mathematical physics.

The son of Giacomo Levi–Civita, a lawyer who from 1908 was a senator, Levi–Civita was an outstanding student at the *liceo* in Padua. In 1890 he enrolled in the Faculty of Mathematics of the University of Padua. Giuseppe Veronese and Gregorio Ricci Curbastro were among his teachers. He received his diploma in 1894 and in 1895 became resident professor at the teachers' college annexed to the Faculty of Science at Pavia. From 1897 to 1918 Levi–Civita taught rational mechanics at the University of Padua. His years in Padua (where in 1914 he married a pupil, Libera Trevisani) were scientifically the most fruitful of his career. In 1918 he became professor of higher analysis at Rome and, in 1920, of rational mechanics. In 1938, struck by the fascist racial laws against Jews, he was forced to give up teaching.

The breadth of his scientific interests, his scruples regarding the fulfillment of his academic responsibilities, and his affection for young people made Levi–Civita the leader of a flourishing school of mathematicians.

Levi–Civita's approximately 200 memoirs in pure and applied mathematics deal with analytical mechanics, celestial mechanics, hydrodynamics, elasticity, electromagnetism, and atomic physics. His most important contribution to science was rooted in the memoir "Sulle trasformazioni delle equazioni dinamiche" (1896), which was characterized by the use of the methods of absolute differential calculus that Ricci Curbastro had applied only to differential geometry. In the "Méthodes de calcul différentiel absolus et leurs applications," written with Ricci Curbastro and published in 1900 in *Mathematische Annalen*, there is a complete exposition of the new calculus, which consists of a particular algorithm designed to express geometric and physical laws in Euclidean and non–Euclidean spaces, particularly in Riemannian curved spaces. The memoir concerns a very general but laborious type of calculus that made it possible to deal with many difficult problems, including, according to Einstein, the formulation of the general theory of relativity.

Although Levi–Civita had expressed certain reservations concerning relativity in the first years after its formulation (1905), he gradually came to accept the new views. His own original research culminated in 1917 in the introduction of the concept of parallelism in curved spaces that now bears his name; it furnishes a simple law for transporting a vector parallel to itself along a curve in a space of *n* dimensions. With this new concept, absolute differential calculus, having absorbed other techniques, became tensor calculus, now the essential instrument of the unitary relativistic theories of gravitation and electromagnetism. Two of the concept's many applications and generalizations were in the "geometry of paths," which extends the concept of Riemannian variety, and in the theory of spaces with affine and projective connections, which is used with the geometry for a complete representation of electromagnetic phenomena in the framework of general relativity.

In studying the stability of the phenomena of motion, Levi–Civita used a general method, which, by means of a periodic solution of a first–order differential system, restores stability or instability to the study of certain point transformations. He ascertained that periodic solutions, in a first approximation of apparent stability, prove instead to be unstable. Another of Levi–Civita's contributions to analytical mechanics was the general theory of stationary motions, in which moving bodies passing the same spot always do so at the same speed. The theory enabled him to find with a uniform method all the known cases of stationary motion and also to discover new ones.

From 1906 Levi–Civita's memoirs in hydrodynamics, his favorite field, deal with the resistance of a liquid to the translational motion of an immersed solid; he resolved the problem through the general integration of the equations for irrotational flows past a solid body, allowing for the formation of a cavity behind it. His general theory of canal waves originated in a memoir written in 1925.

In related memoirs (1903-1916) Levi–Civita contributed to celestial mechanics in the study of the three–body problem: the determination of the motion of three bodies, considered as reduced to their centers of mass and subject to mutual Newtonian attraction. In 1914-1916 he succeeded in eliminating the singularities presented at the points of possible collisions, past or future. His results furnished a rigorous solution to the classic problem—which, by indirect method and by transcending dynamic equations, Karl F. Sundmann had reached in 1912, as Levi–Civita himself admitted.

His research in relativity led Levi–Civita to mathematical problems suggested by atomic physics, which in the 1920's was developing outside the traditional framework: the general theory of adiabatic invariants, the motion of a body of variable mass, the extension of the Maxwellian distribution to a system of corpuscles, and Schrödinger's equations.

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