



Toward a scientific and personal biography of Tullio Levi-Civita (1873–1941)

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Available online 12 May 2004

Abstract

Tullio Levi-Civita was one of the most important Italian mathematicians of the first part of the 20th century, contributing significantly to a number of research fields in mathematics and physics. In addition, he was involved in the social and political life of his time and suffered severe political and racial persecution during the period of Fascism. He tried repeatedly and in several cases successfully to help colleagues and students who were victims of anti-Semitism in Italy and Germany. His scientific and private life is well documented in the letters and documents contained in his *Archive*. The authors' aim is to illustrate the events of his life by means of his large and remarkable correspondence.

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Sommario

Tullio Levi-Civita fu uno dei più importanti matematici italiani della prima parte del ventesimo secolo e contribuì in modo significativo a numerose discipline in campo matematico e fisico. Inoltre, egli partecipò alla vita sociale e politica del suo tempo e fu vittima delle severe persecuzioni politiche e razziali del periodo fascista. Egli tentò in più occasioni, e talvolta con successo, di aiutare colleghi e studenti che erano vittime dell'anti-semitismo sia in Italia sia in Germania. La sua vita scientifica e personale è ben documentata nelle lettere e nei manoscritti contenuti nel suo *Archivio*. Lo scopo degli autori è di illustrare i fatti salienti della sua vita facendo uso della sua ampia e notevole corrispondenza.

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MSC: 01A60; 01A70

Keywords: Levi-Civita; Tensor calculus; Hydrodynamics; Three-body problem; General relativity

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Introduction

In the following we present a sketch of the life and work of Levi-Civita based largely on the letters and manuscripts that are kept in the Archives of the *Accademia dei Lincei* in Rome.¹ These documents—partially published in [Nastasi and Tazzioli, 1999, 2000, 2003]—represent one of the largest testimonies on Italian mathematics in the first part of the 20th century. The letters and reports in Appendixes help to illustrate some important aspects of Levi-Civita's life and work that are too long to be reported in the text of the paper (see [Galletto, 1973; Hodge, 1942]).

We consider both Levi-Civita's fundamental scientific contributions and some important events in his personal life. In fact, he developed his principal researches concerning the theory of relativity, the three-body problem, adiabatic invariants, hydrodynamics, and tensor calculus during the First World War. While Nazism struck German mathematics from the thirties onward, Fascism in Italy during the same period obliged professors to swear fidelity to the government (1931) and the Racial Laws that were promulgated (1938). From 1938 till his death, Levi-Civita as a private person helped colleagues and friends under persecution and sometimes succeeded in finding new positions for them in South America or in the United States. In his correspondence there are traces of all these historical events together with his research in different mathematical fields.

Levi-Civita's professional biography is divided into two great periods—the period at the University of Padua, where he graduated in 1892 and began his extraordinary scientific career, and the period at the University of Rome, where he arrived from Padua in 1918 and created a *school* of mathematics at an international level. The substantial difference between the two parts of our paper reflects this dichotomy. In particular, the first part is mainly devoted to Levi-Civita's scientific contributions, while the second part describes his Roman years, the international appreciation of his work that developed, and his political and social role.

1. Levi-Civita at the University of Padua

Levi-Civita studied at the University of Padua, where he was a student of Giuseppe Veronese (1854–1917) and Gregorio Ricci-Curbastro (1853–1925); he graduated in 1892 under the direction of Ricci-Curbastro with a dissertation on the theory of invariants. During his years in Padua, Levi-Civita concluded his scientific education and embarked on research on a number of topics that were to become fruitful research fields for him and several students of his at the University of Rome.

1.1. *The three-body problem*

The classic three-body problem was one of the principal research fields in Levi-Civita's career; a good survey of his works on the subject is contained in [Barrow-Green, 1997]. Levi-Civita was interested in the three-body problem for over 20 years and derived a regularization of the differential equations in the neighborhood of a binary shock by starting from some results of Paul Painlevé (1863–1933). The first of several papers by Levi-Civita on this topic was published in 1903 in two notes in the *Comptes Rendus*

¹ In the Archives there are about 5000 letters sent by a thousand mathematicians throughout the entire world.

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