Enrico Fermi in Pisa*  
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I discuss the early work of Enrico Fermi (1901–1954) as a student in Pisa at the Scuola Normale Superiore and at the University of Pisa (1918–1922), paying particular attention to the four papers he published during those years and to his licenza and doctoral theses.

**Key words:** Enrico Fermi; Franco Rasetti; Enrico Persico; Adolfo Amidei; Luigi Bianchi; Scuola Normale Superiore; University of Pisa; relativity theory; electromagnetic mass; X-ray diffraction.

**Fermi’s Education in Pisa**

The University of Pisa was founded in 1343 by Pope Clemente VI, while the Scuola Normale Superiore in Pisa was established much later by Napoleon in 1810 as a branch of the École Normale Supérieure in Paris. It began its activities in 1813 as a school for the preparation of secondary school teachers and the promotion of advanced study and research, but closed in 1815 after Napoleon's abdication and exile. It was reopened only in 1846 by the Grand Duke of Tuscany, Leopoldo II of Lorena, as a kind of elite college attached to the University of Pisa. After the unification of Italy in 1861, it became an institution for advanced scientific education and research; finally, in 1932, it was granted administrative autonomy from the University of Pisa. Its restricted student body was and is selected nationally on the basis of severe and impartial competitive examinations and has been a major source of scientific talent for Italy.1

Enrico Fermi (1901–1954) was admitted to the Classe di Scienze of the Scuola Normale Superiore in Pisa in 1918, when he was not yet eighteen years old.2 He already had a broad and deep knowledge of physics owing to his early autodidactic studies, which revealed his preciosity.

The engineer Adolfo Amidei (1877–1965), a colleague and friend of Enrico’s father, was the first to recognize the extraordinary cleverness of the youth and note his great curiosity about the physical world. Enrico asked Amidei for a book where he could find a scientific explanation of the motions of a spinning top and gyroscope. Amidei answered that he would have to “master a science known as theoretical mechanics; but in

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order to learn it he would have to study trigonometry, algebra, analytic geometry, and calculus.”

Between the end of 1914 and the summer of 1918, Amidei then advised Enrico on his studies and lent him many excellent and often difficult books on mathematics by Joseph Serret (1819–1885), Ernesto Cesàro (1859–1906), Luigi Bianchi (1856–1928), Ulisse Dini (1845–1918), Giuseppe Peano (1888–1932), and Hermann Grassmann (1809–1877), as well as the *Traité de mécanique* (second edition, 1833) of Siméon-Denis Poisson (1781–1840). He also suggested that he should study infinitesimal analysis to acquire the basic tools needed for a deep understanding of analytical mechanics that he was learning from the book by the Jesuit Andrea Caraffa (1785–1845), *Elementorum physicae mathematicae*, published in 1840. These early studies prepared him to deal with the difficult mathematical formalism he would use in some of his first scientific works on electromagnetism and relativity. Throughout his life, Fermi had a pragmatic attitude towards mathematics, more like a modern theoretical physicist than a mathematical physicist: He always concentrated on the physics of a problem without submerging it under advanced mathematical tools.

Amidei convinced Enrico’s parents to allow their son to go to the University of Pisa as a student in the Scuola Normale Superiore because, he explained, there was an important library at the students’ disposal there and lectures were offered that were