

# Enriques, Federigo | Encyclopedia.com

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(*b.* Leghorn, Italy, 5 January 1871; *d.* Rome, Italy, 14 June 1946)

*mathematics, philosophy and history of mathematics and science.*

Enriques, the son of S. Giacomo and Matilda Enriques, was educated in Pisa, where the family moved during his childhood. He attended the university and the Scuola Normale with a brilliant record in mathematics and took his degree in 1891. After a year of graduate study in Pisa, a second one in Rome, and some further work in Turin with Corrado Segre, Enriques undertook the teaching of projective and descriptive geometry at the University of Bologna, where in 1896 he was elevated to a professorship in those subjects. He remained there until 1923. He was honored by the University of St. Andrews with an honorary doctorate.

Guido Castelnuovo speaks of the happy years spent at Bologna as being perhaps the most fruitful of Enriques' entire life. His intense interest in all fields of knowledge was nurtured by close contact with professors from all the faculties, and in the period 1907–1913 he served as president of the Italian Philosophical Society. In this capacity he organized the Fourth International Congress of Philosophy, held at Bologna in 1911.

In 1923 Enriques accepted the offer of the chair of higher geometry at the University of Rome. While there he founded the National Institute for the History of Science and a school dedicated to that discipline. Since his way of life and his philosophy made it impossible for him to cooperate with the dictates of a fascist regime, Enriques retired from teaching during the years 1938–1944.

As a young man Enriques studied under Betti, Dini, Bianchi, and Volterra and was influenced in his views on [algebraic geometry](#) by Segre. In 1892 he turned to Castelnuovo in Rome for advice on the direction of his work, and their many consultations led to Enriques' specialization in the theory of algebraic surfaces and to their collaboration in the field. The Turin Academy of Sciences published Enriques' first paper on the subject in June 1893.

A short summary of Enriques' contributions to this field—relating them to those of Castelnuovo, Picard, Severi, Humbert, and Baker—may be found in F. Cajori's *A History of Mathematics*.<sup>1</sup> Greater detail is given in each of two other accounts, both by Castelnuovo and Enriques in collaboration. The first, entitled “Sur quelques resultats nouveaux dans la theorie des surfaces algébriques,”<sup>2</sup> summarizes the Italian contribution up to 1906. The second, an earlier paper, carries the title “Sur quelques récents résultats dans la theorie des surfaces algebriques.”<sup>3</sup> H. F. Baker's presidential address to the International Congress in Cambridge (12 December 1912), published as “On Some Recent Advances in the Theory of Algebraic Surfaces,”<sup>4</sup> also serves to highlight the contributions in that field and in so doing details Enriques' major contributions.

Enriques also contributed to the differential geometry of hyperspace. In 1907 he and Severi received the Bordin Award of the Paris Academy of Sciences for their work on hyperelliptical surfaces. The French honored him again in 1937 by making him a corresponding member of the Académie des Sciences Morales et Politiques.

As early as 1898 Enriques' interest in foundations of mathematics was reflected in his use of a system of axioms in his textbook writings. Having written, at [Felix Klein](#)'s request, the article on the foundations of geometry (“Principien der Geometrie”) for the *Encyklopädie der mathematischen Wissenschaften* (III, 1–129), he became instrumental in the writing of textbooks for both elementary and high schools that greatly influenced teaching in Italy. He was responsible for the publication, in Italian, of Euclid's *Elements* with historical notes and commentary, and he encouraged the publication of historical and didactic articles in *Periodico di matematiche*, which he headed for twenty years. His interest in teaching and in teachers is well reflected in his service as president of the National Association of University Professors.

By 1895 Enriques had concluded that besides the logical criteria of independence and compatibility, a psychological criterion involving the sensations and experiences that lead to the formulation of the postulates must be considered. In an 1898 paper he set up conditions justifying the introduction of coordinates on surfaces, thus supplementing Riemann's a priori approach in the assumption of such an existence. His interest in physiological psychology led to his writing studies for the *Rivista filosofica* that were later expanded into his *Problemi della scienza* (1906). Castelnuovo describes Enriques' thesis as being that topology and metrical and projective geometry are linked, respectively, to three different orders of sensations: to the general tactile-muscular, to those of the special sense of touch, and to those of vision. In the second part of the *Problemi* a critical examination is made of the principles of mathematical, physical, and biological sciences. In the treatment of the principles of mechanics Enriques anticipated some of the foundations of Einstein's theory of relativity. His views on structure are given in *Causalité et déterminism* (1940), and his philosophical thought is found in *Scienza e razionalismo* (1912). A causal

explanation involves a “why” as well as a “how” and links effect to cause. Theory should be “plausible in itself” and “satisfy the principle of sufficient reason which is the mental aspect of causality” Determinism thus becomes a premise of scientific research. Enriques’ philosophical and historical beliefs pervade *Per la storia della logica* (1922).

In the introductory note to the English translation of *Problemi della scienza* (1914), [Josiah Royce](#) writes of the Pragmatic element in Enriques’ thought that brings to the thinking process an adjustment to situations; of his stress on the unifying aspect of scientific theory, the association of concepts and of scientific representation. Enriques’ philosophical stance differs from that of the Comtean school. He disagrees with Mach and Pearson in their limitation of science to a simple description of physical phenomena, yet writes: “In the formation of concepts, we shall see not only an economy of thought in accordance with the views of Mach, but also a somewhat determinate mental process....” He maintains a positivistic position toward the transcendental and relative character of scientific theory; yet his theory progresses toward a comprehension of the essential core concealed in every question. Enriques maintained that “It is plainly seen that scientific questions include something essential, apart from the special way in which they are conceived in a particular epoch by the scholars who study such problems.”

## NOTES

1. ([New York](#), 1961), p. 316.
2. Émile Picard and George Simart, *Théorie des fonctions algébriques de deux variables indépendentes* **48** (1897), 241–316;
3. *Mathematische Annalen*, **48** (1897), 241–316.
4. *Proceedings of the London Mathematical Society*, **12** (1913), 1–40.

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See also *Storia del pensiero scientifico*, I, *Il mondo antico* (Bologna, 1932), written with G. de Santillana; *Nozioni di geometria ad use delle scuole di auuiamento professionale* (Bologna, 1934), written with U. Amaldi; *Il significato della storia del pensiero scientifico* (Bologna, 1936); *Compendio di storia del pensiero scientifico dall’antichita fino ai tempi moderni* (Bologna, 1937), written with G. de Santillana; *Le matematiche nella storia e nella cultura*, A. Frajese, ed. (Bologna, 1938); *La théorie de la connaissance scientifique de Kant a nos jours*, Actualités Scientifiques et Industrielles no. 638 (Paris, 1938); *Le superficie razionali* (Bologna, 1939), written with F. Conforto; *Causalite et determinisme dans la philosophie et l’histoire des sciences*, Actualites Scientifiques et Industrielles no. 899 (Paris, 1940); *Elementi di trigonometria piana ad uso dei lieci* (Bologna, 1947), written with U. Amaldi; *Le dottrine di Democrito d’Abdera, testi e commenti* (Bologna, 1948), written with M. Mazziotti; and *Natura, ragione e storia*, L. Lombardo Radice, ed. (Turin, 1958), a collection of his philosophical writings with a bibliography.

See also *Questioni riguardanti la geometria elementare* (Bologna, 1900), which Enriques collected and arranged; *Questioni riguardanti le matematiche elementari*: I, *Critica dei principii* (Bologna, 1912); II, *Problemi classici della geometria. Numeri primi e analisi indeterminata. Massimi e minimi* (Bologna, 1914); pt. 2, *I problemi classici della geometria e le equazioni algebriche*, 3rd ed. (Bologna, 1926); pt. 3, *Numeri primi e analisi indeterminata. Massimi e minimi*, 3rd ed. by Enriques and

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II. Secondary Literature. On Enriques or his work, *see* H.F. Baker, "On Some Recent Advances in the Theory of *Algebraic Surfaces*," in *Proceedings of the London Mathematical Society*, 2nd ser., **12** (1913), 1–40; F. Baron, "Enriques, Federico," in *Enciclopedia filosofica* (Venice-Rome, 1957), cols. 1916–1917; Guido Castelnuovo, "Commemorazione di Federico Enriques," in *Federigo Enriques: Memorie scelte di geometria*, pp. x-xxii; Poggendorff, IV, 388–389; *Proceedings of the Fifth International Congress of Mathematicians* (Cambridge, 1912), I, 40; II, 22; Ferruccio Rossi-Landi, "Enriques, Federico," in *Encyclopedia of Philosophy* (New York, 1967), III, 525–526; Ferruccio Rossi-Landi and Vittorio Somenzi, "La filosofia della scienza in Italia," in *La filosofia contemporanea in Italia* (Rome, 1958), pp. 407–432; and Antonio Santucci, *Il pragmatismo in Italia* (Bologna, 1963), pp. 302–322.

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