

# Paul Langevin and the Theory of Relativity

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... une montée pleine de tournants imprévus  
et riche de découvertes, en vue de ce sommet  
tout enveloppé en brume. . .

LANGEVIN (1933)

## I. Introduction—Historical Background

Paul Langevin (1872–1946) is well-known for his exceptional work on magnetism, but his impressive work on relativity<sup>1</sup> has not been sufficiently appreciated. One should not neglect fascinating objects when they are eclipsed by more brilliant objects!

Lorentz, Poincaré and Einstein were historically the main pioneers in special relativity, building the theory to its culmination in 1905. Moreover, other workers participated significantly. Nor did the story end there since theoretical and experimental work had to follow: extensions, applications, interpretations and clarification of special relativity—here was the role of Planck, Minkowski and Langevin! The last major contribution to special relativity<sup>2</sup> by Einstein was made in 1907, by Poincaré in 1906, and Planck in 1908; Minkowski died in 1909 (of appendicitis) and Poincaré died in 1912, while in the succeeding decade Lorentz made valuable contributions only on a topic or two.

The development of special relativity (starting in 1911) was continued mainly by Langevin, who did essentially the most that was possible in special relativity after

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<sup>1</sup> Langevin's collected articles are in his three books: *Oeuvres Scientifiques de P. Langevin* (Paris: Centre Nat. Rech. Sci., 1950), *La Physique depuis vingt ans* (Paris: G. Doin, 1923), *Izbranye Trudy* (Moscow: Izdat. Akad. nauk SSSR, 1960). Bibliographies are in his "Oeuvres" and in *La Pensée*, mai-juin 1947, 82–87.

His obituaries are in *La Pensée*, mai-juin 1947, by A. Cotton (pp. 21–30), A. Einstein (pp. 13–14), P. Le Rolland (pp. 34–40). Best surveys of his work: J. Becquerel, *Le Principe de Relativité et la théorie de gravitation* (Paris: Gauthier-Villars, 1922), pp. 42, 105–111, 243–244; O. Staroselskaya-Nikitina, *Pol Lanzheven* (Moscow: Gos. Izdat. fiz.-mat. lit., 1962), ch. 5–6; Ya. Dorfman, in Langevin's *Izbranye Trudy*, pp. 721–746; Yu. Geyvish, *Pol Lanzheven* (Moscow: Izdat. Akad. nauk, 1955); H. Arzeliès, *Relativistic Kinematics* (New York: Pergamon Press, 1966), pp. 79, 140, 187–189, 240; *idem*, *La Dynamique Relativiste* (Paris: Gauthier-Villars, 1957), Vol. I, pp. 21–22; Vol. II, p. 406; *idem*, *Relativité Généralisée* (Paris: Gauth.-Vill., 1961), Vol. I, p. 347.

<sup>2</sup> Einstein, *Ann. Physik*, 1907, 23: 371–384; *Jahrb. d. Radioakt.* 1907, 4: 411–462; for Poincaré and Planck see C. Cuvaj, *Am. J. Phys.*, 1968, 36: 1103, 1105; 1970, 38: 774–775.