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(*b.* Strasbourg, France, 27 September 1855; *d.* Paris, France, 24 October 1930)

mathematics, mathematical physics.

Appell's parents, Jean-Pierre Appell and Elizabeth Müller, were Catholic Alsatians ardently loyal to revolutionary France. The family lived in a corner of the great Ritterhus, formerly a knightly lodge, where the master-dyer father and two sons by a previous marriage managed production while the mother, her sister, and a stepdaughter tended the store. Paul accepted the family ambition and patriotism but rejected Catholic piety. His character was forged by a forced move from the Ritterhus in 1866, his father's death in 1867, transfer from a religious school to the *lycée* at his own insistence in 1869, bitter experiences in the siege of Strasbourg in 1870, and a close relationship with the younger of his half brothers, Charles, who served in the Foreign Legion, fought as an irregular in 1870–1871, and in 1889 was sentenced to ten years' confinement for anti-German activities. When Appell went to Nancy in 1871 to prepare for the university and to assume French citizenship in 1872, He was carrying the hopes of his family, who remained behind in Strasbourg as German subjects.

Blessed with unbounded energy, this attractive outsider with an accent moved rapidly toward the inner circles of French mathematics. At Nancy, he and Henri Poincaré formed a friendship that lasted until the latter's death. In 1873 he entered the École Normale, from which he graduated first in the class of 1876, three months after earning his doctorate. From this time on, Appell maintained an amazing level of activity in teaching, research, editing, and public service. He typically held several teaching posts at the same time, including the chair of mechanics at the Sorbonne from 1885. He was elected to the Académie des Sciences in 1892. He served as dean of the Faculty of Science of the University of Paris from 1903 to 1920 and as rector from 1920 to 1925. In various government posts, including membership in the Conseil Supérieure d'Instruction Publique, he was an exponent of educational reform and initiator of numerous large-scale projects, including the Cité Universitaire.

In 1881 he married Amelie, daughter of the archaeologist Alexandre Bertrand, niece of the mathematicians Joseph Bertrand and Charles Hermité, and a cousin of Appell's classmate and friend Émile Picard. Their son became a deputy and undersecretary of state. Two of their three daughters married the academicians Émile Borel and J. E. Duclaux. The household included Paul's mother, who had joined him in 1877 and remained until her death in 1902. In his *Souvenirs* (p. 180) he described his life as “flowing tranquilly between teaching, mathematical work and vacations in Alsace” at the maternal home in Klingenthal, but he found energy to support vigorously the movement for women's rights, to carry from Alsace his brother's reports destined for the French War Office, and to defend his fellow Alsatian Dreyfus and serve on an expert commission whose ruling played a key role in his final rehabilitation. During [World War I](#) he founded and led the Secours National, a semiofficial organization uniting all religious and political groups to aid civilian victims. He described the return of the tricolor to Alsace as the fulfillment of his “lifelong goal” and felt that Germany had been treated too easily. He served as secretary-general of the French Association for the [League of Nations](#).

Appell's first paper (1876) was his thesis on projective geometry in the tradition of Chasles, but at the suggestion of his teachers he turned to algebraic functions, differential equations, and complex analysis. He generalized many classical results (e. g., the theories of elliptic and of hypergeometric functions) to the case of two or more variables. From the first his work was close to physical ideas. For example, in 1878 he noted the physical significance of the imaginary period of elliptic functions in the solution of the pendulum problem, and thus showed that double periodicity follows from physical considerations. In 1880 he wrote on a sequence of functions (now called the Appell polynomials) satisfying the condition that the derivative of the n th function is n times the previous one.

In 1885 Appell was awarded half the Bordin Prize for solving the problem of “cutting and filling” (*deblais et remblais*) originally posed by Monge: To move a given region into another of equal volume so as to minimize the integral of the element of volume times the distance between its old and new positions. In 1889 he won second place (after Poincaré) in a competition sponsored by King Oscar II of Sweden: To find an effective method of calculating the Fourier coefficients in the expansion of quadruply periodic functions of two complex variables.

The flow of papers continued, augmented by treatises, textbooks, and popularizations and seemingly unaffected by other responsibilities. Although Appell never lost his interest in “pure” analysis and geometry, his activity continued to shift toward mechanics, and in 1893 Volume 1 of the monumental *Traité de mécanique rationnelle* appeared. Volume V (1921) included the mathematics required for relativity, but the treatise is essentially an exposition of classical mechanics of the late nineteenth century. It contains many of Appell's contributions, including his equations of motion valid for both holonomic and non-holonomic systems, which have not displaced the classical Lagrangian system in spite of undoubted advantages.

It is difficult to do justice to Appell's work because it lacks central themes, seminal ideas, and dramatic results. In 1925 he wrote: "I always had little taste for developing general theories and preferred to study limited and precise questions that might open new paths" ("Notice," p. 162). Indeed, his scientific work consists of a series of brilliant solutions of particular problems, some of the greatest difficulty. He was a technician who used the classical methods of his time to answer open questions, work out details, and make natural extensions in the mainstream of the late nineteenth century; but his work did not open new doors, as he hoped. On the contrary, he does not seem to have looked down any of the new paths that were leading to a period of unbridled abstraction and generalization. During the last half of his career he was a pillar of a backward-looking establishment that was to give way to [Nicolas Bourbaki](#), a namesake of a general who was one of his boyhood heroes.

BIBLIOGRAPHY

I. Original Works. Appell's "Notice sur les travaux scientifiques," in *Acta mathematica*, **45** (1925), 161–285, describes 140 publications in analysis, 30 in geometry, and 87 in mechanics. The most notable are *Notice sur les travaux* (Paris, 1884, 1889, 1892), written to support his candidacy for the Académie; "Sur les intégrales des fonctions à multiplicateurs," in *Acta mathematica*, **13** (1890); *Traité de mécanique rationnelle*, 5 vols. (Paris, 1893–1921 and later eds.); *Théorie des fonctions algébriques et de leurs intégrales* (Paris, 1895, 1922), written with E. Goursat; and *Principes de la théorie des fonctions elliptiques et applications* (Paris, 1897), written with E. Lacour.

Not listed in the "Notice" are numerous elementary textbooks, popularizations, addresses and papers on history and education, and several later publications, including *Sur une forme générale des équations de la dynamique* *Mémorial des Sciences Mathématiques* (Paris, 1925); *Sur les fonctions hypergéométriques de plusieurs variables, les polynômes d'Hermité et autres fonctions sphériques dans Phyperspace, ibid.* (Paris, 1925); Henri Poincaré (Paris, 1925); *Fonctions hypergéométriques et hypersphériques. Polynômes d'Hermité* (Paris, 1926), written with M. J. Kampé de Fériet; *Le problème géométrique des déblais et remblais*, *Mémorial des Sciences Mathématiques* (Paris, 1928); *Sur la décomposition d'une fonction en Éléments simples, ibid.* (Paris, 1929); and "Sur la constante d'Euler," in *Enseignement mathématique*, **29** (1930), 5–6, apparently his last paper, a follow-up to one on the same subject, *ibid.*, **26** (1927), 11–14, which had been welcomed by the editor with a note observing that "a great source of light is still burning."

II. Secondary Literature. Appell's life and work are unusually well documented by his four *notices* mentioned above; his charming and revealing autobiography, *Souvenirs d'un alsacien 1858–1922* (Paris, 1923); and E. Lebon, *Biographie et bibliographie analytique des écrits de Paul Appell* (Paris, 1910), which gives many biographical details and seems to have been written with Appell's collaboration. Other biographical articles rely on these sources, but some of them contain personal recollections or other interesting information, notably *Cinquantenaire scientifique de Paul Appell* (Paris, 1927); "Centenaire de la naissance de Paul Appell," in *Annales de l'Université de Paris*, **26**, no. 1 (1956), 13–31; A. Buhl, in *Enseignement mathématique*, **26** (1927), 5–11; **30** (1931), 5–21; **33** (1934), 229–231; T. Levi-Civita, in *Rendiconti Accademia dei Lincei*, 6th ser., **13** (1931), 241–242; and Raymond Poincaré, in *Annales de l'Université de Paris*, **5** (1930), 463–477.

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