Paul Painleve | Encyclopedia.com

(*b*. Paris, France, 5 December 1863; *d*. Paris, France, 29 October 1933)

mathematics.

Painlevé's father, Léon Painlevé, and grandfather, Jean-Baptiste Painlevé, were lithographers. Through his grandmother, Euphrosine Marchand, he was a descendant of Napoleon I's valet. As gifted in literature as in the sciences, Painlevé received excellent marks in secondary school.

After hesitating between a career as a politician, engineer, and researcher Painlevé chose the last, which had been offered him by the École Normale Supérieure. Admitted in 1883, he received his *agregation* in mathematics in 1886. He worked for a time at Göttingen, where Schwarz and Klein were teaching, and at the same time completed his doctoral dissertation (1887). Painlevé became professor at Lille in 1887. In 1892 he moved to Paris, where he taught at the Faculty of Sciences and the École Ploytechnique, the Collége de France (1896), and the École Normale Supérieure (1897).

Painlevé received the Grand Prix des Sciences Mathématiques (1890), the Prix Bordin (1894), and the Prix Poncelet (1896); and was elected a member of the geometry section of the Académie des Sciences in 1900. In 1901 he married Marguerite Petit de Villeneuve, niece of the painter Georges Clairin; she died at the birth of their son Jean (1902), who become one of the creators of scientific cinematography.

Painlevé was interested in the infant field of aviation, and as the passenger with Wilbur Wright and Henri Farman he even shared for a time the record for duration of biplane flights (1908). He was a professor at the École Supérieure d'Aéronautique (1909) and president of several commissions on aerial navigation.

In 1910 Painlevé turned to politics. Elected a deputy from the fifth arrondissement of Paris, the "Quartier Latin," he headed naval and aeronautical commissions established to prepare for the country's defense. In 1914 he created the Service des Inventions pour les Besoins de la Défense Nationale, which became a ministry in 1915. Minister of war in 1917, Painlevé played an important role in the conduct of military operations: he supported the efforts of the Army of the Near East in the hope of detaching Austria-Hungary from the German alliance. He conducted the negotiations with Woodrow Wilson over the sending of American combat troops to France. He also had Foch appointed as head of the allied chiefs of staff.

In 1920 Painlevé was commissioned by the Chinese government to reorganize the country's railroads. From 1925 to 1933 he was several times minister of war and of aviation, president of the Council of Ministers, and an active participant in the League of Nations and in its International Institute of Intellectual Cooperation.

As a mathematician Painlevé always considered questions in their greatest generality. After his first works concerning rational transformations of algebraic curves and surfaces, in which he introduced biuniform transformations, he was remarkabley successful in the study of singular points of algebraic differential equations. His goal was to obtain general propositions on the nature of the integral considered as a function

of the variable and of the constants, particularly through distinguishing the "perfect integrals," definable throughout their domain of existence by a unique development.

In old problems in which the difficulties seemed insurmountable, Painlevé defined new transcendentals for singular points of differential equations of a higher order than the first. In particular he determined every equation of the second order and first degree whose critical points are fixed. This work was presented in notes published in the *Comptes rendus…de l'Académie des sciences* beginning in 1887.

The results of these studies are applicable to the equations of analytical mechanics which admit rational or algebraic first integrals with respect to the velocities. Proving, in the words of Hadamard's *éloge*, that "continuing [the work of] Henri Poincaré was not beyond human capacity," Painlevé extended the known results concerning the n-body problem. He also corrected certain accepted results in problems of friction and of the conditions of certain equilibriums when the force function does not pass through a maximum.

BIBLIOGRAPHY

I. Original Works. Painlevé's mathematical writings are "Sur les lignes singuliéres des fonctions analytiques," in *Annales de la Faculté des sciences de Toulouse* (1888), his doctoral dissertation; "Sur la transformation des fonctions harmoniques et les systémes triples de surfaces orthogonales," in *Traaux et méorires de la Faculté de sciences de Lille*,**1** (Aug. 1889), 1–29; "Sur les équations différentielles du premier ordre," in *Annales scientifiques de l' École normale supérieure*, 3rd ser., **8** (Jan.-Mar. 1891), 9–58, 103–140; (Aug.-Sept. 1891), 201–226, 267–284; **9** (Jan. 1892), 9–30; (Apr.-June 1892), 101–144, 283–308; "Mémoire sur la transformation des équations de la dynamique," in *Journal de mathématiques pures et appliquées*, 4th ser., **10** (Jan. 1894); 5–92; "Sur les mouvements et les trajectoires réels des systémes," in *Bulletin de la Société mathématique de France*,**22** (Oct. 1894), 136–184; *Leçons sur l'inégration des équations de la dynamique et applicantions* (Pris, 1894); *Leçons sur le frottement* (Paris, 1895); *Leçons sur l'intégration des équations différentielles professées à Stockholm…* (Paris, 1897); "Sur les équations différentieles dont l'intégrale générale est uniforme," in *Bulletin de la Société mathématique de France*,**28** (June 1900), 201–261; "Sur les équations différentielles du second ordre et d'ordre supérieeur dont l'intégrale générale est uniforme," in *Acta mathematica*,**25** (Sept. 1900), 1–80; and contributions to Émile Borel, *Sur les fonctions de variables réelles et les développements en série de polynomes* (Paris, 1905), 101–147; and Pierre Boutroux, *Leçons sur les fonctionsdéfinies par les équations différentielles du premier ordre* (Paris, 1908), 141–187.

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II. Secondary Literature. See the collection made by the Société des Amis de Paul Painlevé, *Paroles et écrits de Paul Painlevé* (Paris, 1936), with prefaces by [Paul Langevin](#) and Jean Perrin; and Jean Painlevé, *Textes inédites et analyse des travaux scientifiques jusqu'en 1900*.

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