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(b. Berlin, Germany, 22 February 1817; d. Rudersdorf, near Berlin, 27 June 1880)

mathematics.

The son of Moritz Borchardt, a wealthy and respected Jewish merchant, and Emma Heilborn, Borchardt had among his private tutors the mathematicians J. Plücker and J. Stenier. From 1836 he studied at the University of Berlin with Dirichlet, and from 1839 at the University of Königsberg with Bessel, F. Neumann, and Jacobi. In his doctoral thesis (1843; unpublished and now lost), written under the supervision of Jacobi, he dealt with certain systems of nonlinear differential equations. In 1846–1847 he was in Paris, where he met Chasles, Hermite, and Liouville. Borchardt became a *Privatdozent* at the University of Berlin in 1848, and a member of the Berliner Akademie der Wissenschaften in 1855. He married Rosa Oppenheim. Very poor health interrupted his teaching for years; nevertheless, from 1856 to 1880 he edited, as Crelle's successor, Volumes **57–90** of the celebrated *Crelle's Journal für die reine und angewandte Mathematik*, upholding its high standard of mathematical scholarship.

Borchardt became known as a mathematician through his first publication (1846), in which he generalized a result obtained by Kummer concerning the equation that determines the secular disturbances of the planets (characteristic equation, or secular equation). By means of determinants Borchardt proved that in this case Sturm's functions can be represented as a sum of squares. From this it follows that the roots of the characteristic equation are real. In several further papers Borchardt applied the theory of determinants to algebraic questions, mostly in connection with symmetric functions, the theory of elimination, and interpolation. Another group of his papers dealt with the arithmetic-geometric mean (AGM). Gauss and Lagrange had established its connection with the complete elliptic integral of the first class. Borchardt, starting from the functional equation for the limit value of the AGM, derived a linear differential equation of the second order, the linear differential equation of the complete, first-class elliptic integral. He also studied a variant process of the AGM connected with the circular functions, and the generalization of the AGM to four elements and its relation to hyperelliptic integrals. Other papers dealt with problems of maxima and the theory of elasticity.

BIBLIOGRAPHY

I. Original Works. Borchardt's *Gesammelte Werke*, G. Hettner, ed. (Berlin, 1888), contains 25 papers and some short communications. His works are listed in Poggendorff, I, 238; III, 162; IV, 158.

II. Secondary Literature. Works on Borchardt are Maurice d'Ocagne, "C. W. Borchardt et son oeuvre," in *Revue des questions scientifiques* (Jan. 1890), also repr. separately (Brussels, 1890); and Max Steck, in *Neue deutsche Biographie*, II (Berlin, 1955), 456.

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