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(*b*. Berlin, Germany, 16 March 1821; *d*. Halle, Germany, 21 October 1881)

mathematics.

Eduard Heine, as he is usually called, was the eighth of the nine children of the banker Karl Heinrich Heine and his wife, Henriette Märtens. He was given private instruction at home and then attended the Friedrichswerdersche Gymnasium and finally the Köllnische Gymnasium in Berlin, from which he graduated in the fall of 1838. He studied one semester in Berlin and then went to Göttingen, where he attended the lectures of Gauss and Stern. After three semesters he returned to Berlin; his principal teacher there was Dirichlet, but he also attended courses of Steiner and Encke. After receiving his Ph.D. degree at Berlin University on 30 April 1842, he went to Königsberg, where for two semesters he studied with C. G. J. Jacobi and Franz Neumann. He obtained his *Habilitation* as a *Privatdozent* at Bonn University on 20 July 1844. On 13 May 1848 he was appointed an extraordinary professor at Bonn University and on 6 September 1848 a professor at Halle University, where he finally settled. In the academic year 1864–1865 he held the office of rector of the university. He was a corresponding member of the Prussian Academy of Sciences and a nonresident member of the Göttingen Gesellschaft der Wissenschaften. In 1877 he was awarded the Gauss medal. Two years earlier he turned down the offer of a chair at Gottingen University.

Heine's sister Albertine was married to the banker Paul Mendelssohn-Bartholdy, the brother of the composer. In his brother-in-law's house Heine met his future wife Sophie Wolff, the daughter of a Berlin merchant. They were married in 1850 and had four daughters and a son; one of the daughters was the writer Anselma Heine. Heine's frequent visits to his family in Berlin enabled him to discuss mathematics with Weierstrass, Kummer, Kronecker, and Borchardt. He attracted promising young mathematicians to Halle University, among them Carl Neumann, Gustav Roch, H. A. Schwarz, J. Thomas, and Georg Canton.

Heine published about fifty mathematical papers, most of them in *Zeitschrift für die reine und angewandte Mathematik*. His main fields were spherical functions (Legendre polynomials), Lamé functions, Bessel functions, and related subjects. His greatest work, *Handbuch der Kugelfunctionen*, was first published in 1861. The second edition (1878–1881) of Heine's book was still a standard compendium on spherical functions well into the 1930's if one considers the frequency with which it was quoted; that this edition has never been reprinted, however, belies this impression.

Heine's name is best known for its association with the Heine-Borel covering theorem, the validity of which name has been challenged. Indeed, the covering property had not been formulated and proved before Borel. What Heine did do was to formulate the notion of uniform continuity, which had escaped Cauchy's attention, and to prove the classical theorem on uniform continuity of continuous functions, which could rightfully be called Heine's theorem. One might, however, argue that this was the essential discovery and that Borel's reduction of uniform continuity to the covering property was a relatively minor achievement. Heine's name was connected to this theorem by A. Schoenfliess, although he later omitted Heine's name. Heine wrote a few more papers on fundamental questions. It seems not unlikely that in some way the paper on uniform continuity had its origin in the influence of Cantor, Heine's colleague at Halle.

BIBLIOGRAPHY

I. Original Works. Heine's works include *Handbuch der Kugelfunctionen, Theorie und Anwendungen* (Berlin, 1861; 2nd ed., 1878–1881); and "Die Elemente der Functionenlehre," in *Journal für die reine und angewandte Mathematik*, **74** (1872). 172–188. His papers are listed in Poggendorff, I (1863), 1050, and III (1898), 606.

II. Secondary Literature. On Heine and his work, see A. Wangerin, "Eduard Heine," in *Mitteldeutsche Lebensbilder*, III (Magdeburg, 1928), 429–436. For the theorem with Heine's name, see A. Schoenflies, "Die Entwicklung der Lehre von den Punktmannigfaltigkeiten," in 2 pts., in *Jahresbericht der Deutschen Mathematikervereinigung*, **8** (1900), 51, 109, and supp. 2 (1908), 76; both pts. were reprinted in *Entwicklung der Mengenlehre und ihrer Anwendungen*, 2nd ed., vol. I (Leipzig, 1913), 234.

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