Rosenhain, Johann Georg | Encyclopedia.com

(*b*. Königsberg, Prussia, 10 June 1816; *d*. Königsberg, 14 May 1887)

mathematics.

Rosenhain studied at the University of Königsberg, where he earned the Ph.D. In 1844 he qualified as lecturer at the University of Breslau and remained there as a *Privatdozent* until 1848. His participation in the revolutionary activities of 1848 deprived him of any chance to further his career at Breslau. He therefore qualified as lecturer again in 1851, this time at the University of Vienna. In 1857 he returned to Königsberg, where he was an associate professor until a year before his death.

While studying at Königsberg, Rosenhain was especially close to Jacobi; and while still a student in the 1830's he edited some of Jacobi's lectures. His own scientific activity was mainly inspired by Jacobi, who had enriched the theory of elliptic functions with many new concepts and had formulated, on the basis of Abel's theorem, the inverse problem, named for him, for an Abelian integral on a curve of the arbitrary genus p. The next step was to solve this problem for $p = 2$.

In 1846 the Paris Academy had offered a prize for the solution of that problem, and Rosenhain won it in 1851 for his work entitled "Sur les fonctions de deux variables à quatre périodes, qui sont les inverses des intégrales ultra-elliptiques de la première classe." Göpel had solved this problem at almost the same time, but he did not enter the competition. Rosenhain's work followed Jacobi even more closely than did Göpel's.

In his unpublished dissertation Rosenhain had already treated triple periodic functions in two variables. The solution of the inverse problem for $p = 2$ presented him with considerable difficulties, as can be seen in his communications to Jacobi published in Crelle's *Journal*. It was not until chapter 3 of his prize essay that he introduced, in the same manner as Göpel, the sixteen θ functions in two variables and examined in detail their periodic properties and the algebraic relations.

Most important, Rosenhain demonstrated (in modern terminology) that the squares of the quotients of these sixteen θ functions can be conceived of as functions of the product surface of a hyperelliptic curve of $p = 2$ with itself. Starting from this point and employing the previously derived addition theorem of the θ quotients, Rosenhain succeeded in demonstrating more simply than Göpel that these quotients solve the inverse problem for $p = 2$. Rosenhain never fulfilled the expectations held for him in his younger years, and published nothing after his prize essay.

BIBLIOGRAPHY

Extracts from most of Rosenhain's letters to Jacobi concerning hyperelliptic transcendentals are in *Journal für die reine und angewandte Mathematik*, **40** (1850), 319–360. Rosenhain's prizewinning work is "Sur les fonctions de deux variables à quatre périodes, qui sont les inverses des intégrales ultra-elliptiques de la première classe," in *Mémoires présentés par divers savants*, 2nd ser., **11** (1851), 361–468; also translated into German as *Abhandlung über die Functionen zweier Variabler mit vier Perioden*, Ostwalds Klassiker der Exakten Wissenschaften, no. 65 (Leipzig, 1895).

Werner Burau