A lost mathematician, Takeo Nakasawa : the forgotten father of matroid theory

	Nishimura Hirokazu, Kuroda Susumu
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Mathematics around Takeo Nakasawa

1. Linear Algebra

Nowadays every freshman or sophomore specialized in science, engineering and economics is required to study linear algebra as well as advanced calculus. Nevertheless we should not forget that linear algebra is a relatively new field in the very long history of mathematics. Linear algebra was once known as the theory of matrices and determinants. It took a long period for mathematicians to accept non-numerical entities as objects of their own research. Therefore it is not surprising to note that determinants were introduced long before matrices were exactly formulated, because determinants are numerical entities, though obtained through relatively complicated processes, but matrices are not. It was in the latter half of the 17th century that two great mathematicians discovered determinants independently, one in Japan and the other in Hanover, which lies in the Western part of Germany now. The former was called Takakazu Seki, and the other was called Gottfried Wilhelm Leibniz. Unfortunately their discoveries did not have a great influence on the main development of mathematics. What is now called the formula of Cramer was announced by Cramer in 1750. It was Cauchy that has established a systematic theory of determinants in 1812. In 1858 Cayley published a paper containing a result which is now called the Cayley-Hamilton theorem. What is now called the Jordan standard form of a square matrix was discovered by Jordan in 1871, when he was keenly aware of its applications in the theory of linear differential equations. It was Frobenius that has introduced the notion of linear independence in solutions for linear equations in 1879. The abstract notion of a vector space was introduced by Peano in 1888, though it attracted little attention at that time, and it was reintroduced by later mathematicians such as Steiniz in the context of algebraic extensions of fields in 1910. It is