

*Dedicated to Mie Nakasawa, who is a sister-in-law
of Takeo Nakasawa. Fortunately she is still alive,
and Takeo Nakasawa is still alive in her memory.*

Preface

Takeo Nakasawa was a very unfortunate mathematician. He was born in Kochi prefecture of Japan in 1913, and he died of dystrophia at the age of 33 in Khabarovsk in the Soviet Union in 1946. He was forced to live his youth in Japan in an era of a fanatical government, which entered upon the Fifteen Years War (1931–1945) without any clear purpose or any efficient leadership. His discovery of matroid theory, made independently of the work of American mathematician Hassler Whitney, remained unnoticed or forgotten for a long time. As far as I know, it was Joseph P. S. Kung who discovered Nakasawa in his thorough investigation on the history of matroid theory in the 1980s. Nakasawa wrote four papers, the first three of which were concerned with what is now called matroid theory. The remaining paper was concerned with general topology. All four papers were written in German in the 1930s, and they were published in the same university bulletin, namely, the bulletin of the Tokyo University of Arts and Sciences, from which Nakasawa graduated in 1935 and where he stayed as an assistant until August 1938. His four papers were published during 1935–1938. His career as a mathematician ended in 1938 or so. He left Japan for Manchuria to seek a new life in a new frontier. In Manchuria he worked as a bureaucrat and married a Japanese woman in July 1939. He had three children there. At the end of the Second World War, the Soviet Union invaded Manchuria and took away many Japanese soldiers to such harsh places as Siberia, where they were forced to perform hard labor in camps without sufficient food or shelter. Nakasawa was one of these unfortunate Japanese soldiers to suffer such a brutal death in Siberia.

In summer 2006 Akira Saito, a professor of the Department of Computer Science and System Analysis of Nihon University, asked members of the Institute of Mathematics of our university, via Professor Akito Tsuboi of our institute, how to write “Takeo Nakasawa” in Chinese characters. This was the

first time I ever heard the name. By consulting *Zentralblatt Math*, I could easily identify his four papers, all of which were published in the bulletin of the Tokyo University of Arts and Sciences (which became the Tokyo University of Education after the Second World War). In the 1970s our university, called University of Tsukuba, replaced the Tokyo University of Education. For this historical reason, these three universities have the same association of alumni, and the central library of our university has a special corner for materials related to the above association of alumni. Therefore it was not difficult for me to find that Nakasawa was an assistant of the Tokyo University of Arts and Sciences when his four papers were published, and that Nakasawa had died by 1953. Then a question arose in my mind of when and how Nakasawa died and why at such a relatively young age. Although a complete answer to the question could not be determined, I could easily find how to write Takeo Nakasawa in Chinese characters, and I conveyed the result to Professor Saito.

Hiroyuki Tachikawa, who is presently an emeritus professor of our university and was once a student of Kiiti Morita, came to our university two days a week after his retirement. Kiiti Morita is famous for Morita equivalence and Morita duality. I consulted with Tachikawa about this question, and he was so kind as to get in touch with Tokunosuke Yoshida, who was once a lecturer of Tokyo high school for teachers and had connections with some people surrounding Nakasawa. According to Yoshida, Nakasawa presumably went to Manchuria after he was dismissed from the Tokyo University of Arts and Sciences. Then an idea came to my mind that if he went to Manchuria in the 1930s and had stayed there until the end of the Second World War, it was very probable that he was detained in Siberia or some other places in the Soviet Union by the invading Soviet forces and was forced to labor there. I know well that many Japanese soldiers had the same or similar experiences. Then another idea came to my mind that Nakasawa might have died in the Soviet Union, because I know well that many former Japanese soldiers detained in Siberia or other places in the Soviet Union at the end of the Second World War had died there for unbalanced nutrition or some other diseases. In December 2006 I asked Yasukuni Shrine, where the war dead of modern Japan was apotheosized, about Takeo Nakasawa. Yasukuni Shrine was kind enough to investigate its records, and it got seven hits on the name “Takeo Nakasawa”. Only one of the seven Takeo Nakasawas had the same birthday as the one I was looking for. To confirm my discovery, I asked Yasukuni Shrine where Takeo Nakasawa was born. A spokesperson there replied “Kochi prefecture (of Japan)”, which gave me confidence that I had really found the mathematician I had been seeking.

A fortunate discovery was that Nakasawa’s sister in law was still alive. Her name is Mie Nakasawa. Even if Nakasawa were alive, he would at the time of my investigation have been 94 years old. This meant that it would not be easy to find someone who knew him personally. This is particularly so for a person who died almost unnoticed in the Soviet Union at the age of 33 in 1946.

Thanks to M. Nakasawa, I learned that Nakasawa had married in Manchuria and had three children. Thanks to her generous permission, I was able to look at a copy of Takeo Nakasawa's family register. Although M. Nakasawa was only 7 years old or so when Takeo Nakasawa left for Manchuria, and although she had not met him since then, she was of much help in my preparation of this book. In particular, she had finally found Takeo Nakasawa's photos, which we once believed to have been lost under the utter confusion of the Second World War. I am very happy to be able to include these photos in the book. There are more than ten photos, ranging from his childhood to one in 1944 (two years before his death), in which he stood with his first son and his first daughter.

If Nakasawa's four papers in German were available only in the bulletin of the Tokyo University of Arts and Sciences, they would remain almost unnoticed forever. It is never easy to access the publications of an extinct university, and German is not so popular as it once was in mathematics. This is the reason why I have decided to translate his four German papers into English and to publish them in a book form. The translation was not a simple matter. Since I am not familiar with German, I asked Professor Kuroda, who is an expert in German, to cooperate with me in translation as the coauthor. Professor Kuroda kindly accepted my offer. Frankly speaking, Nakasawa's German was not necessarily sophisticated, and so my English translation is not verbatim. I tried to make Nakasawa's works as accessible as possible to our contemporary mathematicians, not to mathematicians in the 1930s. Nakasawa's notation was considerably antic. By way of example, he wrote $A \leftarrow \rightarrow B$ in place of $A \leftrightarrow B$ (two propositions A and B are equivalent) and $*a_2, \dots, a_n$ in place of $\hat{a}_1, a_2, \dots, a_n$ (the sequence obtained from the sequence a_1, a_2, \dots, a_n by elimination of the first element a_1). In this sense I am not only the translator but the strict referee of his papers. Since Professor Kuroda was not familiar with mathematics, I asked him to translate Nakasawa's four German papers into English without taking notice of mathematical expressions or mathematical jargon at all. Professor Kuroda was so efficient as to give me the English translation of Nakasawa's four papers, one a month for four consecutive months. My work began upon these first English drafts. Strictly speaking, the fourth paper of Nakasawa, which was concerned with general topology, was dealt with principally by Professor Kazuhiro Kawamura of our institute, who is so reserved as to decline to post his name as a coauthor. Nevertheless, I gladly acknowledge that Kawamura's contribution to this book was essential and crucial.

The 1930s, when Nakasawa did his own research on linear dependence and general topology, were an age of storm and stress (*Sturm und Drang*) both in the world and in Japan. In Germany, the Weimar Constitution was replaced by the Nazi party in 1933, which caused a great exodus of European intellectuals into the U.S. In the early days of the 1930s, Japan occupied the whole of Manchuria to establish its puppet state called Manchukuo, while the military became a powerful political power and Japan became more and more

fanatical at home. To understand Nakasawa's life, the reader should understand this situation, in particular, why Japan was led to the Fifteen Years War (1931–1945) internationally at a time when it was a terribly fanatical state domestically. Since European and American readers are not necessarily familiar with Japanese history, I have tried to tell this story in the first four chapters. Those chapters are presented without references, which does not mean that I would like to claim originality there. On the contrary, I have exploited the common knowledge of history, and I have consulted many Japanese books written by true historians. It would be absurd to believe that a mathematician could present original results in history, and I make no such claim. The fifth chapter is devoted to a brief review of the mathematical landscape surrounding Nakasawa in the 1930s. To understand someone in the past, it is necessary to understand him or her historically, i.e., in the historical context where the person at issue was destined to live.

Acknowledgements In preparing this book, I owe much to many people. First of all, I must express my deep thanks to Professor Akira Saito, who let me know that there was a great mathematician called Takeo Nakasawa. Without him, I would never have know even his name. I would like to express my sincere gratitude to Yasukuni Shrine, which has apotheosized Takeo Nakasawa among the war dead for decades. I am thankful to Professor Kikai, a professor in philosophy of our university, who introduced me to Professor Kuroda. I am deeply indebted to Tachikawa and Yoshida, who have turned my attention to Manchuria. I am also indebted to Professor Kawamura, who did most of the preparation of the complete English translation of Nakasawa's fourth paper based on Kuroda's tentative translation into English. I am very glad to acknowledge my indebtedness to M. Nakasawa, without whom it would have been impossible for me to trace the personal trail of Takeo Nakasawa. I am also glad to acknowledge my indebtedness to Hamada, who worked in the bureau of welfare in Kochi Prefecture, sent me Takeo Nakasawa's military record, and introduced me to M. Nakasawa. I owe much to Professor Günter M. Ziegler who, amidst his demanding responsibilities as president of the Mathematical Society of Germany, took the time to help make this conjectured book become a reality by recommending it to Birkhäuser. I owe much also to Thomas Hempfling and Karin Neidhart of Birkhäuser for their endeavors in publishing this book. Last but not least, I am deeply indebted for financial support to the Institute of Mathematics of the University of Tsukuba.

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