

## JUN-ITI NAGATA

### 1925-2007

Professor Jun-iti Nagata passed away on November 6, 2007. His death saddened the international community of topology, especially general topology by losing one of the leaders in this field.

Jun-iti Nagata was born on March 4, 1925 in Osaka. He graduated from Naniwa High School (under the old education system) in 1944, and Tokyo Imperial University (B.A.) in 1947 directed by Professor S. Iyanaga. Nagata said in his reminiscences [5] that he read the following books when he was a student: P. Alexandroff-H. Hopf, *Topologie I*; A. Weil, *Sur les espaces á structure uniforme et sur la topologie générale*; J. Tukey, *Convergence and uniformity in topology*. The book of Alexandroff-Hopf had the most influence on him, and the book is in his room still now. His carrier as a researcher began from a research assistant at Osaka University in 1948. He became a lecturer at Osaka City University at the foundation of Osaka City University in 1949, and he was an associate professor at Osaka City University (1955-1961) and a professor at Osaka City University (1961-1965). The first professor-ship in abroad was a visiting Professor at University of Washington in 1959. While being a professor at Osaka City University, he visited Institute for Advanced Study in 1963 and continued his stay in US. Finally he was a professor at University of Pittsburgh (1965-1975) and then he went to Europe, and was a professor at University of Amsterdam (1975-1982). He came back to Japan in 1982 as a professor at Osaka Kyoiku University (1982-1990). After the retirement at Osaka Kyoiku University, he was a professor at Osaka Electro-Communication University (1990-1995). We saw that Nagata was a professor at the universities in the world, Asia, United States and Europe, and we realized that he was a leader of topology in the world. He was awarded Doctor of Science in 1956 from Osaka University.

Every topologist knows his name by the famous Nagata-Smirnov Metrization Theorem: A regular space is metrizable if and only if it has a  $\sigma$ -locally finite base. He proved the theorem in 1950 “On a necessary and sufficient condition of metrizability, *J. Inst. Polytech, Osaka City Univ.* 1 (1950) 93-100” at the beginning of the career of his research. Then he had been working on the theory of the metrization and generalized metric spaces more than 50 years. One day, after a seminar at Osaka Kyoiku University, Nagata told us that he knew nothing about the work of Smirnov during the study of the metrization theorem, and he learned Smirnov’s work from a Russian topologist. Nagata wanted to see Smirnov very much after knowing his work, and could meet Smirnov at the First Prague Topology Symposium in 1961. The topic of Nagata’s first paper is rings of continuous functions on uniform spaces “On lattices of functions on topological spaces on uniform spaces, *Osaka Math. J.* 1 (1949), 166-181”. In the paper, he proved that if the rings of real-valued continuous functions  $C_p(X)$  and  $C_p(Y)$  are topologically isomorphic, then the spaces  $X$  and  $Y$  are homeomorphic. The paper influenced in further studies in the theory of the rings of continuous functions and topological function spaces (cf. [1]).

Nagata also contributed to dimension theory very much. His first journal paper on dimension theory was published in 1956. Dimension and the metrization were his main interests in research, and they were interrelated in each other for him. His book “Modern

Dimension Theory”, North-Holland Publ., 1965, which was extended and revised in 1983 by Heldermann Verlag, contains a chapter “Dimension and Metrization (Chapter V in the revised publication)”, and we may find the essence of his idea or spirit in the chapter. He compared some theorems from dimension theory and the metrization theory each other. This attempt made us clarify the relationship between dimension and metrization theories.

The rings (lattices) of continuous functions, the metrization theory and dimension theory were the major themes of his research. We can know that from his paper “Open problems left in my wake of research, *Topology Appl.* 146-147 (2005), 5-13”. He posed (or reposed) several questions concerning the metrization and generalized metric spaces, the topics from dimension theory, and the rings of continuous functions. And he said in the paper that “...the main motivation of these twelve questions is just my curiosity, which has impelled the author to work in general topology for more than half century.”

Nagata wrote more than 100 articles and two books: *Modern Dimension Theory*, North-Holland Publ., 1965 (and revised on 1983 by Heldermann Verlag); *Modern General Topology*, North-Holland Publ., 1968 (and revised on 1985 by North-Holland Publ.). He also edited monographs; *Topics in General Topology* (North-Holland Publ., 1989) with K. Morita, and the encyclopedia; *Encyclopedia of General Topology* (Elsevier Sci. Publ. 2004) with K. P. Hart and J. Vaughan. Nagata gave a lot of theorems on general topology, and we can find them in the standard textbooks which cite his theorems [2], [3], [4], [6].

Nagata was also interested in all activities which contributed for topology community; attending or organizing the conference, symposium and seminars, and editing the journals. In particular, he attended the Prague Topological Symposium several times, which is one of the most important conference in topology in the world. We can find his name in the list of the contributions of the First Prague Topology Symposium among the leaders of topology, say R. D. Anderson, P. S. Alexandroff, A. V. Arhangel'skii, R. H. Bing, K. Borsuk, K. Kuratowski, C. H. Dowker, J. de Groot, E. Hewitt, E. Michael, B. A. Pasynkov, Yu. M. Smirnov and M. H. Stone. In his essay “Looking back at modern general topology in the last century, M. Husěk and J. van Mill eds., *Recent progress in General Topology II*, North-Holland (2002), 561-564”, he said that the symposium was very impressive, because the leaders of the old (first half of the century) general topology (P. S. Alexandroff, K. Borsuk, M. Fréchet, K. Kuratowski, M. H. Stone) met the leaders of the new (second half of the century) general topology (R. D. Anderson, A. V. Arhangel'skii, R. H. Bing, C. H. Dowker, E. Eilenberg, R. Engelking, Z. Frolik, J. de Groot, E. Hewitt, M. Katětov, E. Michael, B. A. Pasynkov, and Yu. M. Smirnov). Of course, Nagata was one of the leaders of the new general topology. He presented a talk about “On dimension and metrization” at the symposium.

He came back to Japan in 1982. Then, he organized a seminar at Osaka Kyoiku University, which was originated by S. Hanai and continued by A. Okuyama. The seminar had been held on every Tuesday afternoon and some of the general topologists near Osaka area attended the seminar; A. Okuyama (Kobe Univ.), F. Ishikawa (Osaka Women's Univ.), Y. Yasui (Osaka Kyoiku Univ.), I. Yoshioka (Okayama Univ.), Y. Inui (Kobe Gakuin Univ.), S. Nitta (Shijounawate Women's College), S. Ikenaga (Nara College Tech.), A. Koyama (Osaka Kyoiku Univ.), Y. Hattori (Osaka Kyoiku Univ.), K. Yamada (Osaka Kyoiku Univ.) and the postgraduate students of Osaka Kyoiku University. After the last seminar in each semester, we usually went to a restaurant, and we enjoyed eating, drinking and talking. Nagata liked drinking beer and enjoyed the conversation with the members of the seminar.

Nagata organized the Symposium of General Topology since 1982, which was originated by K. Morita in about 1965. He also started to organize the Soviet-Japan Joint Symposium in 1986. The first Soviet-Japan Joint Symposium was held in Tokyo in June, 1986, and then the symposium was held in Khabarovsk in September, 1989 and Niigata in 1992.

Unfortunately, the symposium was held only three times, because it was hard to continue the symposium by the changes of the social systems of Russia.

We should notice that he wrote several survey papers and essays, and which contained several open questions. It might be important for him that he posed the open questions which should be interested. In this spirit, he originated an international journal “Questions and Answers in General Topology” in 1980, and he managed the journal over 25 years. He was a member of the editorial board of the following international journals:

- Questions and Answers in General Topology (Managing Editor, Symposium of General Topology, Japan)
- Topology and its Applications (Editor and Advisor, Elsevier Sci. Publ.),
- Houston Journal of Mathematics (Editor, University of Houston, USA),
- Scientiae Mathematicae Japonicae (Editor, ISMS, Japan), and
- Rendiconti del Circolo Matematico di Palermo (Editor, Italy).

Nagata enjoyed mathematics as well as his life by fishing and traveling. He had a second house in Shirahama, Wakayama Prefecture, a town near Pacific Ocean. He used to go there and enjoyed fishing with his wife. He traveled almost everywhere in the world, and also in Japan.

His works on topology, especially metrization theory and dimension theory, stand in the center of general topology still now, and the questions posed by himself through a light in the future researches in general topology. We never forget him as a leader of “new” general topology and an excellent teacher.

#### REFERENCES

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