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Our Future, Our Heritage. The Chemical Family Tree of Tetsuo Nozoe

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Note from the Editor:
When I was editing Tetsuo Nozoe's autobiography Seventy Years in Organic Chemistry *in the late 1980s, I realized that the history of Japanese organic chemistry was not too well known in countries other than Japan. I urged Professor Nozoe to include the historical context of his life in his writings, and I was absolutely delighted that he did so. I also suggested that he publish a "Riko Majima Family Tree in Chemistry." Majima was not only Nozoe's professor but, as detailed in Nozoe's autobiography and elsewhere in the literature, the father figure of Japanese organic chemistry. Nozoe was reluctant because to single-out some chemical academics but not others in such a public manner could—would—prove embarrassing. But faithful to his profession, the obligations to history prevailed and Nozoe's autobiography contains the Majima Family Tree. We now skip ahead 25 years where we are immersed in the publication of the* Nozoe Autograph Books *(see:* http://www.tcr.wiley-vch.de/nozoe *and this introductory essay:* J. I. Seeman, *Chem. Rec.* **2012**, *12*, 517–531). *I find myself once again an editor studying in the life and legacies of Riko Majima and Tetsuo Nozoe. The "repeating experiences" of history have been felt once again!*† *I asked Professors Ichiro Murata, Shô Itô, and Toyonobu Asao (who are Professor Nozoe's students and biographers) to follow Professor Nozoe's lead and provide his Family Tree in Chemistry. What follows is a reproduction of the Majima Family Tree as provided by Professor Nozoe along with the next generation Family Tree, that being the students of Tetsuo Nozoe's students who themselves became illustrious professors.*

—Jeffrey I. Seeman
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In 1991, Tetsuo Nozoe (1902–1996) published his autobiography, *Seventy Years in Organic Chemistry.*[1] In that volume, Nozoe not only discusses his life and his chemical research but also provides an understanding of the development of—at least a slice of—organic chemistry in Japan in the 20th century. Nozoe included a Riko Majima Family Tree in Chemistry, Majima being Nozoe's professor. Indeed, Majima was also the

§Biographies of the authors can be found in the published biography of Tetsuo Nozoe in this series: I. Murata, S. Itô, T. Asao, *Chem. Rec.* **2012**, *12*, 599–607. Their photographs are found in Table 2 of this paper.
†For an interesting discussion of the repeating and also cumulative nature in the study of history, see the discussion by Mark C. Eilliot in: N. Heller, *The New Yorker* **2013**, http://www.newyorker.com/reporting/2013/05/20/130520fa_fact_heller, accessed May 21, 2013. JIS thanks Roald Hoffmann for bringing this publication to his attention.

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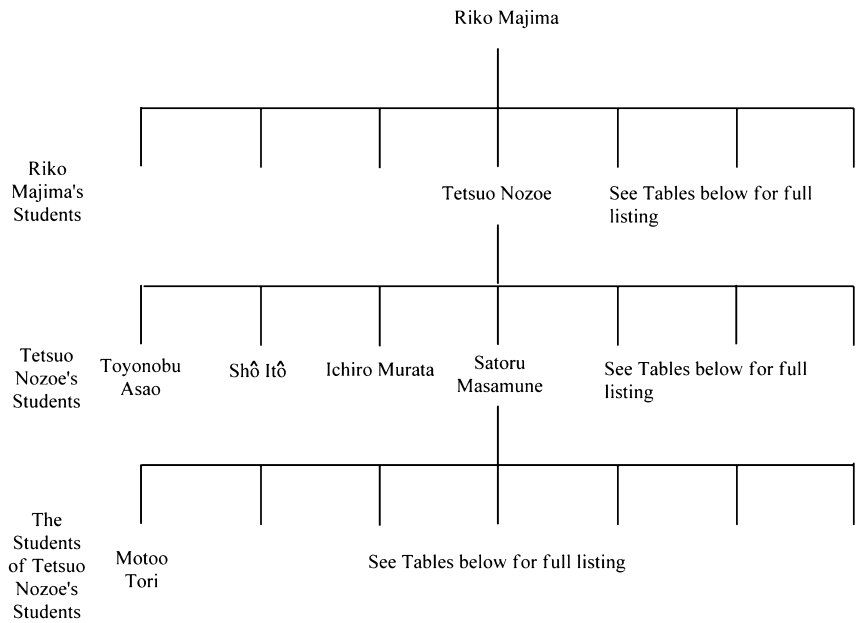

Fig. 1. An illustration of the three generations of leading academic chemists who were related to Professor Riko Majima (first generation) or to Professor Tetsuo Nozoe (second generation) or to the students of Professor Nozoe's leading students (third generation). See Tables 1 and 2 for full listings.

most important Japanese chemist in the first half of the 20th century[2,3] and the chemical father of numerous important Japanese chemists of the next generation. According to Nozoe,

> "This tree lists people in academic positions only and does not include scientists who joined industry. . . . I constructed the Majima tree following an earnest request from the editor. It is quite possible that the names of many important chemists are missing. I take full responsibility for such inadvertent omissions."[1]

In the recent past, there has been an increased interest in chemical genealogy as witnessed by several websites that include genealogies of the faculty within a specific chemistry department[4–6] as well as sites that are, to some extent, worldwide in scope.[7–10] Just as said by Nozoe,[1] we—the authors of this paper—constructed the Nozoe tree following an earnest request from the editor of the Nozoe Autograph Books project, indeed, the same individual who edited Professor Nozoe's autobiography, Jeffrey I. Seeman. We also stipulate, and are pleased to use the words of our own Professor, that it is quite possible that the names of many important chemists are missing. We take full responsibility for such inadvertent omissions.

Figure 1 illustrates the three levels of genealogy that are reported herein. Table 1 is reproduced from Tetsuo Nozoe's autobiography[1] and represents his Majima Chemistry Tree, including 16 "First Generation" Majima students (i.e., Majima "academic children"), one of whom is Nozoe himself, and numerous "Second Generation" students who are essentially Majima "academic grandchildren." Nozoe included only students who were academics. Table 1 also lists the academic institution to which each entry was most closely associated. Interestingly, Nozoe listed Tohoku University, where he taught from 1948 until 1966, rather than (or both) Taihoku Imperial University and the new National Taiwan University, where he taught from 1929 until May 1948 when he and his family repatriated to Japan.

At the request of the editor of the Nozoe Autograph Book project,[11] Jeffrey I. Seeman, the present authors constructed a Nozoe Chemistry Tree (Table 2). This Tree begins with the 16 academic chemists that Professor Nozoe himself identified when he constructed the Majima Tree (Table 1). We faced the same challenge that Professor Nozoe did twenty-five years ago when he prepared the Majama Tree: Who and how many should be included? What are the criteria? In making these decisions—rather subjective judgments—we knew, as did Professor Nozoe, that some of our decisions would surely be unrigorous and that some feelings were likely to be hurt. We were encouraged by Dr. Seeman who said, "The enemy of better is best." Seeman further pointed out, as he did when encouraging Professor Nozoe, that we are acting in the service of history of chemistry and for the good of the international community of chemists.

We are certain that Professor Nozoe would applaud our intentions. We offer the information in this paper in his memory and in his honor. We are very proud to include this paper as one of the accompanying essays with the Nozoe Autograph Books project.[12,13]

Table 1. Majima Family Tree in Chemistry.[a,b,c]

"Professor Riko Majima (1874–1962; Tohoku University and Osaka University) graduated from Tokyo Imperial University in July 1898 and subsequently earned the D.Sc. degree for his contributions to research. He investigated the ozonolysis of urushiol and other subjects from 1907 to 1910 under C. D. Harries at Kiel University in Germany, then spent another year and a half with R. Willstätter in Zürich and at the Davy Faraday Institute in London. He returned to Japan after four years and was appointed professor at the newly established Tohoku Imperial University."[a]

Riko Majima at Tohoku University, 1958

First Generation	Second Generation
Chika Kuroda (1915) (Tokyo Higher Normal School)	
Harusada Suginome (1918) (Hokkaido University, Sapporo)	Sumio Umezawa (Keio University, Tokyo) Toshi Irie (Hokkaido University, Sapporo) Takashi Matsumoto (Hokkaido University, Sapporo) Tadashi Masamune[d] (Hokkaido University, Sapporo) Hiroshi Suginome (Hokkaido University, Sapporo) Masaji Ohno (The University of Tokyo) Akira Suzuki[e] (Hokkaido University, Sapporo)
Munio Kotake (1919) (Osaka University)	Takashi Kubota (Osaka City University) Yasuhide Yukawa (Osaka University) Takeo Sakan (Osaka City University) Masazumi Nakagawa (Osaka University) Masao Nakazaki (Osaka University) Tetsuo Shiba (Osaka University) Toshio Miwa (Osaka City University) Soichi Misumi (Osaka University) Keizo Naya (Kwansei Gakuin University)
Shinichi Morio (1919) (Tohoku University)	
Shinichi Kawai (1922) (Tokyo University of Literature & Science)	Noboru Sugiyama (Tokyo University of Education) Masahiro Hatano (Tohoku University)
Terutaro Ogata (1922) (RIKEN)	
Shinichiro Fujise (1923) (Tohoku University)	Sekio Mitsui (Tohoku University) Shinichi Sasaki (Toyohashi University of Technology) Hisashi Uda (Tohoku University)
Toshio Hoshino (1924) (Tokyo Institute of Technology)	Yoshio Iwakura (Tokyo Institute of Technology) Masaki Ohta (Tokyo Institute of Technology) Kenzo Kurihara (Hokkaido University, Sapporo) Tetsuo Sato (Tokyo Institute of Technology) Teruaki Mukaiyama (The University of Tokyo) Hisatsugu Yoshimura (Tokyo Institute of Technology) Oyo Mitsunobu (Aoyama Gakuin University, Tokyo)

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Table 1. (*Continued*)

First Generation	Second Generation
Shiro Akabori (1925) (Osaka University)	Yoshio Matsushima (Osaka University) Nobue Hagihara (Osaka University) Seinosuke Otsuka (Osaka University) Yuichi Yamamura (Osaka University) Ryo Sato (Osaka University) Yoshiharu Izumi (Osaka University) Nobuo Tamiya (Tohoku University) Kozo Narita (Osaka University) Hidesaburo Hanafusa (Rockefeller University) Masatsugu Inoue (New York State University) Yoshimi Okada (The University of Tokyo) Tokuji Ikenaka (Osaka University) Masayasu Nomura (University of Wisconsin) Hiroshi Kotake (Kanazawa University) Akira Tsugita (Tokyo Science University) Fumio Sakiyama (Osaka University)
Masuo Murakami (1926) (Osaka University)	Yasuhide Yukawa (Osaka University) Shigeru Oae (University of Tsukuba) Ichiro Moritani (Osaka University) Yoshiyuki Okamoto (Polytechnic Institute of New York University) Shinya Nishida (Hokkaido University, Sapporo)
Tetsuo Nozoe (1926) (Tohoku University)	Akira Yokoo (Okayama University) Shuichi Seto (Tohoku University) Yoshio Kitahara (Tohoku University) Toshio Mukai (Tohoku University) Shô Itô (Tohoku University) Akira Yoshikoshi (Tohoku University) Kahei Takase (Tohoku University) Satoru Masamune (Massachusetts Institute of Technology) Ichiro Murata (Osaka University) Yusaku Ikegami (Tohoku University) Toyonobu Asao (Tohoku University) Hitoshi Takeshita (Kyushu University) Shigeo Nozoe (Tohoku University) Kyozo Ogura (Tohoku University) Tsutomu Miyashi (Tohoku University) Masaji Oda (Osaka University)
Eiichi Funakubo (1928) (Osaka University)	Minoru Imoto (Osaka City University) Ichiro Moritani (Osaka University) Niichiro Tokura (Tohoku University) Eiji Imoto (Osaka Prefecture University) Hiroshi Taniguchi (Kyushu University) Shun-ichi Murahashi (Osaka University)
Shunsuke Murahashi (1930) (Osaka University)	Nobue Hagihara (Osaka University) Seinosuke Otsuka (Osaka University) Heimei Yuki (Osaka University) Hiroshi Yamazaki (RIKEN) Akira Nakamura (Osaka University)
Kunisaburo Tamura (1930) (RIKEN)	

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Table 1. (*Continued*)

First Generation	Second Generation
Takeo Kaneko (1931) (Osaka University)	Masazumi Nakagawa (Osaka University) Tetsuo Shiba (Osaka University) Kaoru Harada (University of Tsukuba) Terukiyo Hanafusa (Osaka University) Takashi Amiya (Hokkaido Institute of Pharmaceutical Sciences) Shoichi Kusumoto (Osaka University)
Takashi Kubota (1932) (Osaka City University)	Keizo Naya (Kwansei Gakuin University) Teruo Matsuura (Kyoto University) Isao Kubo (University of California – Berkeley) Yoko Naya (Suntory Institute of Bioorganic Sciences) Takashi Tokoroyama (Osaka City University) Tadao Kamikawa (Kinki University)

[a]This table and footnotes (b) and (c) are reproduced from: Tetsuo Nozoe's autobiography, "Seventy Years in Organic Chemistry" in *Profiles, Pathways and Dreams* (Ed.: J. I. Seeman), American Chemical Society, Washington, D.C., **1991**, with permission of the Nozoe family. Several translational and/or typographical errors in the original have been corrected. [b]"In prewar Japan, it was customary to submit the Ph.D. thesis after many years of research and after being appointed to the rank of assistant and associate professor; thus, the years listed in this tree generally denote the year of graduation with a B.Sc." See footnote (a). [c]"This tree lists people in academic positions only and does not include scientists who joined industry." See footnote (a). [d]Brother of Satoru Masamune. See his entry as a student of Tetsuo Nozoe. See also: T. Masamune, H. Masamune, T. Masamune, *Chem. Rec.* **2013**, *13*, 257–264. [e]Recipient of the 2010 Nobel prize in chemistry, shared with Richard F. Heck and Ei-ichi Negishi.

Table 2. Nozoe Family Tree in Chemistry.[a]

Tetsuo Nozoe taught at Taihoku Imperial University in what was then Formosa from 1929 and continued, after the war, in Taiwan from 1946 to May 1948 at the new National Taiwan University; and from 1948 until 1966 at Tohoku University in Sendai.

Tetsuo Nozoe, 1952.

	First Generation[b]	Second Generation[c]
	Akira Yokoo (1936) (Okayama University)	Shoichiro Ozaki (Ehime University) Shinji Omori (Okayama University) Setsuo Kashino (Okayama University) Masayasu Akiyama (Tokyo University of Agriculture and Technology) Hiroshi Yamamoto (Okayama University)[d] Akihiko Kawaguchi (The University of Tokyo) Kyosuke Satake (Okayama University)
	Shuichi Seto (1939) (Tohoku University)	Tokuzo Nishino (Tohoku University) Shunsuke Takenaka (Yamaguchi University) Tanetoshi Koyama (Tohoku University)

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Table 2. (*Continued*)

	First Generation[b]	Second Generation[c]
	Yoshio Kitahara (1945) (Tohoku University)	Kuninobu Kabuto (Tohoku University) Takahisa Machiguchi (Saitama University)[d] Akio Tajiri (Hirosaki University) Hiroshi Yanagawa (Keio University)
	Toshio Mukai (1947) (Tohoku University)	Makoto Nitta (Waseda University) Katsuhiro Saito (Nagoya Institute of Technology) Masaru Kimura (Okayama University) Yoshiro Yamashita (Tokyo Institute of Technology) Keiji Okada (Osaka City University) Yoshihiro Ohba (Yamagata University) Yasutake Takahashi (Toyama University) Eietsu Hasegawa (Niigata University) Yasuhiko Kawamura (Tokushima University) Masaki Kamata (Niigata University) Takanori Suzuki (Hokkaido University, Sapporo)
	Shô Itô (1950) (TohokuUniversity)	Yutaka Fujise (Hamamatsu University School of Medicine) Mitsuaki Kodama (Tokushima Bunri University) Akira Mori (Kyushu University) Yoshimasa Fukazawa (Hiroshima University) Mitsuyoshi Yatagai (The University of Tokyo) Tohru Shimizu (Tohoku University) Takashi Takahashi (Tokyo Institute of Technology) Masahiro Hirama (Tohoku University)[d] Nobuo Kato (Osaka University) Kazuaki Shimada (Iwate University) Yoshito Watanabe (Nagoya University) Tetsuto Tsunoda (Tokushima Bunri University) Hideaki Hioki (Gunma University) Tohru Oishi (Kyushu University)
	Akira Yoshikoshi (1950) (Tohoku University)	Masaaki Miyashita (Hokkaido University, Sapporo) Hisahiro Hagiwara (Niigata University) Noritaka Chida (Keio University)
	Kahei Takase (1951) (Tohoku University)	Masafumi Yasunami (Nihon University) Masayoshi Ando (Niigata University) Noritaka Abe (Yamaguchi University) Shinzo Kagabu (Gifu University) Kazuo Yoshino (Shinshu University) Tatsuo Watanabe (University of Shizuoka) Minoru Hanaya (Gunma University)

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Table 2. (*Continued*)

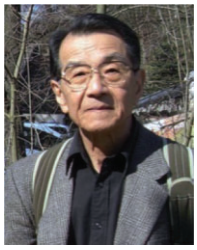
	First Generation[b]	Second Generation[c]
	Satoru Masamune(1952)[e,f] (University of Alberta and MIT)	Motoo Tori (Tokushima Bunri University) Hirotaka Shibuya (Fukuyama University) Shunsaku Ohta (Kyoto Pharmaceutical University) Yuji Hanzawa (Tokyo University of Pharmacy and Life Sciences) Yukishige Ito (RIKEN) Hiromi Tobita (Tohoku University) Hiroshi Okumoto (Kurashiki University of Science and the Arts) Yoshio Kabe (University of Tsukuba) Hiroaki Suga (The University of Tokyo) Kou Hiroya (Musashino University) Hironao Sajiki (Gifu Pharmaceutical University) Thomas Bally (University of Fribourg) Jeffrey T. Davis (University of Maryland) Pamela M. England (University of California at San Francisco) Barbara Imperiali (MIT) Byeong Moon Kim (Seoul National University) Michael H. Nantz (University of Louisville) Lawrence R. Sita (University of Maryland)
	**Ichiro Murata** (1952) (Osaka University)	Yoshikazu Sugihara (Yamaguchi University)[d] Hideki Yamochi (Kyoto University) Takashi Sugimura (University of Hyogo) Mitsuhiro Shibata (Chiba Institute of Technology) Kohki Takatoh (Tokyo Science University, Yamaguchi) Shoko Yamazaki (Nara University of Education) Takashi Kubo (Osaka University)
	Yusaku Ikegami (1953) (Tohoku University)	Hideaki Fujiwara (Osaka University) Shozo Tero (Tohoku University) Tadaaki Ikoma (Niigata University)
	Toyonobu Asao (1954) (Tohoku University)	Noboru Morita (Tohoku University) Shigeyasu Kuroda (Toyama University) Mitsunori Oda (Shinshu University) Shunji Ito (Hirosaki University)
	Hitoshi Takeshita(1955) (Kyushu University)	Shigeru Sugiyama (Tokushima University) Kingo Uchida (Ryukoku University)

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Table 2. (*Continued*)

	First Generation[b]	Second Generation[c]
	Shigeo Nozoe (1955) (Tohoku University)	Tomihisa Oota (Kanazawa University) Shinji Fusiya (Nihon Pharmaceutical University) Shinji Funayama (Nihon Pharmaceutical University) Fumio Hamada (Akita University)
	Kyozo Ogura (1957) (Tohoku University)	Ikuko Sagami (Kyoto Prefectural University) Shin-ichi Ohnuma (University College London)
	Tsutomu Miyashi (1962) (Tohoku University)	Akinori Konno (Shizuoka University) Hiroshi Ikeda (Osaka Prefecture University) Takashi Hirano (The University of Electro-Communications) Takanori Fukushima (Tokyo Institute of Technology)
	Masaji Oda (1965) (Osaka University)	Takeshi Kawase (University of Hyogo)[d] Mitsuo Toda (Shizuoka University) Kazumasa Ueda (Shizuoka University)

[a]The authors take all responsibility for the listing but are afraid of possible mistakes in listing, as it was the hardest choice we have ever been forced to make. [b]The list of the first generation followed Nozoe himself who made the "Majima Family Tree in Chemistry" and published it in his biography "Seventy Years in Organic Chemistry." The years listed in parentheses denote the year of graduation with a B. Sc. Degree. . The format of Table 2 follows the format designed by Tetsuo Nozoe for Table 1 which is reproduced from his autobiography: "Seventy Years in Organic Chemistry" in *Profiles, Pathways and Dreams* (Ed.: J. I. Seeman), American Chemical Society, Washington, D.C., **1991**. [c]The choice of the second generation was made in accordance with the criteria used by Tetsuo Nozoe (see footnote (b) above) to identify the first generation, i.e., those individuals who (i) studied as an undergraduate and/or graduate student under the guidance of "the first generation" professor, (ii) had a career in academics, and (iii) made reasonable scientific contributions as a professor. [d]Also a post-doctoral student in Satoru Masamune's group. [e]Because of the different academic system in the United States, the authors identified only the Japanese postdoctoral students of Professor Masamune. At the authors' request, the non-Japanese students of Professor Masamune who are included in the table were identified by Dr. Seeman to whom we are indebted. Dr. Seeman has informed us that he contacted a number of Professor Masamune's students from both the University of Alberta and MIT. Seeman relied upon their recommendations for the additional entries made in this table. [f]We mention that another, very special "family tree" has previously appeared in one of the essays accompanying the Nozoe Autograph Books. The "Nozoe Family 'Chemistry Family Tree' " appears in the essay "My Father, My Grandfather" written by the Masamune family and published with the fourth installment of the Nozoe Autograph Books. See: T. Masamune, H. Masamune, T. Masamune, *Chem. Rec.* **2013**, *13*, 257–264.

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[11] J. I. Seeman, *Chem. Rec.* **2013**, *13*, 146–160.

[12] J. I. Seeman, *Chem. Rec.* **2012**, *12*, 517–531.

[13] J. I. Seeman, B. Johnson, Bonding beyond Borders: The Nozoe Autograph Books, http://www.tcr.wiley-vch.de/nozoe, accessed on May 9, **2013**.

Second Note from the Editor:

With the publication of this essay, my work with Professors Asao, Itô and Murata comes to a happy, even amazing, yet also sad end. These three gentlemen have participated, from the earliest stages, in the preservation of the Nozoe Autograph Books and in the documentation of Tetsuo Nozoe's life. They have written two biographies of Nozoe, one as essay previously published in this series (I. Murata, S. Itô, T. Asao, *Chem. Rec.* **2012**, *12*, 599–607). I have called upon them in numerous ways during the production of this project. During these many interactions, I have felt the most amazing déjà vu. It has been as if I were, once again, working with Tetsuo Nozoe himself on his autobiography. I have reconnected with a time and an experience twenty-five years ago. I asked much of Nozoe; he always complied with a remarkable blend of promptness, thoroughness, sincerity, and kindness. So, too, have I experienced Asao, Itô and Murata. Perhaps, as Nozoe's academic children, the DNA of the chemistry laboratory has been passed through to the next generation. Indeed, that is the essence of Nozoe's and their compilations presented herein. Echoes of the past influencing today. It is almost certain that I shall call upon them once again. I look forward to that occasion.

—*Jeffrey I. Seeman*

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