Obituary
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Dr. Masatoshi Nei (1931-2023)

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Dr. Nei Masatoshi was born on January 2nd, 1931 in Miyazaki, Japan, and passed away on May 18th, 2023, at the age of 92 in Philadelphia, USA. I would like to give my personal obituary for him as one of his Ph.D. students. Many factual matters abourt him given in this obituary owe to Nei (2020), his autobiography.

Dr. Nei studied at Naka Elementary School in Miyazaki during 1937-1943. He then took Higher Education Part at Naka Elementary School during 1943-1944. He continued to attend two different schools; Miyazaki Agriculture Middle School during 1945-1948 and Ohyodo High School during 1948-1949. He then entered School of Agriculture at Miyazaki University at the age of 18 in 1949. After graduating from Miyazaki University, he entered Graduate School of Agriculture in Kyoto University in 1953. He first received M.S. degree in 1955, then proceeded to doctoral course of that Graduate School. He received Ph.D. in 1959.

Dr. Nei became assistant professor at Kyoto University in 1958 before finishing the Ph.D. course there. Dr. Nei became Rockfeller fellow in 1960, and stayed in USA for two years. In 1961, he became head of the Department of Population Genetics, National Institute of Radiological Sciences, Chiba, Japan. This institute was affiliated with Ministry of Heath of Japan. Dr. Nei conducted both theoretical works (e.g., Nei [1965]) and data analyses (Nei and Imaizumi [1966a], [1966b]) while he worked in Chiba. After he left there to become professor at Brown University in U.S.A., Dr. YASUDA Norikazu got that position. When I was master course student in University of Tokyo, I and KANEKO Ryuichi, one year junior to me, visited Dr. YASUDA every week to learn Crow and Kimura's (1971) "Introduction to Population Genetics Theory". Dr. KANEKO later became Vice Director of National Institute of Population and Social Security Research, Japan.

Dr. Nei moved to Houston from Brown University in Providence in 1972. Around that time, he devised Nei's genetic distance (Nei [1972]), and applied this new measure to protein polymorphism data of human populations (Nei and Roychoudhury [1972, 1974]). It should be noted that he first considered genetic distance between different species without considering polymoprhim (Nei 1971).

He started to have Ph.D. students in Houston. I first met him in the campus of Tokyo Metropolican University in 1980 or so, when he gave an invited lecture there. He was already famous for his many works including Nei's genetic distance, as well as his textbook (Nei, 1975). That book was not available when I wanted to buy a copy, so I xerox-copied the whole book, and studied that book carefully. Much later when I visited Houston in 1988, Dr. Nei gave me a precious copy of that book.

I wanted to study in U.S.A., and got Fulbright Scholarship. I chose Dr. Nei as supervisor, and I bcame his eighth Ph.D. student at the University of Texas Health Science Center at Houston, during 1982-1986. Dan Graur was one year senior to me, and Fumio Tajima was finishing his Ph.D. thesis at that time, and Dr. Takashi Gojobori and Dr. Joel Claiborne Stephens were post-doctoral fellows in Nei Laboratory. Drs. Wen-Hsiung Li and Ranajit Chakraborty were associate professors at CDPG (Center for Demographic and Population Genetics), and Dr. William Jack Schull was director of CDPG.

Based on the symposium held in 1982 in Stony Brook, Dr. Nei and Dr. Richard K. Koehn coedited a book (Nei and Koehn 1983). Meanwhile, Dr. Arun. K. Roychoudhury often visited Houston to prepare "Human polymorphic genes: world distribution" that was eventually published in 1988 (Roychoudhury and Nei 1988).

I was lucky to come up with a simple algorithm to construct a phylogenetic tree, while I was in Houston. In 1985 Dr. Joseph Felsenstein proposed to use the bootsrap probability as the indicator of branch credibility in a phylogenetic tree. Dr. Nei reviewed that paper, and mentioned in lab meeting that exclusively multifurcating tree is the null tree for that method. I started to think about an algorithm based on this comment by Dr. Nei, and reached a simple algorithm to construct unrooted phylogenetic trees from distance matrix data very rapidly in December 1985. We named this method as "the neighbor-joining (NJ) method" and published the paper in 1987. Fortunately, many people even now use this neighbor-joining method. As of May 29, 2023, the total number of citation of Saitou and Nei's (1987) NJ paper was 68,906. I hope the citations will exceed 70,000 within this year.
He was also busy in creating new journal, *Molecular Biology and Evolution* with Dr. Walter Fitch after a great success of the symposium held in Stony Brook. I remember that once "*Molecular Evolutionary Genetics"* was considered as the journal title, but its abbreviation, MEG, was somehow not good, and finally MBE was chozen. He later used this unused journal title for his book.

Dr. Nei started to write "Molecular Evolutionary Genetics" at that time, and it was published in 1987 (Nei [1987]). At that time I was already in Japan, and Dr. Takashi Gojobori and I asked Dr. Nei to let us translate this book into Japanese. This translation was published in 1990 from Baifukan, Tokyo.

Dr. Nei left Houston in 1990, and became director of newly created Institute of Molecular Evolutionary Genetics at Pennsylvania State University. When he was in

Houston, he produced nine Ph.D. including Martin Tracey, Wen-Hsiung Li, Margaret Kidwell, Yoshio Tateno, Aravinda Chakravarti, Fumio Tajima, Dan Graur, Li Jin, and myself. At the PennState, he produced 14 Ph.D. including Tatsuya Ota, Claudia Russo, Sudhir Kumar, Naoko Takezaki, Jianzhi Zhang, Helen Piontiklvska, Hao Li, and Sayaka Miura. There were more than 20 post-doctoral fellows who studied in Nei Laboratory. They include Arun. K. Roychoudhury, Ranajit Chakraborty, Paul Fuerst, Shozo Yokoyama, Takashi Gojobori, Ching-I Wu, Naoyuki Takahata, Joel Claiborne Stephens, Pekka Pamilo, Austin Hughes, Yasuo Ina, Koichiro Tamura, Andrey Rzhetsky, Ziheng Yang, Ingrid Jakobsen, Takeshi Ito, Yoshiyuki Suzuki, Kazuharu Misawa, Galina Glazko, Yoshihito Niimura, Masafumi Nozawa, and Hielim Kim. These former Ph.D. students and postdocs also produced many students of molecular evolution.

We should not forget about his two other great contributions to the field of molecular evolution. One is creation of society called “Society for Molecular Biology and Evolution” (SMBE) in 1993. The first SMBE meeting was hosted by Walter M. Fitch, first president of SMBE. Dr. Nei became the second SMBE president.

Another great contribnution is creation of a user-friendly software MEGA (molecular evolutionary genetics analysis). First MEGA version 1.0 was released in 1993 by Drs. Sudhir Kumar, Koichiro Tamura, and Masatoshi Nei, and the corresponding publication was one year later (Kumar et al. 1994). MEGA grew constantly, and the latest version is MEGA 11 (Tamura et al, 2021). A textbook on molecular phylogeny (Nei and Kumar 2000) was related to this MEGA activity. This book was traslated into Japanese by Tatsuya Ota and Naoko Takezaki.

Another, and essentially the last scienfitic book Dr. Nei published was “Mutation-driven evolution (Nei 2013). Dr. Nei claimed that “perhaps somewhat controvercially, driving force behind evolution is mutation, with natural selection being of only secondary importance”. This is essentially the neutral theory expanded to phenotypic evolution from the molecular level. It was traslated into Japanese by Yoshiyuki Suzuki and Masafumi Nozawa.

Dr. Nei received numerous prizes and honors. Major ones are Japan Society for Human Genetics Prize in 1977, Kihara Prize in 1990 from Genetics Society of Japan, Member, National Academy of Science USA in 1997, International Prize for Biology in 2002 from Japan Society for Promortion of Science, Thomas Hunt Morgan Medal in 2006 from Genetics Society of America, and Kyoto Prize in 2013 from Inamori Foundation.

Dr. Nei published his autobiography in 2020, from Temple University (Nei [2020]). Cover of this book was designed by his son, Keitaro Nei. I was happy when I found my photo in that book as well as frequent mention about me. Motoo Kimura also appeared in that book often.

Last year I was invited by Dr. Nei and visited his retirement house in Philadelphia. He gave me about 120 books written in Japanese as well as about 150 book written in English kept at Temple University. I donated all these books to Genetics Museum at National Institute of Genetics. The attached photo was taken in his retirement house.

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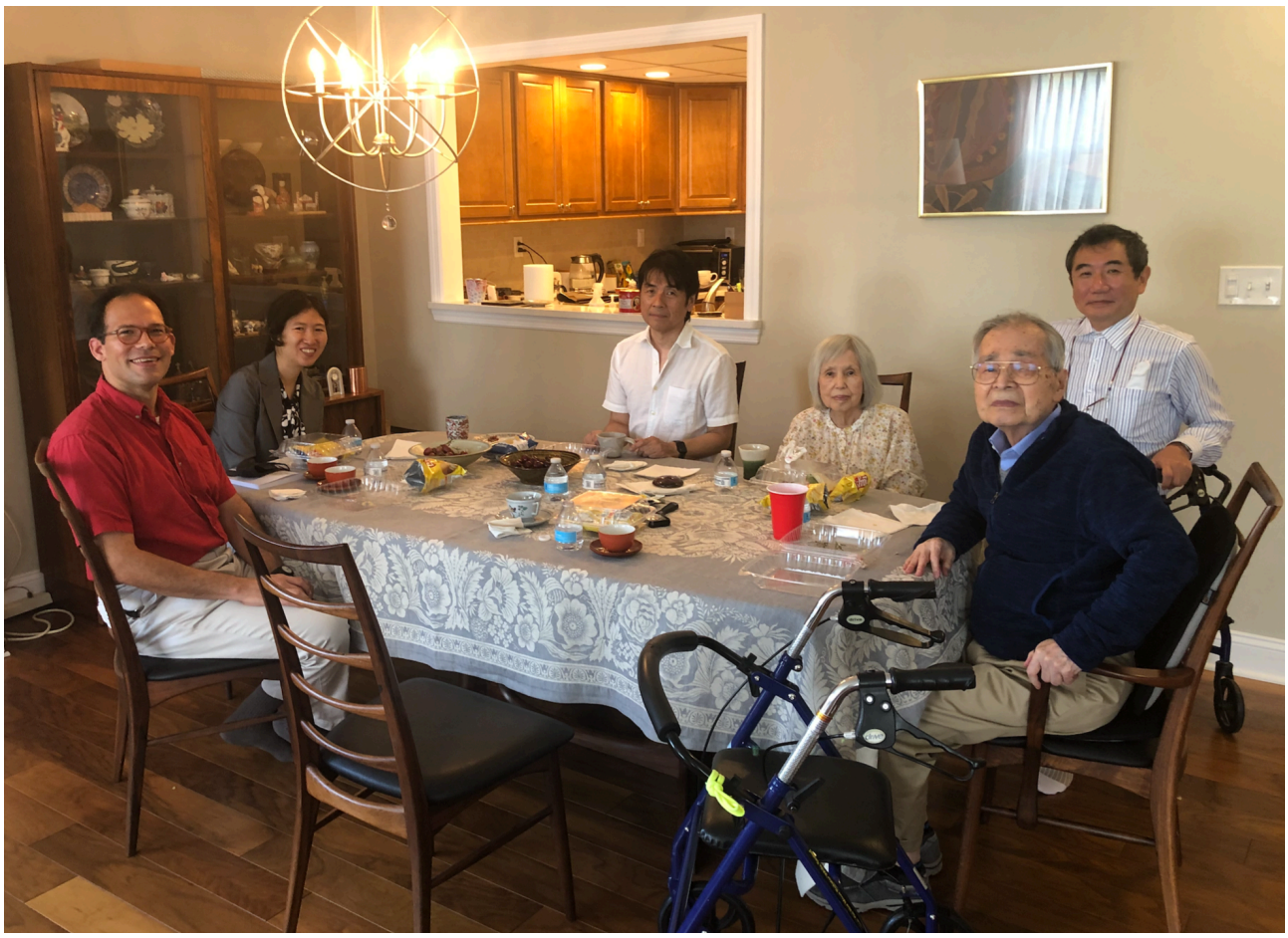

Photo taken at Dr. and Mrs. Nei's retirement house on August 15th, 2022. From right to left: Saitou, Dr. Nei, Mrs. Nei, Keitaro Nei, Sayaka Miura, and her husband.

Edited by TAMURA Koichiro