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Nucleosides, Nucleotides and Nucleic Acids

Publication details, including instructions for authors and subscription information:

<http://www.informaworld.com/smpp/title~content=t713597286>

Biography

To cite this Article (1998) 'Biography', *Nucleosides, Nucleotides and Nucleic Acids*, 17: 1, xv — xxvii

To link to this Article: DOI: 10.1080/07328319808005152

URL: <http://dx.doi.org/10.1080/07328319808005152>

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BIOGRAPHY



Tsujiaki Hata

1934 - 1996

The news of the sudden passing of Prof. Tsujiaki Hata came as a shock to all of us in the field of nucleic acids chemistry. When I was informed of this sad event by Prof. K. Narasaka (Tokyo Univ.), I felt that the world around me had stopped and I was bereft of words. Actually, he had been hospitalized in the Tokyo University Hospital for the past several years. Just a few weeks before, his wife Tokiko had told me his prognosis seemed to be encouraging, and he was looking forward to his discharge and to resuming his regular life. A sudden change occurred when, soon after he had undergone some clinical treatment for removal of phlegm from his lungs, he accidentally swallowed a melon seed which went into a lung. He developed pneumonia, and the end came on September 7, 1996. I would like to express the deep sadness we all feel on the loss and our gratitude for the leadership he had given us.

Professor Hata was born in Yokosuka in 1934. His father was the 22nd successor to the Yokosuka Shrine whose history dates back to the Muromachi Period (1392-1573) and has close contact with the Imperial family. Since Professor Hata was the first son of the

Hata family, he was expected to be responsible for the shrine as the successor and, therefore, had received special training as a "kannushi" (shrine priest). This preordained destiny was changed by chance when he entered Gakushuin University in 1954. There, under the guidance of Prof. Teruaki Mukaiyama who had inaugurated his lab in the Department of Chemistry, he took up the study of organic chemistry. He enjoyed his student life, studying the techniques of organic chemistry and learned the essence of chemistry, how to meet the challenge of new targets and explore innovative ideas. One of his good friends at the university was Prince Hitachi.

After graduation from Gakushuin University, he moved to the lab of Prof. Toshio Hoshino in the Department of Chemistry, Tokyo Institute of Technology (TIT). As a graduate school student, he was much influenced by Professor Hoshino who encouraged young chemists, showing them what was real originality in this line of research. He later rejoined Prof. Mukaiyama's lab where he studied phosphorus chemistry using tervalent trialkyl phosphites and discovered many new methods for phosphorylation involving a new condensation reagent of trialkyl phosphites and bromocyanoacetate. At that time a number of younger chemists including Prof. Oyo Mitsunobu also researched in the Mukaiyama lab. They were good friends and advisers to Prof. Hata during his student days.

After earning a Ph. D. from TIT, he studied at the Max Plank Institute in Göttingen where he pursued a post-doctoral course in Prof. Friedrich Cramer's lab. During his stay he made many life-long friends and enjoyed his work in phosphorylation chemistry. After that, he returned to Japan. Soon after he became a research associate, he received the Young Chemist Award from the Japan Chemical Society in 1965 for his outstanding contributions to phosphorylation chemistry.

In 1967, he created his own laboratory in the organic chemistry section of the Institute of Natural Products of TIT and started studies of nucleic acids chemistry using the new phosphorylation procedure he discovered. He produced new ideas like the activatable protecting group and the purification handle. He had good opportunity to discuss a wide variety of reactions with many good friends and young organic chemists in TIT.

He started studies of silyl phosphite chemistry, just a few years before Prof. Mukaiyama moved his lab to the University of Tokyo, and propounded a new theory of silylation-mediated activation of unreactive phosphonate functions of mono- and dialkyl-phosphonate as well as phosphonic acid. This chemistry has been extensively developed for the synthesis of a variety of phosphorus-containing organic compounds such as phosphoenol pyruvate and L-ascorbic acid 2-*O*-phosphate. He also developed the "thiophosphotriester method" for the synthesis of DNA and RNA utilizing the phenylthio group as not only a phosphate-protecting group but also an activatable group "

In 1975, he turned to the challenging synthesis of more biologically important new biomolecules. In particular, he succeeded in the first synthesis of the so-called cap structure which was found by Prof. Kin-ichiro Miura as the 5'-terminal structure of mRNAs. In 1976 he was promoted to full professor in the Department of Life Chemistry.

In 1976 he was, along with Professors Eiko Ohtsuka and Hikoya Hayatsu, who were his good friends and good rivals, one of the members of their organizing committee for the Nucleic Acids Symposium, which was inaugurated by Prof. Morio Ikehara of Osaka University. The Symposium became an annual event, and Prof. Hata was in charge of the second meeting as the organizer. The Symposium has already been held 23 times and has become a semi-international meeting. The 24th meeting will be held at the Mejiro campus of Gakushuin University by Prof. Kimitsuna Watanabe who had also studied in the Cramer laboratory. Hata often asked straightforward, sometimes very severe, questions, but he was sincerely dedicated to this Symposium and stimulated the participation of young chemists. Through this Symposium and other international meetings he was acquainted with many distinguished overseas guests. He had especially friendly contact with many professors, and whenever he had a chance, invited them or was invited on a personal basis.

In 1977 his lab was moved from Ookayama to Nagatsuta, in the northern part of Yokohama, where a new graduate school campus was opened. Here he had a more spacious workplace for the study of oligonucleotide synthesis. His lifework study on the chemical and enzymatic synthesis of capped mRNA was further extended, in cooperation with Prof. Miura, to the 43mer level in 1994. Professor Hata showed a new method for the synthesis of DNA and RNA using a completely protected thiophosphotriester method. He reported several efficient protecting groups (e.g., the diphenylcarbamoyl group) of the reactive guanine amide function, which resulted in complex results without protection at that time, especially in RNA synthesis. At the oligomer level, he showed the efficiency of this full protection strategy as exemplified by the synthesis of all 26 fragments of Hop Stunt Viroid and some mRNAs. In 1979 he received a Synthetic Organic Chemistry Award, Japan from the Society of Synthetic Organic Chemistry, Japan for his pioneering studies on new methods for the synthesis of oligonucleotides.

Although a number of new methods for oligonucleotide synthesis had been reported by his research group, as head of the Department of Life Chemistry he also had to handle voluminous desk work. The work load often became too much for him and, suffering from fatigue, he was hospitalized several times for one or two months. Fortunately, each time he was able to recover sufficiently to return to his office work as well as guidance of his students. He is "very kind." He was thus described by all who knew him. He checked very carefully the Japanese text of his students' doctorate theses which were submitted as preliminary manuscripts. He advised the students on the basic style for presentations at annual meetings and the Nucleic Acids Symposium, showing them how to draw schemes and to communicate orally their scientific results. He would show up where the undergraduate students were conducting experiments and demonstrate how to use a separatory funnel or a spatula. I was always surprised to see his boundless energy. He was really a man of kindness. When a researcher from a foreign country visited his lab, he did his utmost to attend to the guest. Every person who visited his lab must have

received the same impression of his kindness. He put aside other work to care for his visitors, and it was not possible to tell him to do otherwise. His kindness came from the heart.

In 1991 a major project entitled "Organic Chemistry of Structure and Function of Nucleic Acids" headed by Professor Hata was started under the financial support of the Ministry of Education, Science, Sports and Culture. Many young chemists gathered for this three-year project to activate Japanese nucleic acids research. He established a large-scale synthesis of cap structure, $m^7G^{5'}pppG$, as well as a new method for the chemical synthesis of peptidyl DNA/RNA during this project.

Before he retired from TIT, he first reported the synthesis of CMP-Neu5Ac which had long remained unrealized. This is his last work. Many chemists from the Hata lab are now actively working in the field of organic chemistry as well as nucleic acids chemistry.

On his retirement from TIT, Professor Hata moved to Chiba Institute of Technology (CIT). Because of his health problem, Professor Hata decided to limit himself at CIT to only teaching theoretical organic chemistry in the undergraduate school. His lectures were popular among the young students since his clear-cut teaching style was easily understood.

I think I can not describe here all of his academic achievements nor the various experiences which those who knew him encountered through his advice and kindness. His wife Tokiko and daughter Akiko who had devoted themselves to his care were at the bedside when he passed away peacefully only six days after his 62nd birthday. I join the many others in extending my deepest condolences to the family of Professor Hata.

July 23, 1997

Mitsuo Sekine

Department of Life Science
Tokyo Institute of Technology

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平成9年7月22日

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いつも遅れて申し訳ありません。畑メモリアルN&N用のPREFACEの原稿と、PUBLICATION LIST、写真白黒とカラー2葉を同封いたしました。PREFACEはその後、スベルミスのチェックをして訂正し、とくに外国の友人の個人名はできるだけとるように配慮しました。特定の方の名前がでると、他の友人がきつとなぜ自分の名前がでてないのか気になるとおもいましたので日本人だけにとどめました。

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