Kenji Koga

February 11, 1938 – July 25, 2004

Kenji Koga, the fourth Editor from Japan elected to the Board of Editors of *Organic Syntheses* (1995-1998), died of cancer on July 25, 2004, in Tokyo, Japan. He was 66 years old.

Kenji Koga was born in Nagoya, Japan and grew up in Miyazaki and Fukuoka. He received his undergraduate and graduate education at the Faculty of Pharmaceutical Sciences, the University of Tokyo, where he received his bachelor's degree in 1960 and his Ph.D. in 1967, both under the direction of Shun-ichi Yamada. He continued his research in the laboratory of Yamada as an assistant professor (1965-1968) and then as an associate professor (1968-1976). He spent the period from 1971 to 1973 at the University of California at Los Angeles as a postdoctoral fellow in the laboratory of Donald J. Cram. In 1976, Koga was promoted to full professor as the successor to Yamada, and dedicated his efforts to research and education in pharmaceutical organic chemistry. He became an emeritus professor at the University of Tokyo in 1998, but continued his academic carrier at Nara Institute of Science and Technology (1993-2003) and at Waseda University (2003-2004).

Koga's early research focused on the studies of optically active amino acids as chiral sources for asymmetric synthesis. In particular, stereoselective hydride reduction and stereocontrolled deamination of amino acid esters were significant and versatile methods investigated by Koga for manipulating amino acid stereocenters in asymmetric synthesis. By application of these methods, a number of pharmaceutically useful chiral compounds have been synthesized from optically active amino acids, beginning with chloramphenicol in his B.S. thesis and culminating in polycyclic natural products such as maritidine, galanthamine, podorhizon, steganacin, verrucarinolactone, bourbonene, spatol and carbapenam. Further development in the chemistry of amino acids led to their use as chiral auxiliaries, particularly in asymmetric alkylation and conjugate addition at the α- or β-carbon of carbonyl compounds, exploiting chiral enamines or enimines derived from amino acid esters.

In addition to the asymmetric reactions and synthesis involving amino acids, Koga also made a significant contribution to host-guest chemistry. The use of cyclophanes for capturing organic guests in water was investigated. By use of x-ray crystallography Koga successfully obtained the first direct evidence of the ability of cyclophenes to form inclusion complexes. Water-soluble cyclophanes have since been used extensively in host-guest chemistry. Another significant contribution to host-guest chemistry was the peptide synthesis via alternative intramolecular aminolysis by crown ethers functionalized with two adjacent SH groups. This accomplishment is regarded as an outstanding representative example of synthetic reactions within enzyme model systems.

Through his studies on diastereomeric asymmetric reactions via chiral enamines or enimines, conformational control by metal chelation was confirmed to be the key factor for both diastereoselective and enantioselective reactions. After examinations of metal-chelated enantioselective reactions, including Lewis acid-catalyzed asymmetric Diels-Alder reactions, Koga focused on the chemistry of chiral lithium enolates formed with chiral amine bases derived from optically active amino acids. Asymmetric reaction with chiral bases was initially developed for asymmetric deprotonation of cyclohexanone, and then extended to kinetic resolution by deprotonation of 2-substituted cyclohexanones, as well as regio- and diastereoselective deprotonation of 3-keto steroids. The mechanism of the asymmetric induction was investigated thoroughly by ^{6}Li- and ^{15}N-NMR spectroscopy, revealing the structure of the chelated complex that is active for efficient asymmetric induction. Based on these fundamental studies, highly selective asymmetric induction was achieved for alkylation and protonation. In spite of the inherent difficulties, these asymmetric reactions have more recently been achieved catalytically by an exquisite combination of chiral base and achiral ligand.

Koga's contributions were recognized with numerous honors and awards as he was a leading contributor to organic synthesis, particularly as a pioneer of asymmetric synthesis using chiral bases. In 1988, he received the Inoue Prize for Science, and in 1994 he was the recipient of the Pharmaceutical Society of Japan Award. In 1995, Koga shared the Japan Academy Prize with Shun-ichi Yamada on "Novel Synthetic Methods of Optically Active Compounds Based on the Transcription of the Chirality of L-Amino Acids" and was honored nationally and internationally for his work. He also showed extraordinary devotion to education within the pharmaceutical sciences in Japan, demonstrating the significance of fundamental research in pharmaceutical education. Professor Kenji Koga was an active and intellectual leader of organic chemistry. As a man of sincerity and passion for research and education, he fostered a number of disciples who have made significant contributions to such new fields as catalytic asymmetric C-C bond-forming reactions, host-guest recognition at the membrane surface, and selective genome-targeting molecules. This memorable man is survived by his wife Sumiko of Tokyo, his son Yuji and his grandchildren Tsuyoshi and Risa of Ibaraki, Japan. Kenji Koga is dearly missed by his family, former coworkers, and his colleagues. His name will be memorialized in the Yamada-Koga Prize of the Japan Research Foundation for Optically Active Compounds.

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