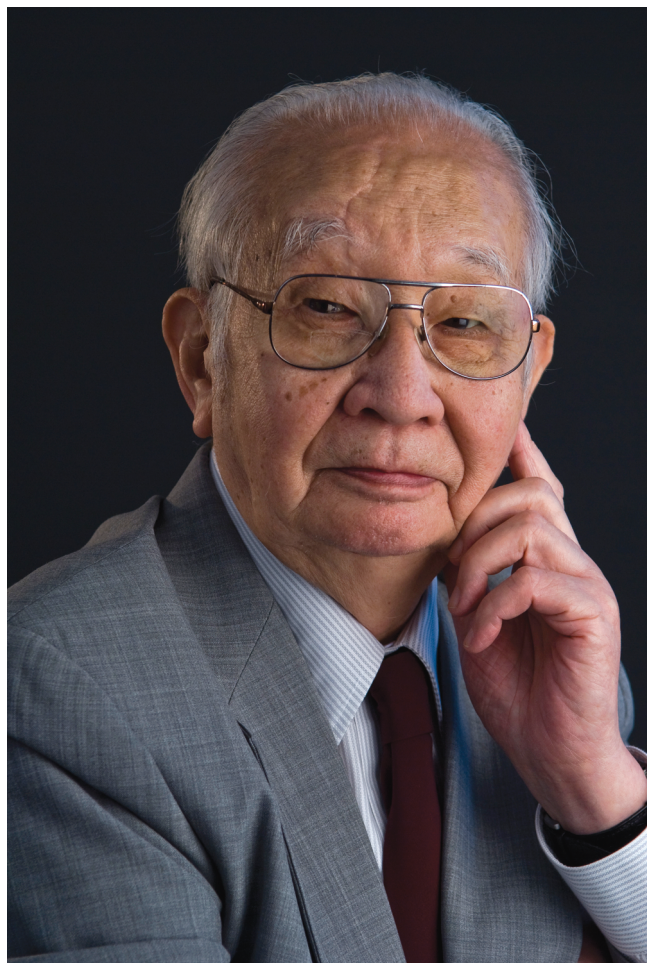


Special Issue in Honor of Koji Nakanishi



We are pleased to dedicate this special issue of the *Journal of Natural Products* to Dr. Koji Nakanishi, the Centennial Professor of Chemistry at Columbia University, New York, New York, in honor of his 85th birthday. We would also like to thank those who contributed to this special issue.

Over the past half-century, Professor Nakanishi has been a pioneer and a world leader in the study of natural products. He has made many seminal contributions in designing innovative methods for natural product isolation and characterization. He is best known for his work on ginkgolides, circular dichroism (CD) and its applications to chiral structure analyses, novel use of IR, NMR, and other spectroscopic techniques to determine complex chemical structures, and the bioorganic chemistry of vision. Throughout these years, he has characterized the chemical as well as the biological properties of over 200 natural products, many of which represented new structural classes of compounds at the time he studied them. His work in the area of small-scale structure elucidation using a variety of spectroscopic tools has

made possible our current ability to routinely characterize microgram (and lower) amounts of new natural products. Professor Nakanishi is also a world-class magician. He has entertained friends and colleagues around the world, including many readers of the *Journal of Natural Products*, with his fascinating magic tricks on numerous occasions.

Professor Nakanishi was born on May 11, 1925, in Hong Kong. He earned B.Sc. and Ph.D. degrees in Chemistry in Nagoya (1947, 1954), working with Professors Egami and Hirata, with postgraduate work at Harvard with Professor Louis Fieser (1950–1952) completed in between. While at Harvard, he became interested in the use of spectroscopy in organic chemistry, in particular the use of IR in functional group analyses. The techniques developed and later refined by his group revealed new possibilities in the characterization of natural products at that time. These techniques and applications were later highlighted in an invaluable textbook, *Infrared Absorption Spectroscopy—Practical* (1962, 1977), which enabled researchers to solve many problems encountered when working with complicated natural product systems.

His interest in the synthesis and structural elucidation of new natural products began in Nagoya and involved difficult work on the characterization of the antibiotics actinomycin and grifolin, together with a new amino acid, roseonine, which is derived from roseothricin. He also worked with Professor Hirata to isolate, characterize, and synthesize various silkworm (*Bombyx mori*) pigments. It was during this time that Dr. Nakanishi pioneered the combined use of spectroscopic techniques to determine the structures of new natural compounds. When he first introduced this nonsynthetic approach to study the new amino acid roseonine at the 1954 Japanese Chemical Society meeting, this new approach was not received kindly. However, he persisted in pushing this approach and further developing the necessary techniques, which became widely accepted in later decades. Unquestionably, these methodologies have raised natural products studies to a much higher level, and today, they constitute the foundation of our modern approach in natural product chemistry.

After receiving his Ph.D., Dr. Nakanishi stayed at Nagoya as an Assistant Professor of Chemistry until 1958, when he moved to Tokyo Kyoiku University as a Full Professor. This is where he honed his skills in spectroscopy and structure elucidation of natural products, particularly the pigments and terpenoids. He was recruited to Tohoku University at Sendai in 1963, where he continued his work on anticancer pigments and began the isolation and structural elucidation of the complex ginkgolides from *Ginkgo biloba*, a commercially important and widely used medicinal plant. His pioneering use of the NOE (nuclear

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Overhauser effects) in NMR spectroscopy to determine the three-dimensional ginkgolide skeletal structure was a breakthrough and was independently confirmed via X-ray at about the same time in 1966. In the intervening years, the literature on natural product chemistry has been loaded with many similar landmark contributions from Professor Nakanishi's research. He recently showed that ginkgolides protect against Alzheimer's disease, and he used chemically prepared labeled ginkgolide derivatives to identify two ginkgolide receptors in the human hippocampus. The binding of ginkgolides to these receptors has been associated with an increased capacity for memory.

At Tohoku, he also began to develop chiroptical methods for the determination of the absolute configuration of secondary alcohols with graduate student Nobuyuki Harada. This project was very successful and led to the development of the exciton chirality CD method for absolute stereochemical determination. This nonempirical technique has had a major impact on our ability to determine the chirality of many different types of organic molecules, from simple compounds to structurally complex biopolymers. Due to its impressive versatility, this method continues to expand into new areas and has fostered the use of CD spectroscopy worldwide. Professors Nakanishi and Harada also published two useful textbooks in the area.

In 1969, Professor Nakanishi was recruited to Columbia University, where his research projects flourished. There he continued to expand the use of spectroscopy and multidisciplinary approaches to the identification of important natural products in chemical ecology, bioactive marine natural products, and natural anticancer agents. He also made significant contributions to the chemistry of vision. His group succeeded in tracing retinal chromophore movement along the visual transduction pathway within the rhodopsin binding site. They also determined the active conformation of the retinal chromophore, as well as its mode of entry into the opsin protein. Overall, he has published more than 800 papers and authored/coauthored/edited many useful books, including the Natural Products Chemistry Academic Press series *Comprehensive Natural Products Chemistry* and several CD, IR, and NMR textbooks spanning over 50 years.

In addition to his vast number of research contributions, Professor Nakanishi has mentored over 550 graduate students and postdoctoral fellows, an astounding figure that testifies to the continuing impact that his interesting research projects have generated and maintained. When one stops to think about it, there is scarcely a modern scientific discipline that has not been affected in some way by Professor Nakanishi, either directly through his work or indirectly through the work of his many former co-workers. When his entire career is taken into consideration, it could be stated that Nakanishi's group has helped to "write the book" on modern natural product chemistry.

Over the years, Professor Nakanishi also found the time to become Director of Research at both ICIPE in Kenya (1969–1977) and the Suntory Institute for Bioorganic Research in Osaka, Japan (1979–1991), as well as the Director of Chemistry at the Biosphere 2 Center in Tucson, AZ (2001–2003). He has been awarded countless accolades by the most prestigious chemical societies around the world, such as the Ernest Guenther Award, Cope Award, National Academy of Science Award, Havinga Medal, Schering Prize, King Faisal International Prize, Tetrahedron Prize for Creativity in Organic Chemistry, Welch Award in Chemistry, Kerrar Gold Medal, and the Nagoya Gold Medal. He has also received numerous honorary degrees including D.Sc. from Williams College and Georgetown University and

the Dr. of Honor, Pharmacy from Uppsala University. He is an Honorary Professor at both the Shanghai Institute of Materia Medica and Tohoku University.

In closing, we feel honored to have known Koji for more than 30 years. In all of that time, his genuine and passionate interest in the elegance of bioorganic chemistry has not waned and has, in fact, only increased with time. His fascination with the chemistry developed and employed by Mother Nature has inspired generations of researchers to explore the frontiers of natural product chemistry in hopes of discovering solutions to critical issues regarding human health. All of us who have had the great privilege to work with Koji or to know him through both his outstanding research achievements and his creative, entertaining, and wonderfully executed magic shows look forward to many more years of productivity as well as new magic tricks. We all join in wishing Koji health and happiness on his 85th birthday!

Michael S. Tempesta

Guest Editor

Phenolics, LLC, El Granada, CA

Hung-wen (Ben) Liu

Guest Editor

Division of Medicinal Chemistry, College of Pharmacy, and
Department of Chemistry and Biochemistry, University of Texas at
Austin, Austin, TX