



Scientific Contributions of Mitsuo Tasumi

Professor Mitsuo Tasumi has been an active researcher in the field of infrared and Raman spectroscopy for over 40 years. The impact of results from the Tasumi group is evident in many areas of this research field, including the vibrational analyses of various molecules ranging from synthetic polymers to biological systems, normal coordinate calculations, and the dynamics of molecules in excited electronic states.

Mitsuo started his career as a vibrational spectroscopist under the supervision of Prof. Takehiko Shimanouchi at the University of Tokyo and earned his Ph.D. in 1964 with a thesis entitled "Vibrational Spectroscopy of Chain Molecules". The phonon dispersion curves of a polymethylene chain that he calculated as part of his thesis are shown in the figure on the cover of this issue. This figure is now used in textbooks of polymer spectroscopy. That work, in which he succeeded in treating the molecular vibrations of an infinite polymethylene chain in a straightforward manner, made his name known to the international community of vibrational spectroscopists.

In 1965–1967, he joined the laboratories of Prof. Samuel Krimm of the University of Michigan in the United States and Prof. Giuseppe Zerbi of the Politecnico di Milano in Italy as a postdoctoral fellow. After returning to Japan, he began to study the resonance Raman effect, which led to his well-known

analysis of the Raman excitation profile of β -carotene published in 1973 and 1974. In that work, he first showed that the Raman excitation profile of a totally symmetric vibrational mode can be quantitatively analyzed by the A term (representing a mechanism based on the Franck–Condon principle) in the Albrecht theory.

In 1977, he was appointed as a full professor at the University of Tokyo and succeeded to the chair previously held by Prof. Shimanouchi. Since then, he has been actively engaged, with his many students, in a wide variety of studies in the field of vibrational spectroscopy; for example, studies on infrared-induced rotational isomerizations in low-temperature matrixes, structural studies on molecules in excited electronic states and vibrational relaxation by time-resolved Raman spectroscopy in the nano- to subpicosecond time range, photoexcitation dynamics in photosynthetic systems, thermal denaturation of proteins, metal–protein interactions, and vibrational analyses of various key molecules including polyenes and peptides based on both *ab initio* molecular orbital and density functional calculations and elaborate normal coordinate calculations. His work on the simulation of the amide-I infrared bands of proteins and that on the Raman noncoincidence in the Raman spectra of polar liquids is also noteworthy. His research has contributed greatly

to the development of near-infrared-excited Raman spectroscopy, picosecond time-resolved infrared spectroscopy, and time-resolved Fourier transform spectroscopy.

For several years around 1980, the Tasumi group studied the structures of polyacetylene in pristine and doped states in collaboration with Prof. Hideki Shirakawa, who received the Nobel Prize in Chemistry in 2000 for the discovery and development of conducting polymers. Mitsuo's interest in conducting polymers continued, and in the middle of the 1990s his group obtained the phonon dispersion curves of a polyacetylene chain shown in the figure of the cover of this issue. This work used a force field derived from a careful analysis of the observed vibrational spectra of oligoenes aided by *ab initio* molecular orbital and density functional calculations. He also studied the vibrational spectra of other conducting polymers such as poly(*p*-phenylene) and poly(*p*-phenylenevinylene).

Professor Tasumi has authored and edited many reviews and book chapters. The "Infrared and Raman Spectroscopy Literature Data Base", published as a special issue of the *Journal of Molecular Structure* at the end of each year since 1985, represents a particularly useful contribution that has been prepared by him and his research group.

Papers written by Mitsuo and co-workers treated a wide range of topics that were at the forefront of their respective fields when published. The frequent citation of his papers by other authors confirms the importance of these papers. The careful attention to the detailed analysis of the origin of every observed vibrational band has been the hallmark of all his work; he has a keen interest in correctly "reading" vibrational spectra, which were once called by Prof. Shimanouchi "letters from molecules".

In compliance with the regulations of the University of Tokyo on the mandatory retirement age (60), Mitsuo moved to Saitama University in 1997 upon invitation from this University. At Saitama University, his group has performed vibrational studies of radical species in solution and developed picosecond time-resolved infrared spectroscopy. In addition to his research interests, Mitsuo fulfills his obligations as Dean of the Faculty of Science.

Mitsuo has published more than 270 original scientific papers, mostly related to vibrational spectroscopy, in various international journals of high reputation. He received numerous honors including the Fulbright scholarship for researchers (1965–1967) and the awards from the Society of Polymer Science, Japan (1971), the Chemical Society of Japan (1994), and the Spec-

troscopical Society of Japan (1997). In 1999, he received the Purple Ribbon Medal from the Japanese Government, the Ellis R. Lippincott Award from the Optical Society of America/Society for Applied Spectroscopy/Coblentz Society, and one of the first TRVS Awards from the International Conference on Time-Resolved Vibrational Spectroscopy.

During the past twenty years, Mitsuo was associated with the organization of a number of international conferences. For example, he played a key role for organizing two large-scale international conferences in the field of vibrational spectroscopy held in Tokyo: the ninth International Conference on Raman Spectroscopy in 1984 and the 12th International Conference on Fourier Transform Spectroscopy in 1999.

At the University of Tokyo, Mitsuo supervised the Ph.D. dissertation work of more than 30 graduate students, many of whom remain active in the field of vibrational spectroscopy. As a research director and mentor, his abilities to recognize scientific skill in co-workers and to identify exciting research opportunities have been outstanding. He routinely provided his students with research projects that were at the forefront of the field, thereby providing them with opportunities to both demonstrate their abilities and to establish their credentials within the international scientific community. While he set high standards for his students and always expected them to achieve the highest levels of performance in research, Mitsuo also provided an outstanding environment for learning. He consistently encouraged his students to fulfill their potential as both scientists and individuals. Although some might think him to have a stern appearance, all of those with whom he has worked know him to have a warm heart and a generous nature. He epitomizes a true and trustworthy gentleman of science.

As Mitsuo prepares to celebrate his 65th birthday on January 23, 2002, we are exceptionally pleased to collectively recognize his achievements in science and to express our appreciation for his friendship. On behalf of his students and many friends, we wish Mitsuo, his wife Noriko, and his daughter Mariko many prosperous, happy, and healthy years ahead and the satisfaction of knowing the high esteem by which he is held by his profession.

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