OKAZAKI CONFERENCES

The Sixtieth Okazaki Conference

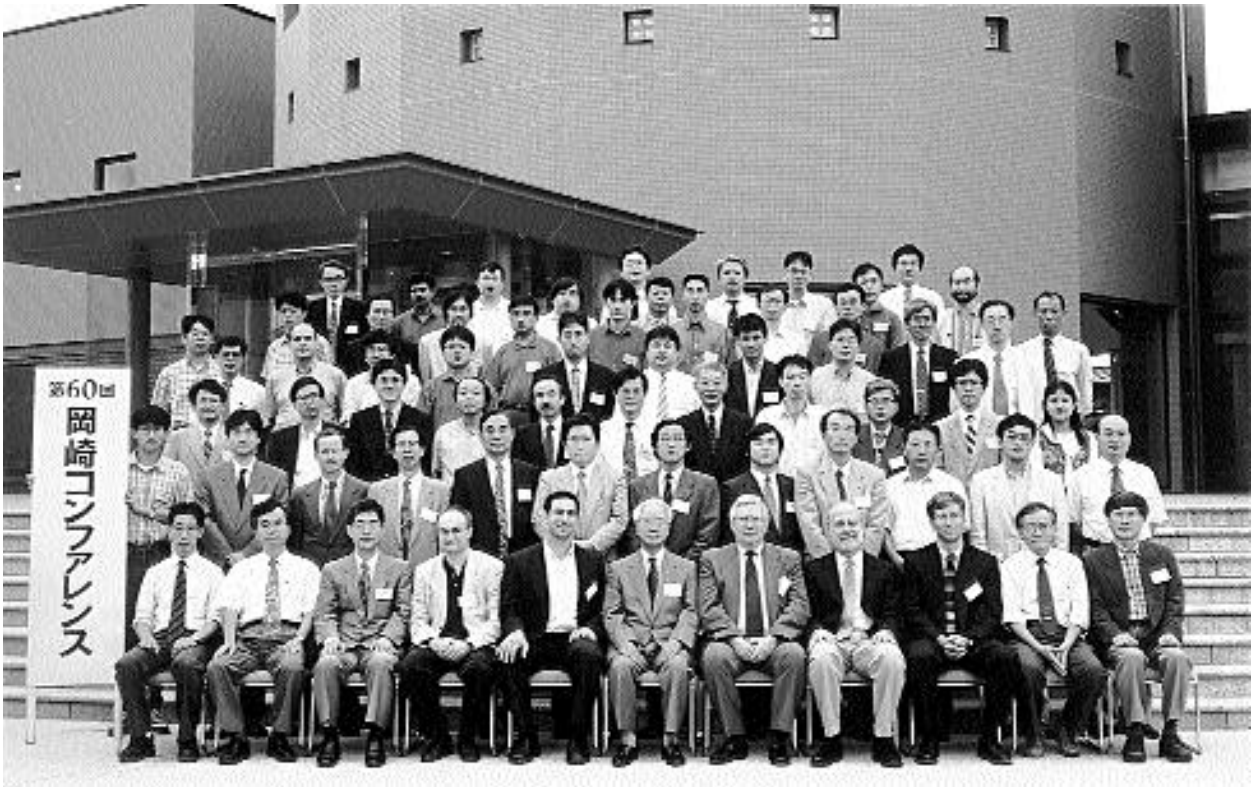
Optical Control of Chemical Reaction Dynamics
(September 22-24, 1997)

Organizers: Y. FUJIMURA *(Tohoku Univ.)***, M. KAWASAKI** *(Kyoto Univ.)* **and N. NISHI** *(IMS)*
Invited Overseas Speakers: H. RABITZ *(Princeton Univ.)***, B. KOHLER** *(Ohio State Univ.)***, D. TANNOR** *(Weizmann Institute of Science)***, P. SAARFRANK** *(Frei Univ. Berlin)* **and J. MUCKERMAN** *(Brookhaven National Laboratory)*

Optical control of chemical reaction dynamics is a new research field. The basic idea consists of manipulating the coherent interactions between molecules and laser fields. This research field has been paid attention because of recent development of laser technology and theoretical treatments. The purpose of the Okazaki Conference was to survey the present status of this research field and to discuss the future development of optical control from the view point of molecular science. There are two types of optical control, one is phase control in which relative phases between pump lasers are varied to generate constructive or destructive interferences between two transition paths in order to select the reaction channel of interest. The other is optimal control in which optimal control theory is used to design laser pulses guiding the most probable reaction path.

In this Okazaki Conference, we considered these two types of optical control from both the theoretical and experimental points of view. We focused on (1) theory of optical control of unimolecular reactions, photochemical reactions and nonadabatic reactions, and development of the algorithm of optimal control calculations, (2) experiments of quantum control using tailored femtosecond laser pulses to localize wave packets in space and time, (3) coherent control of ionization/dissociation of molecules, (4) control of photochemistry in the condensed phases, (5) molecular dynamics under strong laser fields, (6) optical control of selective excitation and population transfer of multimode molecules, (7) measuring the wave functions of diatomic molecules by Coulomb explosion, (8) Optical phase control of coherent electron dynamics in metals, (9)microcavity effects on the Foerster energy transfer, and (10) temporal and spatial shaping of femtosecond optical pulses to create localized excitation of propagating modes in solid materials.

The Conference was held at the newly built Okazaki Conference Center. Fifteen invited talks were presented including Japanese speakers. Hot and stimulated discussions were made among speakers and attended scientists since the optical control is expected to play an important role in the chemical reaction dynamics not only in an isolated system but also in condensed phases.



The Sixty-First Okazaki Conference

Liquid Dynamics Studied by Time-Resolved Vibrational Spectroscopy *(January 21-23, 1998)*

Organizers: K. TOMINAGA *(IMS)***, K. OKUMURA** *(IMS)***, and S. SAITO** *(Nagoya Univ.)*
Invited Overseas Speakers: A. TOKMAKOFF *(Univ. California, Berkeley, U.S.A.)***, E. HEILWEIL** *(National Institute of Standard and Technology, U.S.A.)***, H. BAKKER** *(FOM-Institute AMOLF, Netherlands)***, J. FOURKAS** *(Boston College, U.S.A.)***, T. JOO** *(Pohang Univ. of Science and Technology, Korea)***, R. LORING** *(Cornell Univ., U.S.A.)***, K. WYNNE** *(Univ. Strathclyde, U.K.)***, C. SCHMUTTENMAER** *(Yale Univ., U.S.A.)***, S. R. MEECH** *(Univ. East Anglia, U.K.)***, M. CHO** *(Korea Univ., Korea)***, T. STEFFEN** *(Univ. Groningen, Netherlands)*

Both electronic and vibrational spectra get broadened extensively and sometimes shifted in liquids compared to those in gas phase. This is because the solute molecule interacts with solvent molecules in a complex manner, and consequently molecular spectra can, in principle, serve as probes to obtain information about structure and dynamics of molecular liquids. Understanding of liquid dynamics in the molecular level is also quite important to quantitatively investigate so-called "solvent effect" on chemical reaction in solution. One traditional approach to investigate microscopic details in liquids from molecular spectra is the lineshape analysis. However, the lineshape analysis always carries some ambiguity because of the structureless and broad feature of the spectrum.

For this decade several new methods with ultrafast lasers have been developed to obtain detailed information about dynamics and structures of liquids which cannot be available from the simple lineshape analysis. The techniques newly developed include two-dimensional Raman spectroscopy, picoseconds time-resolved Raman spectroscopy, three-pulse photon echo peak shift measurement, visible-pump and far IR-probe spectroscopy, so on. These are promising methods to provide valuable information on liquids, especially on dynamical behavior.

In this conference we focus on several time-resolved vibrational spectroscopic techniques which have been recently developed to study dynamics in liquids. Theoreticians and experimentalists in this field get together and discuss current problems and future directions of these techniques.

The Okazaki COE Conference on

"Molecular Science of Excited States and Nonadiabatic Transitions"

Organizing Committee: Hiroki NAKAMURA, Yoshitaka TANIMURA, Suehiro IWATA, Yuko OKAMOTO, Fumio HIRATA, Kenji YONEMITSU, Mutsumi AOYAGI *(Department of Theoretical Studies and Computer Centre, IMS)*

The Institute for Molecular Science (IMS) has been recognized as a Centre of Excellence (COE) officially by The Ministry of Education, Science, Culture, and Sports of Japan. By the financial support from The Ministry we had an opportunity to organize an international symposium.

Considering the recent remarkable theoretical progress in the basic theory of nonadiabatic transition, quantum chemistry of excited states, and various nonadiabatic dynamics, we have determined the title of the symposium as "Molecular Science of Excited States and Nonadiabatic Transitions." The symposium was held from March 25 (Wed.) through 28 (Sat.) in 1998 at The Okazaki Conference Center.

Nonadiabatic transition is a very interdisciplinary phenomenon and concept, making an important mechanism of state and/or phase change in various fields of physics, chemistry, and biology. Recent theoretical progress in the related various fields is remarkable, and we think that it is really timely and valuable to organize such a symposium to stimulate interdisciplinary information exchange and discussions and to promote further developments. We have covered the following subjects: (1) Theory of nonadiabatic transition, (2) Molecular nonadiabatic processes, (3) Excited States of molecules, (4) Nonadiabatic processes in condensed phase, (5) Biological system.

Twenty four invited talks and forty four posters were presented, and about 150 people attended the conference. Very fruitful multi-disciplinary discussions were made inside and outside the conference hall with the recognition of the importance of nonadiabatic transitions in a variety of fields of physics, chemistry, and biology. The conference was very successful and even a new multi-disciplinary field would be expected to emerge in future.