



Newsletter

No. **6** E
June 1, 2005

The 21st Century COE Program
Mechanical Systems Innovation, The University of Tokyo

An International Workshop is Held

Workshop on Micro/Nano Scale Thermal/Fluids Engineering for Biotechnology and Energy Conversion Applications



“Opening address by Prof. Nobuhide Kasagi, 21COE program leader”



“Lecture by Dr. Gian Piero Celata”



“Questions and answers related to Prof. Chang-Jin Kim’s lecture”

“International Workshop on Micro/Nano Scale Thermal/Fluids Engineering for Biotechnology and Energy Conversion Applications” sponsored by the 21st Century COE program Mechanical Systems Innovation, was held on April 22 (Fri) 2005 at Takeda conference hall, by inviting leading experts in the area of micro/nano engineering of bio and energy applications. Hot topics on micro heat transfer, fuel reforming for fuel cells, biomass, heat pumps, MEMS, and bio-fluidics were introduced by Dr. G. P. Celata (ENEA Casaccia, Rome, Italy), Prof. R. Shah (Rochester Institute of Technology, USA), Prof. G. Akay (University of Newcastle upon Tyne, UK), Prof. A. Cavallini (University of Padova, Italy), Prof. C. J. Kim (UCLA, USA), and Prof. D. Poulikakos (ETH, Switzerland). More than 120 people, mostly young graduate students and Ph.D. candidates, attended the workshop. The discussions and interactions with invited speakers were intensive and exciting. The workshop was very successful in providing good opportunities for young researchers.

Three Project Promoters Newly Join 21COE

Takashi Ushida

Professor, Center for Disease Biology and Integrative Medicine, Graduate School of Medicine
(Department of Mechanical Engineering, School of Engineering)



I feel very honored to join the 21 COE program “Mechanical Systems Innovation”, while I have a chance to carry out research and continue my education in the Graduate School of Engineering as well as the Graduate School of Medicine. My major is “Medical Engineering”, and I especially focus on “Tissue Engineering (Regenerative Medicine)” as my primary research theme. I would be very pleased if I could contribute to extending the horizon of mechanical engineering by exploring medical fields from mechanical points of view. At the same time, I am charged with publishing and press in the Program. I hope to inform as many people as possible of the Program’s research and education activities by a variety of means, and I am looking

Shinobu Yoshimura

Professor, Department of Quantum Engineering and Systems Science, School of Engineering



I have been enrolled in this COE project since April 1st of this year. I also just moved back from the Institute of Environmental Studies, Graduate School of Frontier Sciences, to the School of Engineering on April 1st. I have worked as a visiting researcher in Computational Mechanics Center,

Georgia Institute of Technology, USA in 1985-86 and in the Material Testing Institute, University of Stuttgart, Germany, in 1994. My research topic is Intelligent Simulation, which is a high level of integration of (1) Computational Mechanics, (2) High-Performance Computing and Networking, and (3) Intelligent and Soft Computing. With the intelligent simulation, I am studying Design of Artifacts, Large-Scale Simulation of Artifacts, Life-Time Assessment, Inverse Analysis, and Social and Environment Simulations. In the COE project, I focus on Large-Scale Coupled Mechanics Simulation and Inverse analysis.

Shigehiko Kaneko

Professor, Department of Mechanical Engineering, School of Engineering



My specialty is dynamics and control of mechanical systems. In connection with small-sized distributed energy systems, I currently am primarily working on the following three research topics: biomass gas-fueled micro gas turbines, gas engines, and foil bearings for small-sized gas turbine use. To prototype a low-

calorie biomass gas-fueled micro gas turbine, we designed and manufactured a special combustor under the guidance of JAXA, developed a control system, and finally succeeded in achieving stable operations.

In general, gas engines have better thermal efficiency than micro gas turbines; however, if we try to operate gas engines fueled by biomass gas that maintain stable combustion, we have to develop control systems to deal with time variations related to the calories and composition of the supplied biomass gas. We are now developing such a control system by adjusting the timing of the igniter. The last research topic is the development of a foil bearing for high-speed small-sized gas turbine use.

To contribute to the early realization of distributed energy systems, I will continue proposing new ideas, and I hope to receive your cooperation. Thank you.

Voices from Young Researchers

Yoshiaki Akematsu

Postdoctoral Fellow, Department of Environmental and Ocean Engineering, School of Engineering



My name is Yoshiaki Akematsu. I have been worked for the University of Tokyo as a postdoctoral fellow since 2004. My specialty is nondestructive inspection. Acoustic emissions, which are made up of transient elastic waves generated by the rapid release of energy, are my particular area of interest. In my research I have attempted to clarify the mechanism of sound source. I have recently studied the "Detection of Elastic Wave by Using Optical Fiber Sensor during Single Pulse Discharge." Electrical discharge machining (EDM) is widely used for manufacturing various kinds of dies and molds. However, the mechanism of material removal in EDM has not been sufficiently clarified because electric discharge is a very short time phenomenon and occurs as electromagnetic noise. In order to overcome some of the problems of discharge monitoring systems, a new optical fiber sensor has been developed. I hope that this optical fiber sensor will clarify the mechanism of material removal in EDM.

Furthermore, I will add to my stock of scientific knowledge to take advantage of the 21st COE Program. Your continued support will be greatly appreciated.

Kohei Okita

Postdoctoral Fellow, Department of Mechanical Engineering, School of Engineering



My name is Kohei Okita. I have been working as a postdoctoral fellow of COE since April, 2004. My research topic is a multi-scale analysis for gas-liquid two-phase flows in "The Hyper Modeling/Simulation Project". In particular, I have been studying the cavitation phenomenon, which is a sequence of nucleation, growth, contraction, and collapse of bubbles in liquids by a change in the surrounding hydrodynamic environment.

Cavitation induces unstable phenomena in fluid machinery and erodes materials in piping systems. Now, based on experimental analyses, however, cavitation phenomena have begun to be effectively utilized in a variety of fields. Bubble collapse can lead to high temperature and pressure conditions, which can be used for a lithotripsy in medical fields, an annihilation of microbes, and the decomposition of chemicals in environmental fields. However, details of the cavitation phenomenon have not yet been clarified due to the complex interaction between micro- and macro-scale phenomena. I intend to study the cavitation phenomenon by using modeling and simulation.

Project Promoters

Program leader

Nobuhide Kasagi Professor, Department of Mechanical Engineering, School of Engineering

Energy innovation

Toshio Nagashima Professor, Department of Aeronautics and Astronautics, School of Engineering

Chisachi Kato Professor, Department of Human and Society, Institute of Industrial Science

Takayuki Terai Professor, Department of Nuclear Science and Management, School of Engineering

Kazuo Kageyama Professor, Department of Environmental and Ocean Engineering, School of Engineering

Nobuo Takeda Professor, Department of Advanced Energy, School of Frontier Sciences

Shinichi Nakasuka Professor, Department of Aeronautics and Astronautics, School of Engineering

Tamaki Ura Professor, Department of Environmental and Ocean Engineering, Institute of Industrial Science

Shinichi Nakasuka Professor, Department of Aeronautics and Astronautics, School of Engineering

Toyohisa Fujita Professor, Department of Geosystem Engineering, School of Engineering

Shigehiko Kaneko Professor, Department of Mechanical Engineering, School of Engineering

Biomedical innovation

Mamoru Mitsuishi Professor, Department of Engineering Synthesis, School of Engineering Masao Washizu Professor, Department of Mechanical Engineering, School of Engineering

Masayuki Nakao Professor, Department of Engineering Synthesis, School of Engineering

Teruo Fujii Associate Professor, Department of Environmental and Ocean Engineering, Institute of Industrial Science

Takashi Ushida Professor, Department of Mechanical Engineering, School of Engineering

Hyper modeling / simulation

Yoichiro Matsumoto Professor, Department of Mechanical Engineering, School of Engineering

Takafumi Fujita Professor, Department of Information and System, Institute of Industrial Science

Hideaki Miyata Professor, Department of Environmental and Ocean Engineering, School of Engineering

Shinsuke Sakai Professor, Department of Mechanical Engineering, School of Engineering

Shinobu Yoshimura Professor, Department of Quantum Engineering and Systems Science

Project members

Toshiki Iino Project Professor, International Research and Education Center for Mechanical Systems Innovation, School of Engineering

Kensuke Tsuchiya Project Research Associate, International Research and Education Center for Mechanical Systems Innovation, School of Engineering

Yosuke Hasegawa Project Research Associate, International Research and Education Center for Mechanical Systems Innovation, School of Engineering

Advisory Committee

Advisory committeemen

Koutaro Inoue Senior Fellow, Japan Science and Technology Agency

Noboru Kikuchi Professor, The University of Michigan

Yoshitsugu Kimura

Tetsuya Tateishi

Chair, President, Kagawa University

Professor, Tokyo Denki University

Activities of Mechanical Systems Innovation Program (scheduled)

<International Workshop>

©Workshop on Micro/Nano Scale Thermal/Fluids Engineering for Biotechnology and Energy Conversion Applications

Date : April 22, 2005

Venue : Takeda Hall, Takeda Building, Asano Campus

<Open Seminars>

©FY2005-1st Seminar

Date : June 10, 2005

Venue : Seminar Room No.2, Faculty of Engineering Bldg.2, Hongo Campus

Subject : Topics in Financial Mathematics

Speaker : Prof. Huaxiong Huang (York University)

©FY2005-2nd Seminar

Date : June 17, 2005

Venue : Seminar Room No.2, Faculty of Engineering Bldg.2, Hongo Campus

Subject : Topics in Financial Mathematics

Speaker : Prof. Huaxiong Huang (York University)

<Industry-Government-Academia Interaction Meeting for Human Resource Development>

©FY2005-1st Meeting

Date : March 15, 2005

Venue : Lecture Room No.226, Faculty of Engineering Bldg.8, Hongo Campus

Subject : Efforts to the Advanced Human Resource Development

Speaker : Yuji Sakakibara (Manager, Ministry of Education, Culture, Sports, Science and Technology [MEXT])

©FY2005-2nd Meeting

Date : April 26, 2005

Venue : Lecture Room No.226, Faculty of Engineering Bldg.8, Hongo Campus

Subject : Expectations and Realities for Postdoctoral

Speaker : Mutsuhiro Arinobu (Chief of Research & Development, Corporate Center, Toshiba Co., Ltd.)

<Industry-Faculty Council for Human Resource Development>

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Date : June 3, 2005

Venue : Lecture Room No.226, Faculty of Engineering Bldg.8, Hongo Campus