

Message from the Director

July 27, 2009

On behalf of all my colleagues at Kyoto University's Institute for Integrated Cell-Material Sciences, iCeMS for short, I welcome you to the Fifth iCeMS International Symposium on "Biomaterials at the interface of chemistry, physics, and biology."

The iCeMS is founded as a response to the Japanese government initiative of World Premier International Research Centers (WPI Program). The initiative is meant to establish globally visible research centers here in Japan, which will attract top-notch researchers from around the globe, particularly talented young scientists -- ones expected to become world's leading investigators in the future. The proposal to establish the iCeMS was funded as one of the five such centers throughout Japan. The iCeMS places a strong emphasis on international collaborations, and the iCeMS international symposium, to be held in a series, is one of our major means to develop our ties with international scientific communities.

We at the iCeMS strive to develop the fundamental understanding and control of molecular complexes in the meso-scale of 5-100 nm (meso-control), as the cell appeared to develop them through evolution. They are also very important to design and create various novel "smart materials" by understanding the molecular events in such materials. We consider these efforts critical for creating the science and technology of the next generation. For this purpose, we make cross-disciplinary approaches to create: 1) new chemistry and physics of meso-space, 2) cellular meso-biophysics, and 3) stem-cell control by meso-engineering.

I hope that the subject matters discussed at this symposium on will provide a unique opportunity for researchers from various fields including biomedical sciences, chemistry, material sciences and physics to meet up and develop closer relationships, exchanging their expertise and new ideas to push back the frontiers of "meso-space" and "meso-control."

Thank you very much again for joining us at the Fifth iCeMS International Symposium. I hope you will enjoy this meeting.

Norio Nakatsuji, D.Sc.

Director and Professor
Institute for Integrated Cell-Material Sciences (iCeMS)
Kyoto University

Welcome to the Fifth iCeMS International Symposium
**“Biomaterials at the interface of chemistry, physics,
and biology”**

July 27(Mon)-28(Tue)
Clock Tower Centennial Hall
Kyoto University, Kyoto

We would like to welcome you all to the Fifth iCeMS International Symposium held on July 27-28, 2009 by the Institute for Integrated Cell-Material Sciences (iCeMS), Kyoto University, Japan.

The symposium focuses on the research fields of biomaterials which have made rapid progress in recent years. For the development of innovative technologies and applications of these materials, it will be more important to consider phenomena occurring in biological meso-space. In other words, these researches are to control and design the atomic and molecular interactions occurring in biological reaction systems in the scale of 5-100 nm by physical/chemical sciences. Thus, the technical program includes 18 distinguished invited lectures in the seven research topics contributing advanced meso-space sciences and technologies.

The main purpose of the symposium is to provide a great opportunity to discuss new results and ideas between scientists working on different research fields of chemistry, physics, and biology. In particular, it will be our pleasure if this symposium provides young researchers with opportunities to obtain new perspectives on their own research works through such interdisciplinary discussion.

We hope all participants will benefit from the lectures and discussion during this symposium.

Takafumi Ueno, Ph. D.

General Manager of the symposium
Associate Professor
Institute for Integrated Cell-Materials Sciences (iCeMS)
Kyoto University

July 27 (Mon) 9:20– Clock Tower Centennial Hall 2F

Opening 9:20

Takafumi Ueno (iCeMS, Kyoto University)

Welcome Address 9:25

Norio Nakatsuji (Director of iCeMS, Kyoto University)

Session 1: DNA Engineering (9:30-12:00)

Chair: Hiroshi Sugiyama (iCeMS)

9:30-10:05 Yi Lu (Univ. of Illinois, USA)
Functional DNA Nanotechnology: Precise Spatial and Dynamic Control of Error-free Nanomaterials Assembly and its Applications in Sensing, Imaging and Targeted Drug Delivery

10:05-10:40 Akimitsu Okamoto (RIKEN, Japan)
Excitonic Interaction: New Photochemical Control for Nucleic Acid Imaging

Coffee Break 10:40-10:50

10:50-11:25 Grigory Tikhomirov and Shana O. Kelley (Univ. of Toronto, Canada)
Nucleic Acid-passivated Semiconductor nanocrystals: Biomolecular Templating of Form and Function

11:25-12:00 Masayuki Endo (iCeMS, Kyoto Univ.)
Design and Construction of DNA Nanostructures for Integration of Molecules

Lunch 12:00-13:30

Session 2: Biophysics of Protein Assemblies (13:30-14:40)

Chair: Aki Kusumi (iCeMS)

13:30-14:05 Motomu Tanaka (Univ. of Heidelberg, Germany)
Roles of Soft Biopolymers in Fine-Adjustment of Biological Interfaces

14:05-14:40 Bogdan Dragnea (Indiana Univ. USA)
Nanoparticle-Enabled Assembly of Icosahedral Protein Cages

Session 3: Peptide and Protein Design for Biodevices (14:40-15:50)

Chair: Shin-ichi Sato (iCeMS)

14:40-15:15 Hiroshi Matsui (The City Univ. of New York, USA)
Biomimetic Assemblies of Peptide Nanowires and Their Applications in Electronics and Sensors

15:15-15:50 Ehud Gazit (Tel Aviv Univ. Israel)
Controlling Assembly at the Nano-scale: From Therapy to Devices

Coffee Break 15:50-16:10

Session 4: Organic Chemistry toward Cell Biology (16:10-17:55)

Chair: Hideki Koyanaka (iCeMS)

16:10-16:45 Matthew B. Francis (Univ. of California Berkeley, USA)
Integration of Live Cells into Devices through DNA Hybridization

16:45-17:20 Itaru Hamachi (Kyoto Univ.)
Chemistry-based Protein Engineering in Test Tube, Cell Lysate, Cell and in vivo

17:20-17:55 Motonari Uesugi (iCeMS, Kyoto Univ.)
Synthetic Molecules that Control Gene Expression

Reception and Poster session 18:30-20:30 (iCeMS Main building 2F)

July 28 (Tue) 9:30–

Session 5: Integrated Materials for Drug Delivery Systems (9:30-10:40)

Chair: Tatsuya Murakami (iCeMS)

9:30-10:05 Victor S.-Y. Lin (Iowa State Univ. USA)
Multifunctional Mesoporous Nanoparticle-based Theranostics for Intracellular Controlled Release Delivery and Biosensor Applications

10:05-10:40 Mitsuru Hashida (iCeMS, Kyoto Univ.)
Cell-specific Gene Delivery with Glycosylated Liposomes and Their Therapeutic Application

Coffee Break 10:40-10:50

Session 6: Molecular design for Bioimaging (10:50-12:00)

Chair: Yoshie Harada (iCeMS)

10:50-11:25 Benoit Dubertret (ESPCI/CNRS, France)
Recent Advances in Quantum Dots Synthesis and Surface Chemistry for in vivo Imaging

11:25-12:00 Yasuteru Urano (The Univ. of Tokyo, Japan)
Selective Molecular Imaging of Viable Cancer Cells with Rationally Designed “Activatable” Fluorescence Probes

Lunch 12:00-13:30

Session 7: Synthetic Biomimics (13:30-15:15)

Chair: Susumu Kitagawa (iCeMS)

13:30-14:05 Trevor Douglas (Montana State Univ. USA)
Self-assembled Protein Cage Architectures: Supramolecular templates for Molecular and Materials Encapsulation

- 14:05-14:40 Hiroshi Imahori (iCeMS, Kyoto Univ.)
Artificial Photosynthetic Mimics
- 14:40-15:15 Kazushi Kinbara (Tohoku Univ. Japan)
Development of Bioinspired Molecular Machines
- 15:15-15:20 Closing**
Susumu Kitagawa (Deputy Director of iCeMS, Kyoto Univ.)