

Welcome to the Fourth iCeMS International Symposium
“Integrated Physical/Chemical Biology of the Cell:
from Genes to Membrane Systems”

May 27 (Wed) - 29 (Fri), 2009
Hotel Fujita Kyoto

We would like to welcome each one of you participating in this symposium, in particular the speakers from abroad, Drs. Barbara Baird, Susan PC Cole, Jean E. Vance, Daniel Choquet, Roger G. Deeley, Karl Kuchler, Eng Hin Lee, and Alan R. Tall.

Research at the iCeMS aims to understand molecular interactions in “meso-space.” “Meso-space” is the space between 5 and 100 nm, which is too complex for quantum mechanics, but cannot be solved by statistical/classical mechanics, either. “Meso-space” still remains unexplored.

Generation of “meso-space” on cellular membranes, in which molecules and lipids interact in special ways, is considered to be prerequisite for various cell functions. Cells have acquired the strategies for the meso-control of molecules in “meso-space” through evolution. Understanding of behavior and reactions of atoms and molecules in “meso-space” is also rapidly advancing in chemistry and physics.

The iCeMS strives to develop new scientific fields of “meso-space” and “meso-control” through integration of biosciences, chemistry, material sciences and physics with an eye to advanced technologies and applications to understand and find out the ways to control “stem-cells” and to innovate “sustainable energy resources” and “eco-friendly chemical technologies.”

The major objective of this symposium is to provide a unique opportunity for researchers from various fields, such as stem cell biology, lipid transporters, biosciences, 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.”

Kazumitsu Ueda, Ph.D.
Organizer of the symposium/
Professor and Chairman of the Board of PIs
Institute for Integrated Cell-Material Sciences (iCeMS)
Kyoto University

Message from the Director

May 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 Fourth iCeMS International Symposium on "Integrated Physical/Chemical Biology of the Cell: from Genes to Membrane Systems."

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. We consider these efforts critical for creating the science and technology of the next generation, and we intend to do these, with a strong focus on pluripotent stem (ES and iPS) cells. 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 "Integrated Physical/Chemical Biology of the Cell: from Genes to Membrane Systems" will provide a unique opportunity for researchers from various fields, such as stem cell biology, lipid transporters, biosciences, 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 Fourth 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

May 27 (Wed) 13:00 - 17:30

- 13:00-13:05 Opening
Kazumitsu Ueda (iCeMS, Kyoto Univ.)
- 13:05-13:15 Welcome Address
Norio Nakatsuji (iCeMS, Kyoto Univ.)
- 13:15-15:15 Session 1
Integrated Approaches to Tissue Development and Function
Chair: **John Heuser** (iCeMS, Kyoto Univ.)
- Daniel Choquet** (Univ. de Bordeaux, France)
“Integrating surface and intracellular trafficking of glutamate receptors in neuronal spines”
- Mineko Kengaku** (iCeMS, Kyoto Univ.)
“Dynamics and mechanisms of branch patterning of neuronal dendrites in the brain”
- Noriko Osumi** (Tohoku Univ.)
“Fatty acid signals in neurogenesis and their application”
- Masatoshi Takeichi** (Riken Center for Development Biology)
“Interplay between cell adhesion receptors and cytoskeletons for epithelial morphogenesis”
- 15:15-15:45 Coffee Break
- 15:45-17:15 Session 2
Physical Biology of Membrane Nano- and Meso-domains
Chair: **Makoto Kiso** (iCeMS, Kyoto Univ.)
- Barbara Baird** (Cornell Univ., USA)
“Toward Nanoscale Spatial Resolution of IgE Receptor Signaling”
- Akihiro Kusumi** (iCeMS, Kyoto Univ.)
“Signal Transduction via Meso-Scale Raft Domains as Studied by Single-Molecule Tracking”
- Toyoshi Fujimoto** (Nagoya Univ.)
“Nanoscale localization of membrane lipids by electron microscopy”
- 17:15-17:30 Presentation of the WPI program by the MEXT officer
- 18:00 Welcome Party at Hotel Fujita Kyoto

May 28 (Thu) 8:30 - 19:30

8:30-10:00 Session 3
Integrated Chemical-Biological Approaches to Lipid Functions in the Cell

Chair: **Konstantin Agladze** (iCeMS, Kyoto Univ.)

Toshihide Kobayashi (Riken)
“Imaging lipids”

Masato Umeda (Kyoto Univ.)
“A membrane lipid-field theory to understand cellular functions”

Kazuma Tanaka (Hokkaido Univ.)
“Cellular functions of phospholipid flippases”

10:00-10:30 Coffee Break

10:30-12:00 Session 4
Stem-cells and their Applications

Chair: **Motonari Uesugi** (iCeMS, Kyoto Univ.)

Toshio Suda (Keio Univ.)
“Niche regulation of the quiescence of stem cells”

Norio Nakatsuji (iCeMS, Kyoto Univ.)
“Human embryonic stem cells as valuable tools for drug discovery and toxicology screening”

Tatsutoshi Nakahata (iCeMS, Kyoto Univ.)
“Clinical applications of various stem cells”

12:00-13:20 Lunch

13:20-15:30 Session 5
ABC Proteins and Cell Functions

Chair: **Mitsuru Hashida** (iCeMS, Kyoto Univ.)

Karl Kuchler (Univ. of Vienna, Austria)
“Fungal ABC transporters: a tale of stress, drugs and heavy metal resistance”

Roger G. Deeley (Queen’s Univ., Canada)
“Acceptor dependence of sterol efflux by wild type and mutant ABCA1”

Alan R. Tall (Columbia Univ. USA)
“ApoA-1 suppresses myeloid cell proliferation in ABC transporter knock-out mice”

Kazumitsu Ueda (iCeMS, Kyoto Univ.)
“ABCA1: Mechanisms and regulations of HDL formation”

Florante A. Quioco (Baylor College of Medicine, USA) : Short talk
“Conformational changes and ligand-affinity differences along the pathway govern ABC transport”

15:30-16:00 Coffee Break

16:00-17:30 Session 6
Signaling Lipid Molecules and Transporters
Chair: **Hiroshi Sugiyama** (iCeMS, Kyoto Univ.)

Susan PC Cole (Queen’s Univ., Canada)
“Molecular determinants of leukotriene C4 transport by MRP1/ABCC1”

Atsuo Kawahara (National Cardiovascular Center)
“Zebrafish spns2 functioning as a S1P transporter is essential for the myocardial precursor migration”

Jean E. Vance (University of Alberta)
“New functions for lipids in neurons and glial cells”

17:30-19:30 Poster Session

20:00- Speakers’ dinner at Hotel Fujita Kyoto

May 29 (Fri) 8:30 - 12:30

8:30-10:30 Session 7

Meso-Control of Functional Materials

Chair: **Takafumi Ueno** (iCeMS, Kyoto Univ.)

Susumu Kitagawa (iCeMS, Kyoto Univ.)

“Fabrication of Core Shell-Type and Nanorod-Type Porous Coordination Polymers”

Mikio Takano (iCeMS, Kyoto Univ.)

“Deriving bio-related functions from ubiquitous 3d transition metal elements”

Koichiro Tanaka (iCeMS, Kyoto Univ.)

“Terahertz Nearfield Real-Time Microscope for Biological Applications”

Keiji Morokuma (Fukui Inst. Kyoto Univ.)

“Theoretical studies of chemical reactions: carbon nanotube growth reaction and enzymatic reactions”

10:30-11:00 Coffee Break

11:00-12:30 Session 8

Multi-Functional Materials Responsive to External Stimuli

Chair: **Yong Chen** (iCeMS, Kyoto Univ.)

Yoshie Harada (iCeMS, Kyoto Univ.)

“Studies on biomolecules using single-molecule imaging and manipulation techniques”

Ken Poppelmeier (North Western Univ. USA)

“Powering the Implantable Cardioverter Defibrillator (ICD)”

Hiroshi Imahori (iCeMS, Kyoto Univ.)

“Artificial Photosynthetic Mesomaterials for Solar Energy Conversion”

12:30 Closing

Susumu Kitagawa (iCeMS, Kyoto Univ.)