

## 第 4 回 iCeMS 国際シンポジウム

### “Integrated Physical/Chemical Biology of the Cell: from Genes to Membrane Systems”

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

京都大学 物質－細胞統合システム拠点では、5月27日（水）から29日（金）までの3日間、ホテルフジタ京都において、第4回 iCeMS 国際シンポジウムを開催いたします。

物質－細胞統合システム拠点では、細胞をモデルとして、メゾ空間での物質間の相互作用のメカニズム理解しようとしています。メゾ空間とは、「ナノ」と「マイクロ」の間の空間の5・100 nm 程度の空間を意味し、量子力学的には複雑すぎ、統計力学では理解できないため、これまであまり研究されてこなかった世界です。

細胞は、「メゾ空間」をうまく利用して生きています。個々のタンパク質の単なる集積ではできないことが、特殊な「メゾ空間」を形成することによって、大きな力を発揮するのです。細胞膜上には、脂質とタンパク質が集積した「メゾ空間」があり、重要な役割を果たしています。一方、物理と化学の分野でも、「メゾ空間」での原子・分子の挙動や反応の理解が進みつつあります。物質－細胞統合システム拠点は、生物学、化学、物理学分野の融合によって、メゾ空間での物質間の相互作用のメカニズム「メゾ制御」を理解し、その知見を幹細胞などの理解と制御に役立てようとしています。さらに、細胞や幹細胞から得た知識を人工的な化学合成物に応用することによって、環境、産業、医療などさまざまな分野で役立つ「人工メゾ空間」を作り出すことを目指しています。

本シンポジウムでは、幹細胞とその応用研究、細胞膜ドメインを制御するトランスポーター、そして化学的に「人工メゾ空間」を作り出す研究に焦点をあて、世界中からそれぞれの分野の第一線で活躍する研究者を招きました。皆様のご参加をお待ちしております。

京都大学 物質－細胞統合システム拠点  
教授／主任研究者会議議長  
実行委員長 植田 和光

## 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**

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- 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**

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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. Quiocho** (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**

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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.)