The First
iCeMS International Symposium

The Eleventh
MEMBRANE RESEARCH FORUM

February 20 - 22, 2008

Hotel Fujita Kyoto

Sponsored by:

The Institute for Integrated Cell-Material Sciences (iCeMS), Kyoto University

Strategic International Cooperative Program
of Japan Science & Technology Agency (JST)

Membrane Mechanisms Project, ICORP, JST

Sokabe Cell-Mechanosensing Project, SORST, JST

National Centre for Biological Sciences (NCBS), Bangalore, India

Message from Director of the iCeMS

February 20, 2008

On behalf of all my colleagues at the iCeMS, Institute for Integrated Cell-Material Sciences at Kyoto University, I welcome you to the First iCeMS International Symposium.

Our iCeMS is founded as a response to the Japanese government initiative of World Premier International Research Centers (WPI program). The initiative is for establishing globally visible research centers here in Japan, which will attract top-level researchers from around the globe, particularly talented young scientists who will become world leaders in the future. The proposal to establish iCeMS was funded as one of the five such centers throughout Japan. 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.

We are holding this First iCeMS Symposium, featuring the meso-scale molecular interactions in/on the cellular membranes of various cells, including stem cells, in collaboration with the Executive Committee of the International Membrane Research Forum, three branches of the Japan Science and Technology Agency, and the National Centre for Biological Sciences of Bangalore, India, one of our partner institutions. I hope that the subject matters discussed here will provide good examples for interesting and useful meso-scale molecular interactions that control cellular functions.

Thank you very much again for joining us on this memorable occasion of the First iCeMS International Symposium, co-held as the Eleventh International Membrane Research Forum. 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 First iCeMS International Symposium and the Eleventh International Membrane Research Forum

February 20, 2008

We would like to welcome everybody who is participating in this symposium/forum, and in particular the keynote speakers and the speakers from abroad, Drs. Yong Chen, Simon Davis, John Heuser, Takashi Hiiragi, Mineko Kengaku, Roger Morris, Robert Nabi, Ken Ritchie, Yoshiki Sasai, Kai Simons, Mike Stowell, Jack Taunton, Mark Terasaki, Fiona Watt, and Tony Watts. It is a great pleasure for us to report that many scientists expressed considerable interest in this forum, and volunteered to present their research results.

We would like to briefly explain the general aim of this membrane research forum. It is an attempt to bring together scientists from different research backgrounds, who are working on biological membranes. With this forum, we are trying to provide a common platform for scientists working on various aspects of membrane biology. The aim is "synthesis" rather than specialization. We believe that the time is ripe for synthesizing current biological and physical knowledge about the membranes, which may be used to better understand membrane functions.

This year, we hold the International Membrane Research Forum as the First iCeMS International Symposium, which gives two interesting key features to this year's forum. The first feature is the emphasis on the meso-scale (5-100 nm) molecular interactions in/on the cellular membranes. This is in line with our traditional emphasis on various membrane domains, or non-random assemblies of membrane molecules that may exhibit wide range of sizes and lifetimes. These assemblies include very small and transient domains made of several proteins or lipids, on the one hand, as well as large and stable assemblies such as cell-to-cell adhesion structures and the apical membrane of the epithelial cell, on the other hand. In addition, we will devote half a day for the sessions on membrane raft domains, and we will have many presentations discussing the cytoskeleton-membrane interactions, which would be very important for understanding membrane-related processes.

The second key feature is the developmental-biology aspect because of the iCeMS' emphasis on pluripotent stem cells. We should be able to learn a lot by being exposed to these development-related talks.

One of the points of emphasis is "new technology", which is being used or which may be useful in the future in membrane research. We place special emphasis on single-molecule and nano-meso technologies.

As always, we try to give ample opportunities for personal interactions during these three days, perhaps with too many breaks. We hope that you will enjoy this meeting, and mingling with other scientists. We would like to emphasize this last point this year more than before, because the spectrum of the participants' backgrounds is much broader than that in previous meetings.

Jiro Usukura, Masahiro Sokabe and Aki Kusumi, Organizers

February 20 9:00 - 17:20

Opening 9:00 - 9:05

Aki Kusumi iCeMS and Institute for Frontier Medical Sciences, Kyoto University (Membrane Mechanisms Project, ICORP-JST)

Welcome Address 9:05 - 9:15

Norio Nakatsuji iCeMS (Director) and Institute for Frontier Medical Sciences, Kyoto University

Welcome to the first iCeMS International Symposium

Keynote Lecture 1 9:15 - 9:55 Chair: Norio Nakatsuji

John Heuser iCeMS (International Affiliate) and Washington University School of Medicine

Electron microscopy of membrane dynamics on the meso-scale; an introduction to techniques, applications, and future goals

Coffee Break 9:55 - 10:15

Keynote Lecture 2 10:15 - 10:55 Chair: Takahiro Fujiwara

Jack Taunton Dept. of Cellular & Molecular Pharmacology, University of California, San Francisco

Reciprocal feedback between polymerizing actin filaments and membrane-associated signaling proteins

Seminar 1: 10:55 - 11:35 Chair: Takahiro Fujiwara

Masahiro Sokabe, K. Hayakawa, and Hitoshi Tatsumi
Department of Physiology, Nagoya University School of Medicine (Cell-Mechanosensing Project, SORST, JST)
Mechanosensing by cytoskeleton

Makoto Kinoshita Kyoto University Graduate School of Medicine
Requirement of submembranous septin polymers for the structural, mechanical and functional integrity of the cell cortex

Lunch 11:35 - 13:00

Keynote Lecture 3 13:00 - 13:40 Chair: Takashi Hiiragi

Fiona Watt Wellcome Trust Centre for Stem Cell Research, School of Biological Sciences, University of Cambridge

Contribution of differentiated cells to epidermal tumour formation

Coffee Break 13:40 - 14:00

Keynote Lecture 4 14:00 - 14:40 Chair: Mineko Kengaku

Yoshiki Sasai RIKEN Center for Developmental Biology

In vitro generation of brain tissues

Seminar 2: 14:40 - 15:00 Chair: Mineko Kengaku

Takashi Hiiragi (prospective PI of iCeMS) Max-Planck Institute for Molecular Biomedicine at Münster

Unique principles in early mammalian development

Coffee Break 15:00 - 15:20

Keynote Lecture 5 by Mike Stowell is cancelled.

Seminar 2a: 15:20 - 16:00 Chair: Jiro Usukura

Nobuhiro Morone — National Center of Neurology and Psychiatry, National Institute of Neuroscience
Electron freeze-replica tomography correlated with a single-molecule imaging: a structural analysis for the plasma membrane

Rinshi Kasai — Membrane Mechanisms Project, ICORP-JST, Institute for Frontier Medical Sciences, Kyoto University
Direct determination of monomer-dimer dynamic equilibrium of a GPCR by a single fluorescent-molecule tracking

Seminar 3: 16:00 - 17:20 Chair: Ken P. Ritchie

Yong Chen — iCeMS, Kyoto University and Département de Chimie, École Normale Supérieure
Microfluidic platform for stem cell differentiation

Konstantin Agladze — iCeMS, Kyoto University
Origination and suppression of spiral waves in cardiomyocytes: from the model to the real heart

Mark Terasaki — Department of Cell Biology, University of Connecticut Health Center
Mechanism of the rapid increase in chloride permeability that accompanies wound-resealing at the plasma membrane

Yuichi Takakuwa — Tokyo Women's Medical University
Decrease in erythrocyte membrane deformability by spectrin glycation

17:50 Bus Transportation to Yasaka-michi
Please get together in the lobby area after the last talk by Dr. Takakuwa.

18:20 - 20:30 Mixer at Oblio Restaurant (see the map2)

Welcome Speech
Jiro Usukura — EcoTopia Science Institute, Nagoya University

February 21 9:00 - 19:00

Keynote Lecture 6 9:00 - 9:40 Chair: Michael H. B. Stowell

Anthony Watts Biomembrane Structure Unit, Biochemistry Department, University of Oxford

Single molecule and structural studies of a GPCR

Coffee Break 9:40 - 10:00

Keynote Lecture 7 10:00 - 10:40 Chair: Michiyuki Matsuda

Simon Davis Nuffield Department of Clinical Medicine and Medical Research Council, Weatherall Institute of Molecular Medicine, University of Oxford

Organizational principles underlying cell surface receptor function

Seminar 4: 10:40 - 11:40 Chair: Ivan Robert Nabi

Michiyuki Matsuda Laboratory of Bioimaging and Cell Signaling, Graduate School of Biostudies, Kyoto University

High turnover rate of phosphoinositides at the front of migrating MDCK cells: An approach with FRET imaging and mathematical modeling

Hideo Akutsu Institute for Protein Research, Osaka University

Structure and Function of ATPsynthase Epsilon Subunit

Kazumitsu Ueda iCeMS, Kyoto University

ABC proteins: Flexible interaction with chemicals and Meso-space control

Lunch 11:40 - 13:00

Keynote Lecture 8 13:00 - 13:40 Chair: Takashi Saito

Ken P. Ritchie Department of Physics, Purdue University

Single molecule investigations into the mobility of proteins in *E. coli* membranes

Seminar 5: 13:40 - 14:00 Chair: Takashi Saito

Yoshie Harada (prospective PI of iCeMS) The Tokyo Metropolitan Institute of Medical Science

Single-molecule experiments on DNA motors

Coffee Break 14:00 - 14:20

Seminar 6: 14:20 - 15:20 Chair: Masahiro Sokabe

Makoto Kiso iCeMS, Kyoto University and Faculty of Applied Biological Sciences, Gifu University

Synthetic ganglioside probes toward applications in medicinal chemistry and cell biology

Nobuhiro Hayashi Institute for Comprehensive Medical Science, Fujita Health University

Approach for studying reversible, delicate, and diverse translocations of fatty-acylated proteins to membranes

Jiro Usukura EcoTopia Science Institute, Nagoya University

Comprehensive spatial distribution of actin binding proteins in the membrane undercoat

Coffee Break 15:20 - 15:40

Keynote Lecture 9 15:40 - 16:20 Chair: John Heuser

Mineko Kengaku RIKEN Brain Institute

The mechanism of neuronal migration in the brain

Seminar 7: 16:20 - 17:00 Chair: Kohji Kasahara

Kazuo Emoto Neural Morphogenesis Lab, National Institute of Genetics

Molecular and cellular mechanisms that regulate establishment, maintenance, and remodeling of dendritic fields

Yasushi Hiromi National Institute of Genetics

Neural network formation through intra-axonal patterning

17:20 - 19:00 Poster Session and Snack

The program is attached at the end of this booklet.
Coffee, tea, beer, sake, and snacks will be served.

19:00 Cab Transportation to Kusumi JST Lab

Please get together in the lobby area. It takes about 10 min to the lab.

19:20 - 21:00 Tour of Kusumi JST Lab

Demo-experiments will be performed by Koichiro Hirosawa and Akihiro Shibata.

February 22 9:00 - 13:00

Keynote Lecture 10 9:00 - 9:40 Chair: Toshihide Kobayashi

Kai Simons Max-Planck Institute of Molecular Cell Biology and Genetics, Dresden

Lipid rafts in membrane trafficking

Coffee Break 9:40 - 10:00

Keynote Lecture 11 10:00 - 10:40 Chair: Jack Taunton

Ivan Robert Nabi Department of Cellular and Physiological Sciences, Life Sciences Institute, University of British Columbia

Lattices, rafts and scaffolds: Domain regulation of receptor signaling and dynamics at the plasma membrane

Seminar 8: 10:40 - 11:40 Chair: Simon Davis

Ken G. N. Suzuki Membrane Mechanisms Project, ICORP-JST, Japan
Mechanism for raft-based signal transduction as studied by single-molecule tracking

Takashi Saito Laboratory for Cell Signaling, RIKEN Research Center for Allergy and Immunology
Spatiotemporal regulation of T cell activation and co-stimulation by microclusters

Kohji Kasahara Tokyo Metropolitan Institute of Medical Science
Translocation of fibrin to lipid rafts of blood platelets by thrombin

Coffee Break 11:40 - 12:00

Seminar 9: 12:00 - 12:20 Chair: Chieko Nakada

Toshihide Kobayashi RIKEN
Cholesterol gradient in cell membranes

Keynote Lecture 12 12:20 - 13:00 Chair: Chieko Nakada

Roger Morris School of Biomedical and Health Sciences, King's College London

Detergent-resistant membrane with raft-like properties can be isolated at 37 ˚C

Closing

Masahiro Sokabe has to leave earlier. So, the closing comment is given by

John Heuser iCeMS (International Affiliate) and Washington University School of Medicine

Poster Session Program
February 21
17:20 - 19:00

Presentation Time **Odd Numbers** **17:20-18:10**
Even Numbers **18:10-19:00**

Name Affiliation

1. Hideo Hagihara Institute for Comprehensive Medical Science, Fujita Health University
Site-selective post-translational modification of proteins using an unnatural amino acid for single-molecule tracking

2. Nobuyasu Komi Institute for Protein Research, Osaka University
Solid-State High Resolution NMR Study on Pituitary Adenylate Cyclase-Activating Polypeptides Bound to Phospholipid Membranes

3. Francoise Hullin-Matsuda Lipid Biology Laboratory, RIKEN
Bis(monoacylglycero)phosphate (BMP) and BMP domains in late endosomes

4. Yasuhiro Tanaka, Akari Hagiwara, Rie Hikawa, Ai Tanigaki, Makoto Kinoshita
Kyoto University Graduate School of Medicine
Requirement of submembranous septin polymers for the structural, mechanical and functional integrity of the cell cortex

5. Masahiro Kitano Laboratory of Bioimaging and Cell Signaling, Graduate School of Biostudies, Kyoto University
Development of the FRET-Based Probe for Monitoring Rab5 Activity in Living Cells

6. Masako Hozoji Laboratory of Cellular Biochemistry, Division of Applied Life Sciences, Graduate School of Agriculture, Kyoto University
Direct interaction of nuclear receptor LXRs with ABCA1 modulates cholesterol efflux

7. Osamu Sano Div. Appl. Life Sci., Grad. Sch. of Agric., Kyoto Univ.
Effect of ABCG1 and ABCG4 on APP processing

8. Kohjiro Nagao Laboratory of Cellular Biochemistry, Division of Applied Life Sciences, Graduate School of Agriculture, Kyoto University

Mechanism of ABCA1-mediated efflux of cholesterol and phosphatidylcholine to apoA-I - ApoA-I-independent lipid movement by ABCA1 -

9. Yuya Azuma Laboratory of Cellular Biochemistry, Division of Applied Life Sciences, Graduate School of Agriculture, Kyoto University

Endocytosis and recycling of ABCA1 and HDL formation

10. Mie Takada Laboratory of Cellular Biochemistry, Division of Applied Life Sciences, Graduate School of Agriculture, Kyoto University

ATP-dependence of ABCA1-mediated cholesterol efflux and ABCA1-apoA-I interaction

11. Maiko Iwai Laboratory of Cellular Biochemistry, Division of Applied Life Sciences, Graduate School of Agriculture, Kyoto University

Analysis of the function of a new ABC protein ABCA13

12. Yasuhisa Kimura The laboratory of Cellular Biochemistry, Division of Applied Life Sciences, Graduate School of Agriculture, Kyoto University

Mechanism of multidrug recognition by MDR1 - cholesterol fill-in model

13. Michinori Matsuo The laboratory of Cellular Biochemistry, Division of Applied Life Sciences, Graduate School of Agriculture, Kyoto University

Sphingomyelin-dependence of cholesterol efflux mediated by ABCG1

14. Nobuhiro Morone Department of Ultrastructural Research, National Institute of Neuroscience, National Center of Neurology and Psychiatry

Caveolae and actin-based membrane skeleton in adiopocyte differentiation of the mouse embryonic fibroblast

15. Kazunori Kawasaki Research Institute for Cell Engineering, National Institute of Advanced Industrial Science and Technology
Quick-freezing-replica of Na^+/K^+-ATPase

16. Takeshi Nomura ICORP/SORST, Cell-Mechanosensing, JST
Interaction between the cytoplasmic and transmembrane domains of the mechanosensitive channel, MscS

17. Hiroaki Machiyama Department of Physiology, Nagoya University Graduate School of Medicine
Direct observation of structural changes in the bacterial mechanosensitive channel MscS during channel-opening

18. Kohki Fujikawa Department of Applied Bioorganic Chemistry, Gifu University
Development of an efficient synthetic method of ganglioside GM3 as a cell membrane component

19. Sadagopan Magesh Department of Applied Bioorganic Chemistry, Gifu University
Towards the selective inhibition of human plasma-membrane associate sialidase (NEU3) for therapeutic value

20. Abdu-allah Hajjaj Hassan Mohamed
Department of Applied Bioorganic Chemistry, Gifu University
Design, synthesis, and structural activity relationships of novel sialosides as CD22-specific inhibitors

21. Hiroaki Yokota The Tokyo Metropolitan Institute of Medical Science
Single-molecule observation of DNA/helicase interaction by novel microscopy

22. Yasuhiro M. Umemura ICORP-JST/Kyoto University
Both MHC class II and its GPI-anchored form undergo hop diffusion as observed by single-molecule tracking

23. Ken G. N. Suzuki ICORP-JST/Kyoto University
Microdomains and membrane-skeleton-induced compartments as studied by single-molecule tracking of GPI-anchored proteins and a phospholipid

24. Yuri L. Nemoto, Ikuko Koyama-Honda, Fumiyuki Sanematsu, Kazunori Ito, Yukiko Shimada, Miyako Yahara, Yoshiko Ohno-Iwashita, and Akihiro Kusumi
ICORP-JST/Kyoto University and
Research Team for Functional Genomics, Tokyo Metropolitan Institute of Gerontology
Single-molecule tracking and detection of transient association of cholesterol in the live-cell plasma membrane

25. Rishi S. Kasai ICORP-JST/Kyoto University
Monomer-dimer dynamic equilibrium of a GPCR; direct determination by a single fluorescent-molecule tracking

26. Rahul Chadda and Satyajit Mayor
National Center for Biological Sciences, Bangalore
ICORP-JST
To be announced

27. Takahiro K. Fujiwara, Shinji Takeuchi, and Takaaki Mizushima
ICORP-JST/Kyoto University and Photron Limited
Ultrasensitive high-speed camera system and its application to single-molecule imaging in the plasma membrane

28. Andor Co., Ltd.

29. Nihon Millipore K.K.
ADVANCING LIFE SCIENCE TOGETHER(TM)

30. TAKARA BIO INC.

31. Funakoshi Co.,Ltd.

32. New England Biolabs Japan, Inc

33. NIKON INSTECH CO., LTD.

34. nacalai tesque

35. ORIENTAL GIKEN INC.

36. Thermo Fisher Scientific K. K.