

The 9th MEMBRANE RESEARCH FORUM

March 15 - 17, 2006

Hotel Fujita Kyoto

Sponsored by:

Membrane Mechanisms Project, ICORP
Mechanotransduction by Nano- and Micro-scale Superamolecular
Complexes Project, SORST
Strategic International Cooperative Program
of Japan Science & Technology Agency (JST)

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Center of Excellence for Research and Education
on Complex Functional Mechanical Systems

The Aim of The 9th Membrane Research Forum

We welcome everybody who is participating in this forum, and in particular keynote speakers, Drs. Wonhwa Cho, Roger Goody, John H. Hartwig, Michiyuki Matsuda, Narla Mohandas, Ian Prior, and Ken Ritchie. It is a 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 aim of this membrane research forum. First of all, 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.

One of the points of emphasis in this year's forum is "new imaging technology", from single molecules to the cellular network, with focuses on the cell membrane.

A second point which this Membrane Research Forum features is the "interactions between membranes and the cytoskeleton". Since many cellular functions are carried out by the collaborative action of these structures, and since the formation, integrity, and traffic of membranes strongly depend on the cytoskeleton, knowledge of these interactions will be essential for us to understand membrane functions.

The third important point is "membrane domains". Here, this term is used in a very broad sense, covering non-random assemblies of membrane molecules that may exhibit a wide range of sizes and lifetimes of assembly. 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 domains and the apical membranes of epithelial cells, on the other hand. In addition to these two extreme cases, this year's forum is featuring something between these two extremes, namely, membrane raft microdomains.

Traditionally, we paid special attention to signal transduction. This year, we emphasize signaling based on lipids and small G proteins, which is the fourth feature of this year's forum.

Our traditional belief that such a forum must be like a fun party continues: we try to promote discussions during the scientific sessions and personal interactions during intermissions and parties, over dinner tables, or through the nightlife.

Since we have many repeaters to attend this forum, we now feel pretty confident that participants are already quite knowledgeable to the area included in this forum. Therefore, since the 7th Forum, normal presentations are extended to 15 min with the following 5 min saved for discussion. However, we ask the speakers to make their presentations interesting to the participants who are working in areas remote from the subject matter of the talk.

Jiro Usukura, Masahiro Sokabe, and Akihiro Kusumi
Organizers

March 15 13:00 - 17:50

Welcome to the Ninth Forum

13:00 - 13:10

Akihiro Kusumi JST-ICORP / Kyoto University
Opening statement

Keynote Lecture 1 13:10 - 13:50 Chair: Ian Prior

Roger Goody Max-Planck Institute for Molecular Physiology
The structural and mechanistic basis for recycling of Rab proteins in vesicular transport

Seminar 1: 13:50 - 14:30 Chair: Toyoshi Fujimoto

Hideji Murakoshi JST-ICORP / Kyoto University
Single-molecule imaging analysis of Ras activation in living cells

Takeshi Kobayashi Nagoya University Graduate School of Medicine
Single molecule imaging of Ras-Raf signaling facilitated by Ras-scaffolding protein, SUR-8

Coffee Break 14:30 - 14:50

Keynote Lecture 2 14:50 - 15:30 Chair: Roger Goody

Michiyuki Matsuda Research Institute for Microbial Diseases, Osaka University
Spatio-temporal regulation of phosphoinositides as visualized by FRET-based probes

Keynote Lecture 3 15:30 - 16:10 Chair: Hitoshi Yagisawa

Wonhwa Cho University of Illinois at Chicago
Expanding roles of lipids in cell signaling and membrane trafficking

Coffee Break 16:10 - 16:30

Seminar 2: 16:30 - 17:50 Chair: Nobuhiro Hayashi

Hitoshi Yagisawa Graduate School of Life Science, University of Hyogo
Coordinated intracellular translocation of PLC-delta with cell cycle

Toyoshi Fujimoto Nagoya University Graduate School of Medicine
Fine localization of membrane lipids captured by freeze-replica electron microscopy

Utako Kato Institute for Chemical Research, Kyoto University
Regulation of membrane phospholipid dynamics and its role in cell size control

Hidetoshi Kotera Kyoto University Graduate School of Engineering
Micro TAS for measuring cell properties

17:50 - 20:00 Mixer at Nexus Restaurant (see the maps on the last pages)

Please get together in the lobby area after the last talk by Dr. Kotera.

We will walk to the restaurant (10-15 min). Please try to make a tight group.

This restaurant is difficult to find once you are lost.

Welcome Speech

Jiro Usukura Organizer
Graduate School of Medicine, Nagoya University

20:00 - 22:00 Tour of Kusumi Lab

Cabs will leave at 20:00. It takes about 10 min to the lab.

If you are interested, please sign up at the reception during the meeting or the party.

March 16 9:00 - 18:50

Keynote Lecture 4 9:00 - 9:40 Chair: Makoto Kinoshita

Narla Mohandas New York Blood Center
New insights into structure and function of red cell membrane skeleton

Coffee Break 9:40 - 10:00

Keynote Lecture 5 10:00 - 10:40 Chair: Jiro Usukura

John H. Hartwig Brigham and Women's Hospital, Harvard Medical School
Role of the membrane skeleton in platelet production/function

Seminar 3: 10:40 - 11:40 Chair: Narla Mohandas

Jiro Usukura Nagoya University Graduate School of Medicine
New cryo-electron microscopic technique for observing membrane cytoskeleton

Makoto Kinoshita Kyoto University Faculty of Medicine / PRESTO, JST
Emerging roles of submembranous septin scaffolds in terminally differentiated mammalian cells

Kenji Yasuda Graduate School of Arts and Sciences, The University of Tokyo
Adaptation and inheritance of epigenetic information stored on the cell membranes, components and their geometric localizations

Lunch 11:40 - 13:00

Keynote Lecture 6 13:00 - 13:40 Chair: Toshihide Kobayashi

Ian Prior University of Liverpool
Probing microdomain organisation and roles in cell signalling and viral budding

Coffee Break 13:40 - 14:00

Seminar 4: 14:00 - 15:20 Chair: Ken Ritchie

Ikuko Koyama-Honda JST-ICORP / Kyoto University
Transient interlayer interactions of lipid-anchored receptors and signaling molecules in the cell membrane: detection by simultaneous two-color, single-molecule tracking

Yuichi Takakuwa Tokyo Women's Medical University
Involvement of raft in the signal transduction

Tomohiro Kurosaki RIKEN Research Center for Allergy and Immunology
Action mechanism of an adaptor molecule, CARMA1, in B lymphocyte activation

Nobuhiro Hayashi Institute for Comprehensive Medical Science, Fujita Health University
Dynamic interactions between myristoylated proteins and biomembranes regulated by crosstalks of intracellular signal transduction systems

Coffee Break 15:20 - 15:40

Seminar 5: 15:40 - 17:00 Chair: Wonhwa Cho

Masaki Fukata National Institute for Longevity Sciences, Laboratory of Genomics and Proteomics
Synaptic function regulated by PSD-95 palmitoylating enzymes

Kozo Kaibuchi Nagoya University Graduate School of Medicine
Roles of Numb in polarized endocytosis of integrin during cell migration

Yasushi Hiromi National Institute of Genetics, ROIS
Sub-axonal membrane compartments in neuronal development

(moved up from Seminar 6)

Kohji Kasahara Tokyo Metropolitan Institute of Medical Science
Translocation of activated heterotrimeric G protein $G\alpha$ to ganglioside-enriched detergent-resistant membrane rafts in developing cerebellum

17:00 - 18:50 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 - 22:00 Walking Tour "Hanatohro" (花灯路 in Japanese)

If you are interested in this tour, please come to the lobby area at 19:00. We will walk to the Shohren-in/Chion-in area as a group, and then you will be on your own to explore the nice strolling path through Kiyomizu temple, lined with many small lanterns (Hanatohro, which make it difficult to be lost). You will find many small restaurants and souvenir stores on the path. Kiyomizu temple is famous for its great wooden stage built on a small cliff. It will be open till 22:00, but you will have to be admitted by 21:30.

March 17 9:00 - 16:40

Keynote Lecture 7 9:00 - 9:40 Chair: Katsumi Matsuzaki

Takashi Saito RIKEN Research Center for Allergy and Immunology
Microclusters and microdomains in T cell activation

Coffee Break 9:40 - 10:00

Seminar 6: 10:00 - 11:00 Chair: Yasushi Hiromi

Katsumi Matsuzaki Graduate School of Pharmaceutical Sciences, Kyoto University
Lipid rafts as a platform of Alzheimer's amyloid fibril formation

Toshihide Kobayashi Lipid Biology Laboratory, RIKEN
Cholesterol controls cell density-associated endocytosis in rab11 dependent manner

Hideo Akutsu Institute for Protein Research, Osaka University
A new model for coupling of H⁺ translocation and c-ring rotation in ATP synthase

Lunch 11:00 - 12:40

Keynote Lecture 8 12:40 - 13:20 Chair: John H. Hartwig

Masahiro Sokabe Nagoya University Graduate School of Medicine / SORST, JST
Cytoskeleton can work as a mechanosensor

Coffee Break 13:20 - 13:40

Keynote Lecture 9 13:40 - 14:20 Chair: Masahiro Sokabe

Ken Ritchie Purdue University
Structure and interactions in cell membranes

Seminar 7: 14:20 - 15:20 Chair: Amit Chattopadhyay

Takahiro Fujiwara JST-ICORP / Kyoto University

Hop diffusion of transmembrane proteins and lipids in various cell types as studied by single molecule techniques

Tomomi Tani Research Institute for Electronic Science, Hokkaido University.

Single molecule analyses of the signaling and trafficking of nerve growth factor on the growth cone

Makio Tokunaga National Institute of Genetics / Research Center for Allergy and Immunology, RIKEN

Visualization of dynamics of T cell signaling, and molecular quantification and modeling of nuclear import using single molecule imaging in cells

Coffee Break 15:20 - 15:40

Seminar 8: 15:40 - 16:40 Chair: Takahiro Fujiwara

Amit Chattopadhyay Centre for Cellular and Molecular Biology, Hyderabad, India

Dynamic confinement of human serotonin_{1A} receptors in the plasma membrane induced upon cholesterol depletion

Kazunori Kawasaki National Institute of Advanced Industrial Science and Technology

Observation of Na⁺/K⁺-ATPase by quick-freezing-replica electron microscopy

Yuki Katanosaka Okayama University Graduate School of Medicine

The role of Na/Ca exchanger in cardiac hypertrophy and dysfunction

Closing

Masahiro Sokabe

Nagoya University Graduate School of Medicine / SORST, JST

Poster Session Program

March 16

17:00 - 18:50

Presentation Time **Odd Numbers** **17:00-17:50**
 Even Numbers **17:50-18:40**

Name

Affiliation

1. Motohide Murate RIKEN FRS
Asymmetric distribution of membrane lipids revealed by SDS freeze-fracture replica method
2. Kunihiro Iwamoto RIKEN FRS
Curvature-dependent recognition of phosphatidylethanolamine by duramycin
3. Kotono Murase RIKEN FRS
Heterogeneity of cholesterol domains in cell membranes
4. Satoshi Komaniwa and Keiko Udaka
Department of Immunology, Kochi Medical School
Raft associated presentation of MHC class II molecule guides thymocytes to the CD4 lineage
5. Ikuko Koyama-Honda JST-ICORP / Kyoto University
Single-molecule tracking of cholesterol monomers and clusters in the live cell membrane
6. Xiao-Yuan Shan JST-ICORP / Kyoto University
Quantitative analysis of the hop diffusion of lipid in the cell membrane
7. Yasuhiro Umemura JST-ICORP / Kyoto University
Single-molecule tracking of raftophilic molecules in the compartmentalized plasma membrane
8. Kenji Tanaka JST-ICORP / Kyoto University
Single molecule observation of the movement of saturated and unsaturated phospholipids on the cell membrane

9. Kenichi Suzuki JST-ICORP / Kyoto University
Creation of a transient raft-based signaling platform by engaged GPI-anchored receptors
10. Hirohito Nishimura JST-ICORP / Kyoto University
Improvement of single-molecule tracking by the development of new fluorescent silicon nanoparticles
11. Kokoro Iwasawa JST-ICORP / Kyoto University
Single fluorescent molecule tracking of MARCKS on the cytoplasmic surface of the cell membrane
12. Akihiro Shibata JST-ICORP / Kyoto University
Detection of Rac1 recruitment to focal adhesion by single fluorescent molecule tracking
13. Hideji Murakoshi JST-ICORP / Kyoto University
Single-molecule imaging analysis of Ras activation in living cells
14. Kazuhiro Aoki Department of Signal Transduction, Research Institute for
Microbial diseases, Osaka University
In vivo and *in silico* analyses of the dynamics of NGF-PI3K-Rac1/Cdc42 signaling networks during neuritegenesis of PC12 cells
15. Hye-Won Shin^{1,2}, Mitsuko Hayashi³, Pietro De Camilli³, Marino Zerial²
¹Graduate School of Pharmaceutical Sciences, Kyoto University; ²Max-Planck-Institute of Molecular Cell Biology and Genetics; ³Department of Cell Biology and Howard Hughes Medical Institute, Yale University School of Medicine
An enzymatic cascade of Rab5 effectors regulates phosphoinositide turnover in the endocytic pathway
16. Yohei Katoh, Yuko Yanagida, Hitoshi Imakagura, Kazuhisa Nakayama
Graduate School of Pharmaceutical Sciences, Kyoto University
Role of Tom1 family proteins in endosomal membrane traffic
17. Hiroshi Koga, Hye-Won Shin, Kazuhisa Nakayama
Graduate school of Pharmaceutical Sciences, Kyoto University
Dual interaction of Arfophilins/Rab11-FIPs with ADP-ribosylation factor and Rab11

18. ^{1,2}Ray Ishizaki, ¹Hye-Won Shin, ³Sanae M. M. Iguchi-Ariga, ²Hiroyoshi Ariga, and ¹Kazuhisa Nakayama

1 Graduate School of Pharmaceutical Sciences, Kyoto University

2 Graduate School of Pharmaceutical Sciences, Hokkaido University

3 Graduate School of Agriculture, Hokkaido University

AMY-1 is localized on the trans-Golgi network in association with brefeldin A-inhibited guanine nucleotide-exchange factor 2 (BIG2)

19. Masaki Wakabayashi Graduate School of Pharmaceutical Science, Kyoto University

Visualization of accumulation of native A β -(1-42) amyloids in living PC12 cell membranes

20. Masami Takeuchi, Hiroya Yamada, and Nobuhiro Hayashi

Division of Biomedical Polymer Science, Institute for Comprehensive Medical Science, Fujita Health University

Role of N-terminal myristoylation of HIVnef product in the onset of AIDS

21. Toru Umemura National Institute of Genetics, ROIS

Identification of a sub-axonally localized antigen

22. Takahiro Fujiwara JST-ICORP / Kyoto University

Regulation mechanism for the assembly of adaptor protein AP2 molecules in clathrin-coated pits as studied by single fluorescent molecule video imaging

23. Takahiro Fujiwara JST-ICORP / Kyoto University

Hop diffusion of transmembrane proteins and lipids in various cell types

24. N. Morone^{1,2,3}, T. Fujiwara², R. Kasai², H. Ike², K. Murase², S. Yuasa¹, Y. Kozuka¹, J. Usukura³, and A. Kusumi²

1. National Institute of Neuroscience, National Center of Neurology & Psychiatry

2. ERATO/ICORP-JST, Institute of Frontier Medical Science, Kyoto University

3. Department of Anatomy and Cell Biology, Nagoya University

Freeze-fracture and deep-etch electron tomography: 3D cell membrane architecture interfaced with the cytoskeleton

25. Akari Hagiwara¹ and Makoto Kinoshita^{1,2}

1. Biochemistry and Cell Biology Unit, HMRO, Kyoto University Graduate School of Medicine

2. PRESTO, Japan Science & Technology Agency

Light and electron microscopic analysis of the septin cytoskeleton in the mouse brain

26. Kuniko Sakamoto JST-ICORP / Kyoto University

Growth of cells on a solid surface

27. Yasuyuki Sawada Nagoya University Graduate School of Medicine

Analysis of gating mechanism of the E-coli mechanosensitive channel, MscL, using molecular dynamics simulation

28. Takeshi Nomura ICORP/SORST, Cell-Mechanosensing, JST

Voltage dependence of the adaptation in MscS occurs independent of the charged residues in the transmembrane domain

29. Nobuyasu Komi¹, Kayo Okawa¹, Yukihiro Tateishi², Hiroshi Inooka³, Masahiro Shirakawa², Toshimichi Fujiwara¹, Hideo Akutsu¹

1 Institute for Protein Reserch, Osaka University

2 Graduate school of Engineering, Kyoto University

3 Takeda Pharmaceutical Company Limited

The Structural Analysis of PACAP Bound to Lipid Membrane by Solid State NMR

30. Yu Ohsugi Hokkaido University, Research Institute for Electronic Science, Laboratory of Supramolecular Biophysics

Study of membrane bound protein dynamics by using total internal reflection fluorescence correlation spectroscopy

31. Yukiko Miyazaki NIKON INSTECH CO., LTD.

Real-time compensation of microscope focus drift

32. Takaaki Mizushima Photron Limited

Focuscope SV-200i, an ultrasensitive high-speed video camera fiberoptically coupled to an intensifier, represents a solution for low-light-level application such as single fluorescent molecule observations