

**The Fourteenth
International
Membrane Research Forum**

**Commemorating
the 41st Anniversary of
Singer and Nicolson's Fluid-Mosaic Model**

**Featuring
Meso-Scale Molecular Complexes and Domains
and their Functions in the Membrane**

15 – 17 March 2013

iCeMS Main Building, Kyoto University

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Welcome to The 14th International Membrane Research Forum

March 15, 2013

We would like to welcome everybody who is participating in this membrane research forum, particularly the speakers from abroad. It is our great pleasure to report that many scientists expressed considerable interest in this forum, and volunteered to present their research results.

This year's forum is for commemorating the 41st Anniversary of the Singer and Nicolson's fluid mosaic model, which formed our basic concept for virtually all biological membranes on Earth (we were to commemorate the 40th anniversary last year, but due to the time constraint we had, we could not make it). Such universality is comparable with that of the double-helical structure of DNA, although this is not recognized as widely as it should be. This suggests that the fundamental mechanisms for the various functions of biological membranes could essentially be understood by a set of simple principles based on their dynamic structures. Therefore, we hope to understand organizing principles of biological membranes and the general cellular strategies utilizing them for various membrane functions, which could be called the "membrane mechanisms".

Since the publication of this model, the structure and dynamics of cellular membranes, and their integration into membrane functions (membrane mechanisms) fascinated cell biologists, chemists, and physicists, and the membrane research has expanded greatly. With this forum, we are trying to provide a common platform for scientists from different research backgrounds who are working on various aspects of biological membranes. The aim is "synthesis" rather than specialization. We believe that the time is ripe for combining our forces together to elucidate meso-scale interactions in/on the membrane.

This year's forum again features meso-scale dynamic molecular complexes and domains and their functions in cellular membranes. Here, the meso-scale roughly represents the space scale between 3 and 300 nm, where key molecular complexes and interactions take place in cellular membranes. The meso-scale structures, including protein complexes and membrane domains, are considered important for membrane functions, such as signal transduction and membrane transport

We hope that you will enjoy this meeting and mingle with other scientists having very different backgrounds.

Executive Committee for the International Membrane Research Forum

Standing Committee Members

Jiro Usukura (Nagoya), Masahiro Sokabe (Nagoya), and Aki Kusumi (Chair, Kyoto)

Invited Committee Members for the 14th Forum

Michio Murata (Osaka), Takeharu Nagai (Osaka), and Taroh Kinoshita (Osaka)

WiFi Instructions in the iCeMS Main Building

SSID: mesodomain
Password: membraneforum

[Failed to get connected?]

Please try the following to initiate the "automatic proxy setting". Also go to the lounge area, where the connection works best.

Internet Explorer on Windows

1. Select the "tools" menu (a gear icon on recent IE) and click "Internet Options."
2. Click the "Connections" tab, and then "LAN settings".
3. Click to check "Automatically detect settings", and then "OK" twice.

Safari on Mac (10.6.x or later)

1. In System Settings, select "Network".
2. Click "AirPort" and then "Advanced".
3. Click the "Proxies" tab, check "Auto Proxy Discovery", and click "OK".
4. Click "Apply".

Safari on Mac (10.5.X or earlier)

1. In System Settings, select "Network".
2. Click "AirPort" and then "Advanced".
3. Click the "Proxies" tab, choose "Using a PAC file", and then enter the following URL "*http://wpad.kuins.net/proxy.pac*". Click "OK".
4. Click "Apply".

iPad

1. In the "Settings" menu, select "Wi-Fi".
2. Tap "Allow" next to "membraneforum".
3. Tap "Auto" in "HTTP Proxy".
4. Enter "*http://wpad.kuins.net/proxy.pac*" in the "URL" box.

March 15 11:30 - 16:40 – 21:30

Opening 11:30 - 11:40

Aki Kusumi iCeMS and Institute for Frontier Medical Sciences
Kyoto University

Keynote Lecture 1 11:40 - 12:20 Chair: Michio Murata

Ole Mouritsen MEMPHYS-Center for Biomembrane Physics
University of Southern Denmark

Active ion pumps and enzymes affect membrane dynamics and remodeling

Keynote Lecture 2 12:20 - 13:00 Chair: Kentaro Hanada

Robert Bittman City University of New York, Queens College

Synthesis and properties of inhibitors and probes of selected targets in sphingolipid metabolism

Coffee Break 13:00 - 13:20

Seminar 1: 13:20 - 14:40 Chair: Robert Bittman

Michio Murata Department of Chemistry, Graduate School of Science
Osaka University

Lipid rafts as nano-scale domains of sphigomyelin, solid-state NMR study

Hiromune Ando and Makoto Kiso

Department of Applied Bioorganic Chemistry, Gifu University
iCeMS, Kyoto University

Novel fluorescent ganglioside probes for single molecule imaging of raft domains

Yoshiki Yamaguchi RIKEN Structural Glycobiology Team

Glycan structure and interaction: from a 3D structural view

Koichi Furukawa Nagoya University Graduate School of Medicine

Regulation of membrane microdomains by glycosphingolipids

Coffee Break 14:40 - 15:00

Keynote Lecture 3 15:00 - 15:40 Chair: Wonhwa Cho

John Heuser iCeMS, Kyoto University
Department of Cell Biology & Physiology, Washington University
The role of cholesterol in controlling membrane dynamics

Seminar 2: 15:40 - 16:40 Chair: Koichi Furukawa

Kentaro Hanada Department of Biochemistry and Cell Biology
National Institute of Infectious Diseases
Molecular architecture of CERT for inter-organelle transport of ceramide at the ER-Golgi membrane contact sites

Shinobu Kitazume Disease Glycomics Team, RIKEN
How glycosylation regulates amyloid β production?

Jin-ichi Inokuchi Division of Glycopathology
Institute of Molecular Biomembranes and Glycobiology
Tohoku Pharmaceutical University
CD4 and CD8 T cells require different membrane gangliosides for activation

16:45 - 21:30 Optional Tours including Dinner (see the attached maps)

Starting as two separate tours, but they join at 19:19 at **Yasaka Shrine**, together going on **Higashiyama Hanatouro** (strolling in lantern-illuminated streets) to reach **Kiyomizu-dera Temple** (400 yen for admission; 1,500 m from Yasaka Shrine).

For Hanatouro, visit <http://www.hanatouro.jp/e/higashiyama/index.html>.

For Kiyomizu-dera, visit <http://www.kiyomizudera.or.jp/lang/01.html>.

For Yasaka Shrine, visit <http://web.kyoto-inet.or.jp/org/yasaka/english/index.html> and http://en.wikipedia.org/wiki/Yasaka_Shrine.

For general information of sightseeing in Japan, visit <http://www.japan-guide.com/>.

Tour A: Kusumi Lab 500-m walk

Dinner in the Kusumi lab. Demo-experiments by Takahiro Fujiwara, Koichiro Hirose, and Kenta Yoshida. Taxi to Yasaka shrine, joining Tour B.

Tour B: Shoren-in and Chion-in Temples 800-m walk

Dinner at Camphora restaurant of Kyoto University Coop. Taxi to Shoren-in, visiting two famous lighted-up temples before joining Tour A at Yasaka Shrine at 19:19.

<http://www.shorenin.com/english/>

<http://www.chion-in.or.jp/e/> and <http://en.wikipedia.org/wiki/Chion-in>

Admission fee: Shoren-in, 800 yen and Chion-in, 1000 yen

March 16 9:00 - 17:30 – 19:30

Keynote Lecture 4 9:00 - 9:40 Chair: Ken Ritchie

V. M. (Nitant) Kenkre Department of Physics
University of New Mexico

Theoretical framework for the description of signal receptor cluster aggregation in cells

Seminar 3: 9:40 - 10:20 Chair: Ken Ritchie

Takashi Taniguchi Graduate School of Engineering
Kyoto University

Rolled-rim formation in a two component vesicle with a single pore

Ziya Kalay iCeMS, Kyoto University

Kinetics of reversible dimerization in the plasma membrane

Coffee Break **10:20 - 10:40**

Keynote Lecture 5 10:40 - 11:20 Chair: Takahiro Fujiwara

Satyajit Mayor National Centre for Biological Science

Active organization of dynamic actin filaments at the plasma membrane provide a new paradigm for organizing membrane components

Seminar 4: 11:20 - 12:00 Chair: Satyajit Mayor

Masahiro Sokabe Department of Physiology
Nagoya University Graduate School of Medicine

Mechanotransduction by actin filaments is realized by tension dependent cofilin severing of actin filaments

Jiro Usukura Nagoya University

Spatial structure of peri-nuclear actin cytoskeleton

Lunch 12:00 - 13:00

Reserved Lunch at Restaurant Shiran
for Invited speakers from abroad and
other participants who signed up for this lunch

Keynote Lecture 6 13:00 - 13:40 Chair: Taroh Kinoshita

Wonhwa Cho University of Illinois at Chicago
Lipids as master regulators of cellular protein interactions

Coffee Break 13:40 - 14:00

Seminar 5: 14:00 - 15:40 Chair: Katharina Gaus

Rinshi Kasai Institute for Frontier Medical Sciences, Kyoto University
Dynamic monomer-dimer equilibrium as a general property of the class A GPCR: single-molecule imaging study

Ken Ritchie Physics Department
Purdue University
FepA and TonB mobility in E. coli membranes

Takahiro Fujiwara iCeMS, Kyoto University
Hop diffusion in the plasma membrane as detected by ultrafast single-molecule localization

Akihiro Shibata iCeMS, Kyoto University
Archipelago architecture of the focal adhesion and its formation mechanism: Elucidation by single-molecule tracking

Kenichi Suzuki iCeMS, Kyoto University
Transient GPI-anchored protein homodimers are units for raft organization and function

15:50 - 17:30 Poster Session and Snack

The program is attached at the end of this booklet.
Beer, sake, soft drinks, and snacks will be served.

15:50 – 16:40 Odd number poster presentation

16:40 – 17:30 Even number poster presentation

17:30 - 19:30 Reception

The volunteers of the present and past members of the Kusumi lab would like to personally invite all the participants of the Membrane Research Forum to this reception.

Welcome Speech

Masahiro Sokabe

Nagoya University Graduate School of Medicine

March 17 8:40 - 17:10

Keynote Lecture 7 8:40 - 9:20 Chair: Roger K. Sunahara

Daniel Choquet Interdisciplinary Institute for NeuroScience
UMR 5297 CNRS Université Bordeaux Segalen
Organization of synapses at the nanoscale

Seminar 6: 9:20 - 10:00 Chair: Daniel Choquet

Haruhiko Bito Department of Neurochemistry
University of Tokyo Graduate School of Medicine
Activity-dependent modulation of receptor dynamics at excitatory synapses

Akio Tsuboi Laboratory for Molecular Biology of Neural System
Nara Medical University
Time-lapse imaging of neuronal migration in the mouse olfactory bulb

Coffee Break 10:00 - 10:20

Keynote Lecture 8 10:20 - 11:00 Chair: V. M. (Nitant) Kenkre

Barbara A. Baird Department of Chemistry and Chemical Biology
Cornell University
Zooming in on Spatial Control of IgE-Receptor Mediated Cellular Responses

Keynote Lecture 9 11:00 - 11:40 Chair: Ole Mouritsen

Roger K. Sunahara University of Michigan Medical School
G protein-GPCR interactions: Structural Analysis of the intimate but platonic relationship

Seminar 7: 11:40 - 12:00 Chair: Ole Mouritsen

Kazumitsu Ueda iCeMS, Kyoto University
Mechanism of the generation of HDL, membrane meso particles, by ABCA1

Lunch 12:00 - 13:00

Reserved Lunch at Restaurant La Tour
for invited speakers from abroad and
other participants who signed up for this lunch

Keynote Lecture 10 13:00 - 13:40 Chair: Takeharu Nagai

Dai-Wen Pang College of Chemistry and Molecular Sciences, Wuhan University
Tracking single virions using quantum dots

Coffee Break 13:40 - 14:00

Seminar 8: 14:00 - 14:40 Chair: Dai-Wen Pang

Yoshie Harada iCeMS, Kyoto University
Development of a new fluorescence imaging technique using diamond nanoparticles

Takeharu Nagai The Institute of Scientific and Industrial Research
Osaka University
Revolutionary bioimaging with super-duper luminescent proteins

Coffee Break 14:40 - 15:00

Keynote Lecture 11 15:00 - 15:40 Chair: Jay T. Groves

Katharina Gaus University of New South Wales
Insights into the regulation of early T cell signaling with localization microscopy

Seminar 9: 15:40 - 16:20 Chair: Kenichi Suzuki

Toshihide Kobayashi Lipid Biology Laboratory, RIKEN
Protein probes for studying lipid domains

Taroh Kinoshita WPI Immunology Frontier Research Center and
Research Institute for Microbial Diseases
Osaka University
Regulation of GPI-anchored protein trafficking

Keynote Lecture 12 16:20 - 17:00 Chair: Barbara A. Baird

Jay T. Groves Howard Hughes Medical Institute
Department of Chemistry, UC Berkeley
Membrane signaling processes at the single molecule level

Closing of the Symposium
Jiro Usukura EcoTopia Science Institute, Nagoya University

Poster Session Program

March 16 15:50 - 17:30

Presentation Time

Odd Numbers **15:50-16:40**
Even Numbers **16:40-17:30**

Posters are listed in the alphabetical order of the first author's last name.

The company names rather than the presenter names are used for PR posters of corporate sponsors (in **Bold** characters). Note that the poster numbers of Bitplane and HAMAMATSU PHOTONICS K. K. are 47-48 and 49-50, respectively.

1. Bhat Hema Balakrishna Lipid Biology Laboratory, RIKEN
Binding of pleurotolysin A ortholog from *Pleurotus eryngii* to sphingomyelin and cholesterol-rich membrane domains
2. Rahul Chadda iCeMS, Kyoto University
Molecular dynamics and concentration in raft and boundary domains in actin-depleted plasma membrane vesicles as revealed by single-molecule imaging
3. Takahiro K. Fujiwara iCeMS, Kyoto University
Compartmentalization of the plasma membrane enhances molecular complex formation, oligomerization-induced trapping, and localized signaling
4. Mana Fukuda Kyoto University Graduate School of Agriculture
Establishment of expression vectors for human ABC proteins and analysis of subcellular localization
5. Peter Greimel Lipid Biology Laboratory, RIKEN
Revisiting the interaction of 10-N-nonyl acridine orange with cardiolipin
6. Nao Hiramoto-Yamaki iCeMS, Kyoto University
Ultrafast diffusion of a fluorescent cholesterol analog in compartmentalized plasma membranes
7. Rie Hirao Tsuruga Institute of Biotechnology, TOYOBO
Improvement of substrate specificity of fructosyl amino acid oxidase by using protein engineering method

8. Françoise Hullin-Matsuda Lipid Biology Laboratory, RIKEN
Limonoid compounds inhibit sphingomyelin biosynthesis by preventing CERT protein-dependent extraction of ceramides from the endoplasmic reticulum
9. Takafumi Ichikawa Div. of Applied Life Sciences,
Graduate School of Agriculture, Kyoto University
Interaction between vinculin and vinexin a plays a key role in sensing extracellular matrix stiffness
10. Takehiko Inaba Lipid Biology Laboratory, RIKEN
Transbilayer movement of sulfhydryl ceramide analogues in model membranes
11. Munenori Ishibashi Riken Quantitative Biology Center
Single-molecule Analysis of Integrin, LFA-1 in Lymphocyte
12. Masato Ishigami Lab. of Cellular Biochemistry, Div. of Applied Life Sciences
Graduate School of Agriculture, Kyoto University
Formation of lipid-rich domain by cholesterol transporter ABCA1 for HDL generation
13. Yuichiro Ishii Dept. of Neurochemistry
University of Tokyo Graduate School of Medicine
Deciphering the life cycle of AMPA receptors during spine morphological plasticity
- 14. Japan Laser Corporation: presented by Tadayoshi Nishi (Osaka office)
High performance diode lasers**
15. Rinshi Kasai Institute for Frontier Medical Sciences, Kyoto University
Dynamic monomer-dimer equilibrium as a general property of the class A GPCR:
single-molecule imaging study
16. Kazunori Kawasaki Kansai Center, AIST
Electron microscopic observation of keratinolytic protease complex produced and released from *Meiothermus ruber* H328
17. Makoto Kinoshita Dept. of Molecular Biology, Div. of Biological Science
Nagoya University Graduate School of Science
Immuno-EM 3D reconstruction analysis of the septin family GTPases which constitute the membrane skeleton in neurons and glia

18. Masanao Kinoshita ERATO Murata Lipid Active Structure Project
Graduate School of Science, Osaka University
Liquid/Liquid phase separation in DHSM/DOPC binary bilayers
19. Naoko Komura Gifu University
Development of Fluorescent Ganglioside Probes for Live Imaging of Lipid Rafts
20. Aiko Kondo iCeMS, Kyoto University
Complex binding-unbinding dynamics of a lectin galectin-3 on the cell surface as detected by ultrafast single-molecule tracking
21. Ikuko Koyama-Honda Dept. of Biochemistry and Molecular Biology
The University of Tokyo, Graduate school of Medicine
Temporal relationships among mammalian Atg proteins with regard to recruitment to the autophagosome formation site
22. Antti Lamberg Dept. of Chemical Engineering, Kyoto University
Interfacial tension of HDL and LDL-type lipid droplets calculated from coarse-grained molecular dynamics simulations
23. An-An Liu College of Chemistry and Molecular Sciences, Wuhan University
iCeMS, Kyoto University
Cooperative function of raft domains and actin skeleton utilized for anthrax toxin assembly and internalization: a single-molecule study
24. Michinori Matsuo Kyoto University Graduate School of Agriculture
Phosphorylation by protein kinase C stabilizes ABCG1
25. Shiho Minakata Nagoya University
Spatial structure of perinuclear actin
26. Nobuhiro Morone iCeMS, Kyoto University
Cavin/PTRF regulates caveolar endocytosis by forming "crescents" that girdle caveolae, stabilizes them in relatively flat conformations, and links them to actin-membrane skeletons (2)
27. Hideji Murakoshi National Institute for Physiological Sciences
Duration of CaMKII activation required for plasticity of dendritic spines revealed by light-inducible inhibitor

28. Ayaka Nagasato Div. of Applied Life Sciences
Graduate School of Agriculture, Kyoto University
PIP2-dependent distribution of vinculin to lipid rafts stabilizes vinculin at focal adhesions

29. Chieko Nakada Nikon Corporation, Instruments Company
Automated, non-invasive culture, and evaluation system for iPS cells under
differentiation process

30. Koichi Nakajo National Institute for Physiological Sciences
Modulation of cardiac voltage-gated KCNQ1 K⁺ channels by KCNE proteins

31. Hajime Ohnuki Div. of Applied Life Sciences,
Graduate School of Agriculture, Kyoto University
Characterization of substrate specificity of human ABCB6

32. OPTO-LINE, Inc.: presented by Teruaki Kaneko
Light Engine & Laser Multicolor Confocal System "MESSIA[®]- α "

33. Phtron Limited: presented by Yosuke Nagai (Osaka Branch)
**Ultrasensitive high-speed camera system for single-molecule imaging in the
plasma membrane**

34. Akihiro Shibata iCeMS, Kyoto University
Archipelago architecture of the focal adhesion: Membrane molecules freely enter and exit
from the focal adhesion zone

35. Koichiro Shirota Lipid Biology Laboratory, RIKEN
Distribution of sphingomyelin in model membranes studied by Raman spectroscopy

36. Kenichi Suzuki iCeMS, Kyoto University
Transient GPI-anchored protein homodimers are units for raft organization and function

37. Takuya Tajima Lipid Biology Laboratory, RIKEN
Transformation of phosphatidylethanolamine- and phosphatidylserine-containing
membranes by phospholipase C beta 1

38. Hui-Hui Tan Lipid Biology Laboratory, RIKEN
Spectroscopic evidence for the unusual stereochemical configuration of an
endosome-specific lipid

39. Yasuhiro Umemura Dept. of Neuroscience and Cell Biology
Kyoto Prefectural University of Medicine
ES cell-based evaluation system of circadian phenotypes in mammals
40. Taro Watanabe Kyoto University Graduate School of Agriculture
ABCG1 suppresses cholesterol synthesis by repression of HMG-CoA reductase activity
41. Toshimichi Yamada Dept. of Chemistry, School of Science, The University of Tokyo
Visualization of Single β -actin mRNA Using Fluorescence Reconstitution Technique
42. Toshiyuki Yamaguchi ERATO Murata Lipid Active Structure Project
Graduate School of Science, Osaka University
Detection of intermolecular hydrogen bond between sphingomyelins by solid state NMR
43. Neval Yilmaz Lipid Biology Laboratory, RIKEN
Real time observation of honeycomb-like assembly of sphingomyelin-specific toxin by high-speed atomic force microscopy
44. Akihiko Yoshimura Dept. of Microbiology and Immunology
Keio University School of Medicine
Pivotal role of innate immunity in ischemic brain injury
45. Hideaki Yoshimura Analytical Chemistry lab., Dept. of Chemistry,
School of Science, the University of Tokyo
Development of a fluorescent probe for live-cell imaging of endogenous mRNA
46. Yu Zhao Lab of Cellular Biochemistry, Div. of Applied Life Science
Graduate School of Agriculture, Kyoto University
Lipid Efflux Activities of ABCA1 and ABCB4 are Modulated by Membrane Environment

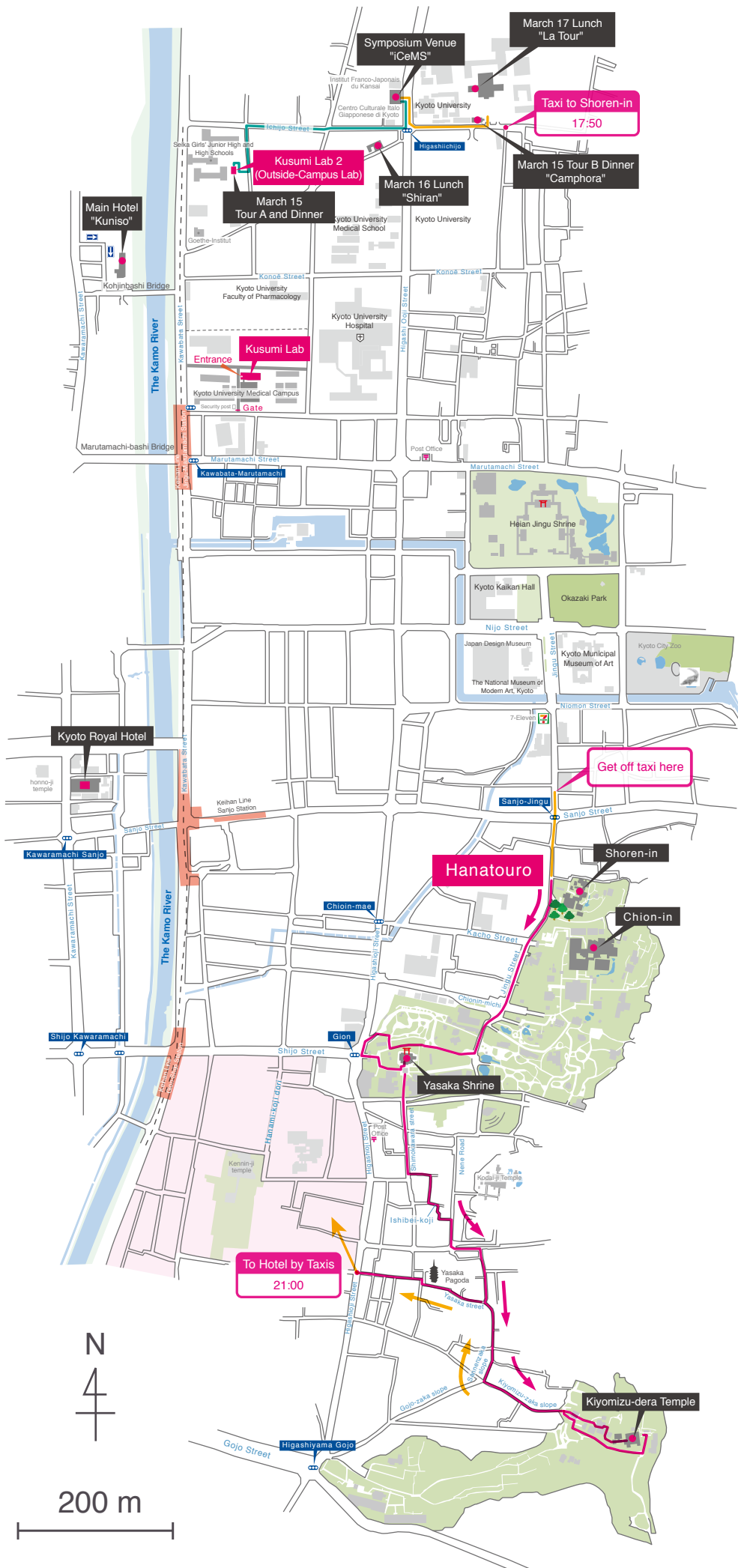
47/48. Bitplane: presented by Shigemitsu Koseki
Imaris (presented by Bitplane)

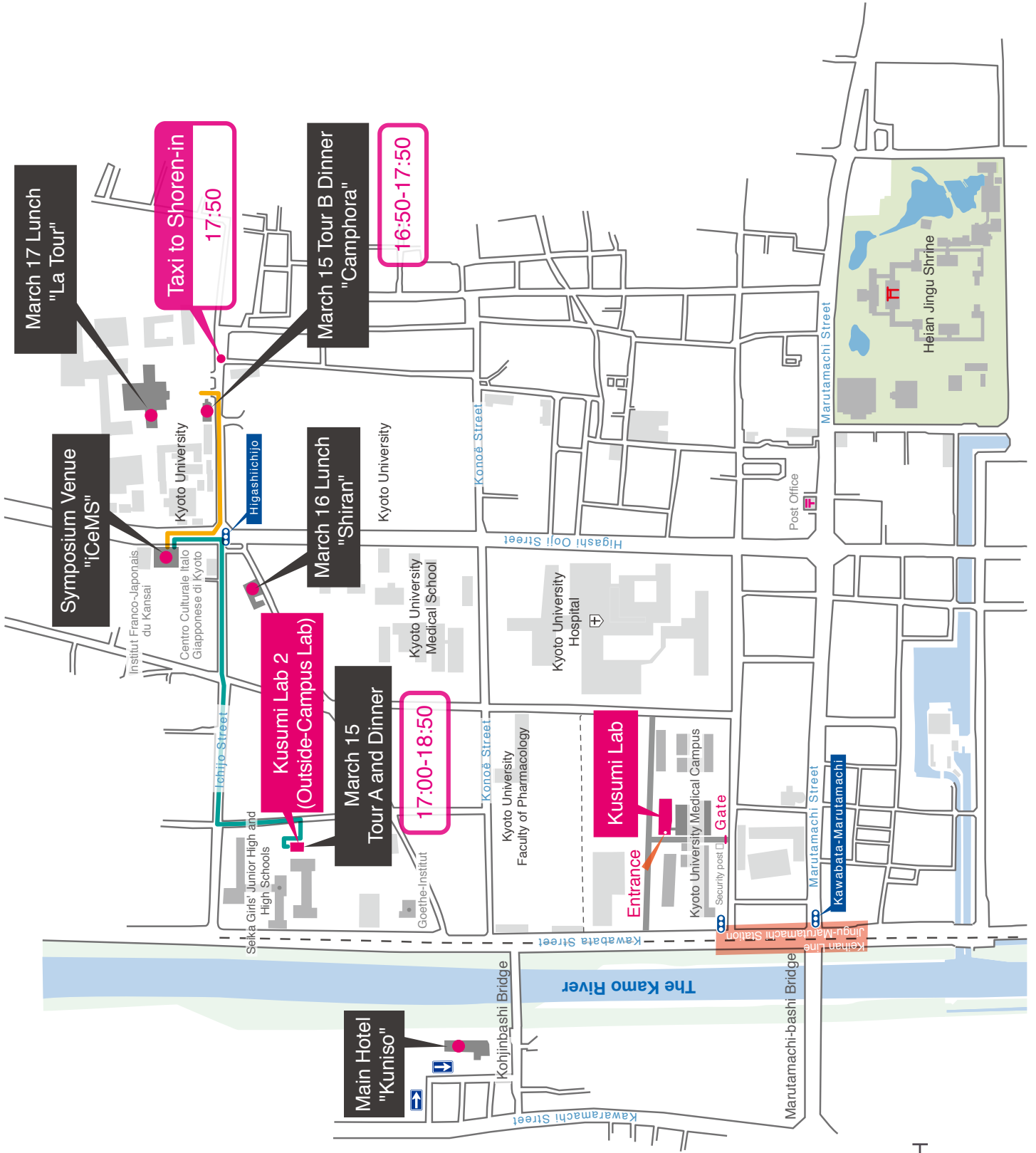
49/50. HAMAMATSU PHOTONICS K.K., System Division

Scientific Imaging And Imaging Application Group:

presented by Jiro Yamashita

GEN II sCMOS is the best choice for almost all fluorescent based microscopy imaging applications

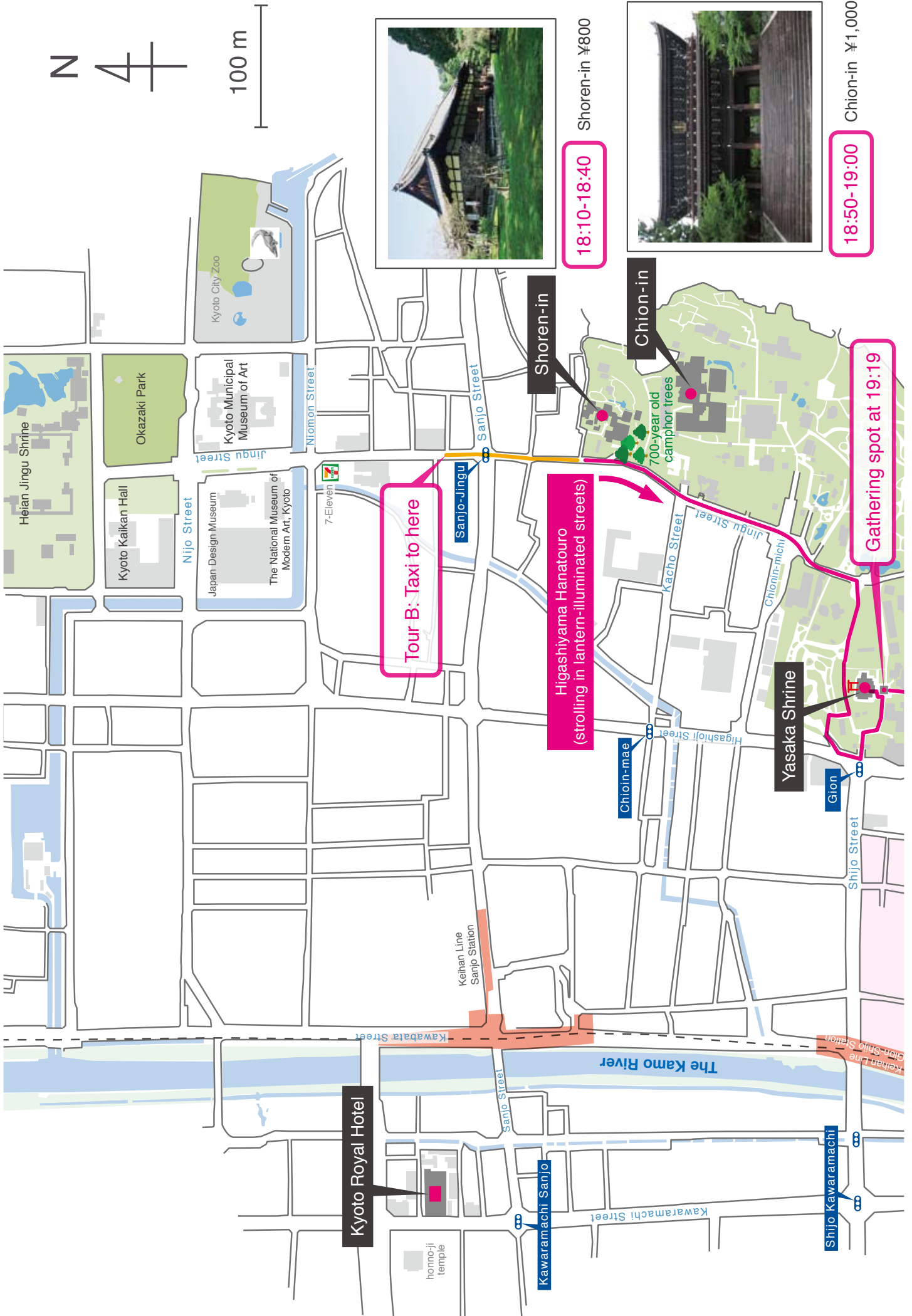




100 m



100 m



Tour B: Taxi to here

Higashiyama Hanatouro
(strolling in lantern-illuminated streets)

18:10-18:40

Shoren-in ¥800



Chion-in



18:50-19:00

Chion-in ¥1,000

Gathering spot at 19:19

Kyoto Royal Hotel

honno-ji temple

Kawaramachi Sanjo

Shijo Kawaramachi

Yasaka Shrine

Chioin-mae

Gion

Keihan Line Sanjo Station

Keihan Line Gion-Shijo Station

The Kamo River

Kawabata Street

Sanjo Street

Kawaramachi Street

Shijo Street

Higashioji Street

Kacho Street

Chionin-nichi

Nijo Street

Japan Design Museum

The National Museum of Modern Art, Kyoto

Kyoto Municipal Museum of Art

Kyoto Kaikan Hall

Okazaki Park

Heian Jingu Shrine

Kyoto City Zoo

Niromon Street

Sanjo-jingu

Sanjo Street

700-year old camphor trees

